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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.')

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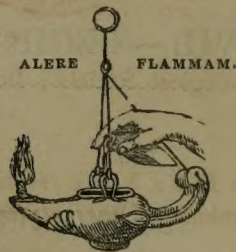
1851.

“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 eruditibus et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit.”—**LINNÆUS.**

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

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

J. TAYLOR, *Norwich*, 1818.



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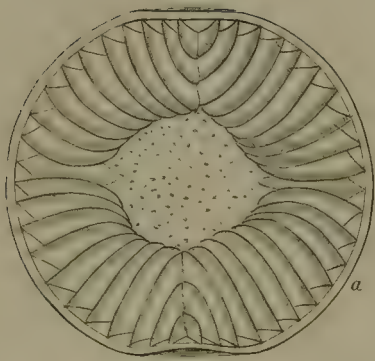
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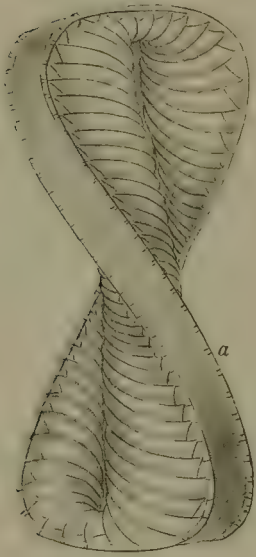
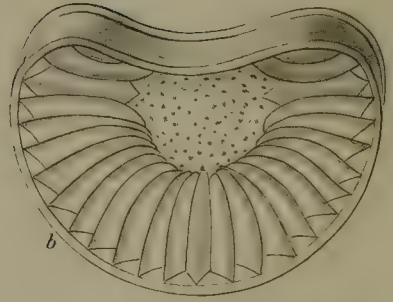
ERRATUM.

Pages 211 & 212, for *Chætostricha* read *Chætosticha*.

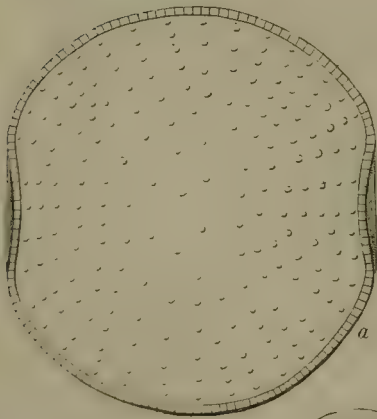
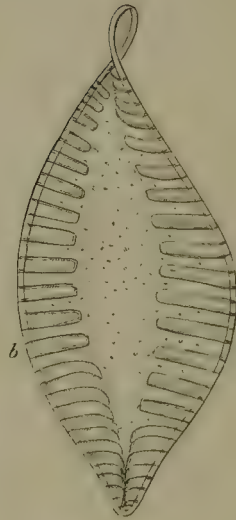




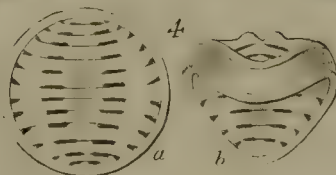
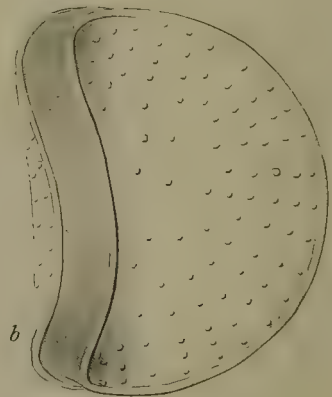
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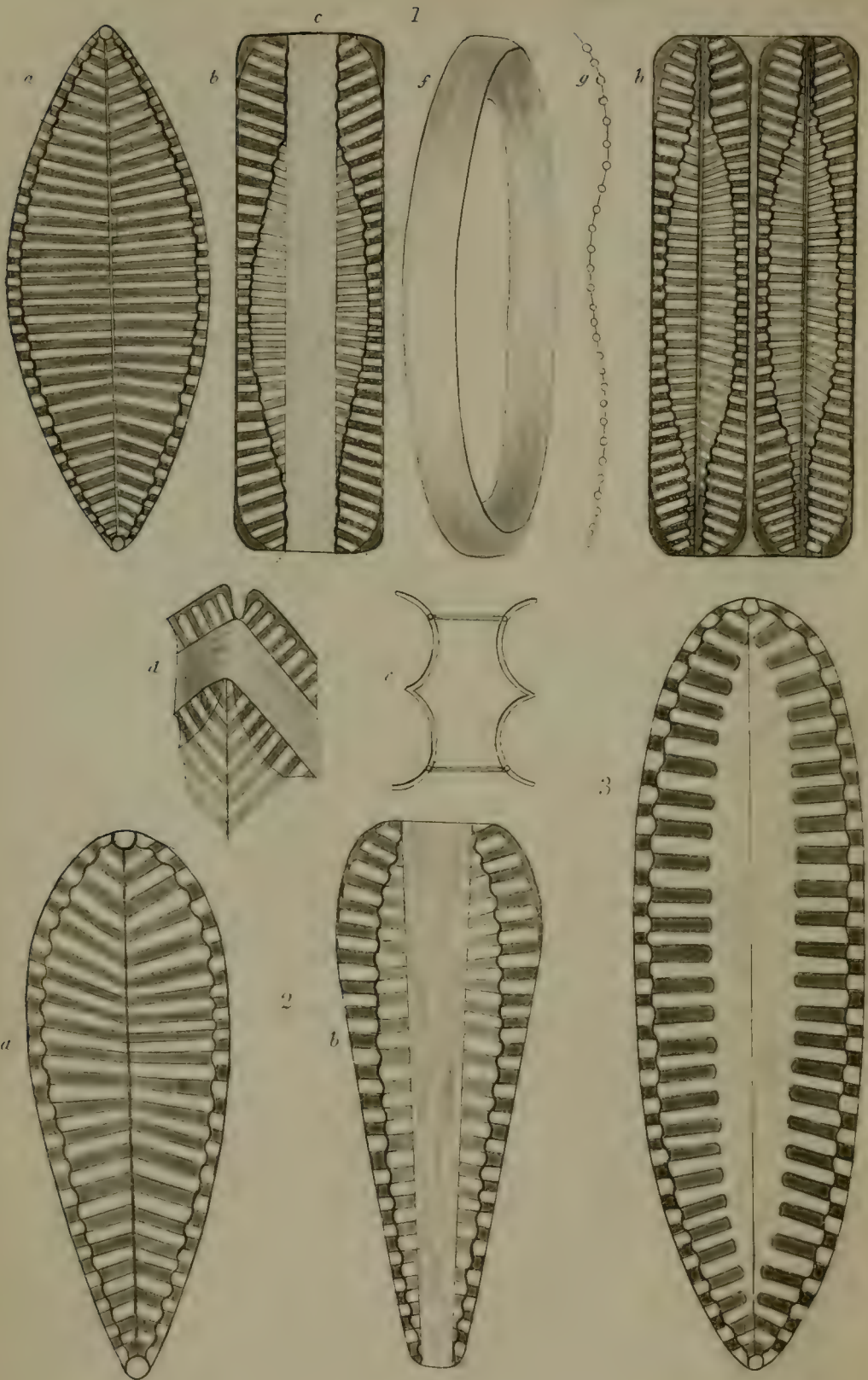


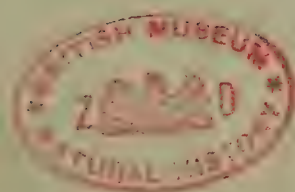
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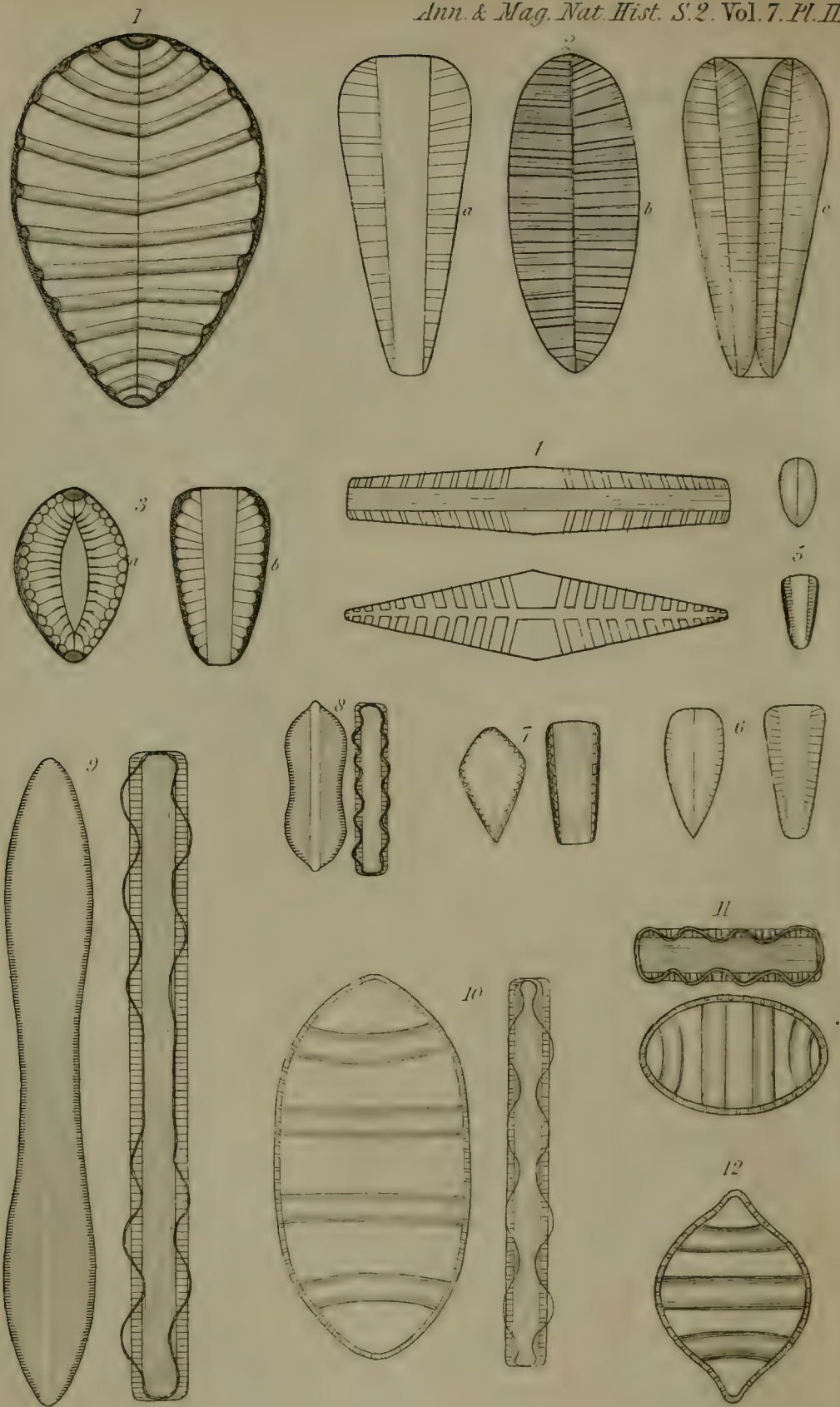


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THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

“..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes :
Pollice virgineo teneros hic 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. 37. JANUARY 1851.

I.—*Notes on the Diatomaceæ ; with descriptions of British species included in the genera Campylodiscus, Surirella and Cymatopleura.* By the Rev. WILLIAM SMITH, F.L.S.

[With three Plates.]

HAVING devoted some attention to the examination of our native *Diatomaceæ*, I have thought it might interest others engaged in similar inquiries, if I made a record in the pages of the ‘Annals’ of the species which have fallen under my notice, many of which have not hitherto been described as British, nor been included in any foreign work which I have had the opportunity of consulting.

A complete monograph of the family similar in extent and execution to the admirable volume on the ‘British Desmidiæ’ is much required, and it is to be hoped that his late sojourn on the continent may have so far recruited the feeble health of Mr. Ralfs, as to enable him at no distant day to undertake a work for which he is so eminently qualified. In the mean time the following notices may be acceptable, and serve to direct increased attention to a class of objects which have hitherto received from the English naturalist a much less careful examination than their beauty and variety would seem to challenge from the amateur,
Ann. & Mag. N. Hist. Ser. 2. Vol. vii. 21

and the important questions involved in their nature and functions demand from the physiologist.

Without attempting authoritatively to determine these questions, I shall accompany the descriptions I shall give with such notes on the structure, mode of growth, and general physiology of these minute organisms, as have been suggested by the repeated and careful examinations to which I have submitted them, and may seem to have a bearing on the discussions respecting their nature, as belonging to the animal or vegetable kingdoms.

This latter point is still a subject of controversy with the most distinguished writers upon the subject, and it is therefore important that the facts noted by independent observers should be carefully recorded, as it is only from the study and comparison of these facts that a theory can be established which shall meet the varied conditions in the life of these singular and beautiful structures, and secure the general assent of naturalists familiar with their forms.

The discoveries of Mr. Thwaites respecting the conjugation of the *Diatomaceæ*, as recorded in the 'Annals of Natural History' (vol. xx. pp. 9 & 343, also Second Series, vol. i. p. 16), seem to place the vegetable nature of these forms almost beyond a doubt. The process detailed and figured by Mr. Thwaites is perfectly analogous to the formation of the sporangium in the *Desmidiæ* and many of the filamentous Algæ, and may be considered as essentially the same as that which takes place in the higher tribes of plants, the contents of the pollen-tube conjugating with the contents of the ovule to form the embryo of the future seed.

It is of importance that the facts noticed by Mr. Thwaites should be shown to be of general occurrence, and that their existence be borne out by the concurrent experience of other observers. I have great pleasure in confirming nearly all the instances of conjugation in the *Diatomaceæ* mentioned by my acute friend, and shall have the opportunity in the course of these papers of recording several additional cases of the same process.

It is well known to the student of the *Diatomaceæ*, that increase by fissiparous or self-division is universal in the tribe. This mode of growth—for such a method of increase is strictly an extension of the individual and not a reproduction of the species—has also an important bearing on the question of the animal or vegetable nature of these organisms.

It seems to be a law of vegetable growth, that all increase in the plant, from the multiplication of the separated cells of the *Palmelleæ* and *Desmidiæ*, through the cells of the filamentous Algæ adherent only at their extremities, to the complex cellular and vascular tissues of the higher tribes, shall take place by a method analogous to fissiparous division, that is, shall com-

mence at a single parent cell, and go on by successive self-division of the cells formed from it. The invariable occurrence of this mode of growth in a tribe so extensive as the *Diatomaceæ* and embracing forms so varied, is surely a presumptive proof that these organisms belong rather to the vegetable than the animal kingdom.

The process of fissiparous or self-division in the *Diatomaceæ* is far more frequently to be seen than that of conjugation, and may indeed be detected on almost every occasion that these forms present themselves to our notice. Besides its bearing upon the question above alluded to, a clear understanding of this process is important as making us in some degree acquainted with the internal structure of the *Diatomaceous* frustule, and supplying an easy mode of distinguishing its different portions and aspects. I shall therefore give a concise description of the process of self-division, as it has appeared to me to take place in every instance which has fallen under my notice. This description will in some respects differ from that given by other observers, and involve views of the structure of these organisms not hitherto maintained; it is therefore right that I should state that its authority rests solely on personal observation.

A *Diatomaceous frustule* consists of a cell, the membrane of whose wall possesses the vital power of secreting an external coating of silix; this silix being deposited in two plates or valves, of varied form in the different species, and decorated with the most beautiful and diversified sculpturing, produced by the arrangement and relative position of series of lines, dots, depressions, furrows or ribs.

In stating that the siliceous valves are deposited *exterior* to a cell-membrane, I am at variance with the opinion held by most writers upon the subject, the general idea being, that the silix of the *Diatomaceæ* exists in intimate union with the membrane of the cell, whose wall is believed to consist of "cellulose penetrated with silica." Such is the view advocated by Meneghini in his treatise 'Sulla Animalita della Diatomee,' p. 20, a translation of which has been kindly furnished to me by Chr. Johnson, Esq., of Lancaster. In the same passage Meneghini alludes to the views of Nägeli, who, he alleges, contends that the silix is deposited *exterior* to an organic membrane. I have no means of ascertaining on what grounds Nägeli rests his opinion, which seems to coincide with the view I have adopted; but I am able to supply one important fact in its support, having in my possession numerous specimens of a *Stauroneis* (probably the *S. aspera*, Kütz.), in which the valves, after a slight maceration of the frustules in acid, have in part or wholly become detached from the cell-membrane, leaving a scar on its walls bearing the distinct

impression of the numerous and prominent valvular markings of this beautiful species.

But to proceed with the process of self-division. At first the siliceous valves are in close contact at their suture, as may be seen in Pl. II. fig. 1 *h*, and Pl. III. fig. 2 *c*, but their adherence is speedily disturbed by the dividing process which these minute organisms are constantly undergoing. The first step in this process is the gradual separation of the valves, an effect apparently produced by the expansion of the internal membrane. *Pari passu* with the retrocession of the valves, the cell-wall exposed between their edges is being covered with a deposit of silex, and the frustule now consists of two symmetrical valves, united by a plate of silex (Pl. II. fig. 1 *c*), which either forms a continuous ring (Pl. II. fig. 1 *f*) or consists of two portions united at the extremities of the valves. This plate with the underlying cell-wall, may for the sake of distinctness and future reference be termed the connecting membrane.

When the connecting membrane has been formed of sufficient width, the original cell, probably by the doubling in of its wall, becomes divided into two, and immediately secretes, at the line of division, two new siliceous valves, symmetrical with and closely applied by their edges to the original halves, and thus the self-division is complete, and two perfect frustules have been the result (Pl. II. fig. 1 *h*, & Pl. III. fig. 2 *c*).

In some cases, by the new or rather semi-new frustules immediately proceeding to repeat the process, the connecting membrane is thrown off and disappears; in others it remains for some time linking the frustules in pairs, as in *Melosira* and *Odontella*; and sometimes it is only partially torn away or absorbed, and unites the frustules successively formed in a zigzag chain by portions remaining attached to their angles, examples of which we find in *Diatoma* and *Isthmia*, &c.

Late writers have found in the process of self-division circumstances to fix the terminology applied to the Diatomaceous frustule, and use the words "primary sides" when speaking of those portions where the interposition of the new half-frustules occurs; the term "secondary sides" being applied to the general surfaces of the valves: others employ the words "front" and "lateral view" in corresponding senses. I shall adopt the latter terms, as more generally applicable; the "primary side," as employed by the writers alluded to, frequently including portions of the frustule which belong to the secondary surfaces, brought into view by the convexity of the valves. In truth, it is difficult to fix upon terms always applicable to forms so varied; I trust however ambiguity will be avoided by my adopting in the following descriptions the language hitherto

employed by Mr. Ralfs and other English writers, and using the term "front view" to denote the aspect of the frustule when the connecting membrane and valvular suture are turned towards the observer, the words "lateral" or "side view" being employed when the general surface of one of the valves is directed to the eye.

I have employed in my investigations a microscope constructed by Messrs. Smith and Beck, with a $\frac{1}{4}$ -inch object-glass, and eye-piece, giving together a power of 400 diameters. In some cases I have availed myself of an excellent $\frac{1}{8}$ th object-glass manufactured by Mr. A. Ross, giving with the above eye-piece a power of 880 diameters; and I have latterly employed Wenham's Parabolic Reflector, a new and ingenious instrument for securing a very oblique illumination of the object, supplied by Messrs. Smith and Beck, and which has revealed markings and aided in the determination of forms respecting which I should otherwise have felt a doubt; but when I have employed either of the latter means of investigation I have not failed to mention the fact, and the descriptions are otherwise to be regarded as depending upon a power of 400 diameters, the figures given being all drawn to this scale.

The frustules examined have been prepared either by exposure to a strong heat on talc, or by maceration in nitric acid. It is only after such preparation that the form and markings of the siliceous valves can be accurately determined, or the frustules satisfactorily mounted in Canada balsam for permanent observation. I have however noted by the letters *v. v.* appended to the specific descriptions, the circumstance of my having examined the frustules in a living state, and by *v. s.* when I have seen only the desiccated or prepared valves.

The first genus, the British species of which I proceed to describe, may be defined as follows:—

CAMPYLODISCUS, Ehr.

Valves equidistant (not concave). Frustules free, solitary, or when undergoing self-division, in pairs, disciform, saddle-shaped.

The species included under this genus may all be recognized by the characteristic bend or contortion of their surfaces, which gives to the frustule under certain aspects the semblance of a miniature saddle. Kützing has indeed removed from *Campylo-discus* and placed in *Surirella*, several species possessing this character, apparently for no other reasons than that the striæ or costæ are confined to the margins of the valves and are parallel, not radiate. When we consider that the striæ are often exceedingly difficult of detection, and that their direction merely cannot be

regarded as necessarily implying an important difference in internal structure, the circumstances alluded to do not seem a sufficient ground of exclusion, and it would perhaps be as well to allow *Campylodiscus* to include all those species with equidistant valves to which its very significant name can with propriety be applied.

Campylodiscus costatus, mihi. Valves orbicular, costæ distinct, radiate, about 44, centre of the disc smooth or minutely punctate. Average diameter of valve $\frac{1}{250}$ of an inch (*v. v.*).

A freshwater species. Living: river Froome near Dorchester, May 28, 1849. Bramley spring near Guildford, *J. R. Capron, Esq.*! Fossil, in deposit from Lough Mourne, co. Antrim, Ireland, described in 'Ann. Nat. Hist.' for February 1850. In deposit at Peterhead, Aberdeenshire, described by *Dr. Dickie* in 'Ann. Nat. Hist.' for August 1848!

This species approaches *C. radiosus*, Ehr., figured by Kützing in his 'Bacillarien,' tab. 28. fig. 12, but differs from it in the number of its costæ, which in *C. radiosus* reach seventy. The costæ in the latter are also, according to Kützing's figure, much shorter than in the present species.

In my paper on the Lough Mourne deposit I have named this species *C. noricus*, Ehr., and it may possibly be identical with that species; but in the absence of any figure I am unwilling to decide positively, and shall on this and other occasions prefer giving a new specific name rather than run the risk of creating confusion by trusting to a verbal description merely.

PLATE I. fig. 1 *a.* *C. costatus* with the disc of valve turned towards the eye; *b.* view showing the edge of frustule and connecting membrane.

Campylodiscus spiralis, mihi. Valves elliptical. Frustule twisted so as to present a spiral outline; costæ distinct, about sixty, parallel or slightly radiate; centre of the disc smooth or minutely punctate. Average length of valve $\frac{1}{170}$ of an inch, average breadth of ditto $\frac{1}{400}$ (*v. v.*).

Surirella spiralis, Kütz.? Bacill. p. 60. tab. 3. fig. 64; Species Alagarum, p. 34.

In a spring near Bramley, Guildford, mixed with *Navicula attenuata* and other Diatomaceæ, *J. R. Capron, Esq.*!

This beautiful species so closely resembles the figure of *Surirella spiralis* given by Kützing, that I have ventured to adopt his specific name. The frustule ordinarily presents an outline exactly resembling the figure 8 with flattened ends; this arises from the twist or contortion of the valves being so considerable that the edge of the frustule is found on the widest part, and is

therefore by gravity directed towards the surface of the glass and the eye of the observer. When the connection of the parts is dissolved by an acid, a single valve may often be detected with its disc uppermost, when the character of the costæ and the smooth portion in the centre of the valve may be readily detected. I am indebted to the discoverer of this species in this country for numerous specimens gathered by him in 1848, and again in 1850.

PLATE I. fig. 2. *a*. *C. spiralis* in its ordinary position; *b*, a detached valve.

Campylodiscus cribrus, mihi. Valves orbicular; disc marked with radiating lines of minute perforations, crowded towards the margin. Average diameter of valve $\frac{1}{240}$ of an inch (*v. v.*). In brackish water, shores of Poole Bay, 1848.

This is probably identical with *C. Echeneis*, Ehr., but I am without a figure to assist in its identification; and the words of the 'Species Algarum,' "disco medio lævi solido," do not apply to the present species, the perforations in ours extending over the entire surface, though more distant and somewhat scattered in the middle.

PLATE I. fig. 3. *C. cribrus*: *a*, surface of valve; *b*, view showing connecting membrane.

Campylodiscus parvulus, mihi. Valves orbicular; disc traversed by two parallel ridges; striæ about twelve, nearly parallel. Average diameter $\frac{1}{50}$ of an inch (*v. v.*). Poole Bay, 1848.

This species is readily distinguished by its minute size and the ridges on its valves, which are very prominent in certain positions of the frustule. It does not appear to have been noticed either by Kützing or Ehrenberg.

PLATE I. fig. 4. *C. parvulus*: *a*, disc of valve; *b*, view presenting the connecting membrane and valvular ridges.

SURIRELLA, Turp.

Valves concave, with a longitudinal central line and margins produced beyond the suture (winged). Frustules free, solitary, or when undergoing self-division, in pairs.

The concavity of the valves, their winged margins, and the longitudinal central line, which wants the central depression so conspicuous in the *Naviculeæ*, are characters which sufficiently distinguish *Surirella* from all other genera. I believe a careful examination of the loriceæ, when deprived of their coloured contents, would detect the presence of alæ in all the species. I have certainly recognized them in six, viz. *S. biseriata*, *splendida*, *striatula*, *gemma*, *fastuosa* and *craticula*, and I think there

are indications in the front view of the other three species I have figured to warrant the conclusion that these valvular appendages are more or less perfectly developed in their cases, though the minuteness of their frustules prevents their certain recognition. It is only on an end view of the valve that the alæ can be clearly seen; this is not often obtained; but I have several specimens of *S. biseriata* mounted in balsam showing the end view as figured in Pl. II. fig. 1 *d*, where these remarkable prolongations of the valves are singularly conspicuous. The section given in same plate, fig. 1 *e*, shows that the position of the wings is such, that they cannot be detected on a lateral view, as they stand up nearly at right angles to the plane of the valve.

The costæ so conspicuous in several species, as well as in *Campylodiscus costatus* and *spiralis*, appear to be caused by canals or tubes passing between the siliceous valves and the inner membrane of the cell; these canals communicate with the exterior by a series of perforations (Pl. II. fig. 1 *g*) along the suture or line where the connecting membrane unites with the valves. Accepting the Diatom as a vegetable organism, these tubes will be regarded as analogous to the intercellular passages, and the exterior perforations will perform the office of the stomates of the leaf. In *S. biseriata* and *splendida* the costæ or undulations caused by these tubes are continued to the margins of the alæ, and give a singularly beautiful appearance to the front view of the frustule, as seen in Pl. II. fig. 1 *b* & fig. 2 *b*.

Surirella biseriata, De Bréb. Frustule on front view linear oblong, extremities rounded; on side view elliptico-lanceolate, extremities acute; alæ large, costæ conspicuous. Average length of valve $\frac{1}{150}$ of an inch, greatest breadth of ditto $\frac{1}{400}$ of an inch (*v. v.*).

Navicula bifrons, Ehr. Infus. 1838. *Surirella bifrons*, Ehr. 1843; Kütz. Bacill. p. 61. tab. 7. fig. 10, tab. 28. fig. 29; Phy. Ger. p. 71. *Surirella biseriata*, De Bréb. Alg. Falaise, 1835; Hassall, Brit. Freshwater Algæ, p. 438. pl. 102. fig. 1; Kütz. Sp. Alg. p. 37.

Freshwater. Living: Wareham, 1847. Lewes, 1850. Fossil: Lough Mourne deposit, described in 'Ann. Nat. Hist.' Feb. 1850. Peterhead, Aberdeenshire, described by Dr. Dickie, 'Ann. Nat. Hist.' August 1848! In earth from Dolgelly, N.W., sent me by Chr. Johnson, Esq.!

This species is frequently to be met with in ditches and ponds mixed with *Oscillatorieæ*, &c.; when occurring alone it forms a brown stratum at the bottom of boggy pools. It is one of the most beautiful of the *Diatomaceæ*. Its elaborate form would seem to imply a structure more complex than that of a single cell, yet its mode of self-division is perfectly similar to that of the simplest of the tribe. In living specimens I have

also noticed a circulation of the granular contents analogous to that which is seen in many of the *Desmidiæ*, and in the cells of the higher orders of water-plants, a further proof that it is a single cell, and a presumptive evidence of its vegetable nature. With the aid of the parabolic reflector, faint striæ may be detected on the surface of the valves.

PLATE II. fig. 1. *S. biseriata*: *a*, side view of frustule; *b*, front view of ditto; *c*, connecting membrane; *d*, end view of frustule *a*; *e*, transverse section of empty frustule; *f*, silex of connecting membrane after maceration in acid; *g*, apertures of costal canals seen in front; *h*, view of the frustules on the completion of self-division.

Surirella splendida, Kütz. Frustule on front view oblong-ovate with rounded ends; side view ovate, with one end rounded and the other somewhat acute; alæ large, costæ distinct. Average length of valve $\frac{1}{140}$ of an inch, greatest breadth of ditto $\frac{1}{400}$ of an inch (*v. v.*).

Navicula splendida, Ehr. Infus. tab. 14. fig. 1. *Surirella splendida*, Kütz. Bacill. p. 62. tab. 7. fig. 9; Phy. Ger. p. 72; Sp. Alg. p. 39.

Freshwater. Living. "Brooks" near Lewes; Ashdown Forest, Sussex. Fossil: Lough Mourne deposit, very abundant; Dolgelly earth, plentiful.

Nearly the same in size as *S. biseriata*, but easily distinguished from that species by its ovate form both on the front and lateral view. The specimens from the Lough Mourne and Dolgelly deposits are so much larger that they might be taken for a different species, but intermediate forms are so often found, that I conclude the larger frustules are merely older and more developed examples; it is remarkable that in many of these latter the costal canals do not appear to reach the central line.

PLATE II. fig. 2. *S. splendida*: *a*. lateral view of frustule; *b*, front view of ditto; fig. 3. valve from Lough Mourne deposit*.

* Since this article has been in the printers' hands, I have met with the following species which appears to be undescribed:—

Surirella constricta, mihi. Frustule on front view oblong with rounded ends; outline on side view elliptico-lanceolate, each margin having a central sinus; alæ distinct; costæ numerous, delicate; medial line inflated in the centre. Average length of valve $\frac{1}{300}$ of an inch, breadth at constriction about $\frac{1}{800}$ of an inch (*v. v.*).

In brackish water near Lewes, 1850.

The front view of this species bears a close resemblance to the same aspect in *S. biseriata*, differing only in the appearance of the costæ, which in the present assume the character of striæ rather than ribs. On the side view the constriction of the margins, the inflation of the central furrow, and line-like appearance of the costæ, afford sufficiently distinctive characters. The superficial observer, regarding the side view only, might indeed confound this species with immature specimens of *Cymatopleura solea*, but a slight examination shows that the resemblance is one of outline merely.

Surirella striatula, Turp. Frustule on front view wedge-shaped with rounded extremities; side view broadly ovate; alæ small; costæ few, about fourteen, conspicuous. Average length of valve $\frac{1}{200}$ of an inch, greatest breadth of ditto $\frac{1}{300}$ of an inch (*v. v.*).

Navicula striatula, Ehr. Infus. tab. 21. fig. 15. *Surirella striatula*, Kütz. Bacill. p. 62. tab. 7. fig. 6; Phy. Ger. p. 72; Sp. Alg. p. 39.

In the sea or brackish ditches. Poole Bay, 1848; near Pevensey, Sussex; near Hull, *Mr. R. Harrison!* Rye, *Mr. Jenner!*

I have not been able to insert a front view of this species without excluding from the plate other more important figures; this aspect of the present species however presents no feature of importance, and the lateral view is sufficient to distinguish it from our other native forms.

PLATE III. fig. 1. *S. striatula*, lateral aspect of the valve.

Surirella craticula, Ehr. Frustule on front view oblong with centre slightly inflated; side view lanceolate with acute ends; alæ large; costæ few, distinct, divergent. Average length of valve $\frac{1}{200}$ of an inch, greatest breadth of ditto $\frac{1}{350}$ of an inch (*v. s.*).

Kütz. Bacill. p. 61. tab. 28. fig. 22; Phy. Ger. p. 71; Sp. Alg. p. 35.

Freshwater. Bramley near Guildford, *J. R. Capron, Esq.!* In a slide labelled "River Bann, Ireland," sent me by *Mr. Cocken!*

Approaches *S. biseriata* in its lateral aspect, and the regular development of its connecting membrane, but well distinguished from that species by its smaller size, fewer costæ, about twenty on each side of the central line, and by the absence of these from the middle part of the valve. The divergence of the costæ is also a peculiarity not found in the former species.

PLATE III. fig. 4. *S. craticula*: *a*, front view of the frustule; *b*, side view of ditto.

Surirella fastuosa, Ehr. Frustule on front view slightly wedge-shaped with rounded ends; side view ovate; alæ small; costæ few, apertures of the costal tubes large; medial line inflated in the centre. Average length of valve $\frac{1}{400}$ of an inch, greatest breadth of ditto $\frac{1}{600}$ of an inch (*v. v.*).

Kütz. Bacill. p. 62. tab. 28. fig. 19; Sp. Alg. p. 38.

Poole Bay, 1848. Coast of Sussex, 1850.

The large round openings of the costal canals, and the smooth central portion of the valve, give to this little species a peculiar and beautiful appearance. The valves are deeply concave.

PLATE III. fig. 3. *S. fastuosa*: *a*, lateral view of the frustule; *b*, front view of ditto.

Surirella gemma, Ehr. Frustule on front view wedge-shaped with rounded ends; side view ovato-elliptical; alæ large; costæ small, unequally distant; surface of valve distinctly striated. Average length of valve $\frac{1}{240}$ of an inch, greatest breadth of ditto $\frac{1}{800}$ of an inch (*v. v.*).

Kütz. Bacill. p. 62. tab. 7. fig. 9; Phy. Ger. p. 72; Sp. Alg. p. 38.

Common on the mud of tidal harbours, &c. Poole Bay, 1847. Belfast Bay, 1849. Shoreham, Seaford, and other places on the Sussex coast, 1850. Rye, *Mr. Jenner!* Shirehampton, near Bristol, *Mr. Thwaites!* Hull, *Mr. R. Harrison!*

The costæ, which in this species assume the appearance of lines, at once distinguish it from those preceding; the greater size of the frustule, the irregular disposition of the costæ, and their reaching to the central line, separate it from those which follow. The striæ may be made out without difficulty on the dry valve after burning or maceration in acid: with the parabolic reflector they are very conspicuous, and add much to the beauty of the object.

It was in connection with this species that Ehrenberg records the presence of cilia, extending from the apertures of the costæ, vibrating with rapidity and being extended or retracted at intervals! The presence of delicate hairs, apparently on all parts of the frustule, may often be detected, and I have noticed them on nearly every occasion when I have gathered this species, but in no case have I been able to perceive any motion in such hairs, and concluded, before meeting with Ehrenberg's remark, that they were merely a parasitic growth, the mycelium of some other Algæ. I have noticed similar appendages to other *Diatomaceæ*, but in every case devoid of motion.

PLATE III. fig. 2. *S. gemma*: *a*, front view of the frustule; *b*, side view of ditto; *c*, frustules in which self-division is just completed.

Surirella ovalis, De Bréb. Frustule on front view oblong, somewhat cuneate, with truncated extremities; side view ovate, slightly attenuated at the ends; alæ obsolete or very minute; costæ only visible at the margin of the valves. Average length of valve $\frac{1}{640}$ of an inch, greatest breadth of ditto $\frac{1}{1200}$ of an inch (*v. v.*).

Kütz. Bacill. p. 64. tab. 30. fig. 64; Sp. Alg. p. 38.

A freshwater species. Near Bristol, *G. K. Thwaites, Esq.!* "Brooks" near Lewes, 1850.

Surirella minuta, De Bréb. Frustule on front view wedge-shaped on side view elliptical or slightly ovate, with ends more or less

rounded; costæ marginal. Average length of valve $\frac{1}{1200}$ of an inch, greatest breadth of ditto $\frac{1}{2500}$ of an inch (*v. v.*).

S. ovata, Kütz. Bacill. p. 62. tab. 7. figs. 1, 2, 3, 4.

In streams. Near Corfe Castle, Dec. 1849. Lewes, 1850.

Surirella salina, mihi. Frustule on front view wedge-shaped, on side view ovate; the larger end rounded and the smaller more or less pointed; costæ marginal. Average length of valve $\frac{1}{600}$ of an inch, greatest breadth of ditto $\frac{1}{1200}$ of an inch (*v. v.*).

In salt-water ditches. Poole Bay, 1847.

The three preceding species are closely allied, and have little to distinguish them except their size and habitats. The first two are found in fresh water, and of these *S. ovalis* is much the larger, has the extremities of the valves less distinctly rounded, and presents a stouter and more oblong aspect on the front view. The last, *S. salina*, is a salt-water species, in form closely resembling *S. minuta*, but usually larger, more distinctly ovate, and with the smaller extremity of the valve in most of the frustules somewhat attenuated.

PLATE III. fig. 5. Front and lateral view of *S. minuta*; fig. 6. front and lateral view of *S. salina*; fig. 7. front and lateral view of *S. ovalis*.

CYMATOPLEURA (nov. gen.), mihi.

Valves undulated, margins not produced into alæ. Frustules free, solitary, or when undergoing self-division, in pairs.

I find it impossible to refer the species I am about to describe to *Surirella*, with which genus the two first have been united by Kützing and others. The undulated surface of the valves seems to indicate a peculiarity of structure sufficient to constitute a generic difference, and the absence of alæ and costæ implies a further diversity in the internal character which cannot be regarded as unimportant. I should have been glad to have adopted Mr. Hassall's genus "*Sphinctocystis*," but as this term refers merely to a peculiarity in the external form of one of the species, I am obliged to reject it also.

Cymatopleura solea, mihi. Frustule on front view oblong, linear; side view fiddle-shaped, symmetrically divided by a central sinus on each margin; surface of the valve with about six undulations, striated, with a smooth central line. Length of valve from $\frac{1}{300}$ to $\frac{1}{100}$ of an inch, breadth of valve in older specimens about $\frac{1}{10}$ th of the length (*v. v.*).

Navicula librilis, Ehr. *Surirella solea*, Kütz. Bacill. p. 60. tab. 3. fig. 61; Phy. Ger. p. 71; Sp. Alg. p. 34. *Sphinctocystis librilis*, Hassall, Brit. Freshwater Algæ, p. 436. pl. 102. fig. 3.

Common in ditches and ponds generally mixed with *Oscillatorieæ*.

This species varies very much in size, and in the form of the extremities of the valves, which are either attenuated, rounded and obtuse, or furnished with apiculi, as in Pl. III. fig. 8; the latter appendages however generally occur in the younger or at least smaller specimens.

PLATE III. fig. 9. *C. solea*, front and lateral view of a mature frustule; fig. 8. front and lateral view of a young (?) frustule.

Cymatopleura elliptica, mihi. Frustule on front view oblong, linear, on side view broadly elliptical; surface of the valve with about four undulations, obscurely striated. Length of valve from $\frac{1}{350}$ to $\frac{1}{200}$ of an inch, breadth of ditto about half the length (*v. v.*).

Surirella elliptica, Kütz. Bacill. p. 61. tab. 28. fig. 28; Sp. Alg. p. 37.

Widely but sparingly distributed in slow streams or ponds mixed with *Oscillatoria*. Living: river Froome near Dorchester. "Brooks" near Lewes. Bramley near Guildford, *J. R. Capron, Esq.*! Fossil: in Peterhead deposit, *Dr. Dickie*! Lough Mourne deposit; Dolgelly earth!

Very variable in size, the fossil specimens being usually twice as large as the recent frustules, but intermediate forms frequently occur. In Kützing's description and figure of *S. elliptica*, one extremity is represented as larger and rounder than the other; I have not been able to verify this peculiarity, but observe in the larger forms, and occasionally in the smaller, that both extremities of the valves are somewhat pointed.

PLATE III. figs. 10 & 11. *C. elliptica*, front and lateral views of fossil and recent frustules.

Cymatopleura Hibernica, mihi. Frustule on side view orbicular, with prominent, somewhat pointed extremities; surface of the valve with about three undulations, obscurely striated. Length of valve from $\frac{1}{370}$ to $\frac{1}{220}$ of an inch, breadth about $\frac{2}{3}$ of the length (*v. s.*).

In a slide labelled "River Bann, Ireland," from *Mr. Cocken* of Brighton!

Unfortunately none of the frustules occurring in the slide above mentioned present a front view of this interesting species. The single valves, which are numerous, are however so distinctly allied to the last species, that I do not hesitate to place them under the present genus.

PLATE III. fig. 12. *C. Hibernica*, side view of a valve.

The above must not be regarded as a complete monograph of the British species of the genera described, but be taken as a

record of individual research merely. If these imperfect notices should serve to draw the attention of microscopists to the study of the objects I have described, many additional species would no doubt be speedily added to the list.

Lewes, November 1850.

II.—*A Stratigraphical Account of the Section from Round Tower Point to Alum Bay, on the North-west coast of the Isle of Wight.*
By THOMAS WRIGHT, M.D.*

THE publication of Cuvier and Brongniart's celebrated 'Description Géologique des Environs de Paris' formed an important epoch in the history of geology in general, and of the tertiary system of the Isle of Wight in particular. The appearance of this work induced the late Mr. Thomas Webster, Secretary to the Geological Society of London, to make in 1813 a minute examination of the structure of the island, with the view of comparing the beds at Headon Hill with those described by the French naturalists in the environs of Paris. He adopted the classification of these authors, and divided the coast section at Alum Bay in a descending order into—

5. Upper freshwater formation.
4. Upper marine formation.
3. Lower freshwater formation.
2. London clay.
- 1: Sands and plastic clay.

In 1816 Sir Henry Englefield published his splendid work on the Isle of Wight, which contains numerous coast sections most accurately drawn by Mr. Webster, together with a series of letters by the same accurate observer written from the island whilst on a tour made expressly for collecting materials for Sir Henry's work.

In 1821 Mr. G. B. Sowerby visited Headon Hill, to collect fossil freshwater shells for the illustration of Férussac's great work on 'Land and Freshwater Mollusca,' and to obtain a regular series of the strata above the chalk. He published a criticism † on Mr. Webster's paper, in which he dissented from many of that author's descriptions, but especially from that part which related to the upper marine formation. He described what he supposed to be a mixture of shells belonging to freshwater and marine genera in this bed, and inferred therefrom its estuary and not its marine origin as stated by Webster. He pointed out

* Read to the Cotswold Naturalists' Club, Sept. 17, 1850.

† Annals of Philosophy, vol. ii. 1821, p. 216.

the existence of fossil shells and *Septaria* in the brown clay beneath the coloured strata.

In 1822 Prof. Sedgwick published* a paper on the geology of the Isle of Wight, in which he confirmed the general correctness of Mr. Webster's descriptions. He noticed that the fossils in the brown clay differed from those figured in Brander's '*Fossilia Hantoniensia*.' He described the tertiary strata on the north side of the island, which he stated belonged to the lower fresh-water formation, and gave a sketch of the beds from Studland Bay to Hordle on the coast of Hampshire, which he compared with beds in the Isle of Wight.

In 1838 Mr. Bowerbank published a paper † on the section at Alum and White Cliff Bays, and gave measurements of the different beds exposed in these coast sections. He likewise showed that the rich shelly sands of Bracklesham Bay had their equivalents in the White Cliff Bay section.

In 1846 Mr. Prestwich published ‡ his valuable paper on the tertiary formations of the Isle of Wight, in which he drew a comparison between the beds at White Cliff and Alum Bays, and compared the relative ages of the English beds with those of the French tertiary system.

None of the works above cited contain an account of the section which forms the subject of our paper. This appears to be the more remarkable, as the analysis of the different beds composing it affords the best key to a knowledge of the true relations of the lacustrine series with the intercalated fossiliferous zones of estuary and marine shells. Indeed I cannot understand how a correct knowledge of these beds can be obtained in any other way. The fact that they have hitherto been studied at Headon Hill alone, is to my mind a sufficient reason why such a variety of opinions prevail regarding them.

With the view of settling to my own satisfaction the question "whether an upper marine formation actually existed," as the fact appeared doubtful from the way in which it had been alluded to by previous observers, I determined to study the beautiful coast section from Round Tower Point to Alum Bay, and take each bed in succession as it rose from the shore, measure its thickness and note its contents. By this means I hoped to ascertain the genera of shells that were naturally associated together in each of the beds, and thereby to arrive at a true solution of the problem. In this investigation I experienced much difficulty, from the extensive founders (or falls) that have taken place in different parts of the section, as well as from the varia-

* *Annals of Philosophy*, vol. iii. 1822, p. 329.

† *Trans. of the Geol. Soc. Lond.* vol. vi. Second Series, p. 169.

‡ *Quart. Journ. of Geol. Soc.* vol. ii. p. 223.

tions in the thickness of the beds in different parts of their course. This fact of local activity during the deposition of these strata forms an interesting feature of our English tertiary system.

It admits of demonstration in several of the minor groups, but becomes strikingly evident when we compare the section at White Cliff with that at Alum Bay, where the difference in thickness amounts to upwards of 300 feet in the entire series. This fact accounts for the difficulty experienced in making measurements of the same beds tally at different points, and therefore our figures must be received only as approximations to the truth. During the accumulation of these strata, irregular local action was going on at very short distances apart, as proved by the diversity which exists between our section and the equivalent beds in the Hampshire basin, and shows how necessary it is, in the study of our tertiary system, to multiply observations upon the individual beds in different parts of their course, and not to confine our observations to one section alone.

The beds may be classified into—

1. Lacustrine.
 - a. Upper freshwater.
 - b. Lower freshwater.
2. Estuary.
Intercalated with the above.
3. Upper marine.
4. Lower marine, divisible into—
 - a. Barton series.
 - b. Coloured sands and clays.
 - c. Bognor series.

The *lacustrine* strata contain the genera *Paludina*, *Lymnæa*, *Planorbis*, *Melania*, *Melanopsis*, *Cyclas*, *Potamomya*, *Unio*.

The *estuary* strata contain *Potamides*, *Melanopsis*, *Melania*, *Natica*, *Nerita*, *Neritina*, *Cyrena*, *Mytilus*, *Ostrea*, and *Serpulæ*.

The *marine* strata contain *Ancillaria**, *Voluta**, *Natica*, *Bulla**, *Murex**, *Cancellaria**, *Rostellaria**, *Fusus*, *Cytheræa**, *Psammobia**, *Maetra**, *Mytilus*, *Ostrea*, *Balanus**, *Serpulæ**.

I rarely found estuary shells mixed with the true lacustrine genera, but occasionally a few *Lymnææ* or *Paludinæ* were found in an estuary bed. *Cyrena* and *Potamides* seem to have been common to beds of estuary and marine origin; the true marine genera marked (*) are limited to the marine formations.

If the premises upon which the argument is based be correct, it follows that many changes of condition took place during the deposition of the lacustrine series, as there are several intercalations of estuary genera between the true lacustrine beds both in the upper and lower formations.

The transition from the lower freshwater to the upper marine is made by a series of beds containing estuary species, and the passage from the marine to the upper freshwater is in like manner made by several zones of estuary shells. The association of the genera in the manner described is very decided. I feel satisfied that the contrary opinion has arisen from observers having collected specimens from the foundered beds on the shore instead of from the strata *in situ*.

The beds rise very uniformly at angles varying from 1° to 5° to the horizon, and incline to the east. Their continuity is interrupted by four chines and one ravine: commencing from the north and proceeding southwards are the following chines, Lynch, Bramble, Colwell, and Weston. The ravine separates the Barton series at Alum Bay from the lower freshwater beds; down this gorge a pathway leads from the rabbit warren to the shore. The chines are formed by streamlets whose waters in their course to the sea have cut down the clays and marls to the beach.

The observer is supposed to walk from Sconce to Colwell and Tollands Bays along the shore, thence round Headon Hill to Alum Bay, and to study the beds as they rise from the shore and ascend into the cliff.

The strata appertaining to the upper freshwater formation around Sconce Point have experienced much disturbance and are in a state of ruin. The hill forms an uneven slope, and is much rent by the breaking up of the clays and marls of which it is composed; it is covered with grass and foliage almost to the water's edge.

From some blocks of limestone near the shore I obtained *Bulinus ellipticus*, *Paludina angulosa*, and *Planorbis*.

These fossils are denuded of their shell. The clays and marls that form the upper part of the hill above the Coast-guard station at Sconce Point contain freshwater shells in a fragmentary state.

No. 1. The first bed *in situ* is a band of blue clay which rises on the shore at a point nearly opposite to Hurst Castle, and where Worsley's Tower formerly stood. It exhibits many shelly laminae. *Potamomya plana* is in great profusion in this bed. It rests upon slate-brown, rusty, and variously coloured clays, in which *Paludina*, *Cyclas*, *Potamomya* lie in zones. It is inclined at an angle of about 2° , and measures about 15 feet. The line of elevation has been much disturbed, and the angles which the bed makes are various at different points; it disappears south of Cliff End.

No. 2. I regard as a brackish water series. It consists of
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bands of bluish or slate-coloured clays with zones of *Cyrena obovata* of large size; *C. cycladiformis*, *Potamides margaritaceus* in great profusion and perfection. It rises on the shore north of Cliff End, at a short distance from No. 1; its line of demarcation from that bed is well defined by the thick fossiliferous band of *Cyrena obovata*. I observed in this bed a few *Cytherea incrassata*. It ascends at angles from 5° to 10° , and runs out on the cliff north of Lynchen Chine; it measures upwards of 21 feet, and contains *Melanopsis fusiformis*, small *Serpula*, and a small-ribbed *Modiola* of the same species as that found at Hordle.

No. 3. Lymnæan limestone (No. 1); this rock contains hard nodules which fall out on the shore, and much oxide of iron. It is full of *Lymnæa* and *Planorbis*.

A ledge formed of this bed stretches across the Solent towards Hurst Castle. It rises on the shore at Cliff End, and blocks of it are seen along the strand, from which good specimens with their shells may be obtained. It measures about 3 feet, and is interstratified with bands of blue clay.

No. 4. Yellow sand rises at the south of Cliff End: its origin is concealed by the debris of the brackish series above. This bed is well seen in the cliff between Lynchen and Bramble Chines, and again at Warden Point.

It contains few shells, and measures under Long's House 24 feet. It attains its greatest development at Headon Hill, where it passes into a light-coloured calcareous rock, richly fossiliferous, with *Lymnæa* and *Planorbis* above, and small univalves and *Melania* below.

No. 5. Laminated sandy clays, with sandy seams between the layers of a slate colour, and containing much iron which stains the surface of the bed. They rise to the south of Lynchen Chine and pass out beyond Warden Point, underlying the yellow sand, and contain several fossiliferous seams. The following section is taken at Warden Point:—

Gray clay striped with fawn and red	4 feet.
Gray sand	1 foot.
Sand striped gray, blue and red	4 feet.
Slate-coloured clay, with a band of <i>Cyrena obovata</i> .	6 inches.

Potamomya plana is found in great abundance and perfection in this bed. The fossiliferous seams are confined to the upper and lower laminae. The lower strata contain many shells, and form a well-marked band between this bed and No. 6. As it passes through the cliff between Lynchen and Bramble Chines, it inclines at an angle of 1° . Between Bramble and Warden Point the angle increases to about 3° .

At Headon Hill this bed is very fossiliferous, and contains there *Cyrena obovata* in great profusion in a black clayey matrix with lignite and much vegetable debris.

From the sandy seams at Bramble Chine I collected many hazel-nuts in a good state of preservation.

No. 6. Underlying the *Potamomya* bed is a band of firm bluish green sand, tolerably compact. This appears to form the transition bed to the estuary series below it. It rises on the shore 1620 feet north of Bramble Chine, forms a prominent belt in the cliff, and in some places a ledge, by the foundering of the superincumbent clays and sands: measures about 3 feet, and is overlaid by laminated clay rich in *Potamomya*.

No. 7. Blue clay with few fossils, 3 feet.

No. 8. Bands of nodular ironstone resting on blue sandy clays; rises 55 paces south of No. 6, and runs out at Warden Point. Beautiful slabs of this bed from 4 to 5 inches thick lie along the shore, and in most of the cottages household specimens may be seen. The clays and nodules contain *Cyrena obovata*, *C. cycladiformis*, *Potamides margaritaceus*, *P. cinctus*, *Cytherea incrassata*; *Melanopsis*, *Nematoura*, as in the *Neritina* bed. This ferruginous bed measures about 20 inches.

No. 9. Gray mottled sands, without shells, 18 inches.

No. 10. Dark stiff tenacious clay. This is a very rich bed, and many of the shells which are of estuary origin are beautifully preserved.

It rises on the shore about 100 paces to the north of Lynchen Chine, is nearly horizontal for a considerable distance, and is much covered by debris, but is seen *in situ* beyond Bramble Chine. It is lost at Colwell and reappears in the cliff at Warden Point, passing out a short distance beyond.

I collected from this bed *Cyrena obovata*, *C. cycladiformis*; *Mytilus affinis*, in great abundance; *Ostrea*, two species; *Cytherea incrassata*, *Potamides margaritaceus*, *Melania muricata*, *M. fasciata*, *M. costata*, *Melanopsis fusiformis*, *Fusus labiatus*, *Nerita aperta*, very few of *Neritina concava*, and *Natica depressa*. It measures about 3 feet.

No. 11. A dark-coloured stiff clay, without shells; measures 18 inches, with a shelly band of blue clay 6 inches in thickness, containing the same genera and species as No. 10, with nodules of ironstone in some parts of its course. These two beds indicate an estuary condition during the period of their deposition.

No. 12. "The *Ostrea* bed" rises on the shore at the south side of Lynchen Chine, is much foundered at its origin, but is well seen *in situ* in the walls of Bramble Chine, in the escarpment south of that gorge, in the cliff at Warden Point, and at Alum Bay, high up on Headon Hill.

In Colwell Bay the foundering of this bed has produced three great masses of oyster-shells which project from the side of the cliff. At first sight they give the observer the idea that they were oyster beds wedged in between the Venus bed which they entirely obscure; but it is not so; they are in fact produced by the falling of the oyster band over the inclined face of the lower beds; the sandy matrix with the oyster-shells having fallen over in a semifluid state. The *Ostrea* bed measures from 18 inches to 2 feet in thickness. The shells are so closely packed together that perfect specimens are obtained with much difficulty.

Besides *Ostrea* of two new species in great abundance, I collected here *Mytilus affinis*, *Potamides margaritaceus*, *P. cinctus*, *Fusus labiatus*, *Balanus*, and *Serpula*.

No. 13. Laminated blue clay mottled with red, non-fossiliferous: 18 inches.

No. 14. "The Venus bed" rises on the shore 484 feet south of Lynchen Chine, and runs out on the cliff at Tollands Bay near the Coast-guard station. Between Weston Chine and the lower flank of the north side of Headon Hill, there has been extensive denudation. The Lymnæan limestone and the upper marine have been entirely removed. These beds reappear in Headon, and the Lymnæan limestone with its underlying beds form a fine bold mural wall, which stands out from amongst the ruins of the softer strata on the north side of that hill. The Venus bed reappears near the summit of the south-western escarpment of Headon Hill.

This interesting bed ought to be studied in Colwell Bay, where it is best developed, and from whence the finest specimens of its beautiful fossils are obtained. At the base of the Venus bed is a thin band of clay, containing *Psammobia compressa* in great perfection. The finest specimens are obtained at low-water mark, when a ground sea has removed the sand. Here likewise we find *Ostrea*, two species undescribed, in considerable abundance. Above the clay-band is the true upper marine or Venus bed; it consists of a slate-coloured siliceous sand mixed with clay. The shells, which are very abundant, lie for the most part on their sides, but I have found them inclined in all directions. This bed appears to have been a slow and tranquil deposit from sea water along a sandy shore. The shells are as perfect in all their parts as recent specimens, and the peculiar nature of the matrix has so preserved their colours, that one almost doubts the fact of their being fossil shells.

I collected from this bed the following shells:—

Actæon.

Ancillaria subulata, *Lam.*

Buccinum desertum, *Brand.*

Balanus reflexus, *Sow.*

— *unguiformis*, *Sow.*

Cancellaria muricata, *Wood.*

Cancellaria elongata, Wood.
Cerithium ———.
Corbula cuspidata, Sow.
Cyrena cycladiformis, Desh.
 ——— *obovata*, Sow.
Cytherea incrassata, Desh.
 ——— *obliqua*, Desh.
Fusus labiatus, Sow.
Lucina ———.
Mactra, new species.
Melania fasciata.
 ——— *muricata*.
Melanopsis ancillaroides.
 ——— *fusiformis*.
Mya angustata, Sow.
Natica depressa, Sow.
 ——— *epiglottina*, Lam.
 ——— *labellata*, Lam.
Nucula similis, Sow.

Nucula, new species.
Oliva, new species.
Ostrea, two new species.
Panopæa corrugata, Edwards.
Pleurotoma semicolon, Sow.
 ———, two new species.
Psammobia compressa, Sow.
 ——— *solida*.
Serpula corrugata, Sow.
 ———, new species.
Rostellaria rimosa, Brand.
Voluta spinosa? Sow.
 ———, new species, like *V. harpa*,
 Desh.

PISCES.

Teeth of *Squalus*.
 Teeth of *Myliobatis*.

The Venus bed measures from 7 to 8 feet in thickness: the lower half is a slate-coloured sand; the upper half in some parts of its course is ferruginous. It is from the lower zone that all the fine shells are obtained; those found in the upper zone are brittle and colourless.

The term "upper marine formation" is only strictly applicable to the oyster and Venus beds with the intercalated band of non-fossiliferous clay.

No. 15. The next series of beds are of estuary origin. They consist of alternations of sand and clay, with seams of *Potamides*, *Neritina*, *Melanopsis*, *Natica*, *Cyrena*, *Mytilus* and *Ostrea*. The following section gives the order of these deposits, which are well exposed in a break in the cliff beyond Long's Cottage:—Pea-green coloured sands with a thin band of *Cyrena obovata*, about 3 ft. Shelly band in a dark clayey matrix, containing *Cyrena obovata*, *Potamides margaritaceus*, *Melania muricata*, and *M. fasciata*, 4 inches. Gray, green, and yellow sands, no shells, 2 feet 4 inches. Shelly band in a dark clay containing *Cyrena obovata*, *Potamides* and *Ostrea*, 4 inches. Sandy clay striped gray, green and ochre, no shells, 2 feet 9 inches. Shelly band with a seam of lignite at the base and *Cyrena obovata* piled upon each other, 6 inches.

The origin of these beds on the shore is seen south of Bramble Chine, but it is much concealed by the ruin which has fallen upon them. The upper marine in Colwell Bay forms an undercliff, the wall of which is the Venus and oyster bed and upper estuary series, and its terrace, the ledge of Lymnæan limestone hereafter to be described. These fossiliferous bands have foundered much at Warden Cliff, where they run out. They reappear *in situ* in Headon Hill, and pass round into Alum Bay. I traced them into the western escarpment of Headon; the beds here are

very fossiliferous, and contain immense numbers of *Potamides ventricosus* and *Cyrena obovata*.

The shelly blocks on the shore containing these elegant shells are derived from the debris of these beds.

No. 16. "The Neritina bed." The origin of this bed on the shore is concealed by debris; it is seen however at low-water mark below Bramble Chine when a ground sea has cleared away the sand.

This bed is seen well *in situ* beneath the flagstaff at Cliff Cottage reposing upon the fossiliferous bands of No. 15. It inclines at an angle of about 2° . Here it is a rich fossiliferous seam about 18 inches in thickness, divisible into three shelly zones. The inferior zone contains *Potamides margaritaceus*, *P. cinctus*, *Melania muricata*, *Melanopsis minuta*, *M. fusiformis*, and myriads of *Nematura* of a new species.

The middle zone contains *Neritina concava* in great abundance, and in a high state of preservation, with all their delicate-coloured pencillings, like recent shells: along with these which characterize the bed, are, *Potamides margaritaceus*, *P. cinctus*; *Nematura*; *Melanopsis fusiformis*, *Serpula tenuis*, *Cyrena cycladiformis*; vegetable impressions and seeds of *Chara medicaginula*, and *C. tuberculata* (*Gyrogonites*).

The upper zone contains *Natica depressa*, *Mytilus affinis*, *Ostrea*, new species, and a profusion of *Cyrena obovata*.

The Neritina bed at Headon Hill is charged with lignite, black clay and vegetable remains, but I collected its characteristic fossils at the western escarpment.

No. 17. Blue sandy clay measuring from 4 to 9 feet? in thickness in different parts of its course, and containing fossiliferous seams in its upper and lower laminæ?

The upper shelly band contains *Cyrena obovata* and *Potamides margaritaceus*. In the lower layers, *Lymnæa longiscata* was observed to occur in a crushed state sparingly.

No. 18. Lymnæan limestone (No. 2) forms a conspicuous bed in this section. It rises on the shore about 390 feet north of Colwell Chine, and inclines at an angle of about 3° . It runs out on the cliff near the flagstaff of the Coast-guard station beyond Warden Point. It has been denuded from the cliff in the centre of Tollands Bay. It appears *in situ* at the north side of Headon, and with the underlying clays and sands forms the prominent mural band which runs nearly horizontal through the northern slope of that hill. At its southern escarpment, where it overlooks Alum Bay, it forms a well-defined bed. Its inclination here increases, and it is suddenly curved up together with the under- and the overlying beds to an angle of 20° , and soon after abruptly ceases.

This limestone band is not uniform in structure throughout its course. It is of a pale yellow cream colour in some places, dense and compact or light and porous in others. It varies in thickness from 3 to 6 feet, and its compact varieties are used for building purposes.

How Ledge is formed by this bed stretching under the Solent; and the rocks at Warden and Alum Point are foundered blocks of Lymnæan limestone. It is very fossiliferous throughout its entire course. The shells are beautifully preserved: as they drop out of the rock they leave cellular cavities; the interior of the shell being filled for the most part with a more spongy material than that which connects the individual fossils with one another.

It is impossible to describe the beauty of some of the rocks lying at Warden Point, which appear to be little else than a mass of freshwater shells cemented together by a calcareous matrix.

The elegant forms of the snow-white shells make a chaste contrast with the yellow rock in which they are imbedded. With a chisel and a light hammer the following specimens may be obtained in great perfection:—

Lymnæa longiscata.	Planorbis euomphalus.
— fusiformis.	— lens.
— columellaris.	— rotundatus.
— pyramidalis.	— obtusus.
— minima.	Bulimus ellipticus.
— maxima.	

I regard this bed as the uppermost of the lower freshwater formation.

No. 19. Fawn-coloured sandy clay, with bands of *Paludina unicolor* in the upper layers; the lower layers are not so fossiliferous: measures 6 feet.

No. 20. Bluish gray sands, no fossils: measures 3 ft. 6 inches.

No. 21. Blue clay with several seams of shells. *Paludina* and *Melania* are very abundant, and fine specimens of *Unio Solandri* are obtained in good preservation, together with bones of *Palæotherium* and *Trionyx*, and a profusion of small black seeds, *Carpolithes ovulum*, Brong., *C. thalictroides*, Brong. It rises south of Colwell Chine. A good section of the bed may be seen at Warden Point: measures 2 feet 6 inches.

No. 22. Striped clays, gray and bluish, with rich seams of shells, in which *Paludina* and *Melania* are most abundant: measures from 6 to 8 feet.

No. 23. Grayish white sand rises on the shore near Warden Point, passes through the upper part of Weston Chine, and is seen capping the hill south of that gorge; it reappears again beneath the Lymnæan limestone on the north side of Headon; here it

passes into a firm rock, and is seen *in situ* in the southern escarpment. It preserves the same angle of inclination as the Lymnæan limestone.

At its origin, the first 8 feet of this bed is a pure sand rock with thin seams of freshwater shells (*Paludina*, *Lymnæa*, *Cyclas*). Below this the bed contains large oblong nodules, chiefly composed of shells, mostly in a fragmentary state; from these I collected—

Paludina lenta.

Lymnæa longiseata.

— pyramidalis.

Planorbis euomphalus.

Planorbis rotundatus.

Melanopsis fusiformis.

Cyclas exigua.

The lower laminæ of this bed contain greenish-coloured sands full of *Paludina*. This bed changes its physical character in different parts of its course. In Headon Hill it is calcareous, and contains a few angular pebbles with two layers of hard siliceous nodules, one in the middle and the other at the bottom of the bed. It is here likewise distinguished by the same group of fossils. As it stretches across the Solent it forms that dangerous reef called Warden Ledge, over which a buoy is anchored: it measures about 20 feet. In Headon Hill escarpment this bed admits of several subdivisions.

No. 24. Olive-green clay, stiff and tenacious, with numerous layers of *Potamomya plana* and *Melania*. It rises on the shore to the north of Weston Chine, and can be traced *in situ* to a considerable distance: measures 1 foot, and rests upon a band of lignite, in which the vegetable structure is well preserved; measures 6 inches.

No. 25. Bluish sandy clay with few fossils in its upper part, but full of *Potamomya plana*, *Paludina* and *Lymnæa* below: measures 2 feet 6 inches.

No. 26. Lymnæan limestone, No. 3, rises on the shore a few paces north of Weston, forms a thin ledge at its origin, and contains *Lymnæa* and *Planorbis* in abundance: measures from 10 to 18 inches.

No. 27. Dark olive-green, marly clay, rises below the preceding Lymnæan limestone; it contains seams of *Lymnæa*, *Paludina*, and *Potamomya*, which prevail most in the lower layers: measures about 10 feet?

No. 28. Light-coloured calcareous marl. It caps No. 29, and forms a ledge over which the water falls in Weston Chine; contains *Lymnæa* and *Planorbis*, and measures 9 inches.

No. 29. Fine gray sand, rises on the shore about 120 paces north of the boat-houses by Weston Chine. This bed is well exposed in that ravine: measures 2 feet 4 inches, and is underlaid by a band of lignite about 7 inches thick.

No. 30. Dark olive-green clay, with a band of *Lymnæa* and *Planorbis* in its upper part, and masses of nodular ironstone below. Several of these have rolled out of the bed and lie on the shore at Tollands Bay : measures 4 feet 6 inches.

No. 31. Grayish white sand, rises on the north side of Weston Chine ; is exposed at the base of that ravine, is covered up with grass in the remainder of its course through Tollands Bay, and concealed by debris on the north side of Headon. It is seen however *in situ* on the southern escarpment of that hill. The anticlinal axis figured by Webster in his coast section of Tollands Bay is very well seen from the water. No. 23 of our section is the bed which appears to droop most. The angle of declension is not more than 2° : upwards of 20 feet ?

The remaining beds of the lower freshwater series are not seen where they rise from the shore in consequence of the debris, which has fallen and covered them up at their origin and through the greater part of their course. Beyond Alum Point several of the lower beds are seen *in situ*, but they are best exposed in the sand-pit at present worked. The following section gives an accurate measurement of the 26 feet of sands and marls that repose upon the pure white sand. The angle of inclination is about 1°.

	ft.	in.
32. Light gray sand with few freshwater shells	2	4
33. Compact gray marl full of compressed <i>Lymnæi</i> , &c....	0	9
34. { Greenish stiff clay	5	9
{ Seam of lignite, vegetable structure shown	0	3
35. { Greenish clay, very tough and tenacious	6	0
{ Seam of lignite, about	0	3
36. { Gray sand	2	4
{ Seam of lignite	0	5
37. Yellow clay, ochre-coloured	4	9
38. Yellow sand	4	4

This forms the floor of the section.

39. Fine white sand. The uppermost bed is a very fine pure white sand dug for making glass, and is largely exported for that purpose. It has proved a California to the proprietor, as it is sold for about 14s. a ton. The white bed passes into one of a pale ochre colour, and then into another of a deeper tint striped with yellow bands. The thickness of the sands at Headon Hill is unknown, as the bed dips beneath the sea. The equivalent bed at White Cliff Bay measures 200 feet in thickness. No fossils have been found in this bed. I observed only fragments of shells, too minute and water-worn to ascertain to what genus they belonged.

Barton Clay Group.

No. 40. A great bed of brownish clay which consists of several subordinate beds. It forms "stratum B" of Webster's sec-

tion. It is traversed by seams of small flint pebbles and by six or seven layers of septaria. At the mouth of the ravine is a hard brown clay, the equivalent of the brown clay which rises near Beacon Bunny in the Hordle section. It contains the same shells, but they are at Alum Bay in the form of casts. I observed in one block, *Nucula*, *Venericardia*, *Oliva* and *Pleurotoma*. It contains much iron and three layers of septaria. The next portion is the true representative of the Barton clay. It is very fossiliferous, but the shells are much crushed and fragile. It is traversed by a layer of septaria and seams of small black pebbles; then follows a thick bed of green sand with few shells, which passes into a stiff brown clay containing vast quantities of *Nummularia elegans*. Then succeed beds of green sand with few shells, and six or seven layers of septaria. This bed measures about 300 feet.

In the following list I have given the Barton shells that are most abundant, but not all the genera and species contained therein:—

<i>Ampullaria acuta</i> .	<i>Nucula similis</i> .
— <i>patula</i> ,	— <i>minima</i> .
<i>Actæon simulatus</i> .	<i>Nummulites lævigatus</i> .
<i>Ancillaria canalifera</i> .	— <i>elegans</i> .
<i>Arca elegans</i> .	<i>Ostrea fiabellum</i> .
<i>Buccinum junceum</i> .	<i>Oliva Branderi</i> .
— <i>labiatum</i> .	<i>Pecten reconditus</i> .
— <i>desertum</i> .	<i>Pectunculus deletus</i> .
<i>Cancellaria evulsa</i> .	<i>Pleurotoma colon</i> .
<i>Calyptrea trochiformis</i> .	— <i>comma</i> .
<i>Chama squamosa</i> .	— <i>prisca</i> .
<i>Conus dormitor</i> .	<i>Pyruia nexilis</i> .
— <i>scrobiculus</i> .	<i>Rostellaria rimosa</i> .
<i>Corbula pisum</i> .	<i>Sanguinolaria Hollowaysii</i> .
— <i>globosa</i> .	<i>Psammobia compressa</i> .
— <i>revoluta</i> .	<i>Triton argutus</i> .
<i>Crassatella sulcata</i> .	<i>Trochus monilifer</i> .
<i>Fusus acuminatus</i> .	<i>Turritella imbricata</i> .
— <i>bulbiformis</i> .	<i>Typhis fistulosus</i> .
— <i>longævus</i> .	— <i>pungens</i> .
— <i>errans</i> .	<i>Venericardia globosa</i> .
— <i>minax</i> .	<i>Voluta luctator</i> .
<i>Lucina mitis</i> .	— <i>lima</i> .
<i>Mitra scabra</i> .	— <i>spinosa</i> .
<i>Murex asper</i> .	Teeth of <i>Squalus</i> .
<i>Natica ambulaerum</i> .	Teeth of <i>Myliobatis</i> .

In reviewing the facts disclosed by the study of the preceding section, the following consequences may be logically deduced therefrom:—

1st. That during the deposition of the series of beds comprised between the upper lacustrine and Barton groups, many alterna-

tions of physical conditions from river or lake to estuary and sea prevailed.

2nd. That the upper lacustrine strata exhibit such alternations, is shown by bed No. 2, but still more clearly by the section at Hampstead Cliff, which belongs to this group. The consideration of its beds does not fall within the limits of our section, belonging as they do to a higher zone in the upper lacustrine series. The lower lacustrine beds present similar phænomena.

3rd. That the estuary conditions more especially prevailed before and after the deposition of the intercalated marine bed.

4th. That the upper marine indicates a period in the struggle between sea and lake, when the former obtained for a time the supremacy: the marine shells and sharks' teeth it contains prove this condition.

5th. The white and yellow sands at Alum Bay immediately overlying the Barton group were probably of estuary origin. The absence of organic remains leaves a doubt upon the subject. The equivalent bed however at Beacon Cliff on the Hampshire coast, which I shall more particularly describe in a future communication, contains a large quantity of estuary shells mixed with true marine genera, together with the bones of turtles and the teeth of sharks. Guided by these facts, we infer that the white and yellow sands of Headon Hill were the great estuary deposit which introduced the lacustrine conditions under which the lower freshwater group, with the other intercalated estuary beds, were deposited.

III.—*Note on the Chemnitzia Gulsonæ of Clark.*

By J. GWYN JEFFREYS, Esq., F.R.S.

To the Editors of the Annals of Natural History.

GENTLEMEN,

WHILE thus publicly expressing the thanks which, in common with I believe all others who take an interest in the study of the British Mollusca, I owe to my old and esteemed friend Mr. Clark, for his valuable papers which have lately appeared in the 'Annals of Natural History,' I cannot forbear also expressing my opinion that the shell which he has described and named in the last number as *Chemnitzia Gulsonæ*, does not belong to the genus *Chemnitzia*. My specimens do not show the slightest inversion of the apical whorls; nor does that character appear to exist in *Jeffreysia diaphana*, of which I have purposely examined about a hundred specimens, any more than in the *Rissoæ*. The peristome too is continuous in adult specimens of both those shells, which is not the case in *Chemnitzia* or *Odostomia*. To the

locality mentioned by Mr. Clark, I may add Sandwich and Weymouth; and Mr. Barlee has also found it on the west coasts of Scotland and Ireland. It is however a very rare and well-marked shell.

I am, Gentlemen, your obedient servant,

J. GWYN JEFFREYS.

Norton near Swansea, Dec. 8, 1850.

IV.—*Descriptions of some new species of Exotic Hymenoptera in the British Museum and other Collections.* By FREDERICK SMITH, Assistant in the Zoological Department of the British Museum.

Genus TRIGONALYS, Westw.

T. bipustulata, n. sp.

Male (length 7 lines) black: head as wide as the thorax, quadrate, smooth and shining, covered with a thin short black pubescence, the clypeus emarginate in front; antennæ setaceous, 20-jointed, the apical eight joints gradually attenuated to a point; thorax closely and deeply punctured, the punctures confluent; the metathorax has a deep longitudinal channel in the centre, and its apex is clothed with pale pubescence; the tibiæ and tarsi very dark ferruginous, the legs are entirely clothed with short fuscous pubescence; wings hyaline, the anterior margin of the superior wings has a dark fuscous longitudinal cloud, covering the externo- and interno-medial, the first discoidal, the marginal, and the first, second and third submarginal cells; the posterior wings are also clouded at their anterior margin which gradually shades off towards that of the posterior; abdomen very closely punctured—the basal segment above has two pale yellow lateral spots, between which is a deep broad groove from the base to the apex; beneath, the basal segment is pale yellow, except a small portion at its base.

Hab. Brazil.

This species is in the collection of W. W. Saunders, Esq., and is the largest which I have yet seen of this rare genus.

Note.—The neuration of the wings in this species differs considerably from that of the type of the genus, *T. melanoleuca*, the second submarginal cell is more elongate, and the third instead of being quadrate is oblong.

T. maculata, n. sp.

Male (length $4\frac{1}{2}$ lines) black: the head quadrate, closely and rather deeply punctured, the clypeus transverse, emarginate in the centre of its anterior margin; it is yellow and has a black

stripe equal to one-third of its width down the centre; the orbit of the eyes yellow, interrupted at their vertex; two minute yellow spots in front of the anterior stemma, and two very minute ones placed obliquely beyond them; the posterior pair of stemmata are placed in a line with the vertex of the eyes; a yellow line traverses the hinder margin of the vertex curving inwards at a central interruption; the mandibles are quadrate, yellow, and tridentate, the apical tooth largest; the teeth and the extreme base ferruginous; the antennæ 19-jointed, the first joint at its base and apex and the seven following joints entirely ferruginous; thorax roughly punctured; a line in front of the tegulæ, the tubercles, a minute spot beneath the wings, two in front of the prothorax, two on each side of the scutellum and one on each side of the postscutellum yellow; the tegulæ testaceous, the nervures of the wings dark piceous; the anterior margin has a fuscous cloud extending from the base to the apex, where it is broadest; the legs ferruginous, their trochanters yellow, the intermediate pair have a stain beneath; the anterior tibiæ in front, and the intermediate and posterior pairs at their base yellow; all the femora beneath are darkest towards their base, the claws black; abdomen subpetiolate, incurved at the apex, the second segment beneath has an obtuse tooth on its apical margin. Above, the margins of the first, second and fourth segments, and the whole of the fifth and sixth yellow; the two latter have an undefined black line down their centre; beneath, the first, second and third segments have their apical margins yellow.

Hab. Moreton Bay, New South Wales.

I have only seen the single specimen in the British Museum; Mr. Westwood informed me he had also one.

Genus MICROPTERYX, St. Farg.

Pompilus, Fab.

M. bicolor, n. sp.

Female (length 10 lines) black: head shining, very minutely punctured, the mandibles slightly ferruginous on their outer margin; the prothorax and a smooth triangular space on the mesothorax ferruginous, as is also the scutellum, which is smooth, shining, and very finely punctured; the metathorax ferruginous and rugose; wings black, the length of the thorax; legs and abdomen also black, the latter clothed with short black pubescence.

This species resembles the *brevipennis* of Fabricius, but is distinguished by its broader head, and by having the metathorax entirely rugose, whereas in *brevipennis* it is finely crenulated towards the base; and the abdomen is spotless.

Hab. Port Natal.

In the cabinet of the British Museum, and also in that of W. W. Saunders, Esq.

M. fasciata, n. sp.

Female (length 6 lines) black: head smooth and shining; the thorax entirely red; anterior wings dark fuscous, the posterior pair subhyaline; a white fascia on the anterior pair, crossing from the first submarginal cell and being of the same width. On the apical margin of the first and third segments of the abdomen is a broad golden band, which is deeply emarginate in the centre; a marginal band on the fifth, and the sixth segment entirely clothed with golden pile; beneath clothed with short silvery pubescence.

Note.—The second segment of the abdomen has an impressed line down the centre, and its margin is notched to the depth of half its width.

Although after a careful examination I consider this peculiar conformation to be natural, and not an accidental deformity; still, in the absence of other specimens, I place it in a note, which may serve to call particular attention to such a remarkable formation.

I have only seen the single specimen in the British Museum.

GENUS LARRAXENA, n. gen.

Head a little wider than the thorax, depressed in front, the anterior stemma situated in a frontal depression, the posterior pair obsolete; eyes lateral, slightly approximating at their vertex; antennæ filiform, the basal joint very much incrassated, inserted at the base of the clypeus which is transverse, the mandibles arcuate; thorax ovate, the metathorax elongate, truncated posteriorly; the anterior wings with one marginal cell, appendiculated, and three submarginal cells; the second triangular and petiolated, receiving the two recurrent nervures; the first submarginal cell equal to the second and third united, the third narrow and oblique, the legs moderate in length, all the tibiæ and tarsi strongly spinose, the tarsi longer than the tibiæ; abdomen elongate-ovate.

L. princeps.

Female (length 8 lines) black: the head deeply and closely punctured, the face and cheeks covered with a silvery pubescence, the mandibles ferruginous, black at their base and apex; the pro- and meso-thorax shining and closely punctured; the metathorax opaque, finely granulated; down the centre a slight depression, which has a central carina reaching nearly to the apex; wings dark fuscous, their tegulæ piccous, the tarsal claws ferruginous,

the thorax above and on the sides covered with a fine silvery pile, most sparing on its disc; abdomen red, smooth and shining; a few long pale hairs on the apical segment.

Hab. Brazil.

Of this species I have only seen the two specimens in the British Museum.

Genus TRIGONOPSIS, Perty.

T. affinis, n. sp.

Female (length $7\frac{1}{2}$ lines) black: head smooth and shining, the clypeus reddish yellow, armed with five teeth, the two lateral ones much stouter than the other three; the mandibles and two basal joints of the antennæ reddish yellow, the former black at their tips; the palpi yellow, the basal margin of the neck and also that of the metathorax fringed with golden pubescence, which is also scattered on its sides; there is also a patch of the same beneath the wings and on the hinder margin of the tubercles; the metathorax above has a broad elongate furrow, is transversely striated, and rugose at the sides and apex; the tegulæ and nervures of the wings are pale ferruginous; a dark cloud crosses the wing from the marginal cell to the apex of the third discoidal cell, and also tips the posterior wings; a second cloud traverses the transverse portion of the externo-medial nervure; the apical half of the anterior femora, the tibiæ and tarsi, and also the intermediate tibiæ, ferruginous; abdomen ferruginous, its petiole black.

Hab. Brazil.

This species is from the collections of Messrs. Wallace and Bates, and was captured at Parà. In my own, and also in the collection of W. W. Saunders, Esq.

T. violaceus, n. sp.

Male (length $7\frac{1}{2}$ lines): head violet, smooth and shining, the clypeus produced in front; the mandibles dark ferruginous; the deep lateral depressions on the face clothed with silvery pile; antennæ black; thorax black, the neck, pro- and meso-thorax, the scutellum, and a space on each side of the deep longitudinal channel of the metathorax very smooth and shining; the channel transversely sulcate, the sides and apex of the metathorax rugose; at its base and also under the wings a patch of silvery pile; the legs deep violet, the abdomen bright violet; the wings marked as in the preceding species, but rather darker.

Hab. Brazil.

Captured also by Messrs. Wallace and Bates. One specimen in the British Museum.

Genus CHLORION, Latr.

Chlorion splendidum, Fab. Syst. Piez. 218. 5.

Pronæus Campbellii, Saund. Trans. Ent. Soc. vol. iii. 58. pl. 5. f. 1.

C. splendidum.

Male (length 8 lines) : head ferruginous, the tips of the mandibles, the four apical joints of the antennæ, and a patch above their insertion enclosing the stemmata, black ; thorax black ; the collar, mesothorax, scutellum, tegulæ, a spot under the wings, the breast and legs ferruginous ; a longitudinal patch, and small spot beyond, situated outside the enclosed portion of the metathorax, ferruginous ; the metathorax transversely striated, the wings yellow, the nervures pale ferruginous, their apex having a dark cloud ; abdomen dark purple-violet.

Hab. India.

This sex was not previously known ; it is from the collection of Capt. Boys. In the cabinet of W. W. Saunders, Esq., and my own.

Genus GORYTES, Latr.

G. scutellaris, n. sp.

Female (length $4\frac{1}{4}$ lines) black ; covered with a fine golden changeable pile, in some lights having a silvery hue ; it clothes the whole insect except the disc of the thorax and abdomen ; the head smooth and shining ; the prothorax has two approximating parallel lines running from the centre of the collar to the disc ; the scutellum and a patch before, blood-red ; the metathorax has a triangular enclosed space at its base which has eight longitudinal carinæ ; the base is coarsely rugose and clothed with a dense silvery pile ; the wings hyaline, dark fuscous at their base, and crossed by a fascia of the same colour as broad as the first and second submarginal cells ; the basal, fourth and fifth segments of the abdomen are covered with a fine silvery pile ; the second segment has an ovate cream-coloured macula situated laterally at its apical margin ; the margins of the third, fourth and fifth segments have a narrow cream-coloured fascia.

The male is rather smaller and has no red patch before the scutellum ; in other respects it exactly corresponds with the female.

Hab. Brazil.

This very beautiful species was captured by Messrs. Wallace and Bates, and is I believe unique in my collection.

Genus SERICOPHORUS, Shuck.

S. chalybeus, n. sp.

Female (length 5 lines) : head of a bluish green ; the clypeus

armed on its anterior margin laterally with three teeth, the margin waved; the first and second joint of the antennæ black, the remaining joints red; the face and cheeks clothed with silvery pile; thorax metallic blue; the metathorax has in the centre a deep incisure, widening to the base; the apex roughly transversely strigose; wings hyaline; legs red, their coxæ, trochanters, and base of the femora of a metallic blue, the pulvilli black; abdomen chalybeous, covered with a delicate silvery pile, most dense at the lateral margins of the segments.

Hab. New Holland.

This extremely beautiful species is unique in the collection of the British Museum.

Note.—The insects belonging to this genus have very much the appearance of those of the genus *Oxybelus*; they are however very distinct, as also from those belonging to the genus *Palarus*; towards the latter they closely approach in the neururation of the wings. I am not aware that Mr. Shuckard has published the characters of the genus; I therefore subjoin its prominent characters:—

Head transverse, as wide as the thorax; eyes oval, the stemmata placed in a triangle on the vertex, the posterior pair a little before the hinder margin of the eyes; antennæ short, gradually increasing in thickness towards the apex, inserted at the base of the clypeus, but not approximate; thorax ovate, truncated posteriorly, the collar and scutellum transverse; the metathorax having a cruciform incisure, the transverse one curving upwards; the superior wings with one marginal cell, and three submarginal; the second submarginal triangular, the third elongate transversely, and of equal width throughout; the first and second submarginal cells each receiving a recurrent nervure near their apex; the legs of moderate length, and stout; the intermediate and posterior tibiæ strongly spinose; the claws have within their fork a large pulvillus; abdomen ovato-conic, the apical segment acute.

V.—*A few remarks on the Menispermaceæ.*

By JOHN MIERS, Esq., F.R.S., F.L.S.

It is now upwards of three years since I completed, as far as the materials at my command allowed me, an investigation of the very interesting and little understood order of the *Menispermaceæ*. This I had arranged in the form of a monograph of some considerable extent, illustrated by numerous drawings of species and analytical details of each genus; but it has not yet been

published, because I have been awaiting the chance of obtaining better materials for determining the characters of a few genera, and also because I have been led away by my inquiries into the *Solanaceæ* and some other families, to which my attention has been called in this interval. The investigation of the *Menispermaceæ*, on account of the minuteness of their flowers, has required much patient examination, and several hundred analyses have been repeated many times, and their details registered, in order to ensure the utmost amount of truth. Still, I feel that the inquiry is yet incomplete, and with the view of obtaining the desiderata required, I will endeavour here, in as short a space as possible, to give an outline of what I have already done, and what still remains to be ascertained. With this view, I now present a sketch of the principal features, that may serve to mark the distribution of this family into distinct tribes, arranged in a tabular view, and assisted by a short distinctive character of each genus. I will not endeavour to explain my views, in regard to the true affinities of this order, until I am better enabled to exhibit at full length the numerous facts I have collected together: this will be reserved for a more fitting opportunity; but I will now merely observe, that after a very careful inquiry into the subject, I cannot accord with the original views of Prof. Lindley, who differs from all other botanists in regard to the position of this order in the system. In his 'Introduction to Botany,' 2nd edit. p. 214, he points out its resemblance with the *Smilaceæ*, and places it in his class of *Imperfectæ*, near *Polygonaceæ*. Subsequently in his 'Vegetable Kingdom,' p. 307, renouncing this view, he arranges the *Menispermaceæ* among his "Diclinous Exogens," near the *Myristicaceæ* and *Monimiaceæ*, far distant from the position assigned to it by all preceding systematists. I feel quite assured, that if this distinguished botanist had been better acquainted with the structure of this order, he would have come to a very different conclusion. My own observations lead me to concur generally with the views of the late Prof. DeCandolle, who in his 'Systema Vegetabilium' and his excellent 'Prodromus,' placed this family near the *Anonaceæ*, among the hypogynous polypetalous orders (the *Hypopetaleæ* of Jussieu), a position confirmed by Endlicher, Meissner, and other eminent systematic botanists. It is hardly necessary to remark, that both the *Schizandraceæ* and *Lardizabalaceæ* must remain in juxtaposition with the *Menispermaceæ*.

There is probably no family in the whole vegetable kingdom so completely heteromorphous as the *Menispermaceæ*, or that presents such extreme and aberrant features at variance with its normal structure. These extremes are found in the habit of the

plants, in the texture and form of the leaves, in the various modes of inflorescence, in the number, arrangement and manner of æstivation of the floral envelopes, in the form and position of the stamens, as well as in the structure of the anthers, and their mode of dehiscence, in the presence or absence of a distinct gynophorus, in the variable character of the style and stigma, in the extent of development of the ovule, in the form of the nut, in the seed, sometimes exalbuminous, at others with albumen highly developed, which is often fleshy and homogeneous, copious or sparse in quantity, and in other cases, singularly constructed of ruminated lamellar plates, and finally, in the variation of the form and development of the embryo, whose cotyledons are sometimes large, fleshy, and adpressed, or they are slender and semiterete, but are often broad, foliaceous, thin in texture, divaricate, and placed in separate cells in the albumen. Such extreme differences of structural arrangement would in many cases induce a division of the family into distinct orders, but the *Menispermaceæ* possess altogether so many features in common, and are so very distinct from any other class of plants, that their integrity as one whole group is both desirable and natural. It is however essential to divide them into distinct tribes, and these again into sections and genera, somewhat after the following manner.

MENISPERMACEARUM DISTRIBUTIO.

Tribus 1. HETEROCLINEÆ. Embryo homotropus, cotyledonibus foliaceis, lateraliter divaricatis, et intra laminas 2 albuminis in locellis distinctis singulatim inclusis (lamina dorsali simplici, ventrali crassiori, sæpissime profunde ruminata, rarissime simplici) radícula brevi, tereti, supera.

- | | |
|---|--------------------------|
| Cotyledonibus foliaceis, foraminibus plurimis perforatis? | 1. <i>Coscinium</i> . |
| Cotyledonibus foliaceis, simplicibus, viz. | |
| Stamina plurima, receptaculo globoso sessili adnata | 2. <i>Anamirta</i> . |
| Stamina 12 omnia libera | 3. <i>Calycocarpum</i> . |
| Stamina 10, <i>i. e.</i> 5 libera, et 5 monadelpha ... | 4. <i>Odontocarya</i> . |
| Stamina 6 libera; antheræ immersæ, longitudinaliter dehiscentes | 5. <i>Tinospora</i> . |
| Stamina 6 libera; antheræ adnatæ, 4-lobæ, transversim dehiscentes | 6. <i>Jateorhiza</i> . |
| Stamina 6 libera; filamenta brevica incrassata, antheræ longit. dehiscentes | 7. <i>Burasaia</i> . |
| Stamina 6 libera; filamenta dilatata membranacea | 8. <i>Chasmanthera</i> . |
| Stamina 6 libera; filamenta petalis involutis adnata | 9. <i>Fibraurea</i> . |
| Stamen 1, filamentum gracile; antheræ 6, bilobæ, in capitem aggregatæ | 10. <i>Parabæna</i> . |

Tribus 2. ANOMOSPERMEÆ. Embryo heterotropus, teres, intra albumen copiosum ruminatum inclusus, cotyledonibus accumbentibus curvatis, radícula recta, stylo excentrico spectante*. Sepala æstivatione imbricata.

Petala 6 carnosâ 11. *Anomospermum*.

Tribus 3. TILIACOREÆ. Embryo hippocrepice campylotropus, cotyledonibus foliaceis, incumbens, intra albumen ruminatum copiosum, radícula centripeta supra: sepala æstivatione valvata.

Petala 6. Ovarium glabrum 12. *Tiliacora*.

Petala 0. Ovarium tomentosum 13. *Abuta?*

Tribus 4. LEPTOGONEÆ. Embryo hippocrepice campylotropus, cotyledonibus teretibus subincumbentibus, intra albumen simplex parcum inclusis, radícula centripeta supra: sepala æstivatione imbricata.

§ *Eleutharrheneæ*. Stamina distincta. Ovaria 3. Sepala 6.

♂ Pet. 0. Stam. 12-18 libera. ♀ Pet. 6 14. *Menispermum*.

♂ Pet. 6. Stam. 6 libera. ♀ Pet. 6 cuneatoauriculata 15. *Pericampylus*.

♂ Pet. 6. Stam. 6-9 libera. ♀ Pet. 6 cuneatoauriculata 16. *Hypserpa*.

♂ Pet. 6. Stam. 6 basi monadelphæ. ♀ ignota. 17. *Pselium*.

§ *Cissampelideæ*. Stamina in unicum coalita. Ovarium unicum.

♂ ignota. ♀ Pet. 3 18. *Ileocarpus*.

♂ ignota. ♀ Pet. 4 19. *Homocnemia*.

♂ Sepala 6. Pet. 3. Antheræ lobæ 6 peltatim affixæ. ♀ Pet. 3 20. *Stephania*.

Sepala 4. Pet. 4 connata. Antheræ lobæ 2 peltatim affixæ. ♀ ignota 21. *Clypea*.

♂ Sepala 8. Pet. 4 connata. Antheræ lobæ 4 conglobatæ. ♀ 22. *Cyclea*.

♂ Sepala 4. Pet. 1 poculiforme. Antheræ lobæ 4-12 peltatim affixæ. ♀ Petalum 1 23. *Cissampelos*.

♂ Sepala 4. Pet. 1 poculiforme. Antheræ lobæ 4 peltatim affixæ. ♀ Pet. 2 24. *Antizoma*.

♂ Sepalum 1. Pet. 1 globosum. Antheræ lobæ 6 peltatim affixæ. ♀ Petalum 1 25. *Rhaptomeris*.

* In this, as in all the following tribes, the radicle, in reality, always points towards the true apex of the fruit, although in some cases, from the very excentric growth of the latter, it seems, at first sight, to be directed towards its base: in this last-mentioned manner it is indeed described by most botanists, but it is manifestly an error. In another place I have fully discussed this point of structure, and it appears to me that my view is supported by unquestionable evidence.

Tribus 5. PLATYGONEÆ. Embryo hippocrepice campylotropus, cotyledonibus foliaceis incumben-
tibus intra albumen simplex parcum inclusis,
radicula centripeta supera.

- Pet. 6 emarginata imo involuta. Nux condylo
2-camerato utrinque perforato..... 26. *Cocculus*.
Pet. 6 bifida lobis acutis. Nux condylo 2-came-
rato utrinque perforato..... 27. *Nephroica*.
Pet. 6 bifida lobis obtusis. Nux condylo 2-came-
rato foraminibus 3 perforato 28. *Holopeira*.
Pet. 6 cuneata auriculata apice dentata. Nux
condylo septiformi hippocrepice 2-marsu-
piata 29. *Diploclisia*.

Tribus 6. PACHYGONEÆ. Embryo omnino ex-
albuminosus, hippocrepice vel fere annulari-cam-
pylotropus, cotyledonibus magnis crassis, radice
parva, centripeta, supera.

- ♂ Pet. 0. ♀ Ovaria 3, cotyledonibus crassis
hippocrepicis..... 30. *Anelasma*.
♂ Pet. 0. ♀ Ovaria ignota 31. *Limacia*.
♂ Pet. 6. ♀ Ovaria 6, cotyledonibus crassis
cyclicis 32. *Pleogyne*.
♂ Pet. 6. ♀ Ovaria 6, cotyledonibus crassis
hippocrepicis 33. *Botryopsis*.
♂ Pet. 6. ♀ Ovaria 3, cotyledonibus crassis
cyclicis: floribus racemosis 34. *Pachygone*.
♂ ignota. ♀ Ovaria 3, cotyledonibus crassis
cyclicis: floribus umbellatis 35. *Sciadotenia*.

Genera dubiæ sectionis, embryonis forma ignota.

36. *Chondodendron* ad *Platygoneas*? vel potius ad *Heteroclineas*.
37. *Hyperbæna* ad *Platygoneas*?
38. *Tinomiscium* ad *Heteroclineas*?
39. *Pycnarrhena* ?
40. *Antitaxis* ?

Genera dubia vel ab ordine repellenda.

- Spirospermum*, Thouars (Endl. Gen. no. 4690): genus in ordinem dubium
propter embryonem exalbuminosum longissimum spiraliter tortum.
Agdestis, Moc. Sess. (idem, no. 4684): genus valde dubium propter ovaria
coalita et flores hermaphroditos.
Iodes, Blume (idem, no. 4689): genus sine dubio ad *Phytocreneas* re-
ferendum.
Meniscosta, Blume (idem, no. 4688) est certissime *Sabia*, Coleb. genus
anomalum dubiæ sedis.

1. *Coscinium*, Coleb., comprises four species from Ceylon and
India:—1. *C. fenestratum*, Coleb. 2. *C. Wightianum* (Coll. Wight,
no. 2469). 3. *C. Wallichianum* (Wall. Cat. n. 4971 in partem).
4. *C. Blumeianum* (Wall. Cat. n. 4971 in partem). The three
last species are in the Wallichian herbarium under the name of
Cocculus Blumeanus, Wall. The structure of the seed, as figured
by Gaërtner, well corresponds with that of the other genera of
this tribe, but the fenestrated appearance of the cotyledons re-

quires to be confirmed by more recent observation. I have not been able to meet with the seed.

2. *Anamirta*, Coleb. has four species, the type of which is the *Cocculus suberosus*, DC.: of this genus I have a very complete analysis. Here also belongs the *Cocculus populifolius*, DC.

3. *Calycocarpum*, Nutt. consists of a single species, the *Menispermum Lyoni*, DC.: its details are very faithfully given in Gray's Gen. Pl. Un. St. Am. i. p. 75. tab. 30.

4. *Odontocarya* comprises three species from Brazil; the type, which I found in the Organ Mountains, and which I examined in the living state, has afforded complete analytical details. The *Cissampelos Vitis*, Flor. Flum. tab. 137, and *Cissampelos Hernandezia*, idem, tab. 136, evidently belong to this genus.

5. *Tinospora* contains eleven species, most of which are already known: it is a well-marked genus, and I have complete details of its structure: the following may be referred to it: *Cocculus cordifolius*, DC.; *C. convolvulaceus*, DC. (Wall. Cat. no. 4955 B and 4966 C); *C. crispus*, DC. (Wall. Cat. 4966 A, 4966 B); *C. Malabaricus*, DC. (Wall. Cat. 4969); *C. lacunosus*, DC.; *C. tomentosus*, Coleb. (Wall. Cat. 4956 A); *C. glaucus*, DC.; *C. flavescens*, DC.; *C. Bakis*, A. Rich.

6. *Jateorhiza* is a very distinct genus, consisting of three species:—1. *J. palmata* (*Cocculus palmatus*, DC. Hook. Bot. Mag. tab. 2970). 2. *J. Columba* (Wall. Cat. n. 4953). 3. *J. strigosa*, from Fernando Po (Flora Nigritiana, p. 213, tab. 18).

7. *Burasaia*, Thouars, a genus consisting of three species from Madagascar, has been well described by Prof. Decaisne in his admirable memoir on the *Lardizabaleæ*, and I am indebted to his kindness for an opportunity of examining its male flowers, the characters of which certainly agree with the *Menispermaceæ*, and these, as well as the structure of the ovarium, as described by M. Decaisne, conform well with the *Heteroclinaæ*. It is due to the very distinguished botanist just mentioned, to state, that in referring this genus to the *Lardizabaleæ*, he did this with much hesitation; the true features of the *Menispermaceæ* had not then been elaborated, and it must be confessed that its 3-foliate leaves and the nucleus being invested by a pulpy arillus indicate a strong tendency towards the *Lardizabaleæ*, but its distinct ovaria with solitary ovules fix it beyond doubt among the *Menispermaceæ*.

8. *Chasmanthera*, Hochst. Of this genus I have very complete details of the male flowers, and of the seed, but the female flowers remain to be examined. The characters of this genus, given by Prof. Hochstedter (as quoted in Walpers Rep. v. p. 18), are far from correct or intelligible: only one species is recorded.

9. *Fibraurea*, Lour. This genus has been here restored upon very efficient data, but I have only seen the male flowers, and

nuts containing imperfect seeds. Loureiro's typical specimen from Cochinchina exists in the herbarium of the British Museum; this I have examined, together with three other species from Malacca, which I have found in the herbaria of Sir William Hooker and Dr. Lemann.

10. *Parabæna*, a genus of which I possess complete details; the typical species is identical with the *Cissampelos oleracea*, Wall. Cat. no. 4984: the other species are: 2. *P. sagittata* (*Cissampelos sagittata*, Wall. Cat. 4983); 3. *P. heterophylla*, from Assam, in the collections of the late Mr. Griffiths (n. 355); 4. *P. ferruginea* (idem, no. 74).

11. *Anomospermum*. This genus comprises three species from Brazil and Guiana: the typical one was found by me in the Organ Mountains, when I made a very complete analysis from living specimens. 1. *A. nitidum*. 2. *A. Schomburgkii* (Schomburgk's Guiana Collection, no. 833). 3. *A. Hostmanni* (Hostmann's Surinam Collection, no.).

12. *Tiliacora*, Coleb., an Indian genus consisting of several species, the type of which is *T. acuminata* (*T. racemosa*, Coleb.; *Cocculus acuminatus*, DC., Deless. Icon. i. tab. 95, Wall. Cat. no. 4958). I have obtained complete details of the structure of the male flowers and of the seed, but the female flowers are yet wanting. One species from Ceylon presents a circumstance of rare occurrence in this order, perfectly hermaphrodite flowers; but whether this be a constant character, or only a casual occurrence, can only be ascertained by future observations with competent specimens. Bisexual flowers are also met with in other genera, although very rarely.

13. *Abuta*. I have restored this genus of Aublet upon a distinct group of plants from Brazil and Guiana. Nine species may be referred here, including among them the *Batschia racemosa* and the *B. conferta* of Thunberg (the genus *Trichoa* of Persoon), which I have had no opportunity of examining. I met with a single species in the neighbourhood of Rio de Janeiro, which offered male flowers only, but Martin's specimens from Cayenne have afforded ample details of the structure of the female flowers. Cunningham's collection exhibits specimens in fruit, but unfortunately not sufficiently matured to enable me to determine the form of the embryo. In the structure of the nut, and the form of the nucleus, it approaches *Tiliacora*, and the nucleus appears lamellated when cut transversely, as if it were ruminated albumen, but this point could not be determined with any degree of certainty from the imperfect state of the specimens in question; its position among the *Tiliacoreæ* cannot therefore be yet affirmed with confidence. The typical species is the *Abuta rufescens*, Aubl. (Pl. Guy. tab. 250), with which the

Cocculus macrophyllus, St. Hil. and Tul., and the *Cissampelos Abutua*, Flor. Flum. tab. 140, may be considered as identical. To this genus are likewise referrible the *Cissampelos convexa* (Flor. Flum. tab. 141), the *Cissampelos ovata* (idem, tab. 141), the *Cocculus tomentosus*, Mart. (Flor. Flum. tab. 143), and the *Cocculus Martii*, St. Hil. and Tul.

14. *Menispermum* now only comprises three of the species enumerated by DeCandolle, viz. *M. Canadense*, *M. Daluricum*, and *M. smilacinum*: specimens of the former have furnished complete details of its characters, of the second I have seen only male flowers, and the last has not come under my observation.

15. *Pericampylus*, a new genus, comprising an Indian group of plants, of which the *Cocculus incanus*, DC. is the type. The *Cissampelos Mauritiana* (Wall. Cat. n. 4980); *C. discolor* (Wall. Cat. 4982 in partem); *Menispermum villosum*, Roxb. (who has a *Cyclea* under the same name in his herbarium); *Cissampelos convolvulacea*, DC., Wall. Cat. n. 4980 in partem, and *Cocculus corymbosus*, Bl., all belong here.

16. *Hypserpa*, an East Indian group of plants, of which the *Cocculus cuspidatus*, Wall., may be considered as the type. Of this genus complete characters have been obtained.

17. *Pselium*, Loureiro, has been restored upon the evidence furnished by his original typical specimen preserved in the British Museum. Of this genus characters have been obtained of its male flowers only.

18. *Ileocarpus*, a new genus proposed for the *Menispermum* (*Cocculus*) *Schimperi*, Hochst., from Abyssinia; of this I have only obtained a sight of the female flowers and of the seed.

19. *Homocnemia*, a new genus founded upon a South African plant of Drégé's collection, the *Cissampelos umbellata*, E. Mey.; the specimen I have seen presents only female flowers; the male flowers and the seed are therefore wanting to complete its full generic characters.

20. *Stephania*, Lour. (non Willd.), comprises a group of East Indian plants, the typical species of which is from Japan. Its characters are well-marked, but there has been a strange confusion in regard to the names of the species. It comprises *Cissampelos hexandra*, Roxb. (*Cocculus Roxburghianus*, DC., Wall. Cat. n. 4972 in partem); *Cissampelos hernandifolia*, Willd.; *C. discolor*, DC.; *C. convolvulacea*, DC.; *C. glaber*, Wght.; *C. australis*, A. Cunn.; *Clypea venosa*, Bl. (Cuming, n. 1160).

21. *Clypea*. This genus of Blume was made to include most of the species of *Stephania*, but as Loureiro's name claims the priority, I have restored *Clypea* for two of Blume's species that differ in their structure from *Stephania*: these are, *Clypea acuminatissima*, Bl., and *Cl. capitata*, Bl. I have seen only male

flowers; the female flowers and the seed are therefore wanting to complete its generic features.

22. *Cyclea*. The characters of this genus have been completed from my observations upon some Indian plants, which appear to correspond with the *Cocculus Burmanni*, a species to which Dr. Wight cursorily refers (Ill. Ind. Bot. i. p. 23), as being distinct from *Clypea*, and for which, although he offers no generic character, he suggests the title of *Cyclea*: I therefore willingly adopt his name. Here also belong *Cissampelos discolor*, Wall. (Cat. n. 4982, non DC.); *C. barbata*, Wall. Cat. n. 4978; *Menispermum villosum*, Roxb.

23. *Cissampelos*, Linn. A great many heterogeneous plants have been referred to this genus, and it is impossible to determine many of the species that really belong to it, from the mere laconic descriptions by which they have been particularized. I have been able to examine many, and to refer them to their proper places, but several yet remain to be inspected; I have also determined a number of new species yet undescribed. As the habit and floral structure of this genus are so peculiar, there can be little hesitation in referring here by far the greater number of the recorded species, notwithstanding the imperfect descriptions given with them. There are however several among them that do not conform to this test, and others of which no sufficient character is registered. Among these two classes of doubtful species are *C. psilophylla*, Presl; *C. triloba*, Spr.; *C. acuminata*, DC.; *C. laurifolia*, Poir.; *C. ebracteata*, St. Hil.; *C. australis*, St. Hil.; *C. monoica*, St. Hil.; *C. gracilis*, St. Hil.; *C. Haenkeana*, Presl; *C. hirsutissima*, Presl; *C. Kohautiana*, Presl; *C. cordifolia*, Boj.; *C. apiculata*, Hochst.; *C. glabra*, Roxb.; *C. ovata*, Poir.

24. *Antizoma*, a new genus founded upon the *Cissampelos calcarifera* and the *C. angustifolia* of Burchell, to which I have added three other species, all from the interior of South Africa. I have seen only male flowers, so that its entire generic character remains yet imperfect.

25. *Rhaptomeris*, a genus founded upon the unusual circumstance in this family of its calycine segments being united into a campanular gamophyllous tube, and its petals being connate, in form of a globular cup. It consists of two species, both from Ceylon, one being the *Cocculus Burmanni*, DC. (non W. and A.). The female flowers and fruit are as yet unknown.

26. *Cocculus*, Bauh. This genus has served to receive Menispermaceous plants of every denomination, so that very few of the numerous species enumerated by different authors can now be referred here with certainty. As at present defined, *Cocculus Carolinianus*, DC., may be considered its type. I have deter-

mined from authenticated specimens the *Cocculus Cebathi*, DC., *C. Leæba*, DC., *C. Epibaterium*, DC., *Epibaterium pendulum*, Forst., and *Cocculus ellipticus*, DC., all to be one species, which will henceforward bear the former name. These, together with the *C. oblongifolius*, DC., are the only three that I have been able to establish, as appertaining to this genus, out of the forty-six species enumerated in the 'Prodromus' of DeCandolle: all the others belong to other genera, to which I have referred them, excepting the eight following, whose place must remain doubtful until they can be more carefully examined: viz. *Cocculus Forsteri*, DC.; *C. rotundifolius*, DC.; *C. aristolochiæ*, DC.; *C. hastatus*, DC.; *C. Thunbergii*, DC.; *C. cotoneaster*, DC.; *C. multiflora*, DC.; and *C. gomphioides*, DC. The following twenty-two additional species, collated in Walpers's 'Repertorium,' remain in like manner doubtful, in regard to the genus to which they are strictly referrible, viz. *Cocculus corymbosus*, Bl.; *C. lanuginosus*, Bl.; *C. rimosus*, Bl.; *C. glaucescens*, Bl.; *C. ovalifolius*, Bl. (non DC.); *C. banisteriaefolius*, Rich.; *C. oblongifolius*, Mart. (non DC.); *C. filipendula*, Mart.; *C. paniculigerus*, Mart.; *C. Japurenensis*, Mart.; *C. reticulatus*, Mart.; *C. Imene*, Mart.; *C. levigatus*, Mart.; *C. urophyllus*, Mart.; *C. Pakni*, Mart.; *C. dichrous*, Mart.; *C. angustifolius*, Heskrl.; *C. cinerascens*, St. Hil.; *C. macrophyllus*, St. Hil., and *C. Martii*, St. Hil.; most of the last-mentioned species, from the descriptions given, probably belong to *Abuta* or *Botryopsis*.

27. *Nephroica*. This genus I have proposed for a very distinct group of plants, mostly natives of India, the type of which is the *Cocculus Nephroia*, DC., the *Nephroia sarmentosa*, Lour.: its characters are well-marked and complete. Here must be referred the *Cocculus diantherus*, Hook.; *C. ovalifolius*, DC.; *C. trilobus*, DC.; *C. cynanchoides*, Presl; *C. Bantamensis*, Bl.; *C. Ferrandianus*, Presl; *C. laurifolius*, DC. (Wall. Cat. 4965); *C. mollis*, Wall. (Cat. 4973); *Menispermum hexagonum*, Roxb. (Wall. Cat. 4968); *M. parabolicum*, Roxb. &c.

28. *Holopeira* is a genus comprising several plants of East Indian and African origin, differing from *Nephroica* in the shape of its petals and the peculiar structure of its nut; its type is the *Cocculus villosus*, DC., and its characters have been completely determined.

29. *Diploclisia* represents another group of East Indian and Australasian plants, of which the *Cocculus macrocarpus*, W. and Arn., is the type. They are readily distinguished by the extreme length of their racemes, the structure of their nut, and the form of the seed.

30. *Anelasma* has been formed for a series of South American plants, one of which has been figured by Pöppig, Nov. Gen.

tab. 188, under the name of *Abuta concolor*. The type is *A. Gardnerianum* from Brazil (Gard. n. 3567); another species is *A. Guianense* (Schomb. n. 440). The *Cocculus Domingensis*, DC. (DeLess. Icon. Sel. tab. 96), also belongs here. It bears much similarity in the form of its flowers to *Abuta*. I have seen only the male flowers and seed; the female flowers are wanting to complete its generic characters.

31. *Limacia*, Lour. This forms another of Loureiro's genera which I have restored upon very sufficient data: it represents a very distinct group of plants of East Indian growth, which I have been able to compare with the typical species *L. scandens*, Lour., still existing in the British Museum, and which bears a close analogy to *Anelasma*, their analogue of the other hemisphere. Here belong the *Cocculus velutinus*, Wall. (Cat. n. 4970, a: Cuming, n. 2402); and *Cocculus oblongus*, Wall. (Cat. n. 4963). I have formed a subgenus under the name of *Stereoclea* for two species, which differ only in having three, instead of six stamens; one is the *Menispermum triandrum*, Roxb. (Wall. Cat. n. 4962); the other also exists in the Wallichian herbarium (Wall. Cat. n. 4952 in partem).

32. *Pleogyne* is a genus proposed for an Australasian plant of Cunningham's collection, distinguished by the unusual number of its ovaria. I have seen only the female flowers and the fruit; the male flowers are therefore wanting to complete its generic character.

33. *Botryopsis* was constituted many years ago, upon a plant which I examined in the Organ Mountains of Brazil. I met with its male flowers and fruit, but its female flowers are yet wanting. Its species bear much external resemblance to those of *Abuta*, and they are only to be distinguished by an examination of their flowers, which are very distinct in structure. I have ascertained that the *Cocculus platyphyllus*, St. Hil., belongs to this genus, and hence also *C. Ildefonsianus*, St. Hil. and Tul., which is said to be only a variety of the same. It is probable that the *Cocculus cinerascens*, St. Hil., is also referrible here.

34. *Pachygone* will represent a group of East Indian plants, distinguished also for their exalbuminous seeds, and of which the *Cocculus Plukenettii*, DC., may be considered the type. Its characters have been fully determined. Here may be referred the *Cocculus Wightianus*, Wall. (Cat. 4959), *C. brachystachys*, DC., judging from the structure of its fruit, and probably also *C. leptostachys*, DC.

35. *Sciadotenia* is a new genus, proposed for a plant of Martin's collection from Cayenne, with a decidedly umbellate inflorescence, and a very distinct habit. Both its male and female flowers are unknown, but its seed is of peculiar structure.

36. *Chondodendron*, R. and P. I have restored this genus of the Flora Peruviana, upon a very distinct group of plants, all of South American origin, and of which the type is the *Chondodendron tomentosum*, R. and P. (*Cocculus Chondodendron*, DC.). Another species is figured by Pöppig (Nov. Gen. tab. 190), under the name of *Chondodendron convolvulaceum*. I have seen only the male and female flowers, but not the fruit: from his figure of the seed, we might conclude it must belong to the *Heterocliniæ*, but as he describes the embryo to be perispherical, and does not state whether or not it be albuminous, it remains uncertain to which tribe this genus can be referred; in habit, all the species bear a remarkable resemblance to *Tinospora*. *Cocculus tamoides*, DC., is referrible here. I have determined eight species altogether, among which are two plants collected by Gardner in Piahy, which I have named *C. hederifolium* (Gardn. n. 2009) and *C. scabrum* (Gardn. n. 2473).

37. *Hyperbæna* is a genus comprising a group of South American and Mexican plants, the type of which, *H. nemoralis*, I found in the forests of the Corcovado, near Rio de Janeiro. The characters of both the male and female flowers are determined, but the fruit is wanting to fix the tribe to which it belongs. I have met with five species, viz. the above-mentioned; *H. Moricandii* from Ilheos (Moric. n. 2346); *H. Hostmanni* from Surinam (Hostm. n. 1050); *H. Mexicana* from Mexico (Jungensen, n. 91); *H. Tweedii* from Rio Grande do Sul (Tweedie). They bear much the habit of some species of *Anelasma*.

38. *Tinomiscium* is constituted for three plants of peculiar habit: the *Cocculus petiolaris*, Wall. (Cat. n. 4964), *Cocculus coriaceus*, Hook., both from Penang; and a species from Java (Zollinger, n. 745). All these species present only male flowers, so that it is yet uncertain to which tribe they can be referred; but from their peculiar habit and the larger size and structure of their flowers, they more resemble the *Heterocliniæ*.

39. *Pycnarrhena* is proposed for a plant from Sylhet, of a very distinct appearance and habit, approaching *Anamirta* in having more than the usual number of stamens, aggregated in a central globular mass. This plant is the *Cocculus planifolius*, Wall. (Cat. no. 4961): it has only male flowers, so that it cannot yet be referred with certainty to any particular tribe.

40. *Antitaxis* is founded upon a plant from Malacca, collected by the late Mr. Griffiths; it bears much analogy in habit to *Pycnarrhena*, but is very different in the structure of its flower; its floral envelopes are decussately arranged in opposite pairs, there being only two petals and four stamens; it has only male flowers, hence its true position cannot yet be determined.

The above brief remarks will afford some general notion of the

extent to which this inquiry has been carried, and what still remains to be done in order to complete the investigation of this interesting family. Having pointed out the desiderata wanting for this purpose, I shall feel greatly obliged to botanists for any assistance they can contribute towards its attainment.

VI.—*On some new Silurian Mollusca.* By FREDERICK M'COY, Professor of Geology and Mineralogy in Queen's College, Belfast.

Poterioceras ellipticum (M'Coy).

Syn. and Ref. *Orthoceras pyriforme* (Sow.), pars Sil. Syst. t. 8. f. 19 (lower and not upper figure).

Sp. Char. Elliptical, last chamber conoidal; greatest width at last septum, from whence the chambered and unchambered portions taper elliptically to the contracted mouth and attenuated extremity; septa nearly horizontal, the last three or four about $2\frac{1}{2}$ lines apart: greatest width of last chamber (at septum) 2 inches 3 lines; length of last chamber 2 inches $4\frac{1}{2}$ lines.

There are clearly two species confounded by Sowerby in the 'Silurian System' under the name *Orthoceras pyriforme*; the difference in form he supposed to be produced by the direction of pressure, but I find it to be constant in perfectly uncrushed specimens. To that represented by his upper figure I would restrict his specific name *pyriforme*, its characteristic pear-shaped form being mainly owing to the greatest width being in the middle of the last chamber, or midway between the last septum and the mouth; the upper half of the last chamber being abruptly rounded, while the other portion of the shell tapers gradually. In the other species the greatest width is at about the last one or two septa, from whence the last chamber tapers gradually to the mouth with about the same curve that the chambered portion tapers towards the apex, giving a very different regularly elliptical figure to the present species, which I have named accordingly.

Common in the Lower Ludlow rock near Aymestry.

(Col. University of Cambridge, &c.)

Phragmoceras intermedium (M'Coy).

Syn. and Ref. *P. arcuatum* (Sow.), pars Sil. Syst. t. 11. f. 1. (not t. 10. f. 1^a).

Sp. Char. Slightly arched, tapering at the rate of 4 lines in 1 inch; section ovate, sides gently convex, outer and inner faces rounded: a specimen (not quite perfect) 2 inches 5 lines long

has the long (antero-posterior) diameter at the large end 1 inch 4 lines, at the small end 9 lines; short (lateral) diameter at large end 10 lines; length of last chamber 1 inch 1 line; the last five or six septa $1\frac{1}{2}$ line apart in the middle of the side.

I have not clearly seen the siphon of this species, which is about as thick and slightly arched as the *P. arcuatum* (of which it is figured as a separate variety by Sowerby), but tapers much more slowly as in the *P. compressum*.

Not uncommon in the green mudstone (Lower Ludlow rock) of Green quarry, Leintwardine.

(Col. University of Cambridge, &c.)

Cycloceras tenui-annulatum (M'Coy).

Sp. Char. Nearly cylindrical (tapering half a line in 2 inches at a diameter of 6 lines); rings narrow, sharply defined, half a line wide, slightly oblique, six in half an inch at the above dimensions; surface with very minute, longitudinal, equal striæ, twelve or fourteen in a space of 1 line; towards the small end a few circular striæ on each ring decussating the longitudinal lines.

This species differs constantly from the *Orthoceras* (*Cycloceras*) *Ibex* by the narrower and more sharply defined rings, and their considerably greater number in a given space in specimens of the same size; the longitudinal striation is even finer than in that species.

Not uncommon in the green Lower Ludlow mudstone of Green quarry, Leintwardine, and near Aymestry; rare in the Upper Ludlow quartzite of Brigsteer, Kendal.

(Col. University of Cambridge.)

Orthoceras politum (M'Coy).

Sp. Char. Very elongate, conic, regularly tapering at the rate of half a line in 1 inch, from a diameter of 7 lines; from which size to 5 lines, the septa have a uniform distance of 3 lines apart; they are slightly oblique, convex, with even edges; siphon moderate, excentric, its own diameter from the centre; surface smooth.

One specimen with a glossy, horn-like external surface, slightly imperfect at each end, measures 1 inch 4 lines in diameter at the mouth, is 1 foot 8 inches long, and measures 2 lines in diameter at the smaller end, where the septa are slightly oblique, and $1\frac{1}{3}$ line apart.

Not uncommon in the impure calcareous concretions of Glenquapple, Scotland.

(Col. University of Cambridge.)

Bellerophon subdecussatus (M'Coy).

Sp. Char. Globose, of one and a half or two very rapidly enlarging whorls, subcompressed towards the very obtusely angular or rounded circumference; sides gibbous; umbilicus small, deep, partially exposing the whorls; diameter $4\frac{1}{2}$ lines; in proportion to diameter, width $\frac{87}{100}$, length of mouth $\frac{85}{100}$, diameter of umbilicus $\frac{20}{100}$; surface with strong transverse ridges arching backward from the umbilicus to the undefined band, forming a wide V-shaped sinus; about four or five of these transverse ridges in the space of 1 line near the mouth; they are crossed by much finer spiral striæ, about the same distance apart, from one to three of which are usually stronger than the rest near the band.

This species is extremely like the carboniferous *B. decussatus* (Flem.), but has the transverse striæ much stronger than the spiral ones.

Rare in the schists of Llanrwst and fine Caradoc sandstone of Mulock, Dalquorhan, Ayrshire.

(Col. University of Cambridge.)

Holopella (M'Coy), n. g.

Gen. Char. Shell spiral, elongate, slender, of numerous gradually increasing whorls, generally crossed by slightly arched striæ; mouth circular, with the peritreme entire; base rounded, with or without a minute umbilicus.

These shells have hitherto been confounded with the recent genus *Turritella*, from which they differ completely in the entire peritreme and definite round margin to the mouth, thus approaching much nearer to *Scalaria*. From *Chemnitzia* they differ in the smaller size of the body-whorl, and in neither it nor the mouth being produced anteally.

Holopella gracilior (M'Coy).

Sp. Char. Very slender, spiral angle 15° , whorls smooth (number unknown), slightly and evenly convex, suture deep, simple, sutural angle 95° ; width at base 5 lines, length of last whorl 3 lines.

This is distinguished from the *H. obsoleta* by its more slender spire (as indicated by the difference in their spiral angles), less convex whorls, &c.

Schists of Dinas Bran, Llangollen.

(Col. University of Cambridge.)

Holopella intermedia (M'Coy).

I provisionally give this name to a species agreeing exactly,

so far as I can see, with the *H. obsoleta* (Sow. sp.), but having an apical angle of 30° , being thus exactly intermediate between it and the *H. conica* (Sow. sp.), striking the eye as manifestly shorter than the former, and more slender than the latter. Length about 7 lines, width 3 lines, length of last whorl $2\frac{1}{2}$ lines.

Not uncommon in the state of casts in the Upper Ludlow rock of High Thorns Underbarrow, Kendal, Westmoreland.

(Col. University of Cambridge.)

Holopella monile (M'Coy).

Sp. Char. Very slender, apical angle about 10° , spire of about nine whorls (six preserved), each turn a little wider than long, exceedingly convex, sutures deep, simple. Length $3\frac{1}{2}$ lines, width 1 line, length of last turn slightly less than 1 line.

The small size, extremely slender form, and very convex whorls, render it impossible to confound this with any other species.

Rare in the schists of Selottyn Road.

(Col. University of Cambridge.)

Littorina undifera (M'Coy).

Sp. Char. Turreted, broad, ovate; spire pointed, about three-fourths the length of the body-whorl; apical angle about 80° ; sutures channeled, having a little below them a thick spiral ridge undulated by about eight vertical depressions, which cross the whorls of the spire and upper part of the body-whorl; below this ridge is a wide concave space bounded by a second thick undulating ridge, forming the most prominent part of the whorl; beneath this second ridge on the body-whorl are about ten very delicate, subequal, spiral threads distinctly separated by concave spaces, about two of which only are visible on the turn of the spire; entire surface crossed by very close, minute, direct lines of growth. Length 3 lines, length of body-whorl 2 lines, width slightly more than 2 lines.

This resembles some of the small oolitic *Pleurotomariæ*, but there is clearly no sinus in the lip, as indicated by the direct lines of growth, and the shell is no doubt congeneric with the *L. carinata*, from the young of which the undulations, &c. distinguish it.

In the Aymestry limestone of Mortimer's Cross, Aymestry.

(Col. University of Cambridge.)

Loxonema elegans (M'Coy).

Sp. Char. Spire very slender, elongate-conic, apical angle about 20° ; of about six elongate evenly convex volutions, crossed by thread-like striæ, arching forward at their ends, and with a

broad backward wave in the middle (about three in the space of 1 line) ; sutures deep, simple, sutural angle 100° . Length 1 inch 11 lines, length of last whorl 9 lines, width $7\frac{1}{2}$ lines.

The greater length and slenderness of the whorls and the broader and more shallow wave in the striæ separate it from the so-called *Terebra sinuosa* (Sow.).

In the gray flags of Pont y Meibion ; slates of Llansantfraid, Glyn Ceiriog.

(Col. University of Cambridge.)

Turbo crebristria (M'Coy):

Sp. Char. Ovate, of three to four very rapidly enlarging volutions ; spire small, apical angle about 90° , whorls convex, with an obtusely bounded narrow concave space at the sutures above, back broad, gently convex ; umbilicus narrow, deep, effuse at the edge, mouth very large, obscurely angulated retrally ; shell thick, surface girt with sharp spiral thread-like ridges, nearly twice their thickness apart, about four in the space of 1 line on the penultimate whorl, with an occasional finer one between a regular pair, all crossed obliquely by very fine, regular, sharp lines of growth. Length (of small perfect specimen) 1 inch, width 1 inch, length of body-whorl 8 lines (grows to nearly 2 inches in diameter).

The large casts of this species are smooth, and resemble Sowerby's figure and description of *T. Priceæ*, except that the back is broad and rather flattened, or slightly convex instead of being angular in the middle as that species is defined to be. The substance of the shell is thick, and its mode of striation resembles that of the so-called *Pleurotomaria bilix* of Conrad as figured by Hall (Palæontology of New York), which is however distinguished by its smaller size, longer spire and want of an umbilicus.

Common, of large size, in the calcareous schists of Gellifine ; in the fine sandy schists of Mandinam, Llandoverly ; in the fine Caradoc sandstone of Alt yr Anker, Meifod, Montgomeryshire ; in the schists of Gelli Grin, Bala, Merionethshire ; and in the limestone of Mynydd Fron Frys, five miles west of Chirk, Glyn Ceiriog.

(Col. University of Cambridge.)

Trochus calatus (M'Coy).

Sp. Char. Conical, apical angle 80° ; spire of three and a half flattened volutions, having a thick rounded keel forming the circumference of the basal whorl, and close to the suture on the spiral whorls ; base flattened ; surface marked with oblique

scaly ridges. Length $2\frac{1}{2}$ lines, width 4 lines, length of last whorl 1 line.

Owing to the scaly nature of the ornament on the rather wide oblique ridges of the surface, they usually adhere to the matrix, and breaking off from the shell leave it nearly smooth.

Very rare in the limestone of Old Radnor, Presteign, Radnorshire.

(Col. University of Cambridge.)

Trochus constrictus (M'Coy).

Sp. Char. Conical, apical angle about 70° , of four or five gradually increasing whorls, each with a shallow concavity or constriction below the suture, the lower portion strongly rounded, base flattened, circumference obtusely rounded; surface obliquely crossed by fine, unequal, often obscurely fasciculate lines of growth; mouth transverse, obliquely ovate. Length 8 lines, width $7\frac{1}{2}$ lines, length of mouth $3\frac{1}{2}$ lines, width of mouth 4 lines.

This seems allied to the *Holopea symmetrica* (Hall) of the Trenton limestone, but the spire is not so elevated, the base is more flattened, and the mouth is stated to be almost circular in that species, which besides has the whorls regularly convex from the simple suture.

In the schists on the Bala limestone, Bryn Melyn quarry near Bala; Cymmerig, Bala, Merionethshire.

(Col. University of Cambridge.)

Trochus Moorei (M'Coy).

Sp. Char. Acutely conical, apical angle 50° , of about five (four preserved) flattened, gradually increasing whorls; mouth transversely subquadrate; base flattened, moderately convex; umbilicus deep, narrow; surface unknown. Length about 8 lines, width 6 lines, length of mouth 3 lines, width of mouth $3\frac{1}{2}$ lines.

I dedicate this very distinct species to J. Carrick Moore, Esq. (Secretary of the Geological Society), who has devoted much labour to the elucidation of the old fossiliferous rocks of Scotland.

In the fine Caradoc sandstone of Dalquorhan near Girvan, Ayrshire.

(Col. University of Cambridge.)

Cucullella (M'Coy), n. g.

Gen. Char. Subrhomboidal, inequilateral, subequivalve, margins even; hinge-line entirely crenulated; muscular impressions

two, with a simple pallial scar between them ; a strong internal septum extends from before the beaks to the posterior margin of the anterior adductor, forming a deep slit in the casts. Surface generally smooth or nearly so.

These palæozoic shells have been confounded with *Nucula* (by Sow., Phill., &c.), from which they differ in wanting the hood-like plate of the posterior adductor, and having the septum in the anterior end, and with *Clidophorus* (in Geol. Surv. of Great Brit. vol. ii. pt. 2), from which they differ in having the hinge crenulated as in *Arca*.

Tellinites affinis (M'Coy).

Sp. Char. Elliptical, moderately convex ; beaks small, about one-third the length from the anterior end, which is elliptically rounded, and with an undefined obtuse cardinal slope ; ventral margin nearly straight, with a faint, shallow sinus in the middle ; posterior like the anterior end, rounded elliptically, with sometimes an almost imperceptible flexure (as in *Tellina*) extending as a hollow in the left valve towards the beak from a small sinus in the margin beneath the posterior end ; surface smooth, or with a few obtuse marks of growth. Length 1 inch $4\frac{1}{2}$ lines, width (from beak to opposite margin) $\frac{4.5}{100}$, length of anterior end $\frac{3.0}{100}$, depth of valve $\frac{1.5}{100}$.

This has almost exactly the shape of our recent *Tellina radiata*, but the minute flexure above alluded to is in the longer end (which in that species is the anterior). The species is most allied to the *Tellina obliqua* (Gold.) from the grauwacke of Ems, from which it differs in being less transverse, in the beaks not being mesial, and in the less angularity of the posterior slope ; its greater length, less central beaks, and concave ventral margin distinguish it from the *Nuculites subemarginata* (Conrad).

Rare in the Upper Ludlow rock of Benson Knot, Kendal, Westmoreland.

(Col. University of Cambridge.)

Arca (Byssarca) subæqualis (M'Coy).

Sp. Char. (Cast.) Oblong, equivalve, nearly equilateral, ends subtruncate, rounded, very gibbous in the middle, about twice as long as wide ; depth of both valves equal to the width ; beaks very large, obtuse, tumid, marked on the sides with four or five large wrinkles ; a shallow sinus for the byssus in the ventral margin a little nearer the anterior than the posterior end, and slightly obliterating the simple pallial scar ; adductor impressions deep, rounded ; hinge-teeth very numerous, small, equal, at right angles to the hinge-line. Width 10 lines, length 1 inch 8 lines.

In t. 20. f. 1. of the 'Silurian System,' Mr. Sowerby seems to have united two distinct fossils (the differences between which have been noticed by various writers) under the one name, *Arca Eastnori*; the fig. 1 *a*. from Eastnor Park should, from the name, be considered the type of the species, and is a regular, subcompressed, oval shell without ventral sinus, while the other, fig. 1 *b*,—of which Mr. Sowerby says, "If it be not an old shell grown very thick, it may be a different species,"—may I think possibly be referred to the present fossil.

In the gray micaceous sandstone of Llechdawdd, Myddfai.
(Col. University of Cambridge.)

Arca Edmondiaformis (M'Coy).

Sp. Char. Oblong, obtusely subquadrate, very gibbous; beaks very large, tumid, about one-fourth of the length from the anterior end, which is obtusely rounded; ventral margin slightly sinuate in the middle; posterior end very slightly oblique, obtusely rounded; hinge-line nearly straight, as long as the shell, with numerous minute teeth inclining slightly towards the beak; surface smooth or with minute wrinkles of growth. Width 5 lines, length $7\frac{1}{2}$ lines, greatest depth of one valve (at middle) $2\frac{1}{2}$ lines.

This species resembles a small *Modiolopsis* or *Edmondia* in form, but in some of the specimens the hinge-teeth are seen as in *Arca*, except that they incline slightly towards the beak instead of from it.

In the fine sandy beds near Llangynyw Rectory, Montgomeryshire; Caradoc sandstone of Alt y Gader; in the Upper Ludlow Rock of Benson Knot, Kendal, Westmoreland; Moel Seisiog, Llanrwst; Bala, Merionethshire; and Ab Hirnant.

(Col. University of Cambridge.)

Dolabra elliptica (M'Coy).

Sp. Char. Elongate, elliptical, length slightly more than twice the width; beaks obtuse, moderate, one-sixth of the length from the anterior end; anterior end small, elliptically rounded; ventral margin slightly convex; hinge-line slightly elevated; posterior end obliquely rounded; valves moderately convex; diagonal ridge very obtusely rounded, posterior slope steep, but not abruptly flattened; surface apparently marked with fine lines of growth. Length 1 inch 6 lines, width from beak to opposite margin 8 lines, width from ventral margin to end of hinge-line about the same, depth of one valve 3 lines.

The specimen described shows that in the left valve there were no other teeth but the thick elongate posterior one or ligamen-

tary ridge, which is about a line below the hinge-margin. This differs from the *D. obtusa* (M'Coy) in its narrow, elongate elliptical figure and less gibbosity.

Tilestone of Storm Hill, Llandeilo.

(Col. University of Cambridge.)

Dolabra obtusa (M'Coy).

Sp. Char. Obliquely ovate, width about three-fifths of the length, gibbous; beaks large, obtuse, nearly in the centre of the hinge-line, and one-fourth of the length from the anterior end; anterior end small, gradually curving into the ventral margin, which is only slightly convex, oblique to the hinge-line; posterior end obliquely subtruncate, the inferior angle obtusely rounded; posterior slope abrupt, inclined, the diagonal ridge obtusely rounded; surface nearly smooth. Width 10 lines, length 1 inch 5 lines, greatest depth of one valve (half-way between the beak and posterior angle) 4 lines.

This species is more obtusely rhomboidal, and is more obtusely keeled, has a longer hinge, and is much less elongate than the *Cucullæa amygdalina* (Phill.), which is only a common variety of the *C. unilateralis* (Sow.), from which this differs by its thick posterior tooth, &c. The thick, elongate posterior tooth in the right valve is simple, and about two-thirds the length of that part of the hinge-line from which it declines; in some parts the hinge-line shows obscure traces of serrature, which may be owing to the roughness of the matrix:

Tilestone of Storm Hill, Llandeilo.

(Col. University of Cambridge.)

Anodontopsis (M'Coy), n. g.

= *Microdon*? Conrad (not Agassiz nor Meigen).

Gen. Char. Equivalve, inequilateral, compressed; general form rotundato-quadrate or subtrigonal; posterior side wide, round or obliquely subtruncate, anterior end slightly contracted in front of the beak; beaks small, prominent, nearer to the anterior than the posterior end; hinge-line shorter than the shell, with a posterior, long, slender lateral tooth or cartilage plate extending just below it (double in the right valve), and another similar but shorter one in front of the beaks; anterior muscular impression simple, ovate, longer and stronger than the posterior; occasionally a slight clavicular extends from in front of the beak behind the anterior adductor impression leaving a furrow in the cast; pallial impression entire (occasionally one small cardinal tooth beneath the beak); surface smooth or concentrically lined.

Except in their small size and marine habits, these little fossils

resemble the recent Anodons, from which there being but two simple adductor impressions separates them. They differ from *Modiolopsis* (or *Cypricardites*) in their rotundato-quadrate compressed form, and the posterior adductor impression like the anterior one, and they have no trace of the byssiferous sinus so common in that group between the body of the shell and the anterior side: from *Schizodus* (*Myaphoria*), with which Prof. King seems to have blended them, they are distinguished by the long, slender, posterior cartilage plate or lateral tooth a little below the hinge-line. Except in form they are identical with *Clidophorus*, and should be considered but as a subgenus thereof, distinguished from those long narrow types by their broad rounded or oblique axe-like form, more prominent beaks, and less marked clavicular ridge. From the figure of *Microdon bellastris* (Conrad) I should have imagined it belonged to the present genus, but his description of the hinge renders it probable that this genus is different, and I accordingly give a description of my own clear types, besides which the name *Microdon* was applied long previously to a genus of fish and one of insects.

Anodontopsis angustifrons (M'Coy).

Sp. Char. Longitudinally subtrigonal, compressed (depth of both valves half the width), diagonally subcarinate from the beaks to the respiratory angle; beaks small but prominent, rather more than one-fourth of the length from the anterior end, which is much narrowed and abruptly compressed beneath the beaks, produced, rounded, not separated from the body of the shell by any sinus; ventral margin nearly straight; hinge-line short, slightly elevated, forming a wide compressed posterior slope, the margin of which is almost uniformly arched from the beaks to the respiratory angle, which is obtusely pointed; surface nearly smooth, a few obscure concentric wrinkles of growth near the margin. Width from beak to ventral margin 6 lines, length 1 inch 2 lines, width from middle of dorsal to opposite ventral margin $\frac{5.6}{100}$, length of anterior end $\frac{2.5}{100}$. Pallial and muscular impressions as in the generic characters.

The more arched and elevated hinge-line and narrow anterior side separate this from the *Pullastra laevis* (Sow.), which seems to belong to the same genus; and the contracted anterior end and greater length separate it from the *A. quadratus* (M'Coy). The posterior lateral tooth or plate extends almost to the end of the hinge-line and close to it.

Common at Benson Knot, Kendal, Westmoreland, and Kirkby Moor, Kendal, Westmoreland.

(*Col.* University of Cambridge.)

Anodontopsis quadratus (M'Coy).

Sp. Char. Rotundato-quadrate, slightly oblique, with about three-fourths of the length compressed, slightly and evenly convex, the posterior ridge obtuse, and posterior slope obscurely marked; beaks very small, subcentral; anterior and posterior sides of nearly equal width, the former broadly rounded, the latter with an obscure, slightly oblique truncation; dorsal margin slightly arched, ventral margin nearly straight, slightly convex. Width $9\frac{1}{2}$ lines, length 1 inch.

The peculiar figure produced by the shortness of the posterior side and less convexity easily distinguish this from the *A. lævis* (Sow. sp.) Casts show the anterior ovate adductor, a faint clavicular ridge extending from in front of the beak to its upper posterior edge; a short cardinal tooth under the beak, and the slender anterior and posterior lateral teeth close under the margin, the latter extending almost to the end of the hinge-line.

Common in the tilestone of Storm Hill, Llandeilo.

(Col. University of Cambridge.)

Anodontopsis securiformis (M'Coy).

Sp. Char. Subrhomboidal, compressed, sides evenly convex; diagonal ridge angular, sharply defined towards the beak; slightly concave towards the posterior slope, which is flattened and steep; beaks small, prominent, about one-fourth of the length from the anterior end, which is semicircularly rounded; ventral margin regularly convex; posterior end narrowed, obliquely truncated, with a straight edge; hinge-line straight, as long as the truncated posterior edge, internal posterior cardinal ridge very delicate, close under the hinge-line; anterior adductor small, oval, with a short slender ridge from the beak to its posterior edge. Length 10 lines, proportional width $\frac{6.8}{100}$, length of anterior end $\frac{2.5}{100}$, length of anal edge $\frac{4.5}{100}$, depth of one valve $\frac{1.3}{100}$.

There is some slight variation in the proportional width of this species, the shortest varieties of which are however much larger and with a more acutely truncated posterior end than the *Cypriocardia deltoidea* or *Isocardia axiniformis* (Phill.) of the carboniferous and (?) Upper Devonian (of S. Petherwin rocks), to which the species is most allied.

Common in the green micaceous quartzite (Upper Ludlow of Benson Knot, Kendal, Westmoreland).

(Col. University of Cambridge.)

Clidophorus ovalis (M'Coy).

Sp. Char. Oval, width two-thirds the length; anterior and pos-

terior ends almost equal, elliptically rounded, ventral margin gently convex; valves slightly and evenly convex, the posterior slope very slightly compressed; surface apparently smooth; clavicular ridge strong, reaching rather more than half-way from the beak to the ventral margin. Width $3\frac{1}{2}$ lines, length 5 lines.

This is distinguished from the *C. planulatus* (Conrad) by its regular oval form, larger and more oblique clavicular ridge and less elongation, and from the *Cucullæa* (*Cucullella*) *antiqua* (Sow.) by the flatness and oval outline of the valves.

Plas Madoc, N. of Llanrwst; abundant in the schists, Dolydd Ceriog Waterfall, E. of the Berwyn Mountains.

(Col. University of Cambridge.)

Tellinomya lingulæ-comes (M'Coy).

Sp. Char. Obovate, slightly and evenly convex; beaks small, compressed, not prominent, close to the anterior end, which is broadly rounded; dorsal and ventral margins slightly convex, converging towards the narrow posterior end, which is truncated more or less obliquely, about two-thirds the width of the shell under the beaks, and has an almost imperceptible sinus between its inferior angle and the ventral margin; surface with fine irregular imbricating plicæ of growth. Width 6 lines, length 1 inch 1 line.

This is much allied to the *T. nasuta* (Hall) of his Trenton group, but is smaller, shorter and more regularly ovate. It has somewhat the form of *Cardinia* with the delicate shell and edentulous hinge of *Anodon*. I believe this is about the oldest known Lamellibranch, occurring in considerable abundance among the *Lingule* in the slates near Tremadoc, and from being about the same size and texture may be confounded easily with them when crushed.

Slates, Penmoifa.

(Col. University of Cambridge.)

Sanguinolites anguliferus (M'Coy).

Sp. Char. Oblong, length three times the width; beaks small, half the width from the anterior end, which is subquadrate, rounded; posterior end subtruncate, not oblique, scarcely wider than the width of the shell from the beak to the ventral margin; dorsal and ventral margins straight, almost parallel; a strong diagonal ridge runs from the beak to the inferior posterior angle, immediately in front of which is the deepest part of each valve; from the beak to the anterior end is marked by eight or ten narrow rounded ridges running obliquely down-

wards and backwards towards the middle of the ventral margins; a few of them meet at an acute angle, about the middle of the shell, with a few, more nearly vertical ridges proceeding from the great diagonal ridge; most of both sets of ridges go towards the ventral margin; they are separated by flat spaces wider than their own diameter; the posterior slope is divided into three broad, rounded radiations by three shallow impressed lines, crossed by irregular wrinkles parallel with the posterior margin, all the ridges are slightly undulated by the faint plicæ of growth; posterior dorsal lunette very narrow, concave, horizontal (or perpendicular to the plane of the valves). Length 3 lines, width 1 inch 4 lines.

A specimen of the right valve shows rather more of the angular ridges, though a smaller individual than one of the left.

Rare in the tilestone of Benson Knot, Kendal, Westmoreland. (Col. University of Cambridge.)

Leptodomus globulosus (M'Coy).

Sp. Char. Globose, subtrigonal, width three-fourths of the length; beaks very large, a little nearer the anterior than the posterior end; sides evenly tumid, most so in the middle; posterior slope undefined, but very steeply sloped; anterior and posterior ends subequal, slightly contracted, rounded, ventral margin convex; hinge-line a little shorter than the shell, not elevated, inflected portion narrow; surface with a few concentric lines of growth. Length $7\frac{1}{2}$ lines, width 6 lines, depth of one valve 2 lines.

This departs so widely from either the shortest or most gibbous varieties of the *L. amygdalina* (Sow. sp.), that it seems desirable to give it a distinctive name; there is no other closely allied form. The general appearance approaches that of the *Nucula ovalis* of the same group, but in the latter the diagonal posterior ridge is more angular, and I have ascertained that it really possesses teeth as in *Nucula*.

Hard green micaceous Upper Ludlow rocks of Tenterfell, Kirkby Moor and Benson Knot, Kendal, Westmoreland.

(Col. University of Cambridge.)

Leptodomus truncatus (M'Coy).

Sp. Char. Oblong or subtrigonal, compressed; beaks very large, gibbous, prominent, terminal, the anterior end being almost vertically subtruncate under it, width of the anterior end (where it is greatest) nearly two-thirds the length of the shell; posterior end obliquely subtruncate or rounded; ventral margin gently convex, with a scarcely perceptible sinus a little

behind the vertical line of the beaks; surface rugged, with strong, thick, irregular wrinkles from the anterior end, becoming obsolete on the posterior slope. Width from beak to ventral margin 1 inch, length 1 inch 5 lines, depth of one valve about one-third of the width.

This is somewhat allied to the *Cypricardia retusa* (Sow.), but has the anterior end even more vertically truncate; it is more elongate (although in this point it varies considerably); but it is most obviously distinguished by the strong wrinkling of the surface, parallel with the ventral edges, by which latter, as well as the great depth of the truncated anterior end, it also differs from the *C. impressa* (Sow.).

Upper Ludlow rock, Benson Knot, Westmoreland.
(Col. University of Cambridge.)

Modiolopsis inflata (M'Coy).

Sp. Char. Longitudinally oblong, very gibbous; beaks obtuse, incurved, large, close to the anterior end, which is large and obtusely rounded; an obtuse sigmoidal ridge extends from the beak to the posterior inferior end, which is elliptically rounded to the very obtuse cardinal angle, which is slightly elevated; hinge-line little more than half the length of the shell, with a slender cartilage ridge just below it; ventral margin very slightly concave in front of the diagonal gibbosity. Width $9\frac{1}{2}$ lines, length 1 inch 6 lines, greatest depth of one valve (about one-third the length from the beak) 4 lines. Surface with minute irregular plications and lines of growth.

Pen Cerrig Serth (very common).

Distinguished from all the varieties of the *M. modiolaris* by its greater gibbosity, shorter hinge-line, and broader anterior end.
(Col. University of Cambridge.)

Modiolopsis (? *Orthonota*) *postlineata* (M'Coy).

Sp. Char. Oblong, twice as long as wide, shell thin, moderately convex; beaks small, near the anterior end, which is obtusely rounded; no byssal sinus; posterior end obtuse, obliquely rounded; dorsal and ventral margins nearly parallel, straight; hinge-line two-thirds the length of the shell, with a nearly parallel delicate hinge-plate running beneath it and nearly parallel with the creet dorsal margins; surface with minute obsolete transverse wrinkles of growth, except of the flattened posterior slope, which is radiated with fine close equal striæ from the beak. Width from the beak to the ventral margin 5 lines, length 1 inch.

Some specimens bear a rough general resemblance to the *Nu-*

culites poststriata (Emmons), but they are distinguished by the parallelism of the dorsal and ventral margins, smaller beaks, greater transverse diameters, &c. It also closely resembles the *Cypricardites sectifrons* of Conrad, but that is figured with radiating lines on the sides as well as the posterior slope; the anterior part of our specimen is unfortunately imperfect.

Alt yr Anker, Meifod, Montgomeryshire.
(Col. University of Cambridge.)

Ambonychia ? acuticostata (M'Coy).

Sp. Char. Ovate, moderately and evenly convex, most so towards the beak; surface radiated with numerous angular ridges, only separated by the angular sulcus formed by the meeting of the steep sides of the ridges (about six ridges in one-fourth of an inch of the margin at half an inch from the beak).

In form and number of the ridges this resembles the small specimen of *A. carinata* (Gold. sp.) figured in Hall's 'Palæontology' (pl. 80. f. 5), but it is distinguished by its ribs being angular and close together—they being rounded and separated by flat interspaces in the American form. Only one imperfect specimen, measuring 7 lines from beak to ventral margin.

In the green schists of Dinas Bran, Llangollen.
(Col. University of Cambridge.)

Avicula ? Danbyi (M'Coy).

Sp. Char. Obliquely ovate, anterior end broadly rounded, posterior end more or less narrowed, rounded, ventral margin evenly convex; hinge-line rather less than half the width of the shell, posterior wing scarcely twice the length of the anterior, both wings nearly rectangular with slightly concave margins; left valve gently convex, most gibbous near the beaks, marked with minute concentric, irregular, interrupted striae and wrinkles, crossed by a variable number of obtuse ridges radiating from the beak, and generally becoming obsolete towards the margin; right valve flat, with slight irregular concentric wrinkles and striae of growth, without radiating ridges.

This species varies much in the amount of its obliquity and transverse elongation, and the number of radiations on the left valve; these latter resemble the radiation of *Pholadomya*, for which that valve might be taken when the ears are concealed. Traces of a subcentral muscular impression occasionally visible. Some of the varieties are so slightly oblique as to assume a rotundato-quadrate form. Average length 1 inch 5 lines, width 2 inches 3 lines, length of hinge-line 1 inch.

Traces of two fine internal ridges diverging from the beak of the flat valve where the wings join the body of the shell (resembling those of *Pecten*). The specific name was suggested by Mr. Salter for this species, if it should prove new, in honour of one who has diligently collected these remarkable fossils, and the others occurring near Kendal.

Very abundant in the greenish quartzite (Upper Ludlow rock) of Benson Knot, Kendal, Westmoreland.

(Col. University of Cambridge.)

Pterinea asperula (M'Coy).

Sp. Char. Obliquely ovate, body of the shell evenly convex, abruptly defined from the anterior and posterior sides; beak gibbous; anterior wing rounded, less than half the length of the posterior wing, which is flat, acutely pointed and extending a little beyond the shell, its posterior margin concave; posterior end of the shell broadly rounded; entire surface radiated with nearly equal rough (obscurely tuberculated) ridges separated by flat spaces rather greater than their diameter in width (six ridges in one line at margin); these ridges are crossed on the body of the shell by fine wrinkles of growth which on the wing and towards the beak become sharp definite striæ parallel with the margin; width from beak to margin $2\frac{1}{2}$ lines, length from beak to posterior end $3\frac{1}{2}$ lines, width of posterior wing from angle to side of shell $1\frac{1}{2}$ line.

Common in the black shale of Bultb Bridge, Radnorshire.

(Col. University of Cambridge.)

Pterinea hians (M'Coy).

Sp. Char. Rotundato-quadrate, slightly oblique, moderately gibbous, most so one-third the length from the beaks, which are one-third the length of the hinge-line from the anterior end; anterior side large, defined by a deep hollow extending nearly at right angles with the hinge-line from before the beak to the ventral margin, in which it produces a slight sinus; in front of this it is convex, and then nearer the slightly acute cardinal angle another smaller shallow sinus extends from the margin towards the beak; posterior wing broad, compressed, not abruptly defined from the body of the shell, slightly acute, and scarcely extending beyond the posterior end of the body of the shell which is obtusely rounded; ventral margin nearly horizontal, slightly convex; surface with close fine equal thread-like radiations, interrupted by slightly irregular concentric imbrications about half a line apart. Width from beak to middle of ventral margin $6\frac{1}{2}$ lines, length of hinge-line 9 lines.

This differs from the *Avicula emarciata* (Conrad) by the large gaping anterior side with its double sinus; the same separates it from a small variety of the *A. Boydii* (Conrad); it is also more square and less oblique than either of these species. The large size of the anterior lobe also separates it from the *Avicula quadrula* (Conrad).

From the Aymestry limestone of Mortimer's Cross, Aymestry.
(Col. University of Cambridge.)

Pterinea megaloba (M'Coy).

Sp. Char. Obliquely subtrigonal, diagonally tumid from the beak to the posterior end (the curve amounting nearly to a semi-circle in old specimens); hinge-line elevated into a compressed, nearly rectangular, broad wing, the angle rather nearer to the beak than to the posterior ventral end, which is obtusely rounded, and to which the margin is nearly straight; anterior end short, forming a very large rounded lobe; a shallow concavity which defines it from the body of the shell extends from the beak to a little in front of the middle of the ventral margin, where it forms a small sinus; beaks narrow, prominent, incurved; anterior muscular impression very strong in the casts; no teeth. Width from beak to opposite ventral margin 7 lines, length from anterior to posterior ends 1 inch 1 line, width of posterior end 11 lines, depth of left valve 5 lines. Surface apparently smooth, or marked with fine concentric striæ.

The great size of the anterior lobe is the most remarkable character, and is produced by the byssiferous sinus *extending backwards* at an acute angle to the hinge-line (about 75°), unlike any other species I know. If it was not for the left valve being so much more convex than the right, the species might have been placed in *Cypricardites*; the general form is exactly that of the *Pterinea rectangularis* (Sow. sp.) Sil. Syst. t. 3. f. 2, from which it seems to differ (nine specimens examined) in the want of the diverging cardinal teeth.

Not uncommon in the tilestone of Storm Hill, Llandeilo.
(Col. University of Cambridge.)

Pterinea Sowerbii (M'Coy).

Avicula reticulata (Sow.), S. S. t. 6. f. 3 (not of Hisinger nor Goldfuss):

Sp. Char. Obliquely ovate, depressed, slightly convex, greatest length along the posterior slope, which is straight and defined; posterior wing gently arched, scarcely extending beyond the shell, its posterior edge slightly and uniformly concave; surface radiated by slightly irregular obtuse ridges, about their

thickness apart, (five in 2 lines about the middle, at an inch from the beak,) partially interrupted by thin concentric imbrications from 1 to 2 lines wide, having the radiating ridges obsolete or nearly so on their half; radiating ridges of the wing rather larger, strongly marked only about the middle. Length from beak to respiratory* angle 2 inches 6 lines, length of posterior wing 1 inch 6 lines, width of ditto 1 inch 1 line, width from middle of hinge-line to ventral margin 2 inches 5 lines, depth of one valve 3 lines.

This fine species differs from the *Pterinea reticulata* of the original continental authors, in its more clongate form, smaller posterior wing, with its gently concave posterior edge, and the comparatively few, broad, thin imbrications interrupting the radiating ridges.

Aymestry limestone, Leintwardine.

(Col. University of Cambridge.)

Pterinea tenuistriata (M'Coy).

Sp. Char. Subquadrate, rounded, slightly oblique, evenly gibbous, left valve most so; width only slightly exceeding the length; beaks large, tumid; anterior wing half the length of posterior one, abruptly compressed, rounded; ventral margin and posterior end broadly rounded, posterior margin slightly concave towards the cardinal angle of the posterior wing, which is gradually compressed and scarcely extends beyond the shell; surface with irregular concentric wrinkles of growth crossed by very fine equal or subalternate radiating striæ from the beak, strongest in the middle, about six in 1 line, less than their diameter apart; posterior lateral tooth or hinge-plate as long as the hinge-line, and close beneath it, a thick internal ridge (often leaving a sulcus in casts) curves from behind the beak towards the ventral margin at an angle of about 50° to 60° from the hinge-line; hinge-line crenulated, forming Arca-like transverse teeth in front of the beak. Width from beak to opposite ventral margin 4 lines, length $4\frac{1}{2}$ lines.

This little species is much less transverse, and has a more obtuse posterior wing than the *Avicula insueta* (Conrad), which it otherwise much resembles. The abrupt bending-down of the curved internal ridge, like a lateral tooth, into the body of the shell, is a curious character, in which, as well as general form, it

* As the term *anal angle* is commonly used in speaking of the angle between the end of the hinge-line and the posterior margin, I propose using the term *respiratory angle* in the description for the angle between the posterior and ventral margins—the excretory or anal siphon being next the former, and the inhaling or respiratory siphon next the latter.

agrees with the *P. sublaevis* (M'Coy) of the Irish Silurian rocks, but from which it is distinguished by its fine close striation.

Common in the Upper Ludlow shale of Cwm Craig Ddu; Middleton Park near Sedburgh; Erw Gillfach, and in the Ludlow schists above Parklane; Upper Ludlow rock of Benson Knot, Kendal, Westmoreland; also in the sandy schists of Pont-ar-y-llechan.

(Col. University of Cambridge.)

VII.—On two new genera of Mollusca.
By HENRY and ARTHUR ADAMS, Esqrs.

To the Editors of the *Annals of Natural History*.

GENTLEMEN, 19 Hanover Villas, Kensington Park,
Dec. 17, 1850.

SHOULD you consider the following notice of two apparently new genera of Mollusca worthy of insertion in the 'Annals,' you will oblige us by its publication.

We remain, Gentlemen, your very obedient servants,
H. & A. ADAMS.

Genus PAXILLUS, nobis.

Gen. Char. Shell pupiform, rimate; spire acuminate; aperture semiovate, ascending on the body-whorl; inner lip adnate, spreading, flexuous; columella with a single prominent tooth-like plait; outer lip with a double peritreme, emarginate anteriorly; umbilical region with a spiral, elevated ridge, terminating in a notch at the fore part of the aperture.

Paxillus adversus, nobis.

P. testa ovato-acuminata, sinistrali, rimata, spira acuminata, corneo-fusca, semipellucida, longitudinaliter substriata.

Hab. Singapore, on mud-banks, in company with *Truncatella* and *Melampus*. *Dr. Livesay*.

Obs. This curious little genus, lately brought to this country by Dr. Livesay, Surgeon of H.M.S. Albatross, seems to approximate to *Diplommatina* of Benson, which, having sessile eyes on the base of the tentacles, and an operculum, belongs to the family *Truncatellidae*. There is, however, no indication of operculum in *Paxillus*, and the plait on the columella would render it referable to the family *Auriculidae*, with which group we place it, until, at least, more information is obtained concerning it.

Genus LIMNERIA, nobis.

Gen. Char. Shell solid, semiglobose, subspiral; aperture wide, expanded, extending posteriorly beyond the apex, rounded anteriorly; inner lip oblique, reflexed posteriorly, straight and acute anteriorly.

Limneria Caspiensis, nobis.

L. testa alba, subpellucida, transversim striata, dorso convexa, gibbosa; spira depressiuscula, involuta; apertura ampla, patula, labio postice reflexa, antice recta, acuta.

Hab. Caspian Sea.

Obs. We have ventured, with the kind permission of Mr. Sowerby, sen., to characterize this interesting shell as a genus, although at present we are unacquainted with the animal which constructs it. It seems to be closely allied to the *Lymnæidæ*, with which family we propose to associate it. The only species at present known is our *L. Caspiensis*.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

December 11, 1849.—R. C. Griffith, Esq., in the Chair.

1. DESCRIPTION OF A NEW GENUS AND SEVERAL NEW SPECIES OF TERRESTRIAL, FLUVIATILE AND MARINE MOLLUSCOUS ANIMALS INHABITING NEW ZEALAND. BY J. E. GRAY, ESQ., F.R.S., PRESIDENT OF THE BOTANICAL SOCIETY, ETC.

Major Greenwood has most kindly transmitted to me, for the Museum Collection, a number of small species of terrestrial and fluviatile Mollusca which he had collected near Auckland in New Zealand.

I hasten to lay before the Society a description of those which were not noticed in the Faunula attached to Dr. Dieffenbach's Travels.

1. ARÇONIDÆ.

1. NANINA? KIVI, *Gray, Fauna N. Z.* 262. n. 220.

Hab. Auckland; *Major Greenwood.*

2. NANINA MARIÆ, *Gray, Fauna N. Z.* 262. n. 221.

Hab. Auckland; *Major Greenwood.*

These species were each described from a single specimen; Major Greenwood has sent one of the former and several of the latter, of different ages, and they prove very distinct and well-marked species.

3. NANINA? CELINDE.

Shell rather depressed, pale brown; spire subconic; whorls five, rather closely adpressed, with transverse membranaceous ridges, the last slightly keeled, convex in front; axis with a narrow deep perfo-

ration; peristome with a very slightly thickened internal submarginal rib. Diam. 2 lines.

Hab. Auckland.

4. NANINA ERIGONE.

Shell trochiform, pellucid, brown-spotted; spire conical, as high as broad, apex blunt; whorls rather convex, very slightly concentrically wrinkled, brown, cross-banded, last rounded, evenly convex in front, axis with a narrow deep perforation; peristome rather reflexed near the axis. Diam. $\frac{1}{2}$ th of an inch.

Hab. Auckland, New Zealand; *Major Greenwood.*

5. NANINA TULLIA.

Shell depressed, pellucid, whitish; spire scarcely raised, with close-pressed, rather convex, transversely-grooved whorls, crossed with pale brown streaks; the last whorl rounded, convex in front, and crossed with brown lines and distinct cross-grooves; axis imperforated. Diam. $\frac{1}{9}$ th of an inch.

Hab. Auckland, New Zealand.

2. LIMACIDÆ.

1. *HELIX DUNNIE*, *Gray, Ann. Nat. Hist.* v. 317, 1841; *Fauna N. Z.* 247. n. 143. Named in honour of Mrs. Dunn, a relative of Mr. Joshua Alder, from whom I received the first land-shell from New Zealand.

2. *HELIX GREENWOODII*.

Shell rather depressed, largely umbilicated, pale brown, thin, pellucid, rugose; spire slightly raised, outer whorl rounded, with three or four rather oblique ridges directed towards the front; umbilicus very large, conical, wide, deep, the pillar side of the outer lip straight and high.

Hab. Auckland, New Zealand; *Major Greenwood.*

This species is very like *Helix Dunnie* in size, colour and form, but the outer whorl is rounded, and with some very peculiar oblique ridges on the outer periphery; the umbilicus is much larger; the pillar-lip, as high as the confines of the umbilicus, is straight, and not arched, as in that species.

I have great pleasure in dedicating it to Major Greenwood, who has so kindly enabled me to add the above genus, and this and the following species, to the New Zealand Fauna.

3. *HELIX (CAROCOLLA) ZELANDIÆ*, *Gray, Faun. N. Z.* 247. n. 144 and 262.

Hab. Auckland.

4. *HELIX PORTIA*.

Shell rather depressed; spire convex, rounded, pale brown; whorls five or six, rather close-pressed, rather convex, crossed with close concentric laminal ridges, edged with elongated hairs, and marked with rather dark brown cross-bands; last whorl rounded, convex in front;

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axis with a rather narrow deep umbilicus; mouth rather wide, peristome thin, slightly reflexed near the axis, and rather sinuous near the suture of the spire. Diam. $\frac{1}{3}$ rd of an inch.

Hab. Auckland; *Major Greenwood and Dr. Sinclair.*

5. HELIX IDE.

Shell depressed, pellucid, whitish, brown rayed; spire flat or rather sunk in the middle whorl, close-pressed, convex, with rather distant very slight spiral membranaceous ridges, and larger and more distinct membranaceous cross-ridges, fringed on the edge with hair-like elongations; last whorl rounded externally in front, slightly flattened near the axis; axis large, umbilicated, showing the volutions. Diam. $\frac{1}{4}$ of an inch.

Hab. Auckland.

6. HELIX (ZONITES) COMA, *Gray, Fauna N. Z.* 263. n. 224.

Hab. Auckland (abundant); *Major Greenwood.*

7. HELIX EGESTA.

Shell depressed, dark brown; spire scarcely raised, at length irregular and rather distorted; whorls subcylindrical, regularly and closely spirally grooved, with rather distant, thick, broad, membranous cross-ridges; last whorl subcylindrical, often twisted rather in front of the regular course, rounded externally and in front, and closely spirally grooved in front; axis widely umbilicated, showing all the whorls. Diam. $\frac{1}{6}$ th of an inch.

Hab. Auckland; *Dr. Sinclair and Major Greenwood.*

8. ZONITES CHIRON.

Shell depressed, dark olive-green, covered with a thick, polished periostraca, and crossed with rather sinuous, concentric, membranous ridges; spire rather convex, rounded; whorls rather convex, last spread out, rounded on the edge and convex in front; axis widely umbilicated, showing the lower whorls; mouth roundish, sublunate; peristome thin, outer lip rather expanded behind, and separated from the penultimate whorl by a slight notch. Diam. $\frac{1}{4}$ of an inch.

Hab. Auckland; *Major Greenwood.*

The upper surface resembles a miniature *Helix Busbyi*, but the under surface is very different.

9. ZONITES? CORESIA.

Shell depressed, dark olive-green, with brown cross-bands covered with a thick, smooth, polished periostraca; spire scarcely raised, rather convex; whorls convex, last expanded, rounded on the edge and in front; axis broadly umbilicated, showing all the whorls; mouth roundish, sublunate; peristome thin, with the periostraca inflexed when dry. Diam. $\frac{1}{6}$ th of an inch.

Hab. Auckland, New Zealand.

This shell is exactly like a very minute specimen of *Helix Busbyi*. It differs from the former, *Z. Chiron*, in being smaller, more depressed, and in the umbilicus being much wider, showing the front side of the upper whorls, which appear rather transverse.

10. BULIMUS? (LAOMA) LEIMONIAS.

Shell trochiform, polished, brown-spotted; spire conical, rather higher than broad, apex obtuse; whorls very slightly convex, polished, with one or two slightly sunk lines on the front half; last whorl with a distinct rib-like keel on the front edge; two spiral grooves on front half outer side; the side flattened with several small concentric grooves; axis minutely and deeply perforated; mouth square; peristome simple, slightly reflexed near the axis; the throat with three equal, well-marked spiral ridges, one on the outer side of the posterior, and another opposite to it on the outer side of the front lip, and one on the middle of the right side or outer edge of the last whorl. Diam. $\frac{1}{2}$ th of an inch.

Hab. Auckland; *Major Greenwood.*

I am inclined to regard this shell as the type of a particular sub-genus of shell which may be characterized by the simple peristome, the perforated axis, the square mouth, and the spiral ridges in the throat; but I have only seen a single specimen, and it may be, though I regard it as very improbable, the young state of a *Pupa* or *Vertigo*. If it prove distinct, it may be called *Laoma*.

AURICULIDÆ?

ELASMATINA RECLUSIANA, *Petit, Proc. Zool. Soc.* 184 .

Hab. Auckland, New Zealand; *Major Greenwood.*

M. Petit described this specimen from the island of Opara in the South Seas.

CYCLOSTOMIDÆ.

REALIA EGÆA.

Shell ovate, pale brown, covered with a dull brown periostraca marked with elevated, transverse, membranaceous ridges rather fringed on the edge; apex rounded; whorls convex, rounded in front, and with a deep brown band round the axis; axis scarcely perforated; mouth ovate; peristome reflexed, sharp-edged, with a thin, sharp-edged, slightly-raised internal peristome. Length $2\frac{1}{2}$ lines.

Hab. Auckland, New Zealand.

CYCLOPHORUS CYTORA.

Shell minute, trochiform, brown, closely and uniformly spirally striated and slightly concentrically wrinkled; apex subacute; spire conical, nearly as high as broad; whorls convex, the last rounded and convex in front; axis perforated; mouth subcircular; peristome scarcely reflexed, thickened internally; ? operculum horny, of a few rapidly enlarging whorls. Diam. $\frac{1}{10}$ th of an inch.

Hab. Auckland, New Zealand; *Major Greenwood.*

LYMNEADÆ.

PLANORBIS CORINNA.

Shell depressed, white, above flat, beneath rather concave; whorls convex; rounded.

Hab. Auckland, New Zealand.

This species is very like the European *P. albus*, but not spirally striated.

The most interesting of these shells is a new genus, which appears to belong to the family *Lymneadæ*, and allied to the genus *Ancylus*, but to be immediately distinguished from it by the shell possessing a thin lamina on the hinder edge of the cavity, most probably extended between the upper part of the body and the upper edge of the foot, as is the case in *Crepidula*. It is easily to be distinguished from the latter genus by the posterior plate having its edge bent suddenly down towards the base of the aperture and enlarged at the front part of the right side, and produced into a lobe having a groove between it and the inner surface of the right side of the shell. This character also separates it from *Navicella*.

The genus may be thus characterized:—

LATIA.

Shell half ovate, spiral, of one or two very rapidly enlarging whorls; spire very short, placed nearly in the centre rather on the left of the hinder edge; aperture very large, nearly occupying the whole of the shell, oblong, rather oblique; cavity simple, hinder edge with a thin, narrow, flat, horizontal lamina occupying the hinder and nearly half the length of the left side of the cavity; the left and hinder edge suddenly bent down towards the base of the shell, and produced into a rather broad expansion at the right side, leaving a rather broad space between it and the inner part of the right side of the aperture; periostraca thin, pale brown, spirally striated.

Animal.—Head with a short broad snout, rounded in front; tentacula two, short, triangular, the eyes on the outer side of their base; body subspiral; mantle submarginal, continued all round; edge simple; aperture of the respiratory cavity on the hinder part of the right side, protected on the inner side by the process of the lamina; upper part of the body subspiral, separate from the back of the foot and fitting into the upper cavity of the shell above the posterior plate; abductor muscle submarginal, horse-shoe-shaped?; foot oblong, rounded at each end.

The description of the animal is imperfect, being taken from a dried specimen softened by being soaked in a weak solution of caustic potash, and then placed in weak spirits.

This genus is evidently allied to *Ancylus*, but differs in the shell being more Nerite-like, and in the aperture of respiration being placed on the right side.

LATIA NERITOIDES.

Pale brown, spirally striated, internal lamina white, transparent.

Hab. Auckland, New Zealand.

Dr. Sinclair sent some specimens of this shell to the British Museum, with animals dried in them, in 1847, and Major Greenwood has kindly sent two additional specimens.

LITTORINIDÆ.

Amnicola? antipodarum, *Gray, Fauna New Zeal.* 241. n. 101.

Auckland, New Zealand; *Major Greenwood.*

Amnicola? Zelandiæ, *Gray, Fauna New Zeal.* 241. n. 102.

Auckland; New Zealand; *Major Greenwood.*

Amnicola? n. sp.

A single specimen, not in a good state.

Auckland, New Zealand; *Major Greenwood.*

Major Greenwood also sent two specimens of a marine shell. He observes, that it was "entirely enveloped by the animal when alive." It proved a new species of *Lamellaria*.

LAMELLARIA OPHIONE.

Shell oblong, elongate, pellucid, white; spire very short, conical; whorls convex, last whorl very large, convex, rather iridescent; aperture ovate; pillar-lip curved, slightly reflexed.

Auckland, New Zealand.

2. DESCRIPTIONS OF NEW SPECIES OF SHELLS FROM THE CUMINGIAN COLLECTION. BY ARTHUR ADAMS, F.L.S.

1. *TELLINA SQUAMULOSA*. *T. testâ transversâ, æquilaterali, albâ, concentricè in medio plicatâ, plicis angulatis subdistantibus, interstitiis longitudinaliter striatis; regionibus lateribus squamulis spinosis, regione ventrali squamulis verrucosis obsitâ; latere antico rotundato, postico subflexuoso rostrato; areâ sulco impressâ; margine ventrali convexo, posticè subflexuoso.*

Hab. Cape York, North Australia; collected by J. B. Jukes, Esq.

2. *SANGUINOLARIA TELLINOIDES*. *S. testâ transversâ, inæquilaterali, utrinque hiante, rubiginosâ, tenui, lævi, striis transversis concentricis radiatim lineolatâ; latere antico latiore, rotundato; postico angustiore, rotundato, subrostrato; areâ laterali lined latâ impressâ; margine ventrali convexo, posticè valdè sinuato.*

Hab. Gulf of California.

3. *PANOPEA JAPONICA*, A. Adams. *Pan. testâ æquivalvi, transversâ, lateribus inæqualiter hiante, inæquilaterali, utrinque rotundatâ, albâ, tenui, fragili, transversim concentricè plicatâ, plicis subdistantibus rotundatis; latere antico breviorè, postico duplo ferè anticum superante; margine ventrali arcuato, integro.*

Hab. Japan.

January 8, 1850.—Wm. Yarrell, Esq., Vice-President, in the Chair.

1. CONTRIBUTIONS TO THE KNOWLEDGE OF THE ANIMAL OF NAUTILUS POMPILIUS. BY J. VAN DER HOEVEN.

[This paper, which would be unintelligible without the plates, will be published in vol. iv. of the Society's 'Transactions.'—ED. *Ann. Nat. Hist.*]

2. DESCRIPTION OF A NEW GENUS OF BATRACHIANS FROM SWAN RIVER. BY DR. H. SCHLEGEL, CURATOR OF THE ROYAL ZOOLOGICAL MUSEUM, LEYDEN. (EXTRACTED FROM A LETTER TO J. E. GRAY, ESQ.)

“The following notice I hope is sufficient to give an idea of a new Toad which was discovered at Swan River by Dr. Pries:—

“MYOBATRACHUS, n. g.

“Tongue small; no teeth except two small horizontal fangs in the intermaxillary bone; eustachian tubes separated, opening behind the eyes. Legs short, enveloped at the base in a duplicature of the skin of the sides of the body. Fingers 4, the second longest; toes 5, cylindrical, tapering, not armed. Eyes lateral, middle-sized.

“MYOBATRACHUS PARADOXUS.

Above brownish grey, beneath greyish.

Hab. Australia; Swan River. *Mus.* Leyden.

The Prince of Canino has made for this animal a family, which he has named MYOBATRACHIDÆ.”

Mr. Gray observed, that a toad which he described and figured in Capt. Grey's Travels in Australia, under the name of *Breviceps Gouldii*, agrees with the animal described by Dr. Schlegel in all particulars, and especially in possessing the two horizontal horny appendages on the intermaxillary, which Dr. Schlegel described as horizontal fangs; they are partly sunk into the integument of the palate. Admitting the propriety of the proposed generic distinction, the animal will therefore now stand in the catalogues as *Myobatrachus Gouldii*.

The presence of the teeth in the intermaxillary separates this animal from the *Breviceps* of South Africa.

3. DESCRIPTIONS OF SOME APPARENTLY NEW SPECIES OF LONGICORN COLEOPTERA IN THE COLLECTION OF THE BRITISH MUSEUM. BY ADAM WHITE, F.L.S., ASSISTANT IN THE ZOOLOGICAL DEPT. BRIT. MUS.

PRIONACALUS ATYS.

In the ‘Annals and Magazine of Natural History,’ vol. xv. p. 108, I have described under the name of *Prionacalus Cacicus*, a curious genus from Mexico, allied to *Psolidognathus*, G. R. Gray. I regarded the two specimens as male and female of the same species, but it would seem that they are both males, and as they are considerably different, must be different species; what was deemed the male may retain the name *Prionacalus Cacicus*; it is figured on Pl. VIII. fig. 1. of the above volume. The other specimen may be named *Prionacalus Iphis*; it is figured on Pl. VIII. f. 2. Since the above we have received a third species from the Andes of Peru, where it was found by Prof. Jameson of Quito; the following short specific characters may distinguish the three:—

P. CACICUS.

Head behind the eyes without a prominent spine, the lateral mar-

gin behind, produced into a slight process directed backwards; a strong crested ridge over each eye, at the end directed outwards; antennæ, palpi and legs rufous, antennæ blackish at the base; jaws, excepting at the end and on the edges (where they are smooth) roughly punctured: head, thorax and elytra, at the base, somewhat roughly punctured, the elytra more delicately punctured towards the end.

Hab. Mexico.

P. ATYS.

Head midway between the eyes and the hind margin, with a small wide spine; a slight, crested, straight ridge over each eye, the space between slightly grooved; antennæ thickish. In colour it is of a dark pitchy brown; the apex of the elytra somewhat ferruginous; legs pitchy brown; tarsi and tips of tibiæ ferruginous; palpi of a clear ferruginous: sculpture much as in last.

Hab. Andes of Peru.

P. IPHIS.

Deep black, coarsely punctured and rugose; antennæ at the ends, palpi, tibiæ at apex and tarsi reddish; head midway between the eyes and hind margin, with a strong wide spine on each side; head with the two keels over the eyes short and straight, the space between them deeply grooved.

Hab. Mexico.

CALOCOMUS MOROSUS.

Antennæ ferruginous, black at the base; 13-jointed, very strongly serrated on the outside, the terminal joint deeply notched, nine at least of the terminal joints with the outer edge elongated at the tip: head, thorax, scutellum, abdomen and legs pitchy black; head, thorax and scutellum thickly punctured; elytra thickly and finely punctured, the punctures of the base coarser; elytra wide, shorter than the abdomen, ferruginous, in some places darkish brown.

Hab. Bolivia. From the Collection of Mr. Bridges.

This makes the fourth species of *Calocomus*, a genus which seems, like some of the other *Prionidæ*, to be very variable in the number of joints in the antennæ; the type *C. Desmarestii* has eleven joints; this species has thirteen; while the *Calocomus Lycius*, and *C. Kreuckelyi*, described by M. Buquet, have no less than twenty-two.

PYRODES TENUICORNIS.

Head and thorax deeply, coarsely and irregularly punctured, washed with golden green, in some lights tinged with a deep purplish rufous; jaws golden green, tips and edges pitchy; antennæ with the first joint flattened above, golden green except at the end, which is bluish green; third joint much elongated, as long as the fourth and fifth taken together; the first six joints punctured, base of the seventh punctured, tip of the seventh joint and the whole surface of the terminal four grooved. Elytra varied with green and purplish red, much depressed, the margin and shoulders lively green; scutellum notched at the end, slightly grooved down the middle, and with a

patch of coarse punctures on each side of the groove. Under parts green with æneous reflections.

Femora green and covered with minute crowded warts; tibiæ and tarsi light rufous, the tibiæ with elongated papillæ and short hairs.

Hab. Mexico.

Of this species there are two examples in the Museum; in the one a purplish red tint pervades all the joints of the antennæ but the first, and extends over the whole elytra excepting on the basal margin and the extreme edge, which are green.

This species seems to link the three genera *Pyrodes*, *Mallaspis*, and *Solenoptera*; it agrees in most particulars with *Pyrodes*.

PYRODES SMITHIANUS.

Scutellum considerably elongated at the point and notched at the base, the shoulder and the elytra close to the scutellum are produced, and near the shoulder there is a deep groove. The head and thorax are rather smooth and closely punctured; the front margin of the thorax is slightly notched in the middle; the scutellum is quite smooth on the edges, down the middle, and at the tip; the elytra are roughly punctured, the punctures often running together and forming characters like letters; there are four longitudinal ribs down each, which are branched at the end.

This *Pyrodes* is of a bronzy copper colour, the tibiæ and most of the joints of the antennæ being tinged with purple.

Hab. Brazil.

A specimen was found by J. P. George Smith, Esq., of Liverpool, on Caripi, an island thirty miles from Para: he presented it, with numerous other fine insects, to the British Museum.

CALLOCTENUS, n. g.

Body small, the elytra extending over its side and considerably beyond its extremity. Head much excavated in front. Eyes large and prominent. Thorax with a distinct tooth on the sides a little beyond the middle. Scutellum of an elongated triangular form, pointed at the end. Elytra spined at the suture and at the end of the lateral margin.

Antennæ in the male pectinated from the fourth joint, in the female serrated from the fifth: in the male the first joint is of the same length as the fourth exclusive of the appendage; the third is considerably elongated and with a protuberance at the end; from the fourth to the eighth the end is furnished with a compressed appendage narrow at the base, dilated afterwards and blunt at the tip (the ninth and other joints broken off). Antennæ in the female with the terminal joints depressed, oblique at the end, so that the inner edge is serrated. Legs moderate, simple, without serratures. Elytra spined at the suture and at the end of the lateral margin.

This genus comes between *Pecilosoma* and *Anacolus*.

CALLOCTENUS PULCHER.

Hab. Venezuela.

Head, thorax, scutellum and under side of body of a dark coppery

green, the head and thorax rather thickly covered with soft greyish yellow hairs; elytra with three longitudinal, considerably raised keels, between each of which is a slighter keel; in the male these latter are abbreviated, between the keels the elytra are closely punctured; the elytra in the male are of a brownish yellow, the punctured parts, except at the base, being darker in colour; in the female the elytra are of a clear ochre yellow; in the male the antennæ are of a dull ferruginous, the base of the joints paler; the legs are ferruginous in the male, while in the female they are of the same dark coppery green as the head and thorax.

In a female specimen the elytra are of a very dark olive-green; the specimen is rather larger than the other.

Sent from Venezuela by Mr. David Dyson of Manchester.

BIMIA, n. g.

Head as wide as the thorax in front, somewhat narrowed behind, in front square and nearly perpendicular, grooved down the middle; jaws short and strong; eyes deeply notched for the insertion of the antennæ, the hinder margin widely sinuated.

Antennæ 11-jointed, shorter than the body; first joint clavate, cylindrical, slightly longer than the third; second joint small, moniliform; third, fourth and fifth joints straight, compressed, and nearly of the same length; the sixth slightly bent and compressed; the five last joints compressed and gradually smaller, the last blunt at the tip. Thorax wider than long, with a strong spine on each side about the middle, its disc depressed and slightly unequal. Scutellum largeish, hollowed slightly in the middle. Elytra rather narrow, not so long as the abdomen, soft, not meeting except at the base; the shoulders prominent, the sides nearly parallel, the ends slightly pointed; the wings large, and extending beyond the elytra and abdomen. Legs strong, slightly compressed; femora somewhat thickened; hind legs, if extended, would reach a little beyond the abdomen. Tarsi scarcely wider than the tibiæ; penultimate joint deeply cut; soles densely covered with short hairs.

This genus would seem to be placed not far from *Molorchus*, and may be allied to *Agapete*, Newman, Zoologist, iii. p. 1017: it is not unlikely that the other sex is very different in form and colour; there is only one specimen in the Museum.

BIMIA BICOLOR.

Hab. Australia (Perth). From the Collection of Mr. George Clifton. The body is of a very deep shining black, closely punctured, and furnished with short hairs; head below and in front yellow, the yellow colour extending triangularly between the antennæ; eyes, antennæ, cheeks and vertex black; thorax yellow, with a black band down the middle, contracted behind; scutellum black; legs of same deep black as the abdomen, a wide yellow ring on the front tibiæ near the top; elytra pale ochre yellow, with three or four longitudinal veins which branch towards the tip; wings long and black.

LAMIA (CEROSTERNA) TRIFASCIELLA.

Densely covered with short yellow and black hairs; head yellow, an impressed line along the middle free from hairs; antennæ with the two first and four last joints black, the other joints yellow at the base and black at the tip; thorax yellow; spines and a band connecting them black, the band crenated in front; legs yellow, joints, tarsi and posterior side of second and third pairs of femora black; scutellum at the end covered with yellow hairs; elytra of a clear ochre yellow, the base from the shoulder to the suture edged narrowly with black; a transverse black band before the middle, nearly but not quite touching the edge and the suture, widest toward the suture; another transverse black band just behind the middle, and neither touching the edge nor the suture, narrower than the first band, and, like it, waved both in front and behind.

Hab. China (Hong Kong). John Bowring, Esq.

This seems allied to the *L. Assamensis*, Hope. In the present unsettled state of the Longicorn Coleoptera it would be rash to found genera on mere isolated species; but it is difficult to refer the present to any of the modern genera; it comes perhaps nearest to *Cerosterna*.

BOTANICAL SOCIETY OF EDINBURGH.

Thursday, Nov. 14, 1850.—Professor Fleming, President, in the Chair.

The Curator gave a report on the state of the Herbarium, noticing that considerable progress had recently been made in the arrangement of the collections. Several important additions of foreign plants were noticed.

The following papers were read:—

1. "On the British species of *Carex*," by John M'Laren. The author stated that the substance of this paper was contained in an essay written for Dr. Balfour's class. He had since re-examined all the species, with the view of improving the descriptions, and was happy to acknowledge his obligations to Dr. Arnott's edition of the 'British Flora,' for some important particulars which he had not previously observed. The author stated, that in the present state of the science, unanimity could hardly be expected among naturalists with regard to the true limits of species; but, as it was necessary, in describing the *Carices*, to adopt an opinion on this subject, he thought it better to lean to the side of simplicity, and rather to unite two plants whose identity might be doubtful, than to retain them as ambiguous and ill-defined species. The result of these alterations is, that about ten of the species described in recent botanical works are considered as varieties.

While agreeing with Reichenbach in dividing this large and natural family, the subgenera have not been made to depend on the number of stigmas, because, by that arrangement, *C. cæspitosa*, *C. saxatilis*, &c., are placed along with the species which have compound androgynous spikes, and *C. pauciflora* and *C. rupestris* are likewise separated from the species with simple solitary spikes. In the general

classification, the system of Fries has therefore been followed; but in the arrangement of the species some alterations have been made. The usual mode of arranging the British species with glabrous fruit and terminal barren spikes appeared to the author exceedingly vague, and liable to many exceptions on account of the difference in the number, form, and direction of the spikes, even in the same species. He has therefore re-arranged them according to the nature of the bracts and fruit, as will be seen from the subjoined table:—

Subgenus *Vignea*; spikes simple solitary, or compound androgynous.

A. Spikes simple, solitary; *Monostachyæ*, Fr.

B. Spikes compound, androgynous; *Homostachyæ*, Fr.

I. Bracts not foliaceous, spikelets fertile below; *Hyparrhenæ*.

1. Root creeping.

2. Root fibrous.

II. Bracts long and foliaceous; *Bracteosæ*.

III. Bracts not foliaceous, spikelets fertile above; *Acroarrhenæ*.
Subgenus *Carex* (*Heterostachyæ*, Fr.); spikes simple distinct, the terminal ones barren or androgynous, the rest fertile.

I. Spikes unisexual, achenes biconvex, stigmas 2; *Distigmaticaæ*.

II. Terminal spike androgynous, fertile above, stigmas 3; *Tristigmaticaæ Mesoarrhenæ*.

III. Spikes unisexual, achenes trigonous, stigmas 3; *Tristigmaticaæ Acroarrhenæ*.

1. Fruit smooth bifid, bracts without sheaths.

2. Fruit smooth entire, bracts sheathing.

3. Fruit smooth bifid, bracts sheathing.

4. Fruit pilose, deeply bifid.

5. Fruit pilose entire or nearly so, bracts foliaceous.

6. Fruit pilose entire, bracts membranous sheathing.

Mr. McLaren then proceeded to give descriptions of the various British species and varieties, and illustrated the paper by specimens and dissections.

2. "Notes of a Botanical Trip to England," by John T. Syme. We are not aware that he detected any species previously unknown to English botanists in the several places which he visited.

3. "Notice of the discovery of *Saxifraga Hirculus*, in Boovland Moss, Walston, Lanarkshire, in September last," by George J. Blackie. The following are the Scottish stations in which this plant has been found:—

1. Langton, Berwickshire.

2. Source of the Medwyn, Pentland Hills: first found there by Dr. A. Hunter, September 11, 1836.

3. Jacksbarns, or Jackston, Glenbervie, Kincardineshire. Mr. James Rae, 29th June, 1839.

4. Between Fala and Stowe.

5. On the northern side of the Ochills, not far from Dollar. Mr. Wyville Thomson.

6. Near Walston, Lanarkshire. Mr. Blackie.

Dr. Balfour mentioned the discovery by Mrs. Balfour, in August last, of *Ginannia furcellata* of Turner, in Lamash Bay, Arran. This is the first Scottish station for the plant.

Dr. Balfour exhibited a recently invented apparatus for drying plants, which has been fully described in the 'Botanical Gazette.'

Mr. Charles Lawson exhibited a large plant of Tussac Grass, grown in Orkney. Some recently received tufts of this grass, when fresh, weighed about one cwt.

Dr. Balfour exhibited specimens illustrating the production of Vinegar.

1. The so-called Vinegar-plant, with vinegar produced by it.

2. Syrup into which the plant had not been introduced, but which had been left for four months undisturbed. In it a peculiar fungus-like growth similar to the vinegar-plant was found, and the fluid had become vinegar.

3. A specimen of vinegar produced by the Vinegar-plant which had been filtered, and then allowed to stand for several months, and in which a fungus similar to that called the Vinegar-plant had been formed.

Dr. Balfour thought the so-called Vinegar-plant must be considered the mycelium of some fungus produced in a peculiar fluid, and which acted as a ferment. The addition of any ferment would probably cause a similar production of vinegar.

MISCELLANEOUS.

RESUSCITATION OF FROZEN FISH.

To the Editors of the Annals of Natural History.

GENTLEMEN,

5 Barge Yard, City, Nov. 15, 1850.

IN the last number of your excellent Magazine there is a short notice by Prof. O. P. Hubbard on the resuscitation of frozen fish, and as he invites the record of facts, probably the fact recorded by Sir John Franklin in his first overland expedition to the Polar Sea may not have come under his observation, and I therefore append it:—

“It may be worthy of notice here (he says) that the fish froze as they were taken out of the nets, and in a short time became a solid mass of ice; and by a blow or two of the hatchet were easily split open, when the intestines might be removed in one lump. If in this completely frozen state they were thawed before the fire, they recovered their animation. This was particularly the case with the carp; and we had occasion to observe it repeatedly, as Dr. Richardson occupied himself in examining the structure of the different species of fish, and was always, in the winter, under the necessity of thawing them before he could cut them. We have seen a carp recover so far as to leap about with much vigour after it had been frozen for thirty-six hours.”—*First Overland Journey to the Polar Seas*, vol. ii. p. 234.

Mr. Hearne, Mr. Ellis, and other travellers in the icy regions, also

mention the power of many of the lower animals to endure intense cold, musquitoses and others of the insect tribe being frequently frozen into one black solid mass, which, when thawed, renewed all their energies. Spiders frozen so hard as to bound from the floor like a pea were revived by the fire ; so were frozen leeches, frogs and snails.

I also avail myself of the opportunity to forward you for publication in your widely-diffused journal some notices of the Moa, which I find in the report of a scientific meeting at Sydney, recorded in the 'Sydney Morning Herald,' and in an article in the second number of a very interesting colonial periodical, the 'New Zealand Magazine.'

Your obedient servant,

P. L. SIMMONDS.

THE MOA.

“ Dr. Nicholson then drew the attention of the meeting to a fossil bone of the Moa, which he had recently received from a friend who had arrived from New Zealand, and which he begged the Society to place in its museum. It was known to all of them that the discovery of the fossil bones of the Moa had excited considerable attention in the scientific world, and Professor Owen, the highest authority on comparative anatomy, had pronounced them to be the bones of a bird of from sixteen to twenty feet high, and of the same type as the Apteryx, which is now in existence in New Zealand. It was supposed that there was a probability of the Moa not being extinct ; and a son of Archdeacon Williams, and some American sailors, said that they saw one when travelling in the interior ; but he (Dr. N.) doubted the fact. It would be seen, however, that this bone was not much fossilized ; that it bore very little of a mineral character ; and it was probable, therefore, that within a comparatively recent period the Moa was in existence. The disappearance of particular species of animals was by no means uncommon. There was the well-known case of the Dodo, which existed in large numbers when the island of Mauritius was first discovered, but is now extinct, and he believed that there is not even a perfect skeleton of it in existence.

“ Within a very short distance of Norfolk Island there is a small islet called Philip Island, which was formerly inhabited by a large number of a peculiar description of Parrot, called, as we believe, the Leicester Parrot : that Parrot is now extinct. Mr. Holroyd thought there was great reason to believe that the Moa would be found alive. The bones were found in large quantities on the Southern Island, which is very thinly populated by natives, and a very large portion of which has never been seen by a white man ; besides which, the natives profess to have seen the Moa within twenty-five years.”

In the second number of the 'New Zealand Magazine,' in a paper by the Rev. R. Taylor, on the Geology of New Zealand, I find the following :—

“ Mr. Memaul, employed by the Government as native interpreter, stated to me, that in the latter end of 1832 he saw the flesh of the Moa in Molyneux harbour ; since that period he has seen feathers of

the same kind in the natives' hair ; they were of a black or dark colour with a purple edge, having quills like those of the albatros in size, but much coarser ; he saw a Moa bone which reached four inches above his hip from the ground, and as thick as his knee, with flesh and sinews upon it. The flesh looked like bull-beef. The slaves who were from the interior said it was still to be found in the island. The natives told him the one whose flesh he had seen was a dead one which they had found accidentally ; that they had often endeavoured to snare them, but without success. A man named George Pauley, now living in Foveaux Strait, told him he had seen the Moa, which he described as being an immense monster, standing about twenty feet high. He saw it near a lake in the interior. It ran from him, and he also ran from it. He saw its foot-marks before he came to the river Tairi and the mountains. Thomas Chassland, the man who interpreted for Memaul, was well acquainted with the Maori language. He also saw the flesh, and at first they thought it was human.

NOTICE OF TRILOBITES*.

Believing that any information upon the subject of Trilobites is at all times acceptable to the scientific world, I venture to tell you of a remarkable portion of one found a few days past by me. It is an "*Isotelus megistos*," and I think presents the most remarkable evidence of their gigantic size of any specimen now extant. It was found in our blue limestone strata, and presents the tail or "post abdomen," and seven of the segments across the back nearly entire. Its width is $9\frac{1}{4}$ inches, and its length a little exceeds this. Thus you perceive, that if we had the other segment and the head, we should have one entire that would measure at least $18\frac{1}{2}$ inches in length and $9\frac{1}{4}$ in breadth.

I see that M. Barrande of Prague is of the opinion that trilobites change greatly according to age. Of the correctness of that opinion I should have some doubts, as I have a variety of the *Isotelus megistos* from half an inch up to the gigantic one above mentioned, and I find no difference in them either in proportions or segments, each having eight, and each portion being equal in length. I have also numerous specimens of the *Calymene senaria* from the size of the smallest pea up to the size of 1 inch in width, and in them I find no difference. And of several other varieties, I have many portions of different ages, all of which have exact resemblance. Of the *Calymene Blumenbachii* I have them from 1 inch to $3\frac{1}{2}$ in length, more or less perfect, and in them I find no change in appearance. Thus it would appear that in our varieties, at least, we have no metamorphosis of the earliest of the moving animals. However, I have not seen his work, and the notice of it may be too short to give a correct idea of what he means.

Carrolton, Montgomery Co., Ohio, April 18, 1850.

* In a letter addressed by Dr. Taylor to the Editors of Silliman's American Journal.

METEOROLOGICAL OBSERVATIONS FOR NOV. 1850.

Chiswick.—November 1. Rain : fine. 2, 3. Fine. 4. Boisterous, with rain : fine : clear. 5. Cloudy. 6. Very fine. 7. Hazy : very fine. 8. Rain. 9. Very fine. 10. Fine : cloudy. 11. Very fine. 12. Uniformly overcast : very fine : clear. 13. Foggy : overcast : cloudy. 14. Clear and fine : frosty. 15. Frosty : overcast. 16. Drizzly : hazy : rain. 17. Fine. 18. Rain. 19. Low clouds : very fine : rain. 20. Fine : rain. 21. Cloudy : fine : overcast. 22. Overcast : slight rain. 23. Rain : clear at night. 24. Boisterous, with rain. 25. Clear : cloudy : rain. 26. Hazy clouds : overcast : cloudy. 27. Cloudy : rain : clear and frosty. 29. Frosty : fine : slight rain. 30. Frosty : overcast.

Mean temperature of the month 45°·49

Mean temperature of Nov. 1849 41 ·99

Mean temperature of Nov. for the last twenty-four years . 43 ·41

Average amount of rain in Nov. 2·38 inches.

Boston.—Nov. 1. Rain : rain A.M. 2. Cloudy. 3. Fine. 4. Cloudy : stormy : rain A.M. 5, 6. Fine. 7. Cloudy. 8. Fine. 9. Cloudy : rain P.M. 10. Fine. 11. Cloudy : rain early A.M. 12—14. Fine. 15. Cloudy : rain P.M. 16. Cloudy : rain A.M. and P.M. 17. Fine. 18. Cloudy : rain P.M. 19. Fine : rain A.M. 20. Rain : rain A.M. and P.M. 21. Cloudy. 22. Cloudy : rain A.M. and P.M. 23, 24. Rain : rain A.M. and P.M. 25. Cloudy. 26. Fine. 27. Rain : rain A.M. 28. Fine. 29, 30. Cloudy.

Sandwich Manse, Orkney.—Nov. 1. Rain. 2. Bright : showers. 3. Showers : thunder. 4. Sleet-showers : showers : sleet : thunder. 5. Cloudy : showers : sleet. 6. Bright : clear : aurora. 7. Rain : showers : thunder and lightning. 8. Showers. 9. Cloudy : rain. 10. Bright : cloudy : aurora. 11. Showers : aurora. 12. Drizzle : showers. 13. Hail-showers : clear : frost. 14. Clear : frost. 15. Clear : frost. 16. Sleet-showers. 17. Showers. 18. Showers : clear : lunar halo. 19. Rain. 20. Showers : clear. 21. Bright : clear : frost. 22. Cloudy : rain. 23. Cloudy. 24. Cloudy : clear*. 25. Showers. 26. Bright : sleet-showers. 27. Snow : clear : frost. 28. Bright : cloudy. 29. Showers : bright : cloudy. 30. Bright : clear.

Applegarth Manse, Dumfries-shire.—Nov. 1. Soft rain and brisk wind all day. 2. Wet A.M. : cleared and was fine. 3. Frequent showers. 4. Heavy rain : hail : stormy blasts. 5. Heavy showers : hail : hurricane. 6. Moist, but rain not heavy. 7. Rain very heavy, especially P.M. 8. Slight showers. 9. Gloomy November day : wet P.M. 10. Fair, but dull. 11. Rain early A.M. : damp evening. 12. Fair and fine. 13. Raw : frost : cloudy P.M. 14. Frost hard. 15. Thick fog : raw and chilly. 16. Thick fog : cleared P.M. 17. Showery : cleared P.M. 18. Rain during night : showers : high wind. 19. Rain very heavy : flood : mercury very low. 20. Rain, not so heavy : mercury rose quickly. 21. Slight frost, rime : clear and fine P.M. 22. Raw and damp : showers P.M. 23. Rain during night : flood. 24. Rain heavy and very high wind. 25. Rain during night : showers all day. 26. Slight frost A.M. : raw : showers. 27. Frost very keen all day. 28. Frost still keen : clear and sunny. 29. Frost milder. 30. Frost keen again.

Mean temperature of the month 49°·1

Mean temperature of Nov. 1849 42 ·0

Mean temperature of Nov. for the last twenty-eight years... 40 ·6

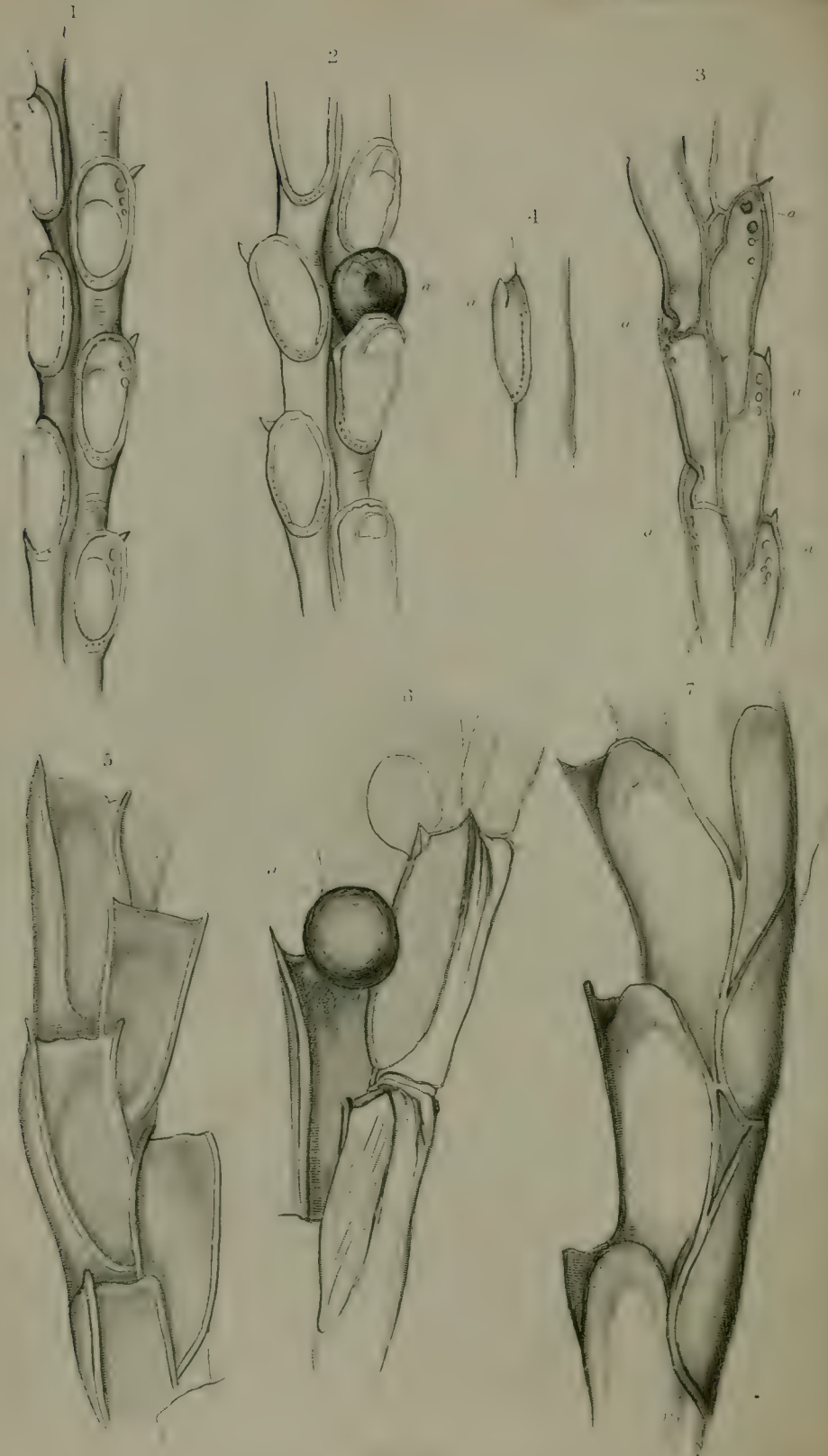
Average rain in Nov. for twenty-three years 3·60 inches.

* Great fall of barometer, but no stormy weather in Orkney. I have subsequently heard of the storm which caused such dreadful wrecks on the west coast of Ireland a few days earlier, and the fall of the barometer here is probably the effect of the same atmospheric wave.

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.

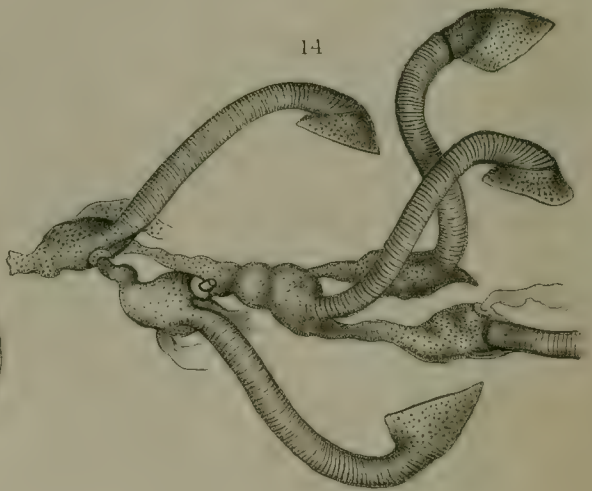
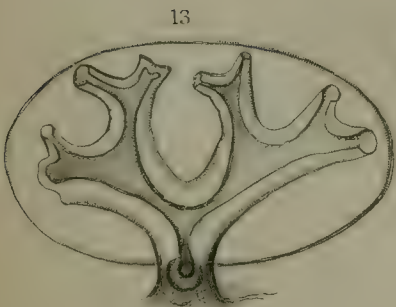
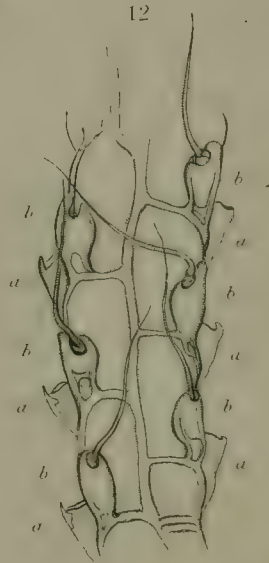
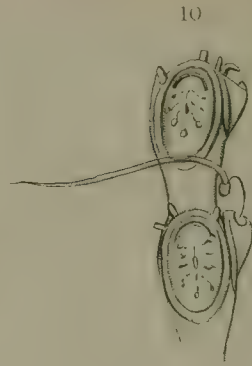
Days of Month.	Barometer.						Thermometer.						Wind.				Rain.								
	Chiswick.		Dumfries-shire.		Orkney, Sandwick.		Chiswick.		Dumfries-shire.		Orkney, Sandwick.		Boston.		Dumfries-shire.		Orkney, Sandwick.		Boston.		Dumfries-shire.		Orkney, Sandwick.		
	Max.	Min.	8 $\frac{1}{2}$ a.m.	9 a.m.	9 p.m.	8 $\frac{1}{2}$ p.m.	Max.	Min.	8 $\frac{1}{2}$ a.m.	9 a.m.	9 p.m.	8 $\frac{1}{2}$ p.m.	Max.	Min.	8 $\frac{1}{2}$ a.m.	9 a.m.	9 p.m.	Chiswick.	Dumfries-shire.	Orkney, Sandwick.	Boston.	Dumfries-shire.	Orkney, Sandwick.		
1. Nov.	29.985	29.915	29.46	29.60	29.61	29.46	60	50	52.5	54	52	52.5	55 $\frac{1}{2}$	49	52.5	54	52	sw.	w.	sw.	.07	s.	sw.	.53	
2.	29.997	29.926	29.40	29.58	29.65	29.39	60	36	53	50 $\frac{1}{2}$	46	53	52	50	46	50 $\frac{1}{2}$	46	sw.	sw.	sw.	.02	sw.	sw.	.07	
3.	30.159	30.037	29.56	29.79	29.67	29.43	58	42	43.5	48	49 $\frac{1}{2}$	43.5	53	44 $\frac{1}{2}$	48	49 $\frac{1}{2}$	48	sw.	sw.	sw.	.02	sw.	sw.	.30	
4.	30.007	29.865	29.18	29.32	29.58	29.22	56	38	56	50	42	56	50	43	46	42	46	w.	sw.	w.	.05	sw.	sw.	.48	
5.	30.030	29.960	29.42	29.50	29.63	29.29	56	42	48	52	40	44 $\frac{1}{2}$	52	42	44	44 $\frac{1}{2}$	44	w.	sw.	w.	.03	sw.	wnw.	.15	
6.	30.100	30.061	29.58	29.77	29.81	29.63	57	36	46	50	42 $\frac{1}{2}$	44	50	42 $\frac{1}{2}$	44	44	44	w.	sw.	wnw.	.02	sw.	wnw.	.05	
7.	30.113	29.932	29.58	29.63	29.50	29.28	58	46	49	50	44	49	45	44	49	45	45	sw.	sw.	sw.	.01	sw.	sw.	.24	
8.	30.153	29.909	29.40	29.61	29.95	29.15	53	29	45	50	40	44	50	40	44	44	44	w.	w.	w.	.01	w.	wnw.	.40	
9.	30.315	30.265	29.87	30.04	30.00	30.01	53	50	45	52 $\frac{1}{2}$	40	41	52 $\frac{1}{2}$	40	41	52 $\frac{1}{2}$	40	w.	w.	sw.	.05	w.	sw.	.16	
10.	30.248	30.183	29.72	29.93	29.90	29.68	58	46	51	53	52	49	53	52	49	49	49	sw.	sw.	w.	.03	sw.	w.	.55	
11.	30.108	29.999	29.57	29.80	29.82	29.67	58	48	51	56 $\frac{1}{2}$	50	48 $\frac{1}{2}$	51	56 $\frac{1}{2}$	50	48 $\frac{1}{2}$	46	sw.	sw.	sw.	.03	sw.	sw.	.02	
12.	29.999	29.980	29.55	29.88	29.95	29.88	56	26	48.5	49 $\frac{1}{2}$	45	45	48.5	45	45	41	41	wnw.	wnw.	wnw.	.04	wnw.	nw.	.12	
13.	30.017	29.986	29.64	29.91	29.98	29.99	47	24	33	48	31	36 $\frac{1}{2}$	35	48	31	36 $\frac{1}{2}$	35	nw.	nw.	nc.	.03	nw.	nc.	.04	
14.	30.248	30.129	29.79	30.09	30.14	30.16	46	19	32	39 $\frac{1}{2}$	25 $\frac{1}{2}$	37	34	39 $\frac{1}{2}$	25 $\frac{1}{2}$	37	34	ne.	nw.	nc.	.03	ne.	nc.	.03	
15.	30.293	30.170	29.90	30.06	29.93	30.12	43	31	32	40	26 $\frac{1}{2}$	33	37	40	26 $\frac{1}{2}$	33	37	w.	sw.	sw.	.06	sw.	sw.	.16	
16.	30.084	29.991	29.68	29.77	29.81	29.67	52	29	42.5	49 $\frac{1}{2}$	38	45 $\frac{1}{2}$	43	49 $\frac{1}{2}$	38	45 $\frac{1}{2}$	43	se.	s.	sw.	.06	s.	sw.	.36	
17.	30.094	30.044	29.66	29.84	29.80	29.69	48	35	38	46	38 $\frac{1}{2}$	46	43	38	46	43	39	sw.	sw.	w.	.07	w.	sw.	.40	
18.	29.888	29.468	29.48	29.67	29.28	29.58	55	45	39	48	43	43	39	48	43	43	39	se.	s.	sw.	.56	se.	sw.	.20	
19.	29.098	28.810	28.60	28.62	28.35	28.99	56	42	50	50	43 $\frac{1}{2}$	45	50	50	43 $\frac{1}{2}$	45	45	sw.	sw.	sw.	.24	sw.	sw.	.78	
20.	28.995	28.696	28.30	28.70	29.20	29.26	50	43	46.5	46	43 $\frac{1}{2}$	41 $\frac{1}{2}$	38	46.5	46	43 $\frac{1}{2}$	38	sw.	s.	nc.	.01	sw.	calm	.07	
21.	29.715	29.480	29.73	29.50	29.50	29.55	49	30	43	45	37	39 $\frac{1}{2}$	35	43	45	37	39 $\frac{1}{2}$	sw.	n.	nc.	.22	sw.	calm	.15	
22.	29.643	29.429	29.30	29.50	29.10	29.59	55	44	38	48 $\frac{1}{2}$	36 $\frac{1}{2}$	39	45	38	48 $\frac{1}{2}$	39	45	s.	sw.	e.	.26	sw.	calm	.104	
23.	29.551	29.337	28.88	29.04	29.15	28.83	53	39	54	49	45	48	45	48	45	48	45	sw.	sw.	s.	.46	sw.	s.	.11	
24.	29.305	29.018	28.66	28.70	28.40	28.74	56	43	51	52	42	43	42	42	43	42	43	sw.	sw.	n.	.04	sw.	n.	.17	
25.	29.217	29.093	28.60	28.65	28.88	28.50	52	31	45	48	41 $\frac{1}{2}$	46	45	48	41 $\frac{1}{2}$	46	45	sw.	sw.	n.	.02	sw.	n.	.20	
26.	29.411	29.358	28.97	29.18	29.49	29.38	45	34	37	45 $\frac{1}{2}$	35	40 $\frac{1}{2}$	34	45 $\frac{1}{2}$	35	40 $\frac{1}{2}$	34	sw.	sw.	n.	.01	sw.	n.	.17	
27.	29.904	29.591	29.32	29.76	29.94	29.89	44	26	40.5	37 $\frac{1}{2}$	32	32	33	37 $\frac{1}{2}$	32	33	33	sw.	n.	n.	.12	sw.	n.	.12	
28.	30.302	30.139	29.51	30.10	30.12	30.13	41	21	29.5	37	21	32	33 $\frac{1}{2}$	21	32	33 $\frac{1}{2}$	33	ne.	n.	n.	.09	ne.	n.	.18	
29.	30.314	30.215	30.00	30.11	30.09	29.98	37	19	33	38	29 $\frac{1}{2}$	40	43	38	29 $\frac{1}{2}$	40	43	e.	calm	calm	.01	e.	calm	.18	
30.	30.146	30.108	29.86	30.05	30.00	30.05	37	31	36	38	23	42 $\frac{1}{2}$	37	38	23	42 $\frac{1}{2}$	37	nc.	e.	e.	.09	nc.	e.	.07	
Mean.	29.914	29.749	29.40	29.566	29.720	29.531	29.565	54.76	35.83	43.6	47.6	39.0	43.1	42.06	39.0	43.1	42.06	2.04	1.50	4.20	6.81	2.04	1.50	4.20	6.81





1/2 mm





THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

No. 38. FEBRUARY 1851.

VIII.—*Notices of three undescribed species of Polyzoa.*
By GEORGE BUSK, F.R.S.

[With two Plates.]

I.

At the late meeting of the British Association in Edinburgh, Mr. Peach brought forward specimens and drawings of what he regarded as a new species of *Cellularia*, and of which he was good enough to give me a specimen for the purpose of examination and comparison. The result has convinced me that Mr. Peach was right in his conjecture, and that the species then produced, though not first collected or noticed by him, is fully entitled to a distinct specific place in the British fauna.

In Dr. Johnston's collection of Zoophytes now in the British Museum, there are, included in the same sheet of paper with the typical form of *Cellularia neritina*, or that from which the figure, if not the description, in the 'British Zoophytes' is taken (pl. 60. figs. 3, 4), two or three specimens of a form, termed in the Catalogue, a "slender transparent variety," I presume on Dr. Johnston's authority, although this variety is not referred to in the same terms in his work. This form, however, and Mr. Peach's new species are identical, and it is so very dissimilar in every respect to the *C. neritina* figured in pl. 60. fig. 3, 4 of 'British Zoophytes,' and in pl. 19 of Ellis's 'Corallines,' that I think it is impossible to regard it merely as a variety of that species. With respect to the latter, it may be remarked, that eventually it may perhaps turn out to be but a doubtful native; for although it is very generally distributed throughout the globe, it would appear to be more especially a southern form. It is stated by Lamouroux to occur in the Mediterranean, and is found in the Red Sea near Suez; it is also met with at Rio de Janeiro, the Falkland Islands, Australia, New Zealand, the Auckland Islands, and still further south, whence I have seen specimens in
Ann. & Mag. N. Hist. Ser. 2. Vol. vii.

Dr. Hooker's collection. And it should be remembered that the figure (pl. 19) in Ellis's 'Corallines' was taken from a specimen sent to his friend Mr. Peter Collinson from America. I would further advert to the circumstance, that from one of the localities enumerated by Dr. Johnston as affording *C. neritina*, viz. Copinstra, I have, through the kindness of Lieut. W. L. Thomas, received specimens of Mr. Peach's species, but none of the true *C. neritina* of Ellis and Lamouroux. It may also be noticed, that although Dr. Johnston's figure and references, as well as the authentic specimen in the British Museum, are plainly assignable to one and the same form, viz. to that figured in Ellis's 'Corallines,' pl. 19, and to that only, yet the description in 'British Zoophytes' (vol. i. p. 340) is not exactly applicable to that form, but more correctly so to Mr. Peach's.

As it is evident the name *C. neritina* must be retained for the form hitherto understood under it, the new species, now for the first time distinguished from it, will demand a distinctive appellation. Perhaps no better can be found than in the name of the worthy and zealous observer, to whose discrimination the British fauna may in fact be considered as indebted for this addition.

In the present not very satisfactory state of nomenclature with respect to the various species of *Cellularia*, I have thought it better to retain that more general term than to adopt any of the divisional ones more recently employed.

Genus CELLULARIA, Pallas.

Sp. *Cellularia Peachii* (Busk).

Cellularia neritina, var. Johnston.

Bugula neritina, var. Gray, List of British Radiata, p. 114.

C. cellulis subelongatis, deorsum attenuatis, supra truncatis, subrotundatis, spinam parvulum erectam externe gerentibus; postice foraminibus 3-5 seriatim dispositis, perforatis. Ore ovali regulari amplo, margine subincrassata minute verrucosa. Ovariis rotundatis superficie tessellatis.

Hab. Boddam, Buchanness; Peterhead, Tynemouth, Copinstra.

Mr. Peach remarks that the species is bushy, erect, attached to stones, old shells, and to other zoophytes from deep water, brought up by the fisherman's lines off Peterhead, &c., and that it is not plentiful. According to the British Museum list it also occurs at Tynemouth; and I have received it from Copinstra by Lieut. W. L. Thomas, R.N.

It is white and of a delicate shining aspect when dry; the branches long, slender and straggling. The inferior end of the cell as seen behind much contracted; the mouth regularly oval and

surrounded with a somewhat thickened margin, beset with minute verrucosities. There is a row of from three to five small openings towards the outer border of the cell on the back, and the upper and outer angle in front supports a minute upright spine, which is however not unfrequently wholly wanting. There are no moveable appendages. The ovarian cells are rounded and affixed above the cell to which they belong, and immediately behind the upper margin of the mouth, which in that case is slightly depressed. Their external surface is marked by lines crossing each other obliquely and giving it a tessellated aspect. The mouth of the cell is filled up by a delicate transparent membrane (more or less calcareous?), in the upper part of which is situated the small crescentic orifice, protected below by a projecting and probably moveable labium as in others of this class.

EXPLANATION OF PLATE VIII.

Fig. 1. Front view of a portion of a branch of *C. Peachii*.

Fig. 2. Ditto to show an ovarian cell (*a*).

Fig. 3. Back view of a portion of a branch: *a, a, a, a*, the series of holes.

Fig. 4. Side view of the mouth of a cell.

For the sake of comparison I have added some figures of the true *C. neritina*, and drawn to the same scale as the others, in order more distinctly and briefly to show the difference between it and the new species.

Fig. 5. Front view of a portion of a branch of *C. neritina* (*Acamarchis neritina*, Lamx.).

Fig. 6. *a*, an ovarian cell.

Fig. 7. Back view of a portion of a branch.

II.

For the following species, which I believe to be also new to the British fauna and hitherto altogether unnoticed, I am indebted to Prof. E. Forbes. It was dredged on the coast in the neighbourhood of Dartmouth. It also occurs among some zoophytes collected on the coast of Spain, or in the Mediterranean, by Mr. M'Andrew in the course of last year.

Its very close resemblance to *Scrupocellaria scruposa* may have caused it to be overlooked, and it may therefore be more generally distributed than at present appears.

Genus SCRUPOCELLARIA.

Sp. *S. scrupea* (Busk).

S. cellulis rhomboideis; supra infraque truncatis; postice sinuatis. Ore subovali margine paullulum incrassato; spinis 4 vel 5 superne armato. Operculo pedunculato reniformi obtecto. Ovariis cucullatis subappressis, lævibus.

Hab. Dartmouth. Mare Mediterraneum.

In stating the form of the cells in this genus, it is more con-

venient usually to refer to the back view of them, as I have done in this case.

In habit this species bears so close a resemblance to *Scrupocellaria scruposa*, that to the naked eye there is very little difference between them. The branches are a little broader, and perhaps more regularly and more closely disposed. The cells are wider in proportion to their length than in that species, and their sides, especially the upper one, more square and straight. The principal difference in the form of the cell consists in the existence in *S. scrupea* of a rather deep depression or sinus on the back of the cell and towards the outer margin, in which sinus is lodged the vibraculum*. This organ is placed considerably more behind the cell than it is in *S. scruposa*, and differs somewhat in shape from the same organ in that species. It is wider, flatter, and as it were, more of a spatulate form. The avicularium occupies the same position or nearly so as in that species, or perhaps is also placed a little more posteriorly. An important difference however between these very similar species consists in the reniform pedunculate operculum, which projects in front of the mouth of the cell. Although this organ exists in a great variety of forms in many species of Cellulariadae, and is particularly well developed in the common *Scrupocellaria reptans*, I am not aware that it has hitherto received the attention it would seem to deserve in the distinction of species: that its presence or absence could scarcely be regarded with safety as a generic character, the present instance might perhaps suffice to show, as it does not exist in *S. scruposa*; but of its specific importance I am convinced, from the examination of many foreign species. Several species furnished with this appendage and in various forms are figured by Savigny in the great work on Egypt, but no allusion is made to it by Audouin in the meagre text relating to those figures.

This process does not arise from the edge of the cell (at least not generally), but from the wall of the cell a little beyond the margin, and it usually appears to be tubular at its origin. It assumes various forms, some very fantastic, and increases in size as the cell becomes older, so that in the older cells at the bottom of the branches it almost entirely covers the mouth.

In the case of *Scrupocellaria scruposa*, the want of this operculum appears to be compensated for by the greater thickness of the velum, and which in that species, in the older cells, becomes the seat of an increased deposition of calcareous matter. When in this state, the cells anteriorly very much resemble those of certain species of *Catenicella*.

I have subjoined a figure of this operculum as it occurs in

* I employ this term to signify the organs furnished with a moveable or vibratile seta, as distinguished from the prehensile avicularia.

Scrupocellaria reptans, in which the peculiar structure of this appendage is well seen.

EXPLANATION OF PLATE IX.

Scrupocellaria scruposa.

Fig. 8. Front view of a portion of a branch of *S. scruposa*.

Fig. 9. Back view of the same : *a, a, a, a*, avicularia ; *b, b, b, b*, vibracula.

Fig. 10. Front view of two older cells ; the front of the cell strengthened by deposition of calcareous matter in the velum.

Scrupocellaria scrupea.

Fig. 11. Front view of a portion of a branch : *a, a, a*, ovarian cells ; *b, b, b, b, b, b*, opercula.

Fig. 12. Back view of the same : *a, a*, avicularia ; *b, b*, vibracula.

Fig. 13. A more highly magnified view of the operculum in *S. reptans*.

III.

The species of *Anguinaria* about to be described was given to me by Mr. J. Quekett of the College of Surgeons, who believes that it came from Torres Straits.

It differs so evidently from the hitherto only known species of *Anguinaria*, that there can be no doubt of their specific distinction, but at the same time the distinctive character of the new species requires but a very short definition.

Genus ANGUINARIA, Lamk.

Sp. *Anguinaria dilatata* (Busk).

A. cellulis apice cyathiformibus, ore magno dilatato suborbiculari.

Hab. Torres Strait ?

In habit this species is rather more robust, but in other respects very nearly corresponds with *A. spatulata*, and as in that species, the cells arise from a creeping, branched, decumbent polyzoarium, which is adnate on fucus ; in this case a species of *Sphacelaria*. It is rather remarkable that *Anguinaria spatulata* should occur in Bass Straits and other parts of the Australian seas, and in the South of Africa, as well as in Europe, whilst the present species would seem to be much more limited in its range ; the one perhaps requiring a temperate and the other a tropical climate.

PLATE IX. fig. 14. *Anguinaria dilatata*.

IX.—*Remarks on the Dentition of British Pulmonifera**.

By Mr. WILLIAM THOMSON, King's College, London.

[With a Plate.]

IN venturing to offer a few remarks upon the Dentition of the Pulmonobranchiate Mollusca, I do so with much diffidence, partly on account of the paucity of species to be met with in the British Islands, and the absence of those connecting links without which no satisfactory conclusions can confidently be arrived at; but mainly from the conviction that those who first make observations upon a subject, which had previously been almost, or altogether, neglected, are much more liable to the commission of errors, alike in their microscopical examinations and in their physiological deductions, than those who have a foundation to work upon, be the works of their predecessors ever so erroneous. It is more, therefore, with the desire of calling attention to the subject, than with the intention of entering minutely into the form, structure and composition of these teeth, that I am induced to make some brief and general remarks upon them;—as foundation-stones, the friability or durability of which must be tested by future malacologists.

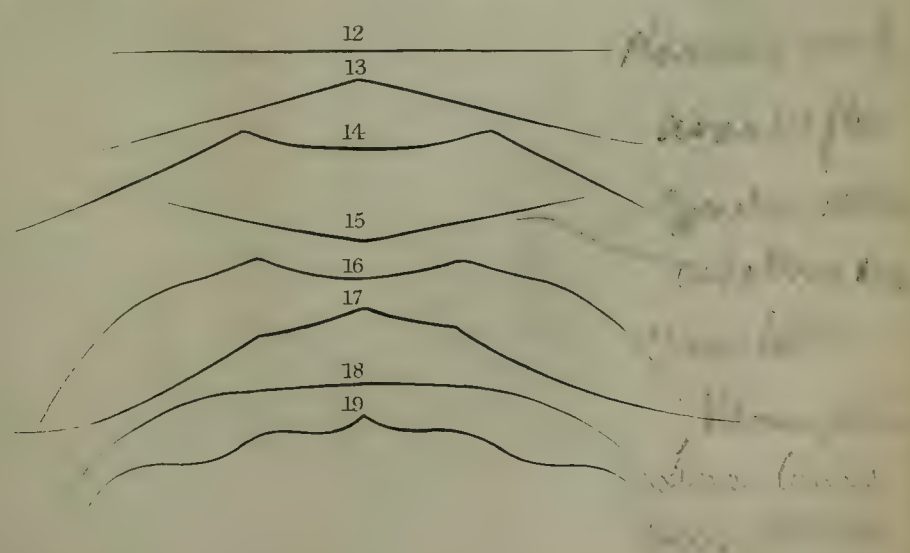
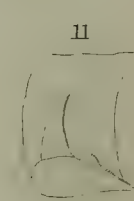
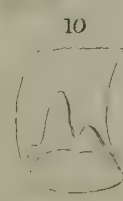
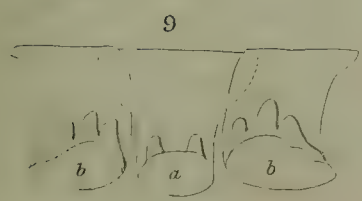
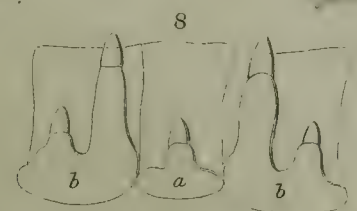
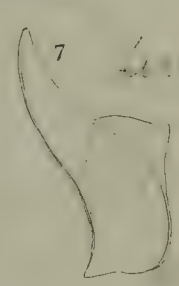
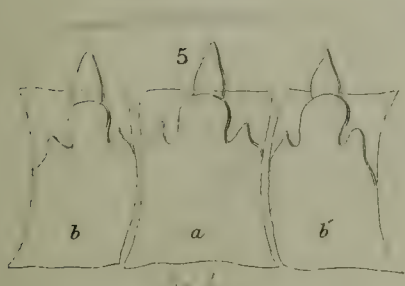
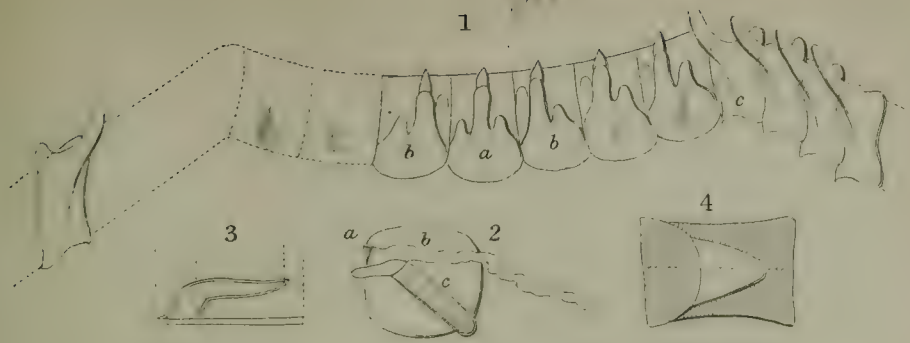
I am not aware of any papers having been published in England upon a detailed examination of the teeth of Mollusca, and but very few have appeared upon the continent. Prof. Lovèn of Stockholm has the credit of first proposing to employ this portion of their œconomy as a basis of classification, and his excellent paper on the subject may be found in the 'Proceedings of the Royal Swedish Academy†.' His observations are however chiefly upon the Marine Gasteropoda.

Herr Troschel has published some valuable remarks upon the dentition of some species amongst the Pulmonobranchiata; but (with the exception of some brief notices of the forms of a few unconnected species by different authors) I know of no other papers of importance in connection with this subject.

The tongue of the Pulmonobranchiata generally is a thin expansible membrane, two-thirds or three-fourths of which is rolled into a tube (Pl. IV. fig. 2 *c*); the posterior end of this tube is closed, while at its anterior extremity the remaining portion of the membrane is expanded into a flattened or spoon-shaped form, which plays against the edge of the horny upper jaw (fig. 2 *a*), thus acting more in the capacity of an under jaw than a true tongue. It is enclosed in the muscular head of the animal, and is connected with the œsophagus (fig. 2 *b*) at the anterior end of the tube, the extended upper portion of the œsophagus forming

* Read at the Meeting of the British Association in August 1850.

† Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, June 1847.





the roof of the mouth, while the expanded surface of the tongue covers the lower part of the mouth. The head is usually globular or nearly so, sometimes slightly attenuated backwards. From the junction of the tubes of the œsophagus and tongue, the former passes backwards through the head and leaves it at its upper part behind (sometimes coming out almost at the top of the head), while the tongue takes at once a downward and backward direction, and protrudes its closed end distinctly at the lower part of the head.

If the tubular part of the tongue be laid open and expanded (when it always proves of the same width as the naturally expanded portion), it will be found to be covered on its upper surface with a vast number of plates, each carrying one or more tubercles, which do not stand perpendicularly to the surface of the plates, but are abruptly curved posteriorly, so that the apices of these projections invariably point towards the closed end of the tongue (Pl. IV. figs. 3 & 4).

These teeth are distributed in rows all over the membrane, and are closely packed together. The longitudinal rows always consist of straight lines, but the transverse rows are variously curved, often bow-shaped, sometimes angular, rarely straight (figs. 12-19).

The degree of curvature of the transverse row, and the variations which the curves show (being sometimes composed of arcs of circles, while at other times they are made up of short straight lines lying in different directions), appear to depend on the form of the teeth. I shall allude to this again, after having described the teeth.

The number of teeth in a row does not seem to be always the same in individuals of the same species, though it may be pronounced as constant within certain limits. In different species, however, it is exceedingly variable: as a rule, there are more teeth in a longitudinal than in a transverse row, usually one-third or one-fourth more, though in *Helix Pomatia* the number in the transverse row exceeds that of the other, while in *Limæus stagnalis* there are 110 in each direction.

Of the rows, taken longitudinally, I need not say much, it being more easy to explain the variations in the teeth, when the rows are regarded transversely. Suffice it to mention, that in the centre of the membrane there is a longitudinal row of teeth of different form to any of the rest.

It is to the form of the central tooth of the transverse row (the series of which constitutes the central longitudinal row just referred to) that I would wish to draw more particular attention; as I hope to show presently that all the other teeth partake more or less of the form of this tooth.

But before proceeding to its description, it will be well to explain the precise meaning of the terms I purpose using. From reference to an ideal vertical longitudinal section of a plate with its tubercle (Pl. IV. fig. 3), it will be evident that on viewing the whole vertically (Pl. IV. fig. 4) through the microscope (the object being almost transparent), three outlines will generally be seen, that of the *plate*, that of the attachment of the tubercle to the plate, which I shall refer to as the *base*, and that of the free point of the tubercle, which I shall speak of as the *apex*: the *tooth* will therefore be regarded as the plate and tubercle combined.

The central plate and its tubercle differ from all the others on the membrane in being symmetrical. The plate is of a subquadrangular form, often somewhat longer than broad, having its sides slightly hollowed out and its ends nearly straight (*Limax*) (Pl. IV. fig. 5 *a*), or with its anterior end (that nearest the base of the tubercle) somewhat bow-shaped, in which cases this part overlaps the posterior straight edge of the plate in front of it (*Zonites radiatulus*) (fig. 1 *a*). In some it is nearly square (*Zonites*), while in others it presents the form of an inverted tapering triangle with a rounded apex (*Amphipeplea*).

The form of the tubercle on the central plate is subject to much greater variation than its plate. Sometimes the tubercle is very large and attached to nearly the whole surface of the plate, leaving but a small free apex (*Limax*) (Pl. IV. fig. 5 *a*): in other species the tubercle is small and attached by its base to the anterior portion of the plate (*Zua*) (fig. 8 *a*). In another genus (*Planorbis*) we find that the tubercle is small and has two apices (fig. 9 *a*). The apex in some few instances projects beyond the edge of the plate, and consequently lies above the base of the tooth next behind it; but in the majority of cases, the apex of the *central* tubercle does not project over the edge of its plate.

The lateral plates not only differ from the central one in form, but also from each other as they approach the edge of the membrane. The general form is subquadrilateral, the anterior and posterior edges being subject to the same variations as those described with reference to the central plate, while the inner edge is always more or less convex and the outer edge concave. In those species where the curve of the horizontal row is considerable, the plates as they approach the edge get narrower, and in these it is not unusual for them also to assume somewhat an S-form on the one side and its reverse on the other. In others, however, the lateral plates become gradually broader, and eventually twice as broad as the primary lateral plates.

I come now to speak of the lateral tubercles; but as they vary

nearly as much in the same individual as they do in different species, it would be an almost endless task to describe all the forms they assume. A careful examination of them generally shows, I think, clearly, that the following rule may be laid down regarding their form.

If an ideal line be drawn longitudinally through the central tubercle, so as to divide it equally, it will be found that the two halves are precisely similar (Pl. IV. fig. 4); but such is not the case with any of the lateral tubercles. We find, too, that those lateral tubercles which are nearest to the central tubercle are always more similar to it in general form than those at the edge; indeed, that the tubercles become more unlike the central tubercle as their position is nearer to the edge of the membrane. Hence I deduce the following rule: viz. that the lateral tubercles are merely modifications of the form of the central tubercle; and that these modifications are effected by the *suppression* of the prominences on the *inner* side of each lateral tubercle, and the simultaneous *increase* of the corresponding parts on the *outer* side. By the "inner" and "outer" sides, I mean the side nearest to, or farthest from, the central tooth.

In *Limax carinatus* and some allied species we have this rule clearly exemplified, the change from the typical form into that at the edge being very gradual, and showing every possible connecting link (Pl. IV. figs. 5, 6, 7). But this gradual progression is far from being the case in all species: the sudden and abrupt change in form which is seen in the fourth lateral tubercle of *Zonites radiatulus* (fig. 1 c) might at first sight seem to overthrow this rule; but on comparing this tongue with others, where the central tooth is somewhat similar and the modification of the lateral tubercles more gradual, it will be at once perceived that this sudden change of form is owing to the *absence* of the connecting links, which a reference to the progressive alteration in other species will readily supply, if not actually, at any rate to the imagination; and it will be found that an application of the rule I have laid down, to the third lateral of *Zonites radiatulus*, would eventually bring out the form of the fourth lateral, though the connection would, I grant, require several plates to complete it. I would now be permitted again to refer to the directions assumed by the horizontal rows, which (as I previously mentioned) depend upon the form of the teeth. Wherever a straight line is observable in the arrangement of the lateral teeth, it will be found that all the teeth in that line are similarly formed, whether the right and left laterals are in the same line as in *Planorbis contortus* (fig. 12), or divaricate from each other at the central tooth, upwards as in *Achatina aciculu* (fig. 15), or downwards as in *Ancylus fluviatilis* (fig. 13). Wherever the

curve presents great angularity (as in *Zonites radiatulus*) (fig. 14), there we find a sudden change in the form of the teeth, while in like manner a gradual curve is the result of a gradually progressive change in the form of the teeth, the degree of deviation from a straight line being exactly in proportion to the amount of change which takes place between the form of the central and edge-teeth.

It may perhaps seem that I have dwelt at greater length on this point than was necessary; but as there are many species of Pulmonobranchiata so small as to render it difficult with the best glasses to determine the form of the plate and often of the tubercle, the attachment of the tubercle to the plate being the only part clearly visible, it appears to me desirable that the following rules should be laid down with reference to the form of the lateral teeth, in connection with the horizontal rows.

A *straight line* indicates similarity in the teeth; a *curve* indicates a GRADUAL change in their form, and an *angularity* in the row indicates a SUDDEN change.

Having stated in general terms what are the usual characteristics of the teeth amongst the Pulmonobranchiata, I purpose now to offer a few observations upon those variations in them which seem to be characteristic of certain genera and families; prefacing these remarks with a list of the species I have had an opportunity of examining.

Arion ater.	Bulimus obscurus.
Limax maximus.	— acutus.
— carinatus.	Zua lubrica.
Vitrina pellucida.	Achatina acicula.
Helix aspersa.	Pupa marginata.
— hortensis.	— juniperi.
— nemoralis.	Vertigo edentula.
— Pomatia.	— pygmæa.
— arbustorum.	Balæa perversa.
— obvoluta.	Clausilia bidens.
— lapicida.	— nigricans.
— pulchella.	Carychium minimum.
— Cantiana.	Limnæus pereger.
— Carthusiana.	— stagnalis.
— fulva.	— palustris.
— concinna.	Amphipeplea glutinosa.
— Pisana.	Ancylus fluviatilis.
— virgata.	Velletia lacustris.
— caperata.	Physa fontinalis.
— ericetorum.	Planorbis corneus.
Zonites rotundatus.	— albus.
— alliaris.	— carinatus.
— cellarius.	— marginatus.
— nitidulus.	— nitidus.
— radiatulus.	— contortus.
Succinea putris.	Segmentina lineata.
Bulimus Lackamensis.	Cyclostoma elegans.

Since this list comprises little more than half our British species, it would be hazardous to attempt to deduce any positive theories as to the constancy of form in any particular groups. Indeed, it would not be safe to lay down any rules even from an examination of all the British species, since many in the same genus present such marked differences, alike in external form and in the conformation of their teeth, that it would be impossible to arrive at any satisfactory deductions, without the opportunity of examining the connecting links which foreign species will supply.

In the list I have given, the names and arrangement are those used in the last edition of Turton's 'Manual,' and on the whole, the form of the teeth is confirmatory of this classification. The *Arionidæ* and *Limacidæ* are much alike, and differ from the *Helicidæ* in having a long projecting single apex to the edge-teeth. The *Helicidæ*, on the other hand, show a marked disposition to increase the number of apices by bifurcation as they approach the edge.

Arion ater.	}	Edge-teeth aculeate.
Limax maximus.		
—— carinatus.		
Vitrina pellucida.		
Zonites alliarius.		
—— cellarius.		
—— nitidulus.	}	Edge-teeth serrate.
—— radiatulus.		
Helix fulva.		
—— aspersa.		
—— Pomatia.		
Zonites rotundatus.		
&c. &c.		

Vitrina evidently belongs more to the *Limacidæ* than the *Helicidæ*, as is shown by the single prolonged apex to the edge-teeth. From the very similar character of the edge-teeth in *Zonites alliarius*, *cellarius*, *nitidulus* and *radiatulus* (whose tongues greatly resemble each other), I am induced to believe that they should come in between *Vitrina* and the true *Helices*, for while their edge-teeth show no appearance of bifurcation, the heel to the apex may possibly be looked upon as an approach towards it. Their sagittate central tubercle corresponds with that of *Vitrina*, and a similarly-shaped central tubercle in *Helix fulva* connects them with the true *Helices*, which have a simple aculeate tubercle. *Zonites radiatus* (or *rotundatus*) is a true *Helix*.

Succinea putris, from its partiality for the leaves of plants growing in the water and for other very wet places, might possibly be expected to show some change towards the form of a *Limnæus* in its teeth, whereas on the contrary they are

truly Helicine in their conformation. So also are the teeth of all the other *Helicidæ* that I have examined, though they of course present specific characters more or less conspicuous. I imagine however that it will be more difficult to fix upon good generic characters in the teeth of the *Helicidæ*, than any other family. *Zua* and *Achatina* should perhaps come at the end of the list, as their very small central tubercle corresponds with that in the genus *Limnæus*. The genera *Pupa* and *Vertigo* present no apparent difference, and have their central tubercle much of the same form as *Zua* and *Achatina*, but in these it is as large as the primary lateral tubercles.

The character of *Limnæus* appears to be, to have one small central tubercle, as it were "squeezed up" between two very large lateral ones, each primary lateral having a very large apex internally with a small external one, while at the edge they have altered to one thick prolonged apex projecting inwards and irregularly lobed on its upper edge. Much the same arrangement prevails in *Amphipeplea*, where however the tubercle of the lateral teeth is even still larger, in proportion to its plate.

Ancylus and *Velletia* present widely distinct characters, clearly showing that they do not belong to one genus. In *Ancylus* there are thirty similar lateral teeth in a straight line on each side of the central tooth, and then there is a slight curve through a series of six more teeth where a trifling change in their form occurs. In *Velletia*, on the contrary, no part of the horizontal row is straight; its central part is much arched, and is composed of the central tooth and twelve lateral teeth on each side which do not alter much in form. Then comes one tooth of a different form, and lastly six more on each side, which latter are in a slight curve.

Physa, again, exhibits a multitude of teeth of a similar form, though different to any that I have seen in other genera; but unfortunately, owing to the delicacy of the tongue-membrane, I have failed in ascertaining either the form of the central tooth, or the curve of the horizontal row.

Planorbis appears to be governed (as botanists would say) by the number three. Its primary lateral tubercles have three apices, and the central tubercle, generally in the genus, has two apices placed far apart from each other (Pl. IV. fig. 9 a): this appears to be merely the result of the suppression of the third intermediate apex, a view in which I am borne out by a specimen of *P. marginatus*, in which there is only one side apex to the central tooth, the central apex and that on the other side being both suppressed.

Of *Segmentina* and a few others I will not now speak, having failed in meeting with glasses good enough to bring out their

forms clearly. The last species on my list is *Cyclostoma*; but as this belongs to a section of the Pulmonobranchiata differing so widely from that to which the subjects of my preceding remarks belong, I will not describe it, but merely call attention to the general aspect of its tongue, which much resembles that of some of the fluviatile Pectinibranchiates; to these species the *Cyclostoma* presents some analogy, in being unisexual, and operculated, in having but two tentacles, with its eyes placed at their base on their outer sides, and in being a vegetable feeder.

It will be desirable, perhaps, before I conclude this paper, that I should give some idea of the number of teeth in a transverse or horizontal row in a few species, together with the number of those rows upon the tongue, and the whole number of teeth on that organ. And to this I propose to add also, the actual size of the individual teeth of one or two species, to show their minuteness.

	Number of transverse rows.	Number of teeth in row.	Number of teeth on tongue.
Arion ater	160	110	17,600
Limax maximus.....	160	180	26,800
— carinatus	80	100	8,000
Vitrina pellucida	100	75	7,500
Helix aspersa.....	135	105	14,175
— nemoralis	135	100	13,500
— Pomatia.....	140	150	21,000
— obvoluta	170	90	15,300
— lapicida	150	80	12,000
— pulchella	65	30	1,950
— Cantiana	125	80	10,000
— fulva	70	45	3,150
— concinna	100	50	5,000
— Pisana	120	70	8,400
— caperata	100	45	4,500
— ericetorum	115	60	6,900
Zonites alliarius.....	45	25	1,125
— cellarius	35	27	945
— nitidulus	55	65	3,575
Succinea putris	50	65	3,250
Bulimus obscurus	120	55	6,600
— acutus	100	37	3,700
Zua lubrica	80	40	3,200
Pupa juniperi	100	40	4,000
Balæa perversa	130	40	5,200
Clausilia bidens	120	50	6,000
— nigricans	90	40	3,600
Limnæus stagnalis.....	110	110	12,100
Ancylus fluviatilis	120	75	9,000
Velletia lacustris	75	40	3,000

It will I think be readily conceded, from a glance at this table,

that the number of teeth upon a tongue is never likely to be of more than *specific* value as a characteristic feature, since there appears to be no general number, or even approximate number, which can be said to belong to any genus. Since *Limax maximus* heads the list with 27,000, and *Helix Pomatia* follows with 21,000, it might be conjectured, perhaps, that *size* had some influence in the matter; but then we find *Helix aspersa* and *nemoralis* possessing nearly the same number, while *Helix obvoluta*, a shell very little, if at all, larger than *Zonites cellarius*, possesses more than *fifteen* times the number of teeth.

With reference to the actual size of some of the teeth, it will be most convenient to take the 10,000th of an inch as the measuring standard; and therefore the numbers that I shall now use, in giving the dimensions of the teeth, are to be regarded as so many 10,000ths of an inch.

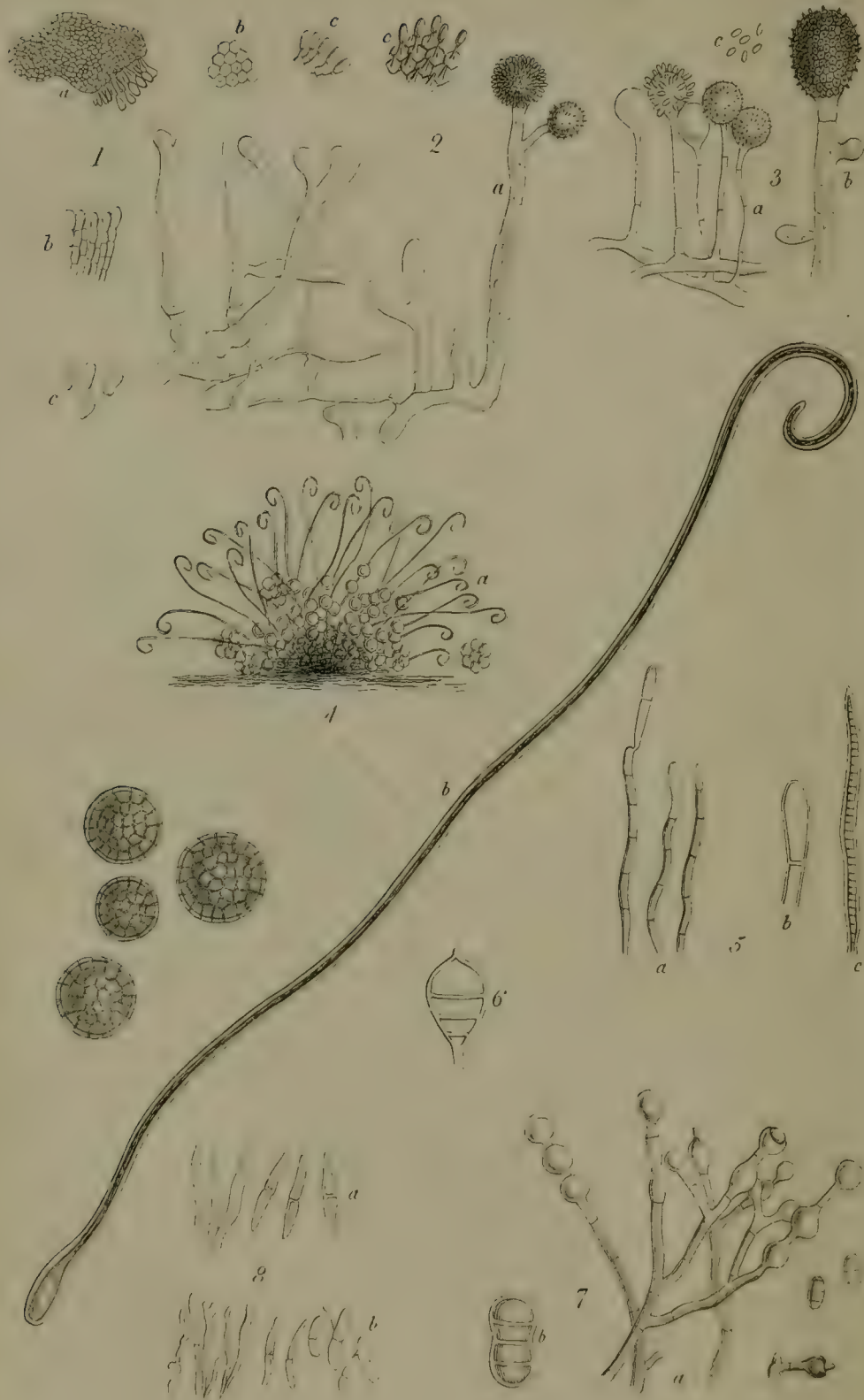
In *Arion ater*, the central and neighbouring plates are 25 long by 15 wide. In *Limax maximus* they are 20 long and $11\frac{1}{2}$ wide. In *Bulimus obscurus* the length of the plates is 7, while the average breadth of all in the row is $4\frac{2}{3}$. In *Zua lubrica* the length is $5\frac{1}{2}$ and the average breadth $4\frac{1}{2}$. In *Clausilia nigricans* the length is $4\frac{1}{2}$ and the average breadth $3\frac{2}{3}$. The primary lateral plates of *Limnæus stagnalis* are 22 long by $14\frac{2}{3}$ wide. In *Amphipeplea glutinosa*, the corresponding plates are $11\frac{1}{2}$ long and 10 wide, which happens to be precisely the size of the primary lateral plates in *Planorbis corneus*.

King's College, July 1850.

EXPLANATION OF PLATE IV.

- Fig. 1.* Central portion of transverse row of *Zonites radiatulus*: *a*, central tooth; *b*, first lateral; *c*, fourth lateral tooth.
- 2. Head of a Snail: *a*, horny tooth; *b*, œsophagus; *c*, tongue.
 - 3. Diagram of a vertical section of a tooth.
 - 4. Ditto central tooth.
 - 5. *Limax carinatus*: *a*, central tooth; *b*, first lateral.
 - 6. Ditto an intermediate lateral tooth.
 - 7. Ditto edge-tooth.
 - 8. *Zua lubrica* (*a*, *b*, as above).
 - 9. *Planorbis carinatus* (*a*, *b*, as above).
 - 10. Ditto an intermediate lateral tooth.
 - 11. Ditto edge-tooth.
 - 12–19. Direction of transverse rows:—
 - 12. *Planorbis contortus*. *Fig. 16.* *Zua lubrica*.
 - 13. *Ancylus fluviatilis*. — 17. *Vitrina pellucida*.
 - 14. *Zonites radiatulus*. — 18. *Limax carinatus*.
 - 15. *Achatina acicula*. — 19. *Helix obvoluta*.





X.—*Notices of British Fungi*. By the Rev. M. J. BERKELEY, M.A., F.L.S., and C. E. BROOME, Esq.

[Continued from vol. v. p. 466.]

[With three Plates.]

502. *Hendersonia Stephensii*, n. s. Peritheciis irregularibus seriatis sub epidermidem fusciscentem linea ruptam latitantibus; sporis maximis ovatis reticulato-cellulosis. On dead stems of *Pteris aquilina*, Bristol, H. O. Stephens, Esq.

Perithecia membranaceous, oblong, irregular, arranged in a single row beneath the cuticle, which exhibits little lanceolate brown spots above them with a fissure down their centre. Spores large, ovate, with about three transverse septa, each division being again traversed by several vertical and transverse or sometimes oblique partitions.

A very beautiful species, which probably exists in collections confounded with *Sph. flicina* and *Leptostroma flicinum*. The perithecia and spores are very remarkable. The latter are much like those of *Sporidesmium cellulorum*, Fr.

PIGGOTIA, n. g.

Perithecia irregularia tenuissima subtus obsoleta in maculam rugulosam confluentia, fissura lacerata rumpentia. Sporophoræ breves (demum tomiparæ, *Mont.*); sporæ majusculæ obovatæ versus basim subconstrictæ.

503. *P. astroidea* *Dothidea astroidea*, Eng. Fl. vol. v. P. 2. p. 287. *Asteroma Ulmi*, Grev. Fl. Ed. p. 368; Fr. El. ii. p. 152. On green leaves of elm, Springfield near Chelmsford, H. Piggot, Esq.

Jet-black, forming irregular roundish granulated or wrinkled patches on the upper surface of the leaf, sometimes seated on a yellow spot, but frequently without any discoloured border. Perithecia suborbicular where solitary, but soon confluent, though not making a uniform stratum, obsolete below, thin and shining above, bursting irregularly by a jagged orifice; spores oozing from the ruptures and forming roundish discs, which at first look like the hymenium of some *Pezizæ*, broadly ovate, slightly constricted towards the obtuse base. Sporophores short, at length, as observed by Dr. Montagne, tomiparous, as in *Oidium*.

This has exactly the habit of *Melasmia*, and bears precisely the same relation to *Dothidea Ulmi* that *Melasmia* does to *Rhytisma acerinum*. It has some resemblance to *Phoma*, but is essentially distinct in the very irregular mode of rupture, the tomiparous sporophores, as well as in habit. The perithecia are far

less regular than in *Sphaeropsis*, with which genus it has in some respects a close affinity. *Discella* again is closely allied, but the perithecium in the present instance, growing between the true cuticle and the cuticular cells, is quite distinct from the subjacent tissues, not to mention the mode of dehiscence and the obovate spores.

A recent inspection of Dr. Greville's specimens, which are however very young and imperfect and mixed with *Asteroma Ulmi*, Chev., shows that Mr. Piggot's plant is just the same. We have great pleasure in dedicating the new genus, which we have been compelled to propose, to the intelligent observer to whom we are indebted for this and many other valuable species. Dr. Montagne, to whom specimens have been submitted, and who has sent a sketch of the sporophores, which appears in our plate, agrees with us in the propriety of placing it in a new genus. We have not however been able to confirm his observations as to the sporophores, though we observe the spores on the field of the microscope frequently disposed in rows, as if just separated. The stability of the genus does not however rest upon this character alone, but on the flaccid irregularly ruptured perithecia, which at first sight resemble the cups of a *Phacidium*.

PLATE V. fig. 1. *a.* Portion of the perithecium magnified, with some of the sporophores (as observed by ourselves) and spores appearing at the edge. In this state the sporophores are simple. *b.* Sporophores separated, and showing the tomiparous origin of the spores, from a sketch by Dr. Montagne; *c.* spores more highly magnified.

504. *Rhopalomyces pallidus*, n. s. Pallide cervinus, floccis fertilibus furcatis flexuosis, sporis minutis ellipticis. On decayed Russian matting, King's Cliffe, Feb. 10, 1848.

Creeping widely over the matrix, on which it forms a mealy pale fawn-coloured ragged stratum. Hyphasma delicate, consisting of very fine threads, which produce little branches swelling out suddenly, and rising at once, or creeping along and giving off fertile flocci. These are rather thick, irregular in outline, once or twice forked. Heads globose or nearly so, beautifully areolate; each areola producing in its centre a short delicate spicule surmounted with a minute elliptic spore.

One of the most beautiful *Mucedines*, distinguished from *Aspergillus* by its areolate head and single stratum of spores.

PLATE V. fig. 2. *a.* Mycelium and fertile threads magnified; *b.* surface of head showing the reticulated structure; *c.* spicules and spores very highly magnified.

505. *R. candidus*, n. s. Candidus; hyphasmate parcissimo, floccis fertilibus rectis simplicibus; capitulis subglobosis, sporis minutis ellipticis. On a mixture of dung, earth and hops. With the foregoing.

Extremely minute and delicate pure white. Hyphasma creeping, but very sparing. Fertile flocci erect, even. Heads globose or somewhat obovate, beautifully areolate. Spores minute elliptic.

Differing from the last in colour and the simple straight fertile flocci; the heads are somewhat larger.

PLATE V. fig. 3. *a.* Fertile threads magnified, springing from the decumbent mycelium; *b.* fertile head more highly magnified, to exhibit the reticulated structure. The thread in this case shows a tendency to become proliferous. *c.* Spores.

BOLACOTRICA, n. g.

Filis simplicibus apice cirrhiformibus articulatis; sporis magnis globosis brevissime pedicellatis conglomeratis, endochromate distinctissime granulato.

506. *B. grisea*. On dead cabbage stalks, old mats made of *Typha*, &c., King's Cliffe, 1839, 1841.

Tufts resembling strongly those of *Myxotrichum chartarum*, but rather larger, forming large effused gray patches. Threads thicker at the base, flexuous, pale purple under the microscope, strongly curved at the tips like little tendrils, sparingly articulate at irregular distances or perfectly continuous. Spores conglomerate, large, 5-8 times as broad as the threads, globose; episporium thin; endochrome strongly granulated.

This fine species has exactly the habit of *Myxotrichum*, but is very different in its simple threads and large spores. It does not accord with the characters of any known genus. The spores are not concatenated as in *Sporodum*, nor minute and linear as in *Tricholeconium*. We place it for the present near *Myxotrichum*, though not quite sure of its nearest affinities.

PLATE V. fig. 4. *a.* Tuft magnified; *b.* thread and spores highly magnified.

507. *Helminthosporium Smithii*, n. s. Cæspitibus spongiosis; filis simplicibus flexuosis; sporis longissimis, endochromatibus diametro subæqualibus episporio communi crasso. On holly bark and wood, Wareham, Rev. W. Smith.

Tufts effused when growing on the wood, linear, and often forming somewhat reticulate erumpent patches when produced on the bark, rather spongy, coarsely velvety. Threads simple, flexuous, articulated; articulations irregular, several times as long as broad. Spores terminal, extremely long, linear, multiarticulated, sometimes bent or flexuous. General episporium double, the outer coat thin, the inner extremely thick. Endochromes united, about as long as broad, sometimes moniliform or very irregular, here and there surrounded by a broad cavity, which appears granular under the microscope.

This is the prince of the genus, resembling somewhat *H. folliculatum*, but with spores exceeding the threads in length, and the common episporium extremely thick instead of being narrow as in that species.

PLATE V. fig. 5. *a.* Flocci magnified; *b.* tip of young thread; *c.* mature spore.

508. *H. turbinatum*, n. s. Filis tenuibus simplicibus; sporis elongato-turbinatis truncato-apiculatis 4-7-articulatis opacis. On dead wood, Speke Hall, Lancashire, July 1840.

Patches thin, effused, finely velvety; threads short, linear, slender, obscurely articulated even when most transparent; spores of a deep rich brown, varying greatly in size and length, but always more or less turbinate, attenuated greatly below, obtuse above, with a sudden more or less truncate apiculus, which often seems as if a joint had separated from it.

Distinguished from all described species by the peculiar shape and character of its spores.

PLATE V. fig. 6. Spore highly magnified.

508*. *H. Rousselianum*, Mont. Ann. d. Sc. Nat. ser. 3. Nov. 1849, p. 300. With *Sporoschisma mirabile*, B. & B.

509. *Triposporium elegans*, Corda, Ic. Fasc. 1. fig. 220. On decorticated oak, Brockley Combe, Somersets., &c., Feb. 1845.

The spores in this species vary considerably in length and in the number of articulations. We have also a *Triposporium* from Mr. Stephens on a leaf mixed with *Fumago*, but there is too little of it to say anything very positive about it.

510. *Helicoma Mülleri*, Cord. Ic. Fasc. 1. tab. 4. fig. 219. On dead wood, Rev. T. Salwey. Without any specific locality.

There is some difficulty in referring the specimen to Corda's species in consequence of the spire of the spores being in general open. It is sometimes however quite closed up, so that the distinction between *Helicosporium* and *Helicoma* is scarcely tenable. The threads also vary much. In specimens from Lower Carolina the spores are precisely those of Corda's species, but the threads very differently articulated. *Helicosporium obscurum* is represented by Corda as having much more slender spores, attenuated threads and very close articulations, which does not agree with our plant. On the whole, we think the best course is to regard it as a variety of *H. Mülleri*.

511. *Cladotrichum triseptatum*, n. s. Furcato-ramosissimum totum articulatum; articulis superioribus inflatis; sporis oblongis obtusissimis medio constrictis triseptatis. On a dead stump, King's Cliffe, July 1848.

Widely effused, forming a thin black powdery stratum; flocci forked and branched, septate from the base, upper articulations

swollen in the centre or above. Spores oblong, extremely obtuse, constricted in the centre, triseptate, the central septum answering to the line of constriction.

A most beautiful species, well distinguished from the others by the triseptate spores. The notion of the genus must be taken from the figures in the 'Pracht-Flora,' and not from those in Sturm or Corda's 'Icones,' which are extremely defective, and convey anything but a correct idea of a very curious production.

PLATE V. fig. 7. *a.* Flocci and spores magnified; *b.* spore highly magnified.

512. *Cladosporium dendriticum*, Wallr. Comp. Fl. Germ. 2. p. 169. *Cladosporium pyrorum*, Berk. in Gard. Chron. 1848, p. 398. *Helminthosporium pyrorum*, Lib. no. 188; Desm. no. 1051. Abundant on leaves of pear-trees in autumn.

The spores in Madame Libert's plant are uniseptate and broader at one end; in ours and Desmazières' in general almost fusiform and simple, though sometimes clavate.

513. *C. orbiculatum*, Desm. Ann. d. Sc. Nat. ser. 3. Mai 1849, p. 275; Exs. no. 1843. On the leaves of *Cratægus Pyracantha*, gardens of Horticultural Society, Chiswick.

Closely resembling the last, but differing in its shorter pyriform spores. Some observations on this species will be found in 'Gard. Chron.' 1848, p. 716, where however it was not considered as specifically different from *C. dendriticum* *.

514. *C. depressum*, n. s. Maculæforme depressum; sporis elongatis uniseptatis floccos brevissimos æquantibus. On the under surface of the living leaves of *Angelica sylvestris*: common. Mr. Ralfs has sent it from Dolgelly.

Spots minute, scattered, olive-green, depressed. Flocci short, straight, or flexuous, sometimes quite even, sometimes waved or nodulose. Spores much elongated, as long as the threads, terminal, uniseptate. Sometimes they are constricted and the articulations much swollen. They often germinate *in situ*, giving out a delicate waved thread from the centre of the articulations.

This species is clearly allied to the foregoing, but has far longer spores. A very similar species occurs in the Canaries on some Umbellifer.

PLATE V. fig. 8. *a, b.* Two different forms of flocci with their spores magnified.

515. *C. brachormium*, n. s. Effusum griseum; floccis erectis

* In a letter just received from M. Desmazières, he informs me that he is now convinced that the two supposed species are mere varieties, and that he will make a statement to this effect in a forthcoming number of his 'Exsiccata.'—M. J. B.

flexuosis nodulosis sursum sporis oblongis breviter concatenatis terminatis. On leaves of *Fumaria officinalis*, King's Cliffe.

Gray, forming a thin stratum; flocci erect, flexuous, somewhat nodulose, terminated by one or more short rows of elliptic-oblong spores.

Nearly allied to *C. rectum*, Preuss, but distinguished by its less rigid habit and more flexuous paler stems. It approaches the genus *Dendryphium*.

516. *C. lignicolum*, Corda, Fasc. 1. tab. 3. fig. 206. On dead wood, Apethorpe, Norths.

The spores in this species are very opaque. Our plant seems exactly that of Corda, but it is a doubtful *Cladosporium*.

517. *C. nodulosum*, Cord. Ic. Fasc. 1. tab. 4. fig. 212. On the stem of some herbaceous plant, Wraxall, Som., Feb. 14, 1845, C. E. Broome.

Remarkable for the alternate projections on which the spores are seated.

518. *Camptoum curvatum*, Lk. Sp. 1. p. 44; Berk. no. 310. Spye Park, Wilts, on *Scirpus sylvaticus*.

519. *Gonatosporium Puccinioides*, Corda, Fasc. 3. p. 8. tab. 1. fig. 18. On various *Carices*, Wiltshire and Somersetshire, as at Spye Park and Batheaston.

This must not be confounded with *Arthrimum Sporophleum*, which has been published by Desmazières at no. 602, under the name of *A. Puccinioides*, and is No. 311 of the 'British Fungi.'

520. *Aspergillus dubius*, Corda, Ic. Fasc. 2. tab. 11. fig. 77. On rabbits' dung, King's Cliffe, Nov. 16, 1842.

In this very curious species the head is covered with linear processes, each of which is surmounted by four sterigmata, on which are developed the chains of spores. Corda does not seem to have observed the quaternate processes.

521. *Botrytis infestans*, Mont. P'Institut, 1845, p. 313. Abundant on the under side of the leaves of potatoes since 1845, previous to which it had not been observed in this country. It has occurred also on *Solanum Dulcamara*, *Anthocercis viscosa*, and on Tomatoes.

It is unnecessary to enter into the question how far this mould is the cause of the potato murrain. The subject is discussed at length in the first number of the Journal of the London Horticultural Society.

522. *B. Urticæ*, Libert MSS. On leaves of the common nettle, Tansor, Norths.

Patches small, orbicular, grayish lilac, flocci loosely divided above, branches forming an acute angle, extreme ramuli simple or forked, sometimes curved, very rarely inflated. Spores large, ovate, apex papillæform. Allied to the last, but distinct. When

the flocci are ruptured, the inner membrane sometimes protrudes, as in the asci of *Sphæriæ*.

523. *B. Arenariæ*, Berk. in Journ. Hort. Soc. vol. i. p. 31. On leaves of *Arenaria trinervis*, King's Cliffe, June.

524. *B. Viciæ*, Berk. *l. c.* Extremely common on the leaves of peas and tares.

525. *B. arborescens*, Berk. *l. c.* On *Papaver Rhæas*; very common.

526. *B. ganglioniformis*, Berk. *l. c.* *Bremia lactucæ*, Reg. Bot. Zeit. 1843, t. 3 B. *Botrytis geminata*, Unger, Bot. Zeit. 1847, tab. 6. fig. 9. Very common on lettuce leaves in spring.

527. *B. macrospora*, Unger, Exanth. t. 2. fig. 14. On leaves of parsnips; very common. Also on *Angelica sylvestris* and other Umbellifers. The roots of the plants which are infested with this mould are generally diseased, like the tubers of potatoes attacked by *Botrytis infestans*.

528. *B. grisea* = *Peronospora grisea*, Unger, Bot. Zeit. 1847, p. 315. On leaves of *Veronica Beccabunga*, Baldovan, May 1846, Gardiner.

529. *B. Tilleti*, Desm. Exs. no. 926. Not uncommon on moss and various leaves, as at King's Cliffe.

One of the most splendid species of the genus, remarkable for its highly branched threads and verticillate ramuli. The colour of the whole plant is pale tawny or fawn.

530. *Menispora lucida*, Corda, Ic. Fasc. 1. tab. 4. fig. 223. On decayed wood, Lambley, Notts, Jan. 1841.

531. *Verticillium apicale*, n. s. Effusum olivaceo-nigrum; floccis rectis; ramulis apicalibus brevissimis basi incrassatis; sporis globosis. On decorticated oak branches, Wraxall, Som., Feb. 1845.

Effused, forming small dark thin patches. Flocci erect, rather closely articulate, bearing at the apex a coronet of very short branches which are swollen at the base and strongly attenuated upwards. Spores globose. There is sometimes the rudiment of a lower whorl of branchlets.

Nearly allied to *V. tenuissimum*, Corda, but differing in its globose spores and terminal branchlets which are not didymous.

PLATE VII. fig. 17. *a.* Threads with spores magnified; *b.* tip of thread with its ramuli and spores highly magnified.

532. *V. nanum*, n. s. Minutum album, floccis vage ramosis, ramulis oppositis; sporis ellipticis. On pears with *Cladosporium dendriticum*, Wallr., Cranford Bridge, F. J. Graham, Esq. Very minute, white; flocci loosely branched; ramuli elongated, opposite; spores elliptic.

An obscure species, in which the whorl of ramuli is reduced

to two, by which character it is distinguished and by its elliptic spores.

PLATE VII. fig. 18. *a.* Tuft of flocci magnified; *b.* spores more highly magnified.

533. *V. epimyces*, n. s. Effusum albo-carneum; filis trifidis, ramulis subternis elongatis; sporis oblongis. On decayed *Ela-phomyces*, Rudloe, Wilts, Oct. 13, 1843.

White with a flesh-coloured tinge, forming thin, effused patches which appear compact and not the least byssoid. Threads once or twice trifid, rarely bifid, ultimate ramuli ternate or binate, slightly swollen below, attenuated upwards. Spores terminal, at first globose, then elongated, when perfect 4-5 times as long as broad.

A very distinct and well marked species, remarkable for its close mode of growth and elongated spores. It approaches very near to *Fusarium*, with which it agrees in habit.

PLATE VII. fig. 15. Upper part of a portion of one of the plants magnified.

534. *V. distans*, n. s. Sparsum niveum, floccis tenuibus; ramis alternatis, ramulis longiusculis regulariter attenuatis; sporis oblongis, endochromate bipartito. On stems of herbaceous plants, Cranford Bridge, F. J. Graham, Esq.

Scattered, snow-white, threads short, slender, branched alternately; ramuli 4-6 in a whorl, rather long, regularly attenuated; whorls distant; spores oblong; endochrome bipartite.

PLATE VII. fig. 16. Portion of plant with spores magnified.

535. *Penicillium roseum*, Lk. Muc. 1. p. 69. On box leaves, Spye Park, Wilts; on *Musa Sapientium*, Chatsworth, Mr. R. Scott.

Flocci delicately septate, branched above; spores oblong, subfusiform.

536. *Dactylium tenellum*, Fr. Syst. Myc. vol. iii. p. 413. On moss, Dundee, Mr. Gardiner, March 1848.

537. *D. tenuissimum*, Berk. in Trans. Lond. Hort. Soc. vol. i. p. 32. tab. 4. fig. 20, 21.

A question has arisen whether this may not be a young state of *Fusarium Solani Tuberosi*, Desm. We are inclined to think that such is the case, and therefore, unless future observations throw any clearer light upon the subject, the species must be erased from the British Flora. Certain it is that specimens of the potato *Fusarium* vary extremely. Figures of several moulds growing on diseased potatoes, but for the most part imperfectly named, will be found in a paper by Fresenius in the 1st volume of the 'Flora' for 1847. Amongst the individuals figured are several forms of the *Fusarium*.

[To be continued.]

XI.—*Descriptions of five new species of Helix from the Cape of Good Hope, with remarks on the known South-African species, and a notice of several Cape Limaces.* By W. H. BENSON, Esq.

1. *Helix biscalpta*, nobis, n. s.

Testa perforata, orbiculato-depressa, translucente, parum nitida, subtus cornea, supra rufescente, utrinque eleganter confertissime striato-plicata, plicarum verticalium interstitiis longitudinaliter striatis-simis, striisque spiralibus decussatis; spira depresso-convexa; sutura profunda; apice lævi, obtuso; anfractibus $4\frac{1}{2}$ convexis, lente crescentibus, ultimo rotundato, subtus convexiori; apertura verticali, lunata, peristomate simplici, acuto; columella arcuata; margine columellari crassiusculo, supra breviter late reflexo, laminam triangularem efformante.

Diam. major 7, minor 6, axis $4\frac{1}{2}$ mill.

Hab. sub lapidibus ad Camp's Bay, P. B. S.

The interstices of the plicæ have a somewhat similar sculpture to that of Krauss' *H. Loveni* from Natal, but the two shells differ altogether in form and other characters. It is more depressed, and the whorls are more closely wound than those of *H. ænea*, Krauss, which is also a Natal shell.

Helix biscalpta inhabits the declivity of the rocky terrace which intervenes between the western face of Table Mountain and the Southern Atlantic Ocean. Seven specimens occurred, in April and May 1846, at the same spot where I had the good fortune to capture a specimen of *Paussus Burmeisteri*, harbouring under loose stones. This station, in common with all the localities of my new Cape species, was explored on crutches; but from the frequent excursions made, it is probable that little was left to be gleaned in the immediate vicinity of Cape Town, in places approachable by a wheeled conveyance. However, it is not unlikely that on the summit and sides of Table Mountain, more especially in the lofty umbrageous nooks at the base of its mural face on the eastern side, towards the Teufelberg, which are occupied by indigenous arboreal vegetation, a conchologist enjoying unfettered action might meet with novel forms. Those friends who had power to scale these points, and who received instructions how to search for shells, returned empty-handed; but their want of acquaintance with the aspect of these creatures in their haunts, and deficiency in the particular zeal necessary for the pursuit, sufficiently accounted for their failure. In connexion with this remark, it may be observed, that a small brown solid, exumbilicate, and smooth *Helix*, marked "from Table Mountain," is to be seen in the British Museum. Specimens presented by the Earl of Derby, as well as by Mr. McGillivray, were observed;

but they had no specific name attached, and none of Pfeiffer's descriptions appear applicable to them. Circumstances however favour the supposition that they may be *Bradybæna monticola* of Beck, whose name was published in his Synopsis unaccompanied by any description, and must necessarily be altered with reference to the Himalayan shell with that designation published by Hutton.

The leaves and stems of the *Palmiet*, which choke the stagnant waters of Hout Bay valley and parts of the Erste Rivier, the exploration of which was equally impossible with that of the mountain and of the precipice, may likewise nourish species as yet unknown to science.

Helix bisculpta, *H. vorticialis* and *raripectata* of former papers in this Journal, *H. rivularis*, *ænea*, &c. of Krauss, and the three species next to be described, present, in their sculpture, a peculiar feature which seems to pervade a large proportion of the Helices of South Africa, giving a character to the species of that region from which the locality of a specimen may generally be recognized. In like manner other distinguishing traits, running through various modifications of form, have been noticed in several local groups, for instance in those of Madeira, and of the Philippines.

2. *Helix perplicata*, nobis, n. s.

Testa umbilicata, globoso-depressa, tenui, cornea, subdiaphana, utrinque oblique plicata, plicis subdistantibus, interstitiis longitudinaliter striatis; spira elevatiuscula, subconoidea; sutura impressa; apice lævi, obtuso, lutescente; anfractibus 5-5½, convexiusculis, lente crescentibus, ultimo leviter depresso, subtus convexiori; apertura rotundato-lunata, vix obliqua, peristomate simplici acuto, margine columellari tenui, superne breviter reflexo.

Diam. major 7, minor 6, axis 4½ mill.

Hab. in sylvis humidis, in stirpibus arborum fungisque putridis prope Newlands, ad basin montis Teufelberg, P. B. S.

The obliquity and mode of sculpture, form, ratio of whorls, and characters of the aperture, independently of other differences, sufficiently distinguish this shell from the preceding, as well as from *H. ænea*, Kr., which more nearly approaches it in figure.

I found a single live specimen of this shell, in June 1846, imbedded in an offensively scented fungus growing in the damp woods between Newlands and the Devil's Mountain where it adjoins the eastern face of Table Mountain. Dead specimens (only one of which was perfect) occurred in the hollow stump of a decayed tree at the same place. The living specimen was broken soon after its capture in consequence of its extreme fragility. A lengthened slender *Limax* was abundant, feeding on

the same fungus, and creeping actively over the surrounding moist rocks.

3. *Helix petrobia*, nobis, n. s.

Testa umbilicata, depressa, pallide cornea, diaphana, minime nitida, utrinque oblique plicata, plicis subdistantibus, inæqualibus, interstitiis sub lente argute longitudinaliter striatis; spira vix elevata, sutura leviter impressa; anfractibus $4\frac{1}{2}$ -5, superne convexiusculis, lente crescentibus, ultimo supra obtuse angulato, subtus convexiori, circa umbilicum angulato-compresso; apertura compresso-lunata, altiori quam lata, infra subangulata, obliqua; peristomate simplici acuto, margine dextro superne arcuato, columellari tenui, verticali, breviter reflexo.

Diam. major $5\frac{1}{2}$, minor $4\frac{1}{2}$, axis 3 mill.

Hab. sub lapidibus, prope High Constantia, P. B. S.

More widely umbilicate than the preceding species, and with equally oblique plicæ, but differing altogether from it, and the other described South-African species, in form, ratio of the whorls, and in the configuration of the aperture. I got a single specimen alive, in December, under a stone at the side of the road leading from High Constantia towards the gorge by which access is gained to Hout Bay valley.

4. *Helix Sabuletorum*, nobis, n. s.

Testa sub-late umbilicata, orbiculato-depressa, utrinque confertissime striata, plicisque arcuatis distantioribus ornata, non nitente, pallide cornea; spira convexiuscula, sutura profunda, apice obtuso; anfractibus $4\frac{1}{2}$ -5 lente crescentibus, convexis, ultimo rotundato, subtus valde convexo; umbilico latiusculo, interdum omnes anfractus exhibente, profundo; apertura lunato-rotundata vix obliqua; peristomate simplici, marginibus conniventibus, columellari breviter subreflexo.

Diam. major $4\frac{1}{2}$, minor 4, axis 2 mill.

Hab. ad Hout Bay; Strand non procul ab vico Somerset; et ad Kalk Bay, P. B. S., in arenosis, prope littora maris.

This shell might, on account of its similar size, and the more prominent features of its sculpture, easily be mistaken for *H. rariplicata*, nobis, by a cursory observer. It differs in its more depressed spire, wider umbilicus, more closely wound whorls, which are in greater number, and in the delicate striæ between the plicæ, which are more regular and distant, and never deficient in the last whorl. In some specimens the umbilicus is wider than in others, plainly revealing the whole of the whorls in its interior. It appears to approach *H. rivularis*, Krauss, in some respects, but is more widely umbilicate, has a greater number of whorls, with a deeper suture, and differs in its mode of sculpture.

5. *Helix dumeticola*, nobis, n. s.

Testa sub-late umbilicata, depressa, superne plane costulato-striata, subtus læviori, tenui, cornea, epidermide lutea caduca, quasi lubrica, induta; spira convexiuscula, apice obtuso, sutura impressa; anfractibus $3\frac{1}{2}$, convexiusculis, ultimo rapide accrescente, subdepresso, basi valde convexa; umbilico latiusculo, profundo; apertura magna, vix obliqua, subcirculari; peristomate tenui simplici, acuto, marginibus subapproximatis, columellari expansiusculo, vix reflexo.

Diam. major 11 mill., minor 9, alt. $4\frac{1}{2}$.

Hab. rarior derelicta ad Green Point, P. B. S., frequentior in dumetis littoralibus prope Simon's Town et Strand, ad littora Sinus Falsi.

This shell has some characters in common with the Natal shell, *H. vernicosa*, Krauss, but is at once to be distinguished by the form of the aperture, its more flattened spire, and wider umbilicus. In the sculpture, and depression of the last whorl, it bears some resemblance to one of the largest South-African species, *H. Caffra*, Fér., which is not known to me as occurring nearer to Cape Town than Algoa Bay in the eastern part of the colony, where it probably inhabits, in like manner, with this species, thickets among sandy dunes near the shore.

On a review of the South-African *Helices* described in this and previous numbers of the 'Annals,' it will be found that, besides *H. Trotteriana*, from the eastern part of the colony, ten species, previously undescribed, have been added to the list. When we consider how small a district was explored, viz. the Cape Peninsula and the sandy isthmus adjoining it, as far as its boundary mountains, it may well be concluded that much remains to be done in the extensive tract embraced by the British possessions in that quarter.

H. Capensis, the most abundant species at the Cape, was only described by Pfeiffer in 1841, and *H. Menkeana* in 1842. Of the *Helices* inhabiting the environs of the chief town in the colony, *H. globulus* (which is conspicuous from its size) alone appears to have attracted the attention of earlier observers. In Krauss' 'Sud Afrikanischen Mollusken' will be found, in addition to his new species, the most complete catalogue of *Helices* previously described from that region. An enumeration of other scattered species attributed to it may form a desirable supplement.

H. Bulbus, Menke, was added by Pfeiffer in the 'Malak. Zeitschrift' for 1848. In the absence of descriptions it is impossible to say what *Helicella comatula* and *sectilis*, *Helicostyla connexiva* and *dolosa* of Férussac's 'Prodromus,' or *Theba Eklo-*

niana of Beck's 'Synopsis,' may be. The Cape is assigned as their habitat, but whether they belong to its neighbourhood, or to distant districts, cannot be readily ascertained. An attempt to identify *Bradybana monticola* of Beck, has been made above. Albers, in his 'Heliceen' published in the present year, considers it likely that *H. argillacea* is a South-African species, because his specimens, received from Eklon, came with the allied *H. Lucana* to Europe; but the Cape is a point to which shells coming from the East are likely to be brought, and, in the absence of certain information regarding their South-African origin, there appears no sufficient reason for doubting that Timor, the received habitat, is other than the correct one; more particularly as some nearly related Helices inhabit the neighbouring north coast of New Holland.

Albers also, on the authority of specimens in the Berlin Museum derived from Lamare Picquot, cites the Cape as the home of the Bourbon species *H. detecta*, Fér. It appears from a notice in page 181, that Lamare Picquot also collected in the sister island of Mauritius; and examples are not rare, in either English or continental museums, of glaring errors in assigned habitats, such as to render it desirable to suspend judgement, in the absence of direct evidence concerning the actual locality from the collector himself, who, moreover, may not have been sufficiently careful in the separation and ticketing of specimens obtained in different countries.

Krauss attributes only two species of naked *Limacidae* to Southern Africa. Near the Cape, four, if not five distinct species were met with. These were, 1st, a large black slug which abounds on oaks at Newlands and Rondebosch; 2nd, a small keeled slug frequent under stones at the latter place, probably Krauss' garden *Arion*; 3rd, the elongated keelless species accompanying *Helix perplicata*; 4th, a variegated slug, brown and yellowish, marked with a white line running from the shield to the tail, inhabiting stony places on the skirts of Table Mountain behind Cape Town, and near the sea at Three-anchor Bay; and lastly, a fine variegated slug which seemed to differ from the last-mentioned species, and which was creeping about in great abundance, at midday, just before a smart vernal thunderstorm, in a stony tract between Stellenbosch and the mountain range of Simonsberg.

XII.—On the Muricidæ. By WILLIAM CLARK, Esq.

To the Editors of the *Annals of Natural History*.

GENTLEMEN, Norfolk Crescent, Bath, December 1, 1850.

SOME of your readers may feel an interest in the following malacological notes on the British *Muricidæ*, which are now distributed in *Murex*, *Buccinum*, *Fusus*, *Pleurotoma*, *Purpura*, *Nassa*, *Trichotropis* and *Cerithiopsis*; these genera form a part of Lamarck's *Canalifera* and *Purpurifera*. This family is of enormous extent, and has its origin in the Linnæan genera *Murex* and *Buccinum*, which, though separated by Linnæus on artificial grounds, have their animals identical in all essential points; and it can scarcely be doubted, with the views held by that great naturalist, that if he had been aware of their similar malacological structure, he would have merged the *Buccina* in *Murex*, or *vice versâ*: we shall therefore consider them synonymous; they have been split by the moderns into numerous genera on pure conchological bases. Many causes have concurred to produce this artificial arrangement—amongst them, the multitude of species, the dissimilarity of the hard parts, which malacologists failed to see in their true light as the indices of species, but chose to consider the variable forms to proceed from generic animal distinction. We will examine these points, and endeavour to reduce them to their proper value.

The principal distinctions between this division and the *Holostomata* are, that the periphery of the aperture of the shells of the *Canalifera* is broken into branchial canals and more marked and extensive depuratory sinuses, and in the soft parts having the invariable presence of a retractile proboscis, with some other variations that will be mentioned. The shells are of elegant structure, and the animals of great beauty, but the latter resemble each other so much as to set generic distinction out of question, and even to render specific characters difficult without the aid of the hard parts, on which account I am obliged to enter into greater minutiae than perhaps may be thought necessary. It will also be shown that the anatomy as well as the hard and soft parts, with the general characters of the coloration, especially in the minor Murices, are all but identical.

There is a singular coherence in the specific descriptions; this arises from the similarity of the objects; but if, to relieve the tedium of the “*iterumque, iterumque,*” I had attempted a generalization beyond what has been admitted, confusion would have resulted from the destruction of the individuality of the objects by amalgamated descriptive characters; the account would rather be that of a compound than of an individual animal, and the

more delicate features so essential for specific comparison lost. If animals are to be described correctly, conciseness must give way to particular description; indeed in zoological matters the term is little better than to express omissions often of very essential features: but if it be insisted on, we must rest content with rough sketches instead of finished portraitures.

The general distribution of the *Muricidæ*, according to my method, includes Lamarck's *Purpurifera*, which have, as I think, been separated from his *Canalifera* on very slight malacological grounds;—so much so, that though the commentators in the last edition of his 'Animaux sans Vertèbres,' state the *Purpura* are sufficiently distinguished from the *Murices*, I must dissent from that opinion, and challenge the production of even one essentially distinct generic character between the two families. There are about twenty-two genera which have sprung from *Murex* and *Buccinum*, whereof six or seven embrace British species, and fourteen or fifteen the exotic.

The present arrangement of the moderns appears to rest altogether on artificial generic characters extracted solely from the hard parts of the animal. Conchologists have thought, that because the muricidal animal, as I designate the *Buccinum* of authors, has a short emarginate canal, and those named *Fusus* and *Murex* have more extended ones, some of them being smooth and others varicose, they must be generically distinct animals: this is a great mistake. We are enabled to say, from a sedulous examination of the animals of all the genera, including the greater part of the British species except the larger and deep-sea Murices termed *Fusi*, that they are identical in organic structure, and differ from each other in colour and slight specialties of the soft and hard parts no more than may be observed in the different varieties of the human race: for the short man with the short neck and inflated trunk, in comparison with the tall, thin, slender individual, does not constitute a different genus; neither is the tumid *Buccinum* or *Dolium* with the short canal generically distinct from the more spindle-shaped Murices, the *Fusi* of authors. For these reasons we are bound to consult nature in preference to artificial considerations.

The animals of all the modern genera of the *Canalifera* and *Purpurifera*, the proceeds of the dismemberment of the genus *Murex* and *Buccinum*, are zoophagous, and have the flat proboscidal head, which is rarely produced so as to intercept the basal coalition of the tentacula that carry eyes externally at different portions of their lengths; the buccal fissure is at the centre of the tentacular veil or head, placed somewhat inferiorly, from whence a long retractile proboscis is exerted, armed with hard parts of variable lengths for boring and sucking their prey; they

all have the double branchial plume, mucous fillets, and more or less long branchial fold; the stomach, liver, heart, auricles, ovarium, testis, and organe générateur, nervous ganglia; in short, the entire internal anatomy scarcely differs. The variations are specialties of small value, as of the size and outline of the foot and its operculum where it exists, the different distances of the pediculated eyes from the base of the tentacula, and the variations in the external markings and contour of the hard parts; with respect to which we observe, that they arise solely from the varying disposition of the mucous glands of the mantle, combined with the variety of food and habitat: but we think such variations do not constitute generic distinction.

Conchologists will ask, if the present numerous genera of this family are merged in the single one of *Murex*, how are they to distribute the multitudinous species? The only answer is, not by dividing the simple genus into twenty others of similar characters. If the genera of these gentlemen only meant aids for the arrangement of vast numbers of species, such symbols can be accepted, though objectionable as to appellation, because without explanation they would convey ideas of generic distinction rather than of divisional assistance; it is therefore better to consider the variations of form and markings as simple sectional guides to reduce an enormous family to comparatively easy identification of its species. It is a very illogical position, that because a genus happens to have a thousand species or more instead of ten, it is on that account to be cut up into numerous genera, which are absolutely misnomers, being without generic distinction. For these reasons I shall consider all the British *Canalifera*, and such of Lamarek's *Purpurifera* that comprise any of our indigena, as represented on malacological grounds by the animal of the ancient genus *Murex*, dividing the species into specific groups by the marked variations of the forms and sculpture of the shells and by sectional indices and definitions.

If however malacologists will not dispense with the old names *Buccinum*, *Fusus*, *Purpura*, *Nassa*, &c., they must follow the bent of their inclination; it is hard to cast off old habits, however much better ones may present themselves, "meliora probo, deteriora sequor:" but in our method they will bear in mind that these words have the precise value of our sectional definitions; they are mere signs and mementos representing objects with certain outward characters, but without the *slightest generic pretension*.

It may be objected that our sections and definitions are the mere equivalents of the old *Buccinum*, *Fusus*, &c.: this is not so; these terms pretend to represent what does not exist—generic distinction; but the sections merely point out variations of ex-

ternal aspect to assist arrangement ; the first stalk abroad under false colours, the others are clothed in simple integrity, casting off the garb of phrases which imply fictitious values.

The generic synonymy appended to the sections will enable the collector to arrange his objects, either in the groups of the Linnæan *Murex*, or in the pseudo-genera of the moderns. The following seven sections will suffice for our Muricidal indigena. The exotic objects will require a few others.

Murex et Buccinum, Linnæus.

SECTIO I.

Testa conica, subinflata, varicosa, effusa, spiraliter striata. Apertura ovalis. Columella aspera. Operculum corneum.

Murex erinaceus, Linnæus, Lamarck, et auctorum.

Animal spiral, yellowish white ; mantle very thin ; the branchial fold extends very little beyond the canal of the shell. The head is small and compressed ; from its angles the moderately long tentacula spring, and almost coalesce at their bases, from which they run tumid to some distance, accompanied by offsets of more than half their length, on which the eyes are placed externally ; from thence the tentacula taper conically to their extremities. The mouth is a vertical fissure beneath the tentacular veil, and emits the characteristic proboscis. The foot when quiescent is nearly oval, but on the march is truncate in front, throwing off on the right and left small auricular points ; it is gently constricted medially, and has a blunt rounded termination, carrying on the posterior upper surface an elongated red-brown corneous unguiculated operculum.

Lamarck's commentators say, that between the genera *Murex* and *Purpura* there are sufficient marks of distinction, and in support of this opinion they adduce the truncature of the tentacula at their offsets in *Purpura*, which they state is more apparent than in *Murex*. We dissent from these views, and think the distinction is purely ideal—at least it is so in the species of each genus we have examined : the fact is, that when the tentacula are collapsed, the basal two-thirds appear very tumid and broad at the termini of the offsets, but in fully extended action the truncature nearly or altogether vanishes and no peculiarity is apparent at these points.

It will be observed below, that the external organs of *Murex lapillus*, the *Purpura* of authors, are nearly identical with those of *M. erinaceus*, and the internal organs of the two are so similar that it would be a repetition to describe them ; the corneous opercula scarcely show distinction ; that of this species may

generally be of a deeper red, somewhat rounder, though the arches of the striæ are no less elliptical. The gland producing the purple dye is as conspicuous as in *M. lapillus*; indeed this gland may be traced in all the *Canalifera*, though its secretion varies in colour; there may also be a slight difference in the lingual riband, which is here rather longer and more coiled than in its congener, and the cerebral ganglions smaller, but these variations are of little value. The different hues of brown in *Murex erinaceus* form the ground colour, but are invariably mixed with white or flaky yellow markings on the upper part of the foot and on the tumid portion of the tentacula, the conically pointed upper parts being of a uniform colour; the under part of the foot is bordered by a narrow band of flake-white transverse filaments: these distinctions in the coloration are constant.

This species inhabits the littoral, laminarian, and coralline zones in abundance at Exmouth. It may be asked, what are the causes that animals of such decidedly similar organs, as the *Muricidæ*, should produce shells so entirely dissimilar? The answer is, that there are certain variations in the form and disposition of the vessels of the mantle for the secretion of the calcareous and colouring matters which are inappreciable, and are the agents that effect the diversity of structure, sculpture and variation of the markings.

Murex muricatus, Montagu et nobis.

Animal of seven or eight spiral volutions, of a pure white ground interspersed sparingly in some specimens with intenser minute white flakes; the mantle is even with the aperture, except that it is prolonged into a branchial fold, often extending beyond the canal of the shell; there is no emargination in the upper part of the outer lip of the shell, but only a small incipient duct, which is lined by a corresponding extension of the mantle. The head is the usual flat, little-produced characteristic organ of the tribe; the mouth is a central vertical fissure that exserts the usual proboscis; the tentacula are pointed and rather long in proportion to the minute size of the animal, with eyes on external offsets at about half their length. The foot is of moderate length, a little curved anteally, forming at its right and left points minute auricles, and tapers gradually to an obtusely pointed termination, on which, at the upper surface, is a light horny suboval and subunguiculated operculum.

This beautiful species is taken abundantly alive at Exmouth in the deepest waters of the coralline zone; it is almost always enveloped in an orange-red spongy mass, which doubtless serves as a mantle of concealment and protection in like manner as the earthy coating of the land *Bulimus obscurus*.

Murex septangularis, Montagu et nobis.

Animal with eight spiral turns, white in all parts, powdered with intenser minute flake-white points; mantle rather thick at the edges, and produced into a fleshy branchial fold that extends beyond the short canal of the shell; the head is compressed, narrow, with a vertical fissure below it, from which a retractile proboscis issues; the coalition of the tentacula at their bases is not in the least impeded by any projection of the head; the tentacula are short, setose, with the eyes on attached thick offsets at the external points, at about two-thirds of their length; the remaining portion is very short. Foot rather narrow, slightly auricled, truncate in front, moderately long, with the termination nearly as broad behind as in front, without a trace of a distinct point, though it is often more or less emarginate; it carries on the upper part a strong, very elongated, oval, pale corneous operculum formed of unguiculated segments. The sinus or emargination at the upper part of the aperture is very slight.

This species is not often obtained alive at Exmouth; its range of habitat is from the littoral to the coralline zone. It has by some authors been deposited in *Pleurotoma*, on what grounds can scarcely be satisfactorily explained, as the pleurotomic emargination is almost obsolete, or less conspicuous than in any other of the minor so-called *Pleurotomata*; besides, as has been stated, the head is perfectly flat, without a trace of projection to intercept the coalition of the tentacula. We consider it in every respect a varicose *Murex*.

Besides the three species above described, this section comprises the *M. turricula*, *M. corallinus*, *M. Barvicensis*, *M. Bamffius*, *M. rufus*, *M. minimus*?, and perhaps one or two others of the minor Murices.

Murex et Buccinum, Linnæus.

SECTIO II.

Testa inflata, lævis, effusa, spiraliter striata. Apertura ovalis. Columella mutica, rarius subaspera, aut fastigiata. Operculum corneum.

Murex, nobis.*Fusus*, Lamarck et auctorum.

The Murices of this section are the *Fusi* of authors, most of which are deep-sea species, as the *M. antiquus*, *M. Turtoni*, *M. Norvegicus*, *M. Berniciensis*, *M. Islandicus*, &c., and the *M. trichotropis*? None of these, except the *M. Islandicus*, occur on the southern coasts, and that we have had no opportunity of examining for several years; but for the type of the animal of the enumerated species, we refer with perfect confidence to either of

our descriptions of the *M. erinaceus*, *M. lapillus*, *M. undatus*, or any other in our list, which will furnish every essential generic character; and I fully expect to have it in my power, by the examination of live *M. Islandicus*, to show the correctness of their assigned position as members of the genus *Murex*. I can say nothing of the animal of *M. trichotropis*, which is admitted here as probably belonging to this section.

Murex et Buccinum, Linnæus.

SECTIO III.

Testa inflata, varicosa, vel lævis, sæpe spiraliter granoso-undato-striata. Canalis brevis. Apertura ovalis. Columella fastigiata. Operculum corneum.

Murex undatus, nobis.

Buccinum undatum, Linnæus et auctorum.

Animal with eight spiral turns, of a pale yellow ground colour in all parts, sparingly interspersed with irregular dark blotches on the upper part of the foot, the tentacula, and branchial fold; the mantle is of thin texture, and no portion of it extends beyond the shell, except the branchial fold, which floats when in action far beyond the emargination of the shell, for only slight traces of a canal remains; the head is small, compressed, not at all produced, and does not in the least interfere with the coalition of the tentacula at their bases; they are long and flattish, broad at their origins as far as the eyes, which are placed on shortish external offsets, and the remaining portion terminates in rounded but not pointed extremities; the mouth is a vertical central fissure rather below the surface of the head, and from it a very long and powerful proboscis is exerted, armed with the usual spinous tongue. The foot is large, broad, and about as long as the shell, slightly auricled and curved in front, and rounded posteriorly to an obtuse point; on its upper part it carries a comparatively small, but strong, light corneous suboval operculum, having the striæ of increment of the same form, with the nucleus about the middle of its outer edge. There are two branchial plumes, one very large and pale brown, the other small, linear, of a still darker brown. We say nothing of the internal organs, as it has already been stated that they are identical throughout the Muricidal tribe. We refer those who are desirous to see a full account of the internal structure of this animal to Baron Cuvier's anatomies, where they will find an elaborate account and delineation of it. This celebrated animal may be looked on with perfect confidence as a faithful type of the entire Muricidal division; our descriptive notes of the various animals will fully confirm this view.

Having taken the bold step to merge one of the classic genera of Linnæus and authors in the genus *Murex*, I must say a few words by way of justification, in addition to what I have advanced on this point in the former part of the present memoir. I am prepared to have much obloquy heaped on me for my presumption; I shall enter on no defence beyond the present observations, but will leave to the unerring critic Time to pass sentence on the step I have taken. I will now only observe, that I have as much right to suppress, on what I consider to be just grounds, a Linnæan genus, as others have to split one into twenty genera; and I am confident that if the great and candid Linnæus had known as much of the animals of the *Murices* and *Buccina* as the progress of science has made known, he would have merged one or the other of these genera: no conscientious naturalist can support both with identical animals as regards all essentials. I have preferred to retain *Murex* as the representative of the most extensive group, and by far the elder genus. The British Murices of this group are very few; we have only examined the *M. undatus*: the animal of *M. ovum*, if indigenous, has not occurred, nor that of the *Buccinum acuminatum* of authors.

Murex et Buccinum, Linnæus et nobis.

SECTIO IV.

Testa tumida, lævis, sæpe spiraliter substriata. Canalis obliquo-dorsali-brevissimus. Apertura ovalis. Columella dorso-fastigiata. Operculum corneum.

Murex lapillus, nonnull et nobis.

Buccinum lapillus, Montagu.

Purpura lapillus, Lamarck et aliorum.

Animal spiral, of a uniform pure white or pale yellow, without the intermixture of other colours and markings, except a single superficial fine longitudinal line of intenser hue which divides the under part of the foot in two portions; the mantle is of very thin texture, lining the shell only to the margin, except the part constituting the branchial fold, which is carried occasionally in marching a little beyond the short canal. The head is very small, slender and flat, from which spring the moderately long tentacula that are tumid and rounded from their bases, accompanied for two-thirds of the length by offsets on which the eyes are placed externally, and from thence they run conically to not very pointed terminations; the mouth and its vertical fissure is beneath, from which a short proboscis is very rarely seen protruded. The foot at rest is nearly an oval, but in action is trun-

cate and auricled in front, somewhat attenuated in the middle, and has a rounded termination, with, on its posterior upper surface, an irregular oblong, red-brown, corneous, subunguiculated operculum, having the lines of increment raised on the inner surface. The buccal mass, as in all the Murices, lies within the proboscis, which itself is inclosed in a case, and consists of two pale fleshy lobes, supported by very thin corneous plates, between which the tongue is fixed, and after passing the extent of the proboscidal tube it forms a coil of four or five turns immediately behind its posterior part; it is narrow, white and spiny, and about half an inch long; under the coil is the cerebral cord embracing the œsophagus, formed of about eight suboval yellow ganglions. There are two branchial plumes, one large and pale brown, the other minute, linear, and of a much darker hue; they have the arterial vein in the centre, and are fixed as in its congeners; then are seen the mucous fillets which furnish the material for the capsules of the ova; the rectum and ovarium, with the canal of the viscous sac, debouche on the right side. The stomach is enormous, and always found filled with a tenacious mass of pulp; the ovarium is yellowish white, mixed up with the liver, which is of a dark brown green, occupying with either the ovarium or testis the posterior whorls of the shell to the apex. The sexes are distinct; the male organe générateur differs from the ridged, grooved, spatulate and double-pointed appendages of some of the Murices, in being smaller, flatter, less pointed and more strap-shaped. This detailed account of these organs will not be repeated, as they are essentially the same in all the Murices.

This section I believe contains only the British species now described. It is common everywhere, and rarely extends its habitat beyond the littoral zone.

Murex et Buccinum, Linnæus.

SECTIO V.

Testa tumida, granuloso-plicata, vel lævis. Canalis obliquo-dorsali-brevissimus. Apertura ovalis. Columella striata, in plicam intorta. Operculum corneum.

Murex reticulatus, nobis.

Buccinum reticulatum, Montagu.

Nassa reticulata, Lamarck et auctorum.

Animal spiral; mantle of very thin texture, not extending beyond the aperture, except that portion of it styled the branchial fold, which in adult specimens is often exerted an inch beyond the emargination of the shell; it floats free, as there is no canal for its support; it is also evidently a tentacular aid.

The colour of the upper part of the foot, of the tentacula as far as the eyes, and of the branchial fold is a light brown ground, so thickly studded with yellow flakes and minute dark points and blotches as to give the animal a dark pepper-and-salt aspect; the under part of the foot is yellowish brown, aspersed with very minute dark points. The head is small and flat, with two long tentacula bearing eyes externally on offsets about a quarter of an inch from the bases, where they are wide, but from thence to their termination they become slender and pointed. The foot is very large, long and broad, extending when in full march more than the length of the shell; it is bevelled to a fine edge, gently rounded, indented in the centre in front, and has slightly curved rather long auricles; it then gradually declines to an elongated lanceolate termination, which is emarginate and sends forth from each fillet of the fork a pointed filament; close and anterior to the caudal emargination is a brown, corneous, suboval, subunguiculated operculum. I have thought that the emargination might be the seat of a gland, as that part is constantly covered with mucus, which, when removed, recurs; but as I could trace no distinct duct, I presume the exudation is of porous origin. The mouth is a vertical fissure under the head, from which a very long proboscis is protruded, the architecture whereof is in all respects similar to that of *Murex undatus*, mihi (the *Buccinum undatum*, auctorum), as are the cerebral ganglia, the salivary glands, the double branchial plumes, the mucous fillets, and the heart and auricle; all these organs I have dissected and compared with the same parts of that species, and I found no essential differences.

It appears from these notes that the principal variations of this section of the Muricidal group from its fellow-species consist in the large size and somewhat varied outline of the foot with its caudal filaments; but surely no malacologist will contend that these are generic distinctions: the whole of the animal must be taken into view, which will undoubtedly, with all disinterested naturalists, stamp it as a true member of the genus *Murex*. This animal is lively, active, not at all shy, and marches with rapidity; it inhabits in great abundance the littoral and laminarian zones. It must be regarded as the type of the British species of this section; it has the most intimate and congeneric alliances with the animals of the third and fourth sections.

Murex incrassatus, nobis.

Buccinum macula, Montagu.

Nassa incrassata, auctorum.

Animal spiral, throughout of a pale dirty yellow, marked irregularly on all its organs with small dark lead-coloured or brown

dots, lines or blotches. The branchial fold of the mantle extends far beyond the short canal, and though cloven, forms apparently an entire cylindrical tube, which is constantly in motion and used as a tentacular organ. The head is pale red with a vertical fissure, from which a long proboscidal trunk issues; the tentacula are not long, but thickened from their bases to half the length, at which point the eyes are fixed at the internal angles, from whence they terminate in slender conical points. The foot anteriorly is truncate, indented in the centre in front, and curves right and left into pointed auricles; when extended it is longer than the shell, and tapers posteriorly to a flat bevelled emarginate terminus with scarcely a trace of caudal filament; the operculum is corneous, of suboval shape, and shows the subunguiculated striæ of increment. There are two semilunar branchial leaves, one much larger than the other, with dark brown transverse vessels, and connected with the mantle and neck in the usual manner; the heart is a pale, minute, subcircular inflation, situate immediately behind the branchiæ. The male has on the right side the ordinary spatulate organe générateur, and the testis, which is paler than the ovarium, is substituted for that organ; in the female the ovarium is large, of a deep marone red, mixed up with the pale brown liver, and fills the three terminal volutions. The animal displays very energetic locomotion; it inhabits at Exmouth abundantly all the sea zones.

Murex varicosus, nobis.

Nassa varicosa, auctorum.

This species has been considered a variety of the preceding; it is closely allied to it, but the animal and shell sufficiently indicate specific distinction. To describe it in the entirety would be a useless repetition, I therefore only note the deviations from its congener: the animal is more slender and invariably of much lighter colour, and in addition to the simple emarginate termination of the foot in the *M. incrassatus*, there are here two long, pointed, apparently tentacular filaments issuing from the fillets of the caudal fork; these are the only two material differences. But in this case the shells of the two present so distinctive a contour as to corroborate the malacological variations; that of the *M. varicosus* is of much more elegant form, being more produced, the volutions rounder, with additional cancellated ribs, which are not undated, and display the white varices, from two to five, of former apertures, which in this species, in fine fresh specimens, are of purple colour; but in the *M. incrassatus* the apertures are rufous brown. This animal, at Exmouth, only inhabits the coral zone, and is rarer by ten to one than the *M. incrassatus*; it is very lively and submits to the closest examination; we have kept

for days separate assemblages of the two species; we believe they are distinct.

Murex, auctorum.

Cerithium, nonnull.

Cerithiopsis, Forbes.

SECTIO VI.

Testa conica, elongata, gracilis, turrata, granuloso-plicata. Canalis obliquus, brevis. Columella recta et lævis. Operculum corneum.

Murex tubercularis, Montagu et nobis.

Animal inhabiting a spiral shell of 10-15 volutions, flake-white, except some sulphur-colour points behind each eye; and behind them, on each side the neck, is a longitudinal band composed of minute brown points; and anterior to the operculum are two sulphur-colour patches, one on each side. The head is small, compressed; mouth a vertical fissure in the centre of the fork between the tentacula, from whence, as in the *Canalifera*, a retractile proboscis is exerted. The tentacula are short, inflated, subrotund, slightly triangular at the bases, and for the terminal part flat and more slender, blunt or very little clavate at the tips; they are frosted hyaline, and edged throughout all the margins with hair-like lines of intenser white, giving them a very elegant appearance; the foot is also bordered in like manner. The mantle forms a branchial fold, which does not float beyond the canal of the shell, and it also lines the slight sinus at the upper angle of the aperture; the eyes are comparatively close together, rather large, immersed exactly in the centre of gently raised subrotund inflations. The foot in front is scarcely auricled at the external angles, square, with a shallow groove dividing the sole in front from the upper lamina, and forming slight labia; it is gradually constricted in the middle, tapering to a moderately pointed termination, with a very deep central longitudinal groove in the posterior half of the foot, terminating at its centre in a minute deep cavity, which undoubtedly pierces the integuments, and appears to communicate with the interior of the foot at the junction with the body.

This decided cavity and the very deep scission are in some measure new features; they are either to act as aquiferous canals, or to allow the posterior half of the foot to fold, and to assist its doubling at right angles; the foot is usually carried in advance of about half the length of the tentacula, but in great exertion is sometimes produced to their tips. Though medial grooves in the foot of the Gasteropoda are not unusual, I have never met with one like this. There is a distinct margined operculigerous

lobe without wings or caudal appendages, on which is fixed an exceeding light horn-coloured, subrotund, corneous operculum at some little distance from the termination of the pedal disk, and is marked with the usual characteristic striæ of increment of the muricidal opercula. I can say nothing of the branchial plume and reproductive organs, being unwilling to make perhaps a useless attempt to see them by the destruction of the beautiful specimens.

This very elegant creature inhabits the middle levels of the littoral zone at Exmouth, in quiet sheltered pools amongst the minor Algæ, in company with the *Cerithium reticulatum*, which outnumbered it by fifty to one. With it is also rarely found the *Murex adversus* of authors, which we believe will turn out, when the animal is seen, congeneric with the present species. When our present animal is just captured it is very lively, and creeps up a glass quickly. There can scarcely be a greater contrast than between this animal and that of the *Cerithium reticulatum*, with which it has hitherto been confounded, and which has the entire aspect of an elongated *Rissoa*, to which I think it is even more closely allied than to *Turritella* and *Aporrhais*, whereas our *Murex tubercularis* is an undoubted *Canalifer*, though it has evident relations with *Eulina* and *Chemnitzia* by the position of the eyes and shape of the tentacula; still the balance of characters is greatly in favour of the present position. I believe Mr. Alder and myself are the first and nearly contemporaneous observers of this species.

Murex et Buccinum, Linnæus.

SECTIO VII.

Testa gracilis, fusiformis, plicata, effusa, spiraliter striata, labio externo plus minusve emarginato. Apertura subovalis. Columella planato-substriata. Operculum nullum.

Murex gracilis, Montagu et auctorum, et nobis.

Pleurotoma, *Murex*, *Fusus*, nonnull; *Clavatula*, Lamarek; *Defrancia*, Millet; *Mangilia*, Leach.

Animal spiral; ground colour white, aspersed throughout all the organs with intense white flakes, mixed nearly equally with pink lines, points and blotches; these are minute, though varying in size and irregularly distributed. Mantle rather thick, not extending beyond the margin of the aperture, except the branchial fold, which is often carried considerably beyond the canal of the shell; it also forms in the outer lip at the upper part a small, open, slightly produced conduit that lines a deep scission in that

part of the shell. This species is one of the most typical of the *Pleurotomata* of British authors, but its distinguishing feature, the sinus, is not sufficiently stable in the British species to give them the impress of generic distinction.

The head appears to be a very short protrusion of the red vertically cloven proboscis, which can be exerted to a great length; it contains the usual short spiny tongue and other organs of the buccal apparatus, consequently in this species the tentacula do not completely coalesce basally. The want of conjunction of the tentacula at their bases is the character principally relied on by those malacologists who contend for a generic distinction between the so-called *Fusus* and *Pleurotoma*, but the character as regards the British *Pleurotomata* is very variable and cannot be depended on, as some decided ones, as to the shell, have not a trace of an exerted head or veil, and whose tentacula at their bases are conjunctive, with only the separation of the proboscidal fissure; and in their genus *Fusus* the same discrepancies occur, as in some of the minor species the tentacula coalesce, whilst in others the conjunction is slightly intercepted by the scarcely appreciable appearance of a head or head veil. The tentacula in the present animal are short, with eyes on the external extremities of offsets which extend within a very short distance of their points. The foot at rest is beautifully puckered; when in action it is truncate in front with small auricles, flat, long, acuminate behind, and extending to the fourth volution from the base. There is not a trace of operculum: it is difficult to account for the absence of this appendage; it may be surmised that the apertures of these shells are so narrow as not to require such a protection; but this argument cannot be relied on, as we see the *Aporrhais pes pelecani* that has a corneous operculum with a still narrower aperture. The branchiæ are semilunar, one large, one smaller, of a dark brown colour; immediately above the larger one are the coarse pale yellow mucous filaments, which are edged with a dark border. The organe générateur mâle is a very long, narrow, pale yellow, white, strap-shaped appendage, pointed at the end, springing under the right tentaculum, and lies doubled up and reflected back in the branchial cavity. The ovarium and liver occupy all the posterior volutions, and run mixed together to near the pylorus; the two organs are easily distinguished, the ovarium being pale yellow, and the liver red-brown. In the male the testis replaces the ovarium. I have a little exceeded the limits of ordinary description on account of this animal being the type of the section.

This elegant species is sufficiently abundant in the coralline zone at Exmouth.

Murex Ginannianus, nobis.*Pleurotoma Ginannianum*, Philippi.*Fusus Ulidianus**, nonnull.

Animal spiral, ground colour white or pale yellow; mantle plain, even, except the branchial fold, which, when the animal is in motion, floats free beyond the canal, and from its constant movement appears to act as a feeler; the mantle also at the upper part of the outer lip lines a very inconspicuous emargination of the shell, forming a minute anal conduit. The head is small, white, compressed, and does not at all interfere with the basal conjunction of the tentacula; the proboscidal fissure, as in *Murex undatus*, is below the coalescing membrane; the tentacula are short, flake-white, with eyes at the terminal surface of external offsets nearly extending to their points. The foot when fully extended reaches to the third or fourth posterior volution; it is pale yellow below, with marginal transverse white markings, and on the upper surface sprinkled with intense flake-white spots; it is subrotund in front, scarcely auricled, narrow, gradually tapering to a blunt slightly emarginate point. There is no operculum, and in this respect and in all the other organs it agrees with *Murex gracilis*.

I might have generalized in this species, but I am obliged to give a somewhat more detailed account of it than usual, as it is to be the standard of comparison with the two next species, with which it has been considered identical by some conchologists.

I have personally dredged this species in the laminarian zone off Budleigh Salterton. A larger variety is taken occasionally in the deeper waters of the coralline zone, which I am inclined to think may turn out a distinct species. The organe générateur is precisely similar to that of *Murex gracilis*.

Murex nebula, Montagu et nobis.

This animal has the closest alliance with *M. Ginannianus*, therefore only the very doubtful and almost inappreciable variations will be mentioned. In this species the eyes appear larger and the tentacula proportionately shorter than in *M. Ginannianus*. The general aspect of the shells of the two species appears to afford even better specific distinctions than the animals. In August 1849 I dredged in Littleham Cove near Exmouth, in the laminarian zone, several specimens both of the *M. Ginannianus* and *M. nebula* in company, and at the same haul; they proved lively and afforded a good examination for some hours; and the differences between them with respect to the shells are, that the *M. Ginannianus* is less slender, the aperture more patulous, and

* For *Ulidianus*, see 'Annals,' vol. xv. p. 316.

the colour of a uniform yellow, whilst that of *M. nebula* is much darker, and shows a still darker spiral band in the sutures. The animals also differ: the *M. Ginannianus* has the ground colour of a very pale yellow brown, suffused with a tinge of light red, and the flakes with which the whole body is aspersed have a light sulphur tinge; whereas in *M. nebula* the ground colour is pale yellowish white shot with slight hues of red, and the flakes are snow-white: these differences are certainly not very important, but they do not appear to depend on differences of food and habitat, and they are constant in the two species; I am therefore rather inclined to think that there may be sufficient grounds for specific distinction. There is no trace of operculum, and in other respects they closely agree with the type, except that here the pleurotomic sinus is very inconsiderable.

Murex brachystoma, nobis.

Pleurotoma brachystomum, Philippi.

The *P. brachystomum* of Philippi, recorded in the 2nd vol. p. 169 of the 'Enumeratio Moll. Siciliæ,' appears to be distinct from *M. Ginannianus*, judging from the characters of the shells, which exhibit greater distinctive marks than the animals; we have examined the two alive, and the only perceptible difference is in the colour, which in this species is pure hyaline, without the least effusion of the pale red or yellow brown which is apparent in *M. Ginannianus*, and the snow-white flakes on the upper part of the foot are very distinct, and do not run into each other as in its congener. In all other respects the two are identical as regards the markings and coloration of the organs that have not been mentioned, and in the shape of the foot and tentacula, and position of the eyes.

At Exmouth the two are taken together in the coralline zone. The *M. Ginannianus* also occurs commonly in the laminarian zone in company with *M. nebula*, but in that habitat we never met with the *M. brachystoma*. It must be admitted that the specific distinctions between these species are even less important than those between *M. Ginannianus* and *M. nebula*; the shells exhibit some distinctive characters, the animals nearly identical ones, consequently we are bound to consider the animal diagnoses of preponderating value, and pronounce the two to be varieties of the same species.

Murex linearis, Montagu et nobis.

Pleurotoma aut Fusus, auctorum.

Animal spiral; the colour throughout is of a uniform brilliant frosted white, occasionally suffused with snow-white opaque mat-

ter. The mantle is simple, being only produced into a simple branchial duplicature lining the canal of the shell, and as in its congeners is often extended beyond it. The head is very short, flat, forming a sort of head-veil, under which the usually armed proboscis issues; consequently the tentacula do not form a completely conjunctive angle at their bases.

I should have been glad to have seized and admitted such a character as generic in default of a better to separate the *Pleurotoma* and *Fusus* of authors, but I found the character not constant, and that some of the more decided *Pleurotomata* have the complete conjunctive tentacula, and not a trace of head or head-veil, but merely the intervention of the usual vertical buccal orifice. I am therefore compelled to relieve the genus *Murex* of these modern dismemberments. I feel confident that none of the so-called British *Pleurotomata* or *Fusi* differ generically from *Murex*. Some of the exotic species may perhaps afford better distinctive generic indices.

The tentacula are long and taper to a fine point, having the eyes at the external angles of pedicles of not half their length. The foot in front is subtruncate, acutely auricled and labiated; when in action it is sinuated, long, narrow, tapering to a fine point, and when fully extended reaches beyond the posterior end of the spire; it is the only species I know of, except the *M. costatus*, that shows this peculiarity: there is no vestige of an operculum, and the lateral scission is rather more apparent than in the two preceding species. The branchial plumes and all the other organs are in exact accordance with the type, *M. gracilis*.

The shells exhibit two well-marked varieties; the one the typical *M. linearis*, with more regular subdued spiral striæ; the other is more scabrous. The smoother variety is sparingly found in the coralline zone, the scabrous shells in the same zone at Exmouth are abundant. I have only examined the animal of the latter; it is possible the former may be distinct. Exmouth, 3rd August 1850.—Since writing the above I have met with a fine live specimen of the smoother variety, and I am unable to detect a sensible variation in them.

Murex attenuatus, Montagu et nobis.

Pleurotoma aut Fusus, auctorum.

This beautiful species is in most respects so similar to the *Murex gracilis*, the type of this section, that to describe it would be nearly a literal repetition of the account of that animal, except that the emargination of the outer lip, which scarcely merits that term, is rather a minute hollow shoot than a scission; there is no operculum. This is a rare animal, but I have examined several from the coralline zone at Exmouth.

Another variation from the *M. gracilis* is, that the foot when fully extended is as long as the shell; it is bordered with flake-white spots; but no pink marks are mixed up with it either below or above, as in *M. gracilis*. In this species the only pink or red spots are on the termination of the branchial fold. The organe générateur is of a pea-green colour, and in other respects is precisely similar to that of the type.

Murex costatus, Montagu et nobis.

Pleurotoma costatum, auctorum.

Animal spiral, of seven or eight turns, nearly throughout of a pale hyaline ethereal blue, shaded with the most delicate white; the mantle is of the general ground colour, and even with the shell, except the slight depuratory fold which lies in the minute canal at the upper angle of the outer lip, and the branchial fold that lines the basal canal and floats far beyond it: we have omitted to state that the prevailing ground colour is sprinkled with minute sulphur-yellow flakes. The head is small, compressed, almost obsolete, and from the vertical fissure under it the usual armed proboscis is exerted. The tentacula are moderately long, with eyes placed externally on offsets half their length; the terminal portions are slender, setose and slightly clavate at the tips. The branchiæ and other organs offer no variations. The foot is pale ethereal blue, with a transparently white narrow border, in front truncate, slightly indented, and gently curves at the right and left angles into small auricles, narrow, and tapers to a point which extends beyond the spire.

This minute species displays, in its splendid coloration of azure shot with brilliant snow-white streams, and in the proportions of its organs, more deviation than is usually exhibited in this beautiful group, but these elegant distinctions are only specialties. Its habitat extends throughout all the zones. I have had only one opportunity of examining this beautiful minute creature, which being lively, dégagé, and free from shyness, gave me every assistance, and the mate of this lovely Venus may truly apply to it the Ovidian phrase, "non rustica conjux." The Scotch specimens are of larger growth than those of more southern climes.—Exmouth, 20th August 1850. I have just met in the littoral zone with several live animals, and I find that in the males the organ of reproduction is exactly the same as in the type.

Murex purpureus, Mont. et nobis.

Pleurotoma purpureum, auctorum.

I can only from recollection speak of this species; I examined several of the animals many years ago, but I have not the notes

thereon ; it is as large or a larger animal than the *M. gracilis*, and if my memory is correct, it bears a close resemblance to it ; I am certain it has no operculum, and that the emargination in the outer lip is as conspicuous as in *M. gracilis* and *M. teres*. Full-grown specimens are rare at Exmouth ; I have not obtained one during the last two summers. It inhabits the coralline zone.

Murex Smithii, nobis.

Pleurotoma Smithii, auctorum.

Animal spiral ; ground colour white throughout, thickly mixed with opaque intense snow-white flakes, and on the siphon with eight or nine bright pink spots, inhabiting a yellowish brown plicated shell of nine volutions. The mantle is rather tumid at the margin of the aperture, and is produced into a short, fleshy, rather open or scoop-shaped branchial fold, which on the march is carried somewhat beyond the termination of the canal ; it also lines the anal sinus at the upper angle of the outer lip, which some authors term a pleurotonic scission. The head is the usual flat muricidal one, having at its centre the vertical fissure from which the ordinary armed proboscis is emitted. The tentacula are short, and the portions as far as the offsets, on which the large black eyes are fixed externally, are thick and strong, but the continuations are exceedingly short fine filaments.

I consider the present, of all the species I have examined, as that which has the eyes nearest the points. The foot is exactly truncate in front, and scarcely eared at the external angles ; in repose it is puckered and rounded postally, but on the march it extends to a sufficient lanceolate termination. There is no longitudinal line on the sole, nor trace of an operculum ; it is bevelled from the long pedicled base by which it is fixed to the body laterally, and also slopes from the antea truncate to a sharp edge.

The animal is rare at Exmouth, and inhabits the coralline zone ; it is extremely free, and gives every facility for examination ; it scarcely differs from *M. attenuatus*, or the type, *M. gracilis*.

It appears that the *Murices* of this section, none of which much exceed an inch in length, are all without opercula, and have erroneously been considered the *Pleurotomata* of Lamarck, who constituted the genus *Clavatula* for some of the species, but afterwards abandoned it. The true *Pleurotomata* have all a deep sinus or emargination in the upper angle of the outer lip of the shell, and a corresponding scission in the mantle of the animal, and the foot is invariably accompanied by an operculum. We have shown that the British *Pleurotomata* are almost always without opercula ; the genus has scarcely a malacological sup-

port ; it rests solely on the emargination in the upper part of the outer lip and the corresponding sinus of the mantle, which in the British species is not cloven as in the true exotic *Pleurotomata*. These slight characters, whether of the shell or the animal, so far from being essential permanent ones, are most variable and uncertain, shadowing in the numerous species, from the deep pleurotomic scission into the simple, scarcely perceptible canal of the Murices of our second section, the *Fusi* of authors. No one can define the boundary of this arbitrary generic index, which does not in many species even indicate specific variation.

M. Philippi states that the great differences in the pleurotomic sinuses and other organs of the minor Murices of the Mediterranean, many of which are amongst our indigena, from the generic characters of the true *Pleurotomata*, induced M. Millet to found the genus *Defrancia* as a depository for these aberrant species. Dr. Leach placed them in his genus *Mangilia*, but I can see nothing in those I have described to justify the creation of a genus for their animals distinct from *Murex*. I view them as Murices in which the opercula have vanished or become obsolete ; I have therefore on that account placed them as the last section of the genus *Murex*, considering them as on the confines of the family, and forming the passage to the exotic genera *Cancellaria*, *Dolium*, *Harpa*, *Mitra*, *Voluta* and *Conus*, all of which except *Conus*, that has a minute operculum, are without that appendage ; and though these families are not the typical *Canalifera*, still it is clear that the *Columellariadæ* and *Convolutidæ* have very many points of connection with the *Muricidæ*. In this section there are two or three British species, the animals of which have not occurred to us ; amongst them, the *Pleurotoma teres*, nonnull., which is placed here provisionally, being the only British species without longitudinal ribs ; the animal may be the true exotic *Pleurotoma* with an operculum ; the character of the scission is peculiar, and more in accordance with that genus ; its position must remain in doubt until the soft parts have been examined.

I have to say a few words on the gland which is seen in many species of the *Muricidæ*, and is conspicuous in the *Murex lapillus*, *Purpura* of authors, and which has been considered by naturalists to be the organ that produced the ancient far-famed Tyrian purple dye. The gland is of a white or green colour ; it lies between the mucous fillets and the ovarium on the right side of the animal ; it is of linear form, and though in some species it appears of a dark green colour, the juice or secretion, when extracted and exposed to the air and sun, assumes the purple hue. It is doubtful from what species this famous dye was obtained ; it can

scarcely have been from the *Murex lapillus*, the *Purpura* of authors, as Lamarck's commentators say that that species does not inhabit the Mediterranean—

. "Tyrioque ardebat Murice læna."
 "te bis Afro
 Murice tinctæ
 Vestiunt lanæ"
 "Vestes Gætulo murice tinctas."

From these quotations it appears that the costly purple dye was an African production, and not obtained from the European coasts of the Mediterranean. Horace mentions the *Murex* of the Italian shores—

"Murice Baiano melior Lucrina peloris."

This *Murex* of the Baiaæ may be our *M. erinaceus*, the *M. undatus*, *Buccinum undatum*, auctorum, or any other species; it is not spoken of in connection with a dye, but as an edible shell-fish, inferior to the *Peloris* of the Lucrine lake: what this may be is quite conjectural.

It must have been observed that the descriptions of the numerous Muricidal species are so similar as to give the idea of ringing the changes on the various organs, and it would appear that we have only exhibited the portraiture of a single similar animal inhabiting all the species that have been mentioned. If this view is acquiesced in, I shall have accomplished the object of my preliminary proposition, that the Linnæan genera *Murex* and *Buccinum* have been dismembered to an extent far beyond the requirements of the progress of science.

I conclude by observing that it may be objected, that I have dispensed with all considerations of the figure and markings of the shell as contributing to generic distinction. I admit this position, as I am of opinion that when the animals of a group are identical in essentials, the greater or less tumidity and the smooth or varicose aspect of the external hard parts are only specific indices arising from the various dispositions of the mucous glands of the mantle. I consider the causes I have mentioned of the different aspects of the shells inhabited by similar animals, in no other light than the different aspects of the organs of the human race, which arise from similar agents, as the ever-varying disposition of the superficial veins, of the pores, absorbents and other emunctories, combined with climate, food, and peculiar habits.

With regard to malacology, I am strongly supported in these opinions by having in my cabinet a large series of all the varieties of the *Murex undatus*, *Buccinum undatum*, auctorum, in which we see the smooth, thin, fragile, slender and fusiform varieties shadowing gradually to their various forms, from the thick,

heavy, strong, ridged, undated varicose typical *Murex undatus*. The series I speak of are the identical shells of Professor William King which have passed into my hands, and were the illustrations of his valuable malacological paper in the 18th volume, p. 248, of the 'Annals of Natural History,' the perusal of which I earnestly recommend to naturalists, as he has therein demonstrated that in this species the singular and great deviations of form, as the slenderness, tumidity, markings, &c., do not arise from generic distinction, but from the influences of climate, habitat, food, and bathymetrical considerations.

If these views are valid, they explode the long-held opinions that external form and markings ought to be regarded as unerring elements of *generic distinction*; and our observations appear sufficiently to prove that this doctrine has too long been insisted on, even in animals of essentially similar structure, both of the external soft parts and internal anatomy.

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

On a new species of Chemnitzia.

Bath, 17th January 1851.

POSTSCRIPT.—My friend Mr. Barlee, whose persevering labours in this branch of zoology have often been very favourably mentioned in our 'Annals,' presented me some time ago with a minute shell, which he considered an unpublished *Rissoa*, but on examination I found it had all the conchological characters of a *Chemnitzia*. Mr. Barlee obtained it in the Shetland Islands. That the honours due to him may not be taken up by some Bathyllus, I send the specific characters, and request the favour of their insertion in the 'Annals.'

Chemnitzia Barleei (n. s.).

C. testa gracili, alba, costis circa duodecim subrectis instructa; anfractibus quatuor rotundatis, quorum primus, in sequentem reflexus, alter, duabus, tertius, et ultimus, striis tribus spiraliter cincti. Apertura subovalis, haud continua, labium columnare plica obsoleta, vel penitus abdita, latus externum, sine callo. Sutura linearis, distincta. Umbilicus vix notatus. Axis $\frac{1}{12}$, diameter $\frac{1}{30}$ unciae.

Hab. ad insulas Zetlandicas.

These characters indicate, as far as conchological ones can, that the animal when observed will prove a *Chemnitzia*. The outer lip is without the callus of most of the *Rissoæ*; the apex is undoubtedly reflexed, a character which is generally the concomitant of

the *Chemnitzia*. I believe no example of a *Rissoa* with a similar apical structure is known; we may say that there is not a single essential character of the *Rissoa* in this species. It is a congener of *Chemnitzia excavata*; at one time I thought it a variety of that species, but the different disposition of the spiral striæ, the more oblique ribs and hollowed-out volutions in the *C. excavata*, point out that the *C. Barleei* is probably distinct, though most closely allied to it. The apex of *C. excavata* is precisely reflexed as in this species: this character with me, as regards the *Chemnitzia*, is of great value; the exceptions to it are few; in that tribe the decided reflexed apex, or the sunken subreflexed one, I never found absent, or present in a true *Rissoa*. But the examples must be fresh and perfect—not the usual cabinet ones ground to button-like apices by attrition; but even in these the practised eye will detect the true character. The fold on the pillar-lip of the *C. excavata* is sometimes present, and at others absent. I believe this remark holds good in this species, but in my specimens from Mr. Barlee it is distinctly visible, though very small, and far retired within the aperture.—W. C.

XIII.—*Descriptions of some new genera and species of Spatangidæ in the British Museum.* By J. E. GRAY, Esq., F.R.S., P.B.S. &c.

THE following genera and species do not appear to be included in M. Agassiz and Desor's 'Catalogue Raisonné.' They will be figured in the Catalogue of the *Echinidæ* in the British Museum:—

Spatangus Reginae. Purple? subcordate; back convex, larger dorsal tubercles few and far apart, scattered, ambulacral petals broad.

Hab. Malta.

This species is very like *S. purpureus*, but the back is higher, more convex, and there are not half the number of dorsal tubercles found in that species. It was collected by Miss Emilie Attersoll, who formed part of the suite of H.M. Queen Adelaide during her visit to Malta.

Eupatagus similis. Ovate, depressed, with only two or three rather larger tubercles near the peripetalous fasciole.

Hab. Australia, Flinders' Island.

This species differs from *E. Valenciennesii* of Agassiz, t. 15. f. 3, in not having nearly so many tubercles on the back. Several specimens of it were sent to the Museum by Joseph Millington, Esq.

Lovenia elongata. *Spatangus elongatus*, Gray, in Eyre's Discov. Central Australia, i. 436. t. 6. f. 2. Ovate, rather elongate, depressed; back with many sunken tubercles on the sides.

Hab. Port Essington, Mr. Jukes.

Lovenia subcarinata. Shell elongate, narrow, the lower anterior edge keeled, the lower part of the upper side with six or eight large tubercles placed in two series on each side at the end of the anterior lateral ambulacra.

Hab. Philippines, Isle of Luzon, H. Cuming, Esq.

ECHINOCARDIUM. This genus may be divided into the following sections:

* *Anterior odd ambulacral groove deep, hinder end perpendicular, lower part blunt.*

Echinocardium cordatum, &c. To this section also belong—

Echinocardium australe. Very like *E. cordatum*, but the hinder end is erect and the lower edge rather acute.

Hab. Australia, Port Jackson, J. B. Jukes, Esq.; Van Diemen's Land, Ronald Gunn, Esq., and Dr. A. Sinclair.

Echinocardium zealandicum. Very like the former, but plastron lanceolate elongate, and the body more ovate and elongate.

Hab. New Zealand, Dr. Andrew Sinclair: several specimens.

** *Anterior odd ambulacral groove shallow, lower part of hinder end produced, acute.* *E. gibbosum*.

Breynia Australasiæ. *Spatangus Australasiæ*, Leach, Zool. Misc. ii. t. 82. 1825. *S. Crux Andreae*, Lamk. Hist.; Agassiz, Ann. Sci. Nat. vi. t. 16. f. 14. Large tubercles on sides of lateral ambulacra few, internal fasciole short, broad.

Hab. Port Jackson.

Dr. Leach's specimen exactly agrees with M. Agassiz's figure.

Breynia Desorii. Sunken tubercles on the lateral and posterior interambulacral area numerous (about thirty), the internal fasciole elongate, narrow.

Hab. Swan River.

Several specimens, all differing in the above characters from the former.

MEOMA. Shell subcordate, vertex subcentral; ambulacra sunken, lateral pairs equal, odd anterior one entirely obliterated, marked by a shallow groove, surrounded by a very sinuous peripetalous fasciole, without any lateral fasciole; subanal fasciole incomplete, edging the under side of the indistinct subanal disk, and only extending up to the level of the lower edge of the vent and with the subanal pores in the fasciole.

This genus differs from *Brissus* in the incompleteness of the subanal fasciole, the indistinctness of the subanal disk, and in the entire absence of the anterior ambulacral pores. It differs from *Faorina* in wanting the lateral fasciole. Dorsal tubercles small, equal.

Meoma grandis. Subcordate, rather convex.

Hab. Australia, Capt. Sir Edward Belcher, K.C.B., R.N.

FAORINA. Shell ovate, subcordate, ventricose; vertex central, hinder end truncated, without any distinct subanal disk; ambulacra sunken, the lateral ones regularly diverging, anterior longest, anterior odd one obliterated, marked by a deep groove, all surrounded by a rather sinuous peripetalous fasciole without any lateral or subanal fasciole or anal plate; ovarial pores two, three or four.

Faorina chinensis. Purple, with a smooth band between the upper anterior tesseræ, and a smooth vertical band over the suture from the end of the anterior lateral ambulacra to the front of the mouth.

Hab. China, J. R. Reeve, Esq.

Faorina antarctica. Subcordate, rather depressed; lateral ambulacra ovate, longitudinal, very deep, forming a very distinct rib on the inner side of the shell; peripetalous fasciole broad, sinuous.

Hab. South Polar Seas, Capt. Sir James Ross's expedition.

This species differs from *Faorina cavernosa* (Erichson, Arch. 1845, t. 11. f. 2) in the ambulacra being less broad, and in the fasciole being much broader and more distinct.

Tripylus Philippii. Cordate, rather depressed; lateral ambulacra oblong, linear, the hinder pair not half the length of the anterior one, the sides of the hinder part of the peripetalous fasciole parallel.

Hab. ———.

The genus *Tripylus* of Philippi differs from *Desoria* and *Schizaster* in the regular cordate form and central vertex, and differs from *Brissiopsis*, with which M. Agassiz confounded it, in the absence of the subanal fasciole.

DESORIA. Shell ovate, convex, vertex subanterior; ambulacra narrow, sunken, like *Brissus*, the anterior odd one formed of a series of small double pores, all surrounded by a very sinuous peripetalous fasciole giving off a lateral fasciole, which extends to the vent without any distinct subanal fasciole or subanal disk.

Very like *Brissus*, but distinguished by the presence of the lateral fasciole and the absence of the subanal one and disk.

cf. Agassiz
Rev. Echini
p. 359.

Desoria Australis. Ovate, purplish white.

Var. 1. Brown, each of the tesseræ with a broad pale edge.

Hab. Australia, Flinders' Island, Joseph Millingen, Esq.
Several specimens.

Schizaster ventricosus. Very like *S. canaliferus*, but the hinder part of the body is very high, the hinder end nearly vertical, ventricose, and regularly rounded above the vent, the hinder part of the peripetalous fasciole straight between the two lateral ambulacra.

Hab. Australia ??

Schizaster Jukesii. Like former, but vertex nearly central; crown strongly keeled between the two hinder ambulacra; the part of the peripetalous fasciole between the anterior and posterior ambulacra regularly bent up nearly to the vertex, the hinder end vertical, regularly rounded above the vent.

Hab. North Australia, J. B. Jukes, Esq.

KLEINIA. Shell ovate, elongate, ventricose, subcordate, vertex subcentral; centre of back with rather larger perforated tubercles; lateral ambulacra sunken, ovate, linear, confluent near the vertex, where the inner series of twin pores are nearly obliterated, the anterior pair diverging, the hinder pair nearly parallel, diverging at the end, the anterior odd one in a rather deep groove with only rudimentary pores; all surrounded by a broad, rather sinuous peripetalous fasciole; subanal fasciole surrounding the oblong subanal plate, which is covered with radiating series of tubercles, and transversely divided in half by a subcentral fasciole; ovarial pores four, hinder largest; mouth anterior, vent in the upper part of the high hinder extremity covered with small irregular plates; spines of the crown elongate subulate, of the plastron and subanal plate longer, stronger, rather dilated at the end.

This genus differs from *Brissus* in the peculiar form of the ambulacra, and in the larger size of the dorsal spines and tubercles, and from *Plagionotus* in the form of the subanal plate and ambulacra.

Kleinia Luzonica. Shell ovate, ventricose; ambulacra confluent near the vertex, inner series of pores nearly obliterated; lateral ambulacra ovate, petaloid, the hinder pair shorter, nearly parallel, anterior pair divergent; vent in the upper part of the high hinder extremity.

Hab. Philippines, Isle of Luzon.

Agassizia subrotunda. Ovate, subglobose, regular, even, without any tubercles on the side or round the vent, the odd anterior groove with two lines of minute tubercles.

Hab. Australia, Capt. Sir Edward Belcher.

LESKIA. Shell ovate, subglobose, thin, vertex central; lateral ambulacra broad, petaloid, rather sunken and separate from each other, the hinder lateral pair rather the shortest, the odd anterior ambulacra in a rather broad sunken groove, rudimentary, with only a single series of pores on each side; all surrounded by a broad rather sinuous peripetalous fasciole; lateral and subanal fasciole none; mouth anterior, round, on a level with the rounded under surface, and covered with five triangular converging valves; plastron and subanal plate not distinctly defined; anus round, in the upper part of the rounded posterior end, and covered with five triangular converging valves forming a cone, with some small spicula in the centre; ovarian pores two, very large; spines and tubercles subequal, subulate, those of the back being rather the largest.

This genus agrees with *Brissus* in the form of the peripetalous fasciole, but differs from it and all the other *Spatangida* in the form of the mouth and vent.

1. *Leskia mirabilis*. Shell ovate, subglobose.

Hab. Isle of Luzon.

BIBLIOGRAPHICAL NOTICES.

The Dynamical Theory of the Earth. By ARCHIBALD TUCKER RITCHIE. Longmans, London, 1850. Vol. i. pp. 562; vol. ii. pp. 664.

COSMOGONIES seem to have shared the fate of the philosopher's stone, the perpetual motion, and such other dreams. Given up by the true philosopher, such projects have become at once the glory and the stumbling-block of those who with much learning and little knowledge seek at the well of truth, diligently indeed, but who, like scientific Danaïdes, seem condemned to draw the living waters with a sieve.

The many-sided man of science, skilled at once in books and things, whose wide ken scans the whole field of human knowledge, modestly confesses a cosmology to be beyond his powers, and contents himself with a mere "Cosmos,"—a statement of what the world is, not how it came to be: and where Humboldt feared to tread, the author of the 'Vestiges of the Creation,' and Mr. Ritchie in the present work have rushed in.

We have mentioned these two works together, but we would not do the 'Vestiges' the wrong to say, that it is from any similarity between them: truth to say, their relation is one of antithesis, not of resemblance.

The style of the 'Vestiges' is always grammatical and eminently perspicuous, sometimes indeed rising to eloquence. The style of the 'Dynamical Theory' is frequently ungrammatical, rarely perspicuous, and often descends to twaddle.

In the 'Vestiges' the premises may be false, but the reasoning is clear and logical: in the 'Dynamical Theory' premises, reasoning and conclusions seem equally drawn from cloud-land.

In the 'Vestiges' the whole spirit of the work is religious and truth-seeking; in the 'Dynamical Theory' it is imbued with a suicidal theological prejudice.

The author of the 'Vestiges' trusts wholly in human reason, and sometimes in human unreason, to discover the origin of things.

Mr. Ritchie, on the other hand, would have us take our modern understanding of the first chapter of Genesis (more especially as set forth by the Very Rev. F. Scio de San Miguel) as the truth, the whole truth, and nothing but the truth (p. 6. vol. i.); and tells us with a degree of mediæval moral courage (worthy of a better cause), that where science and our interpretation of Scripture differ, the former must at once yield (p. 81. vol. i.).

But enough of such contrasts. It is more instructive to observe in how strange a manner the two works are related—related by antagonism indeed, but as opposite phases of the same character of mind and quality of mental accomplishment.

This character of mind is acuteness without depth: this quality of mental accomplishment is copious information as to results, without the required severe critical check, of a practical knowledge as to how these results are obtained. There is much reading and no research; and to grapple with the grand problem of science on such a basis as this, is as if a man should attempt to play the fiddle on the strength of having heard a great deal of music.

Our fathers sought knowledge painfully, and with prayer and fasting. They wrestled with nature for her secrets. We moderns, in these days of the "diffusion of useful knowledge," attend hour-long popular lectures, see charming experiments, inspect particoloured geological diagrams, and learn that the *Plesiosaurus dolichodeirus* might, had he been so inclined, have devoured the *Clupea sprattiformis*—and then, thanking God for these times of illumination, go home and *devise a cosmology*. Or perhaps, if some juster notion of the mode of discovering truth enter the luckless speculator's head, he goes a step further, lays violent hands upon scientific treatises of all sorts (as may be imagined, however, chiefly of the popular description), reads and makes extracts, and then builds up the infinite Universe as a child puts together its puzzle:—if the fragments fit, then plainly, the puzzle is rightly put together.

In more than one sense, Mr. Ritchie's book is a *Mosaic* of this description.

As for the 'Vestiges' it has been judged elsewhere; but who that has had his reason stolen away by that delightful scientific romance (and there be many who must plead guilty to such *lèse-majesté* against truth) will not confess that his ultimate verdict upon the book might be expressed in somewhat similar terms?

The 'Dynamical Theory' and the 'Vestiges' are as necessarily connected to one another as reaction to action—as the tyranny of des-

potism to the license of revolution. Let us hope, that now the cycle of superficiality is complete—that the disease has run its course, and that we are in a manner vaccinated for cosmogonies; and having once for all put in our most decided protest against both the spirit and the substance of the work under consideration, we proceed to perform our remaining duty to the reader, namely; to set before him without malice or extenuation, ‘The Dynamical Theory of the Formation of the Earth.’ And first let the author speak his own estimate of his work: “We finally believe that scientific research has attained a state of perfection sufficient to enable us, by judiciously blending its truths with those of revelation, to produce such a system of cosmogancy (cosmogony?) *as shall entirely satisfy the human mind, as shall meet all its requirements*, by convincing the understanding while it invigorates our faith in the word of God.” These are large promises. Let the reader judge by what follows whether they be fulfilled or not.

Mr. Ritchie’s theory is to the following effect:—

In the period indicated by the Mosaic expression, “In the beginning,” the earth moved in its orbit round the sun, but was without diurnal rotation, without atmosphere and without light; its surface was everywhere a plain, and deeply covered by the waters of an ocean composed of water containing “silex, alumina, lime, magnesia, barytes, strontites, zirconia, glucina, potash, soda, and ammonia—oxides of various metals, especially iron and manganese, carbonic and fluoric acids, hydrogen and oxygen, with muriatic, sulphuric, and most probably nitric acid” (p. 452. vol. i.) “in chemical combination.”

Notwithstanding all these ingredients, this ocean “possessed all the characters of fresh water as far as the nourishment of its vegetation was concerned;” and covering its bottom there was a luxuriant growth of those plants which now constitute the coal, and these, according to our author, were all acotyledonous.

There were no land animals, nor indeed any which breathed and had the faculty of locomotion in its proper sense (none “moving by aeriated blood” is our author’s favourite expression).

Now the plants continually decomposed carbonic acid, and set free oxygen into the water of the primæval ocean. The animals continually separated carbonate of lime from the same menstruum. As they died and putrefied, they gave forth ammonia. What became of the ammonia and oxygen is not stated; they must have existed in some marvellous chemical state not at present understood.

Will it be believed that the origin of all these extraordinary and baseless assumptions lies in the first chapter of Genesis? thus:—

“Darkness was upon the face of the deep.” “And the spirit of God moved upon the surface of the waters:” therefore the earth was dark and covered with water:

“And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.”

But as the firmament was not made till after the period called “In the beginning,” there could *then* have been no atmosphere:

“Let the earth bring forth” “the herb yielding seed,” &c. As herbs yielding seed were created on the third day, they did not exist before; therefore the plants of the primæval ocean were acotyledonous:

“Let the waters bring forth the moving creature that hath life” —dependent upon light and air, adds Mr. Ritchie somewhat gratuitously. But as this did not happen till the fifth day, those animals which existed in the “period of non-rotation” were independent of light and air.

If the astronomer, the chemist, the zoologist, the anatomist, the botanist, the geologist cry out that no man in his senses could make assertions so utterly at variance with all the fundamental truths of their respective sciences, we only beg to refer them to Mr. Ritchie’s book; and, by way of commentary, to—Mr. Tristram Shandy’s chapter on Hobby-horses.

But more surprising propositions are to come: darkness is not a mere subjective matter;—it is an entity (so that perhaps after all Peter Schlemihl really *did* sell his shadow), and is identical with attraction. Light on the other hand is expansion, and when it was first created was not “separated from the darkness,” but existed mixed up with it. There must have been a sort of general Oxford-gray tinge about the universe.

When the light was “divided from the darkness,” the ether, of which it is composed, made a general rush, and impinging on the earth at some oblique angle, set it twirling. Then came a general *bouleversement*; the waters of the primæval ocean rushed centrifugally to the equatorial regions, carrying with them the great fragments of rock which now exist in the boulder formation. The denser, deeper, strata of the earth broke centrifugally through the upper crust, and grinding and rubbing as they made their way, generated heat enough to produce all the present signs of igneous fusion. Mud and sand covered in the ocean plants, and prevented their being decomposed by the heat, and all the animal inhabitants of the globe were entombed in the debris. So arose at once the whole thickness of the different formations, and the varied surface of the earth as it now is.

At the same time the light, as principle of expansion, combined with the gases in the primæval ocean, and extricating them (how, is not explained) as nitrogen and oxygen, they formed our present atmosphere.

So that we owe this air we breathe to plants, which without the assistance of light evolved oxygen, and to the putrefactive decomposition of animals. Surely the reader has had enough of all this (as Mr. Dennis the critic, with more pith than politeness, used to call it) “clotted nonsense.” If he have not, we must refer him to the work itself, for reviewers after all are but men, and have only a limited faculty of endurance; and if he will not take our word for their existence, to the same source he must go for an inexhaustible supply of errors—errors in orthography, errors in grammar, errors in fact, with a whole army of sophisms of all sorts and sizes.

He will see at page 39, vol. i. seven authorities given for the fact, that a saline solution may be evaporated to dryness; and at page 11, vol. i., Blair's Chronological Tables quoted as "confirmation strong" of a statement made in the book of Genesis.

And, lastly, if he be still bent on reading the book, we will hint to him a method, by which he may read almost the whole, and yet derive much edification. Our secret is, to read only the extracts from other authors. Mr. Ritchie has copiously employed the scissors, and his work is the reverse of amber, being chiefly valuable for the fragments which it contains.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 22, 1850.—Matthew Truman, Esq., M.D., in the Chair.

The following papers were read:—

1. DESCRIPTION OF A NEW SPECIES OF CHRYSODOMUS,
FROM THE MOUTH OF THE MACKENZIE RIVER.
By J. E. GRAY, Esq., F.R.S. ETC.

Sir John Richardson, M.D., on his return from the Arctic searching expedition, kindly presented to the Museum a series of shells which he had collected between the mouth of the Mackenzie River and Cape Parry: several of them were broken by the extreme cold during the wintering of the expedition at Great Bear Lake.

The collections consisted of the new *Chrysodomus* here described, and the following species, which are exactly similar to the species brought home by Ross, Parry, and the other arctic voyagers from Baffin's Bay, and are interesting as showing that these species are found more than half-way towards the Northern Pacific Ocean; viz.

Saxicava arctica. Very like *S. rugosa*, but larger.

Hiatella arctica. Very large size, with the hinge-teeth almost entirely obliterated.

Mya truncata.

Glycimeris siliqua. All young.

Cardium Grœnlandicum. On the shores.

Crassina semisulcata, Leach, not Müller. In the mouth of the river: eaten by the birds.

Buccinum glaciale.

The egg of a large species of *Natica* was abundant on the sands, probably *N. ampullaria*, Lamk.?

CHRYSODOMUS HEROS.

Shell elongate; spire conical, longer than the mouth; whorls convex, two or three upper with a strong central keel, rest with irregularly placed distant rounder tubercles, the last rounded, not keeled; throat white.

Var. 1. Whorls as with a strong, central, continuous keel; the last slightly nodulose.

Egg-cases ovate-oblong, erect, on an expanded base, contracted beneath; surface deeply punctated, granular.

Inhab. Arctic Ocean.

This shell is very like *Chrysodomus despectus*, but differs from that species in the form and surface of the egg-cases, as well as by the greater convexity of the whorls, and the strength and angularity of the keel on the upper whorls.

Like the other species of the genus, the white, opaque, outer coat of the shell is very much inclined to separate from the inner or central coat, which presents, where the outer coat is removed, a smooth surface of yellowish or brown colour.

Dr. Richardson observed several specimens of this shell in the sand-hills which edge the coast, some distance from the sea.

I have named this species *Heros*, as being the finest of the genus, and in commemoration of the enterprise and heroic conduct under great hardship of its discoverer.

2. REMARKS ON THE MORPHOLOGY OF THE VERTEBRATE SKELETON. BY EDWARD FRY.

The objects of the present paper are,—1st, the brief statement of the probability that there are laws which govern animal form, in addition to the law of final causes; and 2nd, the *à priori* discussion of certain propositions about the vertebrate skeleton; being an attempt to illustrate the vertebrate by some invertebrate forms, and thus to show their unity of plan.

SECTION I.

The existence of laws governing animal form is rendered probable by the discovery of such laws as regards the forms of plants, all whose parts may be referred to a leaf as the fundamental archetype, as is shown not only by the correspondency in many normal conditions, but also by the transmutations of parts, and the monstrosities to which the petals, sepals, stamens, &c. are liable. Though the greater simplicity of plants, and the more numerous monstrosities to which they are liable by nature or art, render the existence of laws of the kind spoken of more readily apparent in them than in animals, the nature of the proofs and of the conclusions are alike in both cases.

It may, secondly, be remarked, by way of showing a general probability for such a scheme, that there exist unities of structure both in different animals and in different stages of development of the same animal, which are independent, so far as we know, of unity of end; or, in other words, that final causes do not explain all the affinities and resemblances which we are able to trace*.

And again, it must be observed, that those remarkable likenesses, which are observable in many or all animals, between their various forms and conditions up to maturity, on the one side, and the various

* This part of the subject has been fully illustrated by Prof. Owen in his various writings.

members of the animal kingdom up to their own position in the scale, on the other hand (so that, for instance, man passes through forms resembling, but not identical with, those of many animals from the lowest monad up to his own position in the scale), are inexplicable on the theory that the forms of animals are regulated by final causes only; but are in perfect accordance with that other which holds that there is expressed in the structure of animals some abstract idea, which running through all the frame, and modified to all purposes of need, and manifested in all variety of conditions, is yet one and the same.

It must be admitted that the force of these arguments may, to some extent, be barred by an assertion which it is difficult fully to answer, viz. that our ignorance of final causes is so great as to allow us no room to argue on the existence of other causes from their apparent inadequacy; nevertheless as the other supposition seems to have in it no improbability, but as I think the contrary, it may be admitted as at least what best suits our present knowledge.

The belief in the existence of other laws of organization besides that of final causes does in no wise lessen or obscure the argument of natural religion derived from it, which was advanced with great pertinency by the ancient Stoical philosophers, and has been amplified by Derham, Paley and others in our own country.

I now proceed to the second portion of my paper.

SECTION II.

There are reasons derived from the structure of animals below the Vertebrata which might induce us to expect that the vertebrate skeleton should be composed of elements of a common character.

1. So soon as the nervous system assumes the form of a line or chain down the body of the animal, the whole structure puts on a segmental or annular arrangement. Thus in the Annelida the body consists of numerous segments, similar one to the other, with the exception of the anterior one or head, which is sometimes slightly different in form, but in other instances only distinguishable by the presence of a mouth. Each segment has its proper nervous ganglion, connected by two fibrous commissures with those of the neighbouring division.

2. But these segments are subject to change. Thus the *Polydesmidae*, a family of the Myriapoda, exhibit the posterior part of the body composed of segments similar to those above described, whilst in the anterior part each segment is the result of the coalescence of two original ones. In the Chilipoda, the same process has gone on further; so that all the apparent segments are thus composed by the anchylosis of two original ones at an early period of growth, as proved by the two pair of legs which each one bears, and the double nervous ganglia which they contain, the nervous centres of the original elements having approximated to one another without coalescence (Newport on Myriapoda, Phil. Trans. 1843).

3. But not only does the progression from lower to higher forms in the scale of the animal kingdom teach us how segments of the

body originally similar may be changed—the progression of individuals does the same thing. The larval condition of insects undoubtedly corresponds very nearly with the Annelida; the arrangement of the body and the relation of each segment to the nervous system are similar. But the perfect state shows a very great modification in the form; many segments have disappeared by coalescence, whilst the equality of size originally existing between them has been lost by reason of the centralization of functions; the nervous centres have often been removed from their respective segments, yet the number remains the same; for although only nine centres appear in the abdomen (Blanchard sur les Coleoptères, Annales des Sciences Naturelles, 1846, part i.), yet the last has been shown in the Lepidoptera (Newport on *Sphinx*, Phil. Trans. 1832) to consist of two which have united.

4. The same segmental arrangement of the body, and the same ganglionic condition of the nervous centres in accordance with the rings of the body, obtain throughout many members of the class of the Articulata.

We now descend to two more particular propositions, resulting from and embraced in the foregoing, but which we nevertheless prefer to illustrate separately.

There are reasons to expect that the head of the Vertebrata should be composed of segments similar to those of the body.

1. We have already noticed the close resemblance between the anterior segment or head and the following ones in the *Polydesmida*.

2. In the larval insects the similarity is great; but in the perfect one a number of the other segments become anchylosed, and enter into the composition of the head, in accordance with the law, that the more perfect an animal is, the more complex and individualized are its parts, and consequently the more is its abstract nature hidden under its teleological manifestation. The divisions between the segments entering into the composition of the head sometimes remain permanently recognizable in the external skeleton. The number of these segments has been a much-vexed question among entomologists, the numbers advocated by different naturalists having been two, three, four, five and seven. I am inclined to believe the real number of these segments to be four:—1st, because of the very slight evidence for the presence of any other, the fifth segment being considered as entirely atrophied, and no corresponding manducatory organ appearing; 2nd, from four being the only number at all discoverable in some insects, as in the *Hydroüs piceus* (see Newport on Insecta in Todd's Cyclopædia); 3rd, because the brain (*i. e.* the coalesced ganglia of the cranial segments) of the *Necrophlagæophus longicornis* has been discovered by Newport, at the period of its bursting its shell, to consist of four double ganglia (Newport in Phil. Trans. 1843).

We next consider the reasons for supposing *that the organs composing the mouth of the Vertebrata should be the homologues of those of locomotion.* It must be remarked, that everything now to be said assists most strictly in support of the preceding proposition,

and would have been introduced under that head but for the sake of conveniency in illustrating the vertebrate skeleton.

1. In the Crustaceans the jaws differ in scarcely any other character than size from the true legs used in locomotion.

2. In the Myriapoda the members of the basilar segments of the head are jointed and retain the form of true legs, but are used for prehension (Newport in Todd's *Cyclopædia*).

3. In Insects the tarsal joints of the cranial legs are undeveloped; the femur and coxa are small or confluent with the under side of the segment, whilst the tibiæ are alone enormously enlarged, and thus become elements in the complex mouth of Insects; their muscles, however, being attached to the basilar and posterior lateral parts of the head, just as if they still subserved the purposes of locomotion (*idem*).

4. All the parts of the complex mouth of Insects are thus referable to the segments of the head. In the Great Water Beetle this is clearly shown; the manducatory organs visibly resemble the proper organs of locomotion, and are articulated to the distinct segments (*idem*).

5. We must remark intermediate normal conditions between the true locomotive and manducatory form of leg; as in the genus *Onitis*, where the prothoracic legs are without tarsi, and the tibiæ are terminated by sharp hooks; and in the *Bubos bison*, a species of a neighbouring genus, where the tibiæ strongly approach in form the proper mandibles of the head: also,

6. A monstrous condition in a specimen of *Geotrupes stercorarius*, where the prothoracic legs were arrested in development and the tarsi were absent, so that they very closely resembled the form of the mandibles (*idem*).

SECTION III.

The spinal cord of the Vertebrata is homologous with the ganglionic cord of the Articulata.

1. The elements of the systems are alike, being in both cases cellular nervous matter and commissural fibres.

2. The experiments and investigations of recent physiologists have proved the real independence of the segments of the cord contained in each vertebra, insomuch as each performs separately from the others its own reflex actions, just as is the case in the ganglionic cord of the Articulata; so that, as far as its reflex actions are concerned, the cellular or dynamic element of the spinal cord is not one organ or centre, but a series of independent organs or centres, as is seen in the Insects, the external longitudinal fibres serving only as commissural or communicating portions.

3. Those ganglia of the Insects which are perfectly separate in the larval condition often exhibit a tendency to fusion in the perfect condition (Blanchard *ut antea*). Thus in the Coleoptera the last abdominal ganglion is always formed by a fusion of several original ones; the first and second abdominal often form a single mass with the metathoracic, whilst in the Chafer this last is united with the mesothoracic (*idem*). In like manner the fourth and fifth segments in

the perfect insect are fused together. In the *Polydesmidæ*, the two first segments which bear legs unite their nervous centres with the first subœsophageal, so as to form a short cord similar to that of the Ostracion and some other fish (Newport on Myriapoda, Phil. Trans. 1843). In the Scorpion the fusion has gone so far as to form a sort of medulla oblongata, giving rise to eight pairs of nerves (*idem*). In *Nitidula ænea* all the abdominal ganglia have united to form a short cord (Blanchard *ut antea*, plates); and in *Calandra palmarum* the ganglia of the whole body have approximated so as to form a continuous moniliform cord (so far ganglionic in appearance as that the distinction between the segments has not been obliterated), which is placed in the anterior portion of the body (*idem*, plates).

4. The ganglionic cord of Insects undergoes the same alteration at its posterior extremity that the spinal cord of the Vertebrata does by its withdrawal from the caudal vertebræ and the formation of a cauda equina, as may be clearly seen in Blanchard's plates (*ut antea*, *e. g.* in the *Nitidula ænea*, the *Calandra palmarum*, and the *Dyticus marginalis*).

5. In the Chilognatha, or higher order of the Myriapoda, the ganglia coalesce so as to form a uniform spinal cord, the commissural fibres no longer occupying intervening spaces as in the Chilipoda, but forming the external layer of the nervous cord (Newport on Myriapoda, Phil. Trans. 1843):

6. Whilst the true vertebrate fish *Orthogoriscus mola* exhibits exactly an opposite character in the ganglionic condition of its myelon (Owen's Lectures, ii. 173, on the authority of Arsaki).

SECTION IV.

A vertebra is the correlative in the osseous of a centre in the nervous system.

This appears to me to be the most general possible definition of a vertebra, and therefore the most philosophical. The general idea of the relation of the osseous and nervous centres involved in it, though not the relation of the segments of each one to the other, was thus expressed by Oken: "Bones are the earthy, hardened, nervous system; nerves are the spiritual, soft, osseous system—*Contentens et contentum*" (quoted by Owen, Rep. Brit. Assoc. p. 242).

1. The number of vertebræ constituting the spinal cord always corresponds with the number of segments in the cord as indicated by the number of pairs of nerves given off. When more than one pair perforate one piece of bone, it results from an ankylosis of several vertebræ, as in the sacrum; and the coccygeal vertebræ, which appear to be an exception to the definition, are not so in reality, the spinal cord passing into them in the foetal condition, and being gradually withdrawn just in the same manner as is the case in some of the Coleoptera. As is clearly seen in them, too, the cauda equina represents the nerves of the vertebræ from which the cord has been withdrawn. Some Vertebrata, as *e. g.* the Python, retain the original relation of the vertebræ and centres throughout the whole of the spinal cord (Owen, Report *ut antea*, 221).

2. The same dependence of the vertebræ on the nervous centres is shown by the fact, that the tail which is reproduced by Lizards, in the case of the loss of that member, is a single bone, because although bone may be reproduced, the spinal cord cannot be (Owen *ut antea*, 254).

3. In accordance with this definition may also be cited the very long vertebra which is formed on that part of the spinal cord of the Anourous Batrachians which does not give off nerves, and which is not the result of ankylosis of several elements, but arises from one point of ossification (Martin St. Ange, *Recherches anatomiques et physiologiques sur les Organes transitoires et la Métamorphose des Batraciens*, Ann. des Sci. Nat. No. xviii. p. 401); and also the invariableness of the number of the vertebræ in the Mammalian's neck, resulting from the presence of the same number of nerves, and irrespective of the length of the vertebræ.

SECTION V.

A segment is the representative in the Articulata of a vertebra in the Vertebrata.

This view has been advocated by Geoffroy St. Hilaire, both in his "Mémoire sur la Vertèbre," in the ninth volume of the 'Mémoires du Muséum d'Histoire Naturelle,' and previously in a memoir read by him before the Academy in 1820. Nevertheless, the argument on which I would mainly rest it, is not yet universally admitted, for we find M. Emile Blanchard very recently asserting that nothing really indicates the analogy between the spinal cord of the Vertebrata and the ganglia of the Articulata.

1. We have seen what a close relation of correspondence exists in the Articulata between the segments and the ganglionic nervous centres; and we have endeavoured to prove that in the Vertebrata a vertebra is the correlative of one of the spinal nervous centres; and also that the spinal cord of the one class is the representative of the ganglionic cord of the other; whence it appears, that a segment of the Articulata and a vertebra of the Vertebrata must be homologous.

2. The ossification of the centrum of a true vertebra is first peripheral, and subsequently fills up the interior with osseous matter (Owen *ut antea*, 256). Thus if we suppose a vertebra stopped in the first stage, and forming the external instead of the internal support of the body, we have a segment of an articulate creature, with only a histological difference, which must by no means be allowed to conceal from us the true nature of a part (Geoffroy St. Hilaire, *Sur la Vertèbre, ut antea*, p. 92).

3. If to this view it should be objected, that the including in the one case what is excluded in the other dispels all semblance of homology, it must be answered—

α. That notwithstanding this difficulty, the general homology of the vertebrate and articulate skeletons as wholes has long been admitted, though this more particular one of their parts has not been.

β. That the hæmal arch of the Vertebrata, whose normal office it is to enclose the main blood-vessels of the body, and which office it

exclusively performs in many cases, is yet in others so developed as to enclose a mass of viscera, viz. in the thorax.

γ. In the Testudina we have an example of those vertebral elements which are usually internal, becoming external, and including not only all the viscera, but having the whole muscular system attached internally, as in the Articulata, and even the limbs arising from the inside instead of the outside of the thorax.

4. It presents no difficulty that the segments of the Articulata have no superior or inferior arches like vertebræ, because both the spinal cord and circulatory organs which those arches are respectively designed to protect are included within the body (St. Hilaire).

5. To the order of development of a vertebra in the lateral processes for locomotion being produced subsequently to the body, we have an analogous case in that the Myriapoda are at birth and for some time afterwards apodal, and subsequently acquire their numerous legs (Newport on Myriapoda, Phil. Trans. 1841). This is also the case with some other articulate animals.

SECTION VI.

The brain of the Vertebrata is a modification of a series of four ganglia homologous with those of the spinal cord.

1. In the *Amphioxus* that part of the cord which must be regarded as the homologue of the brain, because it gives off five pair of cephalic nerves, is only distinguished from the other part of the cord by its pointed anterior extremity, its posterior part being entirely like the other ganglia; even its greatest vertical diameter is not greater (De Quatrefages on *Amphioxus*, Annales des Scien. Nat., third series, vol. iv.).

2. We have already noticed that the two large cephalic ganglia of the Centipede are the result of the coalescence of a series of four ganglia, as they appear in the foetal condition, each of these nervous centres supplying nerves to the senses. Closely corresponding with this arrangement is that displayed by many of the fish, as *e. g.* the Eel, where the brain is only a series of four closely arranged ganglia. And this same original scheme seems to me traceable throughout all the Vertebrata to man himself. There are, however, as the great centralization and individuality of the organ would lead us to expect, many variations and modifications, which tend at first sight to conceal its real nature, as *e. g.* the removal of the olfactory ganglia to a great distance from the other elements of the brain, with which they only maintain their connexion by means of filiform crura, as in the Whiting and many fish; the amplification of the segments of the encephalon by the addition of supplementary ganglia, as the hypophysis, &c. as they occur in many fish, and some of which are retained in the higher orders, or the cerebrum in the cartilaginous fishes, and in all animals upwards to man, and which comparative anatomy teaches us is only to be considered as a special appendage to or development of the prosencephalic ganglia; or the extreme development of one pair of ganglia so as to obscure the others,

as the cerebellum in the Sharks, Sawfish, &c. (Owen's Lectures, ii. 175); or the very diminutive size of a segment, as the cerebellum in many reptiles; or the coalescence of the pair, and consequent obliteration of the mesial division, just as is equally the case between the two halves of the spinal cord, as in the cerebellum.

3. Embryonic anatomy, too, comes in to strengthen the conclusion of comparative anatomy, that a series of four ganglia is the essential element of the brain, and that all the other parts of which it consists in adult life of the higher Vertebrata, including of course the cerebrum, are superadded.

The argument of the preceding sections, exclusive of Section I., and the conclusion to which it is intended to lead, may thus be stated:—

Considering that the head of the Insecta, Myriapoda, &c. is composed of a series of segments serially homologous with those of the body, as its brain is of ganglia serially homologous with those of the cord; that a vertebra is the general homologue of a segment as the spinal cord is of the ganglionic cord; and that the brain of the Vertebrata consists of a series of four segments; there appears a strong probability that its head in like manner shall consist of a series of four vertebræ.

3. MONOGRAPH OF THE SPECIES OF MYOCHAMA, INCLUDING THE DESCRIPTIONS OF TWO NEW SPECIES FROM THE COLLECTION OF H. CUMING, ESQ. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

MYOCHAMA, Stutchbury.

Testa inæquivalvis, adhærens; valva affixa dentibus duobus marginalibus, divaricatis, ad umbonem disjunctis, foveolâ trigonâ intermedîâ alteram testaceâ appendicis extremitatem, cartilagine corneâ connexam, excipiente; valva libera dentibus duobus inæqualibus, parvis, divaricatis, alterâ appendicis extremitate foveolæ intermedîæ insertâ; umbones valvæ liberæ internè, alterius externè, recurvi; impressiones musculares duæ orbiculares, distantes, laterales; impressio muscularis pallii sinu brevî lato, ligamentum tenue externum.

MYOCHAMA ANOMIOIDES, Stutchbury. *M. testâ rosed, tenui, fragili, costis prominentibus radiantibus dichotomis; valvâ liberâ valdè convexâ; umbone extra apicem valvæ alterius pro ducto; epidermidè tenui pellucidâ.*

Long. $\frac{11}{12}$; lat. $\frac{5}{12}$; alt. $\frac{9}{12}$.

Hab.

This species is always regularly radiately ribbed, but when found attached to smooth shells the ribs are smooth, but if fixed to *Trigonia pectinata* they are crossed by tubercles.

MYOCHAMA TRANSVERSA, A. Adams. *M. testâ inæquilaterali transversâ fuscâ, subquadratâ, anticè longiore posticè breviorè subtruncatâ, radiatim costatâ, costis subnodosis interdum di-*

chotomis, concentricè minutissimè striatâ, valvâ liberâ subconvexâ, umbone extra apicem valvæ alterius producto.

Hab. Cape Upstart, 8 fathoms; *Mr. Jukes.* (Mus. Cuming.)

MYOCHAMA STRANGEI, A. Adams. *M. testâ luteâ, tenui, fragili, corrugatâ, costis nodosis, non distinctis, concentricè striatâ, lineis radiantibus asperis ad marginem ventralem distinctioribus; valvâ liberâ depressâ umbone plano cinerascente non extra apicem valvæ alterius producto.*

Hab. Port Jackson; *Mr. Strange.* (Mus. Cuming.)

4. DESCRIPTION OF NEW SPECIES OF THE GENUS CUMINGIA,
WITH SOME ADDITIONAL GENERIC CHARACTERS.

BY ARTHUR ADAMS, R.N., F.L.S. ETC.

CUMINGIA, G. B. Sowerby.

Testa bivalvis, inæquilateralis, æquivalvis, latere antico rotundato, postico hiantè subacuminato; dentibus, cardinali, in utraqûe valvâ unico, parvo antico, lateralibus in alterâ valvâ ad utrumque latus uno, valido, in alterâ nullo; ligamento interno foveolæ subcochleariformi affixo; impressionibus muscularibus duabus lateralibus distantibus, anticè irregulari oblongâ, posticè subrotundatâ; impressione musculari pallii sinu maximo.

All the species of this genus gape more or less posteriorly, are more or less lamellose, and the cavity for the cartilage is spoon-shaped and projects into the cavity of the valves, differing in this respect from *Amphidesma* or *Semele*.

CUMINGIA SIMILIS, A. Adams. *C. testâ subtrigonalio-ovatâ decussatè striatâ, lineis transversis concentricis, lamellâ unicâ prope marginem ventralem anticè latiore rotundato supra angulato posticè angustiore subrostratâ, arâ posticâ clausâ, lunulâ lanceolato-ovatâ, margine ventrali posticè coarctatâ.*

Hab. N.W. coast of America. (Mus. Cuming.)

CUMINGIA CLERII, A. Adams. *C. testâ ovatâ compressâ subæquilaterali, albâ, opacâ, sublævi, nitidâ, striis transversis concentricis alveolisque irregularibus, latere antico angustiore rotundato, postico latiore, margine ventrali integro arcuato.*

Hab. Found at Talcuhan, Chili, by Capt. Clery, French Marine, attached to fuci in shallow water. (Mus. Cum.)

CUMINGIA ANTILLARUM, A. Adams. *C. testâ ovato-trigonalî, concentricè lamellosâ; lamellis subdistantibus, interstitiis valdè longitudinaliter striatis, latere antico breviorè latiore rotundato, postico longiorè, angustiorè subrostrato, valde hiantè, margine ventrali posticè subsinuato.*

Hab. West Indies. (Mus. Cuming.)

CUMINGIA FRAGILIS, A. Adams. *C. testâ transversâ ovali albâ fragili subpellucidâ concentricè lamellosâ; lamellis elevatiusculis, subdistantibus, interstitiis tenuissimè longitudinaliter striatis, latere antico latiorè margine sinuato, postico angustiorè rotundato subflexuoso, margine ventrali integro arcuato.*

Hab. Guadaloupe; Governor Admiral Tourbeyre. (Mus. Cuming.)

CUMINGIA STRIATA, A. Adams. *C. testâ ovato-trigonalî sub-ventricosâ albâ tenui fragili; striis transversis concentricis elevatis confertis, interstitiis longitudinaliter striatis, latere antico latiore rotundato, postico subacuminato, margine ventrali posticè coarctato.*

Hab. Conception; seven fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CUMINGIA SINUOSA, A. Adams. *C. testâ subtrigonalî albâ semipellucidâ subæquilaterali concentricè lamellosâ, insterstitiis longitudinaliter substriatis, latere antico sublatiore rotundato, postico angustiore, margine ventrali posticè valdè sinuato.*

Hab. West Indies. (Mus. Cuming.)

February 12.—William Yarrell, Esq., Vice-President, in the Chair.

The following papers were read:—

1. ON THE TRICHOGLOSSINE GENUS OF PARROTS, *Eos*, WITH THE DESCRIPTION OF TWO NEW SPECIES. BY CHARLES LUCIAN, PRINCE BONAPARTE, MEMBER OF THE PRINCIPAL ACADEMIES OF EUROPE AND AMERICA.

The genus *Eos* is, like *Eclectus*, a new instance of the impropriety of that *middling course* (as disgusting in science as it is in politics), of uniting together by two and two, four and four, &c., small groups (or *States*), which, natural by themselves, have no stronger relation to each other than to any other member of their family. Take for example (comparing them to Naples and Sicily!) *Spiza* and *Paroaria*, Bon., united by G. R. Gray under his *Spiza*! amongst the *Fringillidæ*, and amongst the Parrots *Psittacodis** and *Eclectus* confounded together by the same process!

The genus *Eos* is intermediate between the two subfamilies *Trichoglossinæ* and *Loriinæ*. Although it may astonish some naturalists that I do not consider it as one of the latter, still, on account of its tail, its anatomy and its habits, I keep it within the boundaries of the former, in close relation with my new genus *Chalcopsitta* †,

* Since I speak of *Psittacodis* (the only green Genus of Lorine Parrots, which forms the same beautiful passage from *Loriinæ* to *Psittacinæ* that *Eos* does from *Trichoglossinæ* to *Loriinæ*), let me submit to the Society the phrases of two new species that make the whole number hitherto known five: they come as near *Psittacodis magnus* or *sinensis* (with which I for that reason compare them) as the three *Eclecti* do to each other:—

1. PSITTACUS MAGNUS et SINENSIS, Gm. (*viridis*, Lath.; *lateralis*, Shaw; *Mascarinus prasinus*, Less.; *Psittacodis magnus*, Wagl.; *Eclectus! polychloros! Gr. ex Scopoli*) Pl. Enl. 514; Edw. B. t. 231; Lev. Perr. t. 132.

Major: ilis rubris: margine alarum cyaneo: cauda apice subconcolori.

2. PSITTACODIS INTERMEDIUS, Bp. Mus. Lugd.

Minor: ilis rubris: margine alarum rubro: cauda apice subconcolori.

3. PSITTACODIS WESTERMANNI, Bp. Zool. Soc. Amst.

Minor: ilis concoloribus: margine alarum cæruleo: cauda apice subconcolori.

Dedicated to the able and modest Director of the Zoological Society of Amsterdam, where this new Parrot is living.

† This new genus of mine, though composed of decided *Trichoglossine Parrots*,

which connects it with *Trichoglossus*, the type and centre of the subfamily; as on the other side *Lathamus* and *Charmosina* connect the same *Trichoglossus* through *Coriphilus* (and especially by means of *Lathamus*) with the subfamily *Platycercinæ*.

It may be characterized by its elegant form, small stature, compact, red plumage with more or less blue; compressed, moderate, red bill, with the cere apparent (not concealed as in *Eclectus*); short feet, with robust toes and powerful, arched, very acute nails; and longish, not very broad, wedged tail.

It is composed, to my knowledge, of only seven species;—five already described (and some of them too many times) in the systems, and two new ones, which form the subject of the present paper. And when I say that only five are the hitherto known species of *Eos*, it is because I do not count *Eos variegata* and *Eos Isidorii* of Wagler, since, the first is evidently nothing but a *variegated* or *pied bird*, and the other, named, described and figured by Swainson, appears identical with *Eos riciniata*, for which the false name of *cochinchiensis* cannot be retained. Of the other three (out of the ten admitted by our friend G. R. Gray, in his 'Genera of Birds'), *E. scintillata* is a *Chalcopsitta*, and *E. cervicalis* and *ornata* are *Trichoglossi*!

1. EOS CYANOGENIA, Bp.

E. rubra; maculâ magnâ periophthalmicâ cyanâ: humeris ex toto, remigibus elongatis rectricibusque magnâ ex parte nigris.

Long. 9 poll.; alæ, 6 $\frac{1}{4}$ poll.; caudæ, 4 poll.

Close to *Eos indica* or *coccinea*, but having no blue on the head, back or breast; and instead, a large blue patch, including the eye and covering the cheek, which *Eos indica* has red; the black also is more predominant on the wings, and the red tinge duller.

I found the specimen upon which I did not hesitate to establish my species among the endless treasures of the Leyden Museum.

2. EOS SEMILARVATA, Bp.

E. coccinea; vittâ a gulâ ultrâ oculos, maculâ utrinque scapulari, crissoque, cyaneis: remigibus brevibus rectricibusque apice tantum nigris.

Long. 9 poll.; alæ, 5 $\frac{3}{4}$ poll.; cauda, 4 poll.

Resembling *Eos rubra*, but much smaller and *half-masked*!

shows a strong affinity, not only to the *Lorine* but also to the *Platycercine*. It is composed in fact of

1. PLATYCERCUS ATER, Gr. (*Psittacus novæ guineæ*, Gm.; *Ch. novæ guineæ*, Bp.); and of

2. EOS SCINTILLATA, Gr. (*Psittacus scintillatus*, Temm.; *Ch. scintillans*, Bp.); to which I have added a third new species, also from the Moluccas:—

3. CHALCOPSITTA RUBIGINOSA, Bp. Mus. Lugd. ex Ins. Barabay et Guebe.

E. purpureo-badia, capite obscuriore; subtus fasciolata, plumis singulis lunulâ medianâ et apicali nigricante: remigibus rectricibusque virescentibus caudâ; apicem versus gradatim lutescente.

Rostrum rubrum: pedes nigri: irides albæ. Magnitud. Turdi.

I picked up this beautiful species in the rising Museum annexed to the Zoological Gardens of Amsterdam; and as soon as he became aware of the value of his bird, Mr. Westermann, as a compliment to Dr. Schlegel and myself, with a liberality of which few men even of science are capable, made a present of it to the Leyden Museum; where, duly greeted by Mr. Temminck, the typical specimen is safely deposited.

To complete the monography of the genus, I add the comparative phrases of the five other species, all of which have several beautiful representatives in the Leyden Museum.

1. EOS INDICA, Wagl.

E. coccinea; fasciâ verticis latissimâ, cervice, dorso, pectore, tibisque, cyaneis: tectricibus alarum internis et remigibus apice nigris.

Synonyms.

Psittacus indicus, Gm.

Psittacus variegatus, Gm., *Lath. ex Buff. Pl. Enl.* 143.

Psittacus coccineus, *Lath.*

Eos indica, Gr.

Eos variegata, Gr.

Perruche des Indes orientales, *Buff. Pl. Enl.* 143, accidental var.!

Le Lori-Perruche violet et rouge, *Levaill. Perr.* t. 53.

Hab. In Insulis Moluccis.

2. EOS RUBRA, Wagl.

E. rubra; crisso, scapularibusque cyaneis; tectricum majorum margine apicali, remigibusque primariis externè nigris.

Synonyms.

Psittacus ruber, Gm.

Psittacus borneus? Gm., *Lath. jun.*

Psittacus cæruleatus, *Shaw.*

Psittacus cyanonotus, *Vieill.*

Eos rubra, Gr.

Lory de la Chine, *Buff. Pl. Enl.* 519.

Le Perroquet Lori à franges bleues, *Levaill. Perr.* t. 93.

La Perruche écarlate, *Lev. Perr.* t. 44.

Hab. In Insulis Moluccis; Amboina.

3. EOS GUEBIENSIS, Wagl.

E. coccinea, sæpius tamquam squamata; plumis pilei, colli, pectoris et laterum margine nigro-virescentibus: alarum fasciâ duplici remigibusque apice nigris.

Synonyms.

Psittacus guebiensis, *Auct.*

Psittacus squameus, *Shaw.*

Eos squamata, Gr. ex *Scopoli.*

Lory de Gueby, *Buff. Pl. Enl.* 684.

Le Lori écaillé, *Levaill. Perr.* t. 51.

Hab. In Insulis Gueby, Buron et Ceram.

4. EOS RICINIATA, Bp.

E. rubra; vertice, collo et maculâ abdominali magnâ, cyaneis : tetricibus alarum remigibusque ad apicem latè nigris.

Synonyms.

Psittacus cochinchinensis, Lath.

Psittacus riciniatus, Bechst.

Psittacus cucullatus, Shaw.

Lorius Isidorii, Sw. *Zool. Ill. n. s. t.*

Lorius riciniatus, Müll.

Eos cochinchinensis, Wagl., Gr.

Perruche à chaperon bleu, *Levaill. Perr. t. 54.*

Hab. In Insulis Moluccis. Gilolo et Ternate, *Forsten, Müller*; nec in Cochinchina!

5. EOS CYANOSTRIATA, Gr.

E. rubra, alis caudâque, nigro variis; maculâ postoculari nigro-cæruleâ: dorso striis cæruleis.

Synonyms.

Lorius borneus! *Less. Traité d'Orn. p. 192, nec Lath.*

Eos cyanostriata, *Gray and Mitchell, Gen. of Birds, t. 103.*

Hab. In Insulis Moluccis, minimè in Borneo!

BOTANICAL SOCIETY OF EDINBURGH.

Dec. 12, 1850.—Professor Fleming, President, in the Chair.

The following were appointed office-bearers for the year:—

President.—Professor Balfour.

Vice-Presidents.—Dr. Seller; Professor Fleming; Dr. Parnell; Dr. Cleghorn.

Secretary.—Dr. Greville.

Treasurer.—Mr. Evans.

Curator of Museum.—Mr. J. T. Syme.

Assistant Secretary and Curator.—Mr. G. Lawson.

A letter from the Rev. W. A. Leighton was read, requesting specimens of Lichens belonging to the genera *Endocarpon*, *Verrucaria*, *Sagedia*, *Collema*, *Opegrapha*, and *Calicium*, in order to aid him in a work on the Angiocarpous Lichens of Great Britain. Any member who could aid him with specimens was requested to communicate through Dr. Balfour, or direct to him at Shrewsbury.

The following communications were made:—

1. Dr. Balfour, "An Account of a Botanical excursion to Ben Chonzie and other mountains near Crieff, in October 1850." He remarked that the mountains had been neglected by botanists, but were very productive. Among the plants gathered were:—*Saxifraga oppositifolia*, *stellaris* and *nivalis*, *Potentilla alpestris*, *Sibbaldia procumbens*, *Gnaphalium supinum*, *Polystichum Lonchitis*, *Woodsia ilvensis*, *Asplenium viride*, *Poa Balfourii*, *Silene acaulis*,

Thalictrum alpinum, *Draba incana*, *Carex capillaris*, *Hieracium alpinum*, *Lastrea Filix-mas* var. *erosa*, and *L. dilatata* var. *montana*. At the upper part of Glen Turrit, Dr. Balfour remarked the occurrence of numerous mounds resembling moraines.

2. Mr. Charles Lawson, jun., "On the growth of the Tussac Grass (*Dactylis cæspitosa*) in Orkney." Mr. Lawson remarks:—

Mr. Traill of Woodwick, in Orkney, has been the most successful cultivator, and from a letter written by him, I give the following particulars regarding his method of culture:—Previous to June, some pasture ground is selected and trenched. During the first week of that month turnip seed is sown in drills 4 feet apart. So soon after as wet weather sets in, Tussac grass plants are dibbled in between the rows of turnips, at a distance of 3 feet apart. After the turnips are removed for use, manure is wheeled in and potatoes set on the same ground. By adopting this method of culture, the Tussac is cultivated with no expense beyond the outlay for the plants and the labour of dibbling. The work requisite for the two intervening crops is found to be quite sufficient to keep the Tussac plants clear, after which they need no further care, and speedily close up the rows. Where practicable, however, it would be much better to commence with a field previously manured for turnips, by which a saving of the ground in wheeling manure during winter would be effected.

Mr. Traill thus sums up the advantages of the Tussac:—1. The enormous produce of a highly nutritive food for cattle. 2. Having this food every day in the year equally plentiful. 3. The conversion of a poor unproductive field into the most productive of the whole farm in two years, without outlay beyond the plants themselves. 4. The ease with which it can be cut and carried off in snowy weather, and the certainty with which a farmer can count his supply of fodder. 5. When cut down for use, it recovers its bulk in two months in winter, and in about five weeks in the summer.

During the four years over which Mr. Traill's experiments extend, the plants have been steadily increasing in height, and at the present time the oldest ones have attained 7 feet. When not cut, Mr. Traill notices that the leaves continually augment in number, length and breadth, whilst about a fourth of the older leaves gradually turn yellow and dry up, become brittle, and fall to the ground. It is somewhat remarkable, that this decay does not take place at particular seasons, but is progressively developed throughout the year. January is the time of flowering, but the flower spikes are fully formed in December, generally during the first week.

While the necessity of procuring strong and healthy plants will naturally suggest itself to all, the cultivator must bear in mind, that it is necessary to the vitality of the plant that it be kept free of weeds for at least two years. This, Mr. Traill very satisfactorily proved last year by selecting twelve fine healthy plants, and sowing ryegrass around them. As the ryegrass got up, one half of the Tussac was completely killed, and of the remainder scarcely a single plant can be discerned.

As to the soil in which the plant is grown, Mr. Traill gives the following, progressing from the best to the worst:—

- | | |
|--------------------------|-------------------------------|
| 1. Dry sandy peat. | 8. Any wet peat and earth. |
| 2. Wet do. | 9. Dry peat and clay. |
| 3. Any dry sandy soil. | 10. Wet do. |
| 4. „ wet do. | 11. Dry friable clay. |
| 5. „ dry peat do. | 12. Wet do. |
| 6. „ wet do. | 13. Dry stiff retentive clay. |
| 7. „ dry peat and earth. | 14. Wet do. do. |

Mr. Traill's soil, generally speaking, is of the very worst kind; but he overcomes this disadvantage by mixing sand, peat, and retentive clay. The principal objection to this soil is, that the plants, perhaps a tenth, die out the first year, and sometimes a few in the second. If they survive this period, they thrive quite as well as those grown in the better soils.

Mr. Horsburgh of Tongue, one of the factors of the Duke of Sutherland, has, at the request of his Grace, also instituted a series of experiments with the Tussac, which, however, in their results, are somewhat different from those of Mr. Traill, Mr. Matheson, or the Messrs. Lawson. Mr. Horsburgh obtained in 1846 two plants of the grass, which "tillered out," to use his own words, "beautifully." In the following year, by a division of the roots sixty plants were obtained, which were planted in his garden at Tongue. In 1848 the plants were again divided, and a portion of them dibbled into mossy ground, exposed to the influence of the sea spray. In the year following (1849), all the plants, with few exceptions, flowered and produced abundance of apparently good seed, which was sown in August of the same year, but did not vegetate. In December, the plants in the garden were cut, and the grass given to cattle, who devoured it greedily. In the spring of 1850 a number of the plants which had been cut, withered away and completely "died out." A few of the healthy plants were again divided, and set in a patch of sandy ground near the Ferry at Tongue (west coast of Sutherland), and at the present date are reported to be healthy and thriving. Very few of the plants in Mr. Horsburgh's garden bore seed this year. A portion of last year's seed, which was saved for further experiment, was sown in June of the present year and vegetated freely; but in consequence of being hoed up by an ignorant lad, the result of this experiment cannot be known. Mr. Horsburgh states as the result of his observation, that the Tussac thrives best in rich garden soil, where its growth is very luxuriant, while on poor mossy land the plants thrive very indifferently. The greatest length of blade of Mr. Horsburgh's specimens was 6 feet; but the average was only between 4 and 5. All the plants stand the winter very well. Mr. Horsburgh's gardener is inclined to attribute the decay of the cut plants to the nibbling of mice, which little animals not only lived upon them, but constructed their nests at the base of the thick bushy tufts.

Mr. Matheson's experiments, as to the growth of the Tussac grass

in the Lewes, are contained in the Journal of the Royal Agricultural Society of England. The results of Messrs. Lawson's experiments will be found in the last edition of their Treatise on the Cultivated Grasses.

3. Mr. James Backhouse, jun., "An account of the rare Alpine plants picked by him in the Clova, Glen Isla, and Braemar districts, in Aug. 1850." The following are the plants noticed, with his remarks upon them:—

Hieracium cerinthoides (Fries). On the mica rocks, in the gorge of the Eannach, near Loch Lee; also at the head of Glen Fiadh, and in the ravine of the White Water. Found originally by the late Mr. G. Don.

H. Oreades (Fries). Ravine of the White Water; Cairntoul. No British station previously known?

H. sp. nova? Resembles *H. melanocephalum* of Fries, but has large broadly obovate bluntish leaves, forked panicles, and enormously large shaggy heads. Two specimens gathered in a vertical fissure (almost inaccessible) on the great crag of Lochnagar.

H. cæsiuum (Fries). Canlochen Glen. White Water, &c. &c.

H. rupestre (Allioni, Koch and Fries). A new and interesting species, which seems to be unquestionably the above-mentioned plant. Cairntoul.

H. atratum (Fries). Maintains the same distinct character, on Loch Esk Craig, Clova, Lochnagar, Canlochen, Garachary and Ben-na-bourd.

H. pallidum (Fries) var.? Near to *H. persicifolium* (Fries): a curious and interesting plant.

H. alpinum, typical. On Lochnagar and Ben-na-bourd? Exactly the same as the plant from Glara-mara (Cumberland). It is covered all over with long shaggy white silk, and has broad-based short involucreal scales. Its ligules are strongly ciliated. Under cultivation this plant becomes still less like *H. melanocephalum*.

H. sp.? Allied to *H. alpinum*, but differs in several respects, and seems to keep its characters. Ben-na-bourd and ravine of the Garachary.

H. nigrescens. On granite rocks almost exclusively.

Poa cæsia. Very abundant and fine in a ravine in Canlochen Glen.

P. Balfourii? Along with the previous one. I have not the slightest hesitation in pronouncing my *P. Balfourii?* specifically distinct from *P. cæsia*, with which it grows, but retains a perfectly different character. The two species may be described as follows:—

P. cæsia. Plant 4 to 6, (sometimes) 8 inches high, erect, rigid, bluish green, or slightly tinged with purple in the florets. Branchlets of the panicle spreading rigidly at right angles when growing. Florets acute; free. Leaves broad and short; joints covered and confined to the lower fourth of the stem. Ligules very long. (*P. cæsia* loses its character by pressing.)

P. Balfourii? Plant 6 to 9 inches high, erect, rather slender, purplish green (not at all cæsius), spike often rather lax, branchlets spreading, but not at all rigid. Florets ovate, slightly webbed.

Uppermost joint one-third from base; occasionally all the joints concealed. Leaves narrower than in the former species. Ligules very long.

Both the species appear to form tufts in the same way. In examining the latter I never thought of its being *P. Balfourii*, from the root of that species being described as creeping, and the ligules similar to those of *P. montana*, whereas they are as dissimilar as those of *P. annua* and *P. nemoralis*. *P. cæsia* has not the remotest connection with *P. nemoralis*. My impression is that *P. montana* and *P. Parnellii* are both varieties of *P. nemoralis*.

P. nemoralis. Alpine form. Canlochen Glen.

P. montana. Sparingly in Canlochen Glen, and near Loch Esk, Clova.

P. laxa (vivipara). Abundant in and below the ravine on Lochnagar, intermixed with

P. minor and *Aira alpina (vivipara)*.

P. alpina (vivipara)? Strange diminished form. Ravine of the Garachary and on Cairntoul. The true and evident *P. alpina vivipara* grows there also, but looks very different. *P. laxa* is there likewise, I suspect.

Carex leporina. In two stations above the corrie of Lochnan-ean (Lochnagar). In two new stations in the great ravine of the Garachary north of Cairntoul, and spread over a locality half a mile long! in the corrie of Lochan-nain, Cairntoul. One specimen nearly a foot high. Five stations in all.

C. saxatilis (pulla). Locality half a mile long! in the corrie of Lochan-nain, Cairntoul.

Cerastium latifolium. A very beautiful object by the margins of rivulets on Cairntoul, and in the ravine of the Garachary.

Stellaria cerastoides. Cairntoul, Ben-na-muic-dhui, and Ben-na-bour.

Arabis petraea. At the same places.

Crepis succisæfolia. Canlochen Glen.

Saxifraga rivularis. In "the ravine" on Lochnagar; in two stations above the corrie of Lochnan-ean. In a corrie on the south side of Cairntoul. Abundant in the corrie of Lochan-nain, north side of Cairntoul. Also on the eastern cliffs of Ben-na-bour!

Mr. Backhouse failed in obtaining *Carex Grahami* and *Saxifraga cæspitosa*. He found *Woodsia ilvensis* in great abundance.

4. Mr. Thomas Anderson, "A short account of the Flora of the district around Clonmel, including parts of the counties of Tipperary and Waterford." On Galtymore, a mountain rising to the altitude of 3000 feet, and lying about seventeen miles west from Clonmel, which is composed of a coarse conglomerated sandstone, resting on the limestone of the surrounding district, he found on the banks of a rill near the summit, *Saxifraga hirta* associated with *S. stellaris*. At Glendine, near Youghal, he gathered *Trichomanes brevisetum*. Near Clonmel, *Bromus maximus* was discovered, the only previous station known for it being Jersey, where it was found by Mr. Bashington.

The season having arrived for noting the flowering of plants in the

Botanic Garden, Mr. M'Nab stated, that the *Helleborus niger* was in full flower on 2nd December.

Dr. Balfour exhibited from Dr. Jameson of Saharunpore, specimens of *Daphne Cannabina*, and samples of the paper prepared from it; and gave an account of the mode in which the paper is manufactured.

MISCELLANEOUS.

THALASSEMA NEPTUNI*.

SEARCHING for *Venerupis irus* in limestone thrown on the beach (at Clonea, near Dungarvan) I split a lump into two, which presented the appearance of a honey-comb, being perforated by holes, and in each what appeared to be a large maggot. However, on examining them I found them to be the veritable spoon-worm. On carefully removing them I found that the perforations in the stone were perfectly circular, and which the animal accurately filled, so that its power of locomotion, if any, in this position must be very circumscribed. However, when placed in the finger-glass it exhibited some indication of locomotion; but the tube was the organ over which the animal appeared to have the greatest power, in some instances extending it to four times its own length—in fact, making it appear like a filament, but even here *flattening* it out in some portion of its length, and then changing it suddenly to another; but in all cases the tube presented a patulous opening. I obtained specimens of *Gastrochæna pholadia* in the same stone.

VICTORIA REGIA.

To the Editors of the Annals of Natural History.

Botanic Gardens, Regent's Park, Jan. 24, 1851.

GENTLEMEN,—In your Number for October last, p. 310, you have done me the honour to insert my observations on the names of the *Victoria*, in which I stated that “the specific name *Amazonica* ought to be retained, or rather it ought never to have been altered.” There has since appeared in Mr. Paxton's ‘Flower Garden’ for January a copy of Mr. Gray's paper on the same subject with notes by the editor, and concluding with the following paragraph:—“So much for Mr. John Edward Gray. Another proposal made by Mr. Sowerby to change the name of *Victoria regia* to that of *V. amazonica*, because it now appears that the plant was originally called *Euryale amazonica*, we do not think worth serious consideration.” This passage will of course be taken for no more than it is worth by those naturalists who value the established rules of nomenclature; nevertheless I feel called upon to trouble your readers with a notice of it, because, as the previous observations are in defence of the name *Regia*, it must be intended to reject *Amazonica*, although it offers no argument against the latter name, but, on the contrary, it admits the right of priority. The only remaining plea for rejecting Pöppig's original

* Extract of a letter from Dr. Farran to Prof. E. Forbes.

name is, that the name *Regia* is contained in a letter from Sir H. W. Wheatley to the President of the Royal Geographical Society (Ann. and Mag. Nat. Hist. December 1850) conveying the Queen's pleasure that the plant in question should be dedicated to Her Majesty; but it appears by a letter from Capt. Washington (Secretary to the Society) to Dr. Lindley (Annals, Dec. 1850, p. 493), that the Queen had very properly accepted the dedication conditionally. That Her Majesty should be graciously pleased to accept the dedication of the plant is indeed an honour to the science of botany, and the reserve expressed respecting the genus shows a just anxiety to support the established rules which must apply also to the name of the species. No reason therefore remains for retaining the name *Regia*: but it is much to be regretted that it was so hastily advised.

I have lately been shown that I am not the first to suggest that *Victoria amazonica* would be the proper name. The editor of the 'Magazine of Science' (vol. i. p. 22. for 1840) has stated in a note, that "the new name then, unless retained by the consent of Dr. Pöppig, must be given up."

Yours, &c.,

J. DE C. SOWERBY.

List of Spiders captured by F. WALKER, Esq.

For the names of the spiders in the following list I am indebted to the kindness of Mr. Blackwall, who has also specified the sex and the epoch of growth of each spider. The localities of a few are mentioned; all the rest were found near Southgate.

Segestria senoculata, November 1847. Immature, June, July 1849. Under fallen pales near woods, and in crevices of the bark of plane-trees.

Lycosa (agretyca?). Immature, May 1848.

Salticus coronatus. Male adult, May 1848.

— *cupreus*. Male adult, May 1848.

Clubiona accentuata. Immature, May, June 1848, July 1849.

— (*amarantha?*). Male adult, May, June 1848, June 1849; male immature, April 1848, November 1847; female immature, November 1847. Under fallen pales on the borders of woods. When young on the beech in May, feeding on *Aphis Fagi*.

Clubiona (corticalis?). Male immature, November 1847.

Pachygnatha Clerckii. Male adult, August 1849; female adult and immature, August 1849.

Pachygnatha Degeeri. Male adult, May 1848, August 1849; female, August 1849. Female, September, Broadstairs, 1848.

Hecæрге spinimana. Female adult, July 1849.

Thomisus cristatus. Male immature, May, June 1848, August 1849; September, Broadstairs, 1848: male adult, May, June 1849, May, Birchwood, 1847. On the juniper.—Female immature, June 1848, 1849. The young of a species of this genus dwell in moss during the winter.

Thomisus citreus. Male adult, May 1848.

Dolomedes (mirabilis?). Female immature, July 1849.

Philodromus aureolus. Immature, November 1847, May 1848;

male immature?, May 1848; adult, June 1849; female adult, June 1848, July 1849. Abdomen of the male bright purple.

Epeira diadema. Female immature, May 1848.

— *conica*. Male immature, March 1848, October 1847; female immature, March, April 1848.

Epeira cucurbitina. Male adult, May, June 1848, June 1849; female immature, May, June 1848; female adult, June 1848.

Epeira (inclinata?). Male adult, June, August 1849; female adult, July 1849.

Epeira (Solers?). Female, September, Broadstairs, 1848.

— *bicornis*. Male adult, June 1848.

Tetragnatha extensa. Immature, April, May, September (Broadstairs), October 1847. On the spruce fir.—Male immature, March, May 1848; male adult, August 1849; female adult, September (Broadstairs); female immature, June, August, October.

Linyphia triangularis. Male adult, August 1849; September, Broadstairs, 1848; female? immature, July 1849.

Linyphia (montana?). Male immature, August 1849; female, August 1849.

Linyphia (rubra?). Male adult, April, May 1848.

— *cauta?* Male immature, July 1849.

Oonops pulcher. Female, November 1847.

Theridion lineatum; var. formerly known as *T. redimitum*. Male immature, May, June 1848, June 1849; male adult, June 1848, July 1849; female adult, June, July 1848, 1849; female immature, June 1849.

Theridion Sisypus. Female immature, August 1849.

— *nervosum*. Male adult, May, June 1848, June 1849; female adult, June 1848.

Theridion pulchellum. Male adult, May, June 1848, June 1849; female adult, May 1848; September, Broadstairs, 1848.

Theridion denticulatum? Male immature. Under bark of plane-trees, December 1847.

Theridion pallens? Female adult, May 1848.

On the Circulation and Digestion in the lower Animals.

By Prof. AGASSIZ*.

Prof. Agassiz read a paper on the circulation and digestion in the lower animals, showing that the circulation in the Invertebrata cannot be compared to that of the Vertebrata.

Instead of the three conditions of chyme, chyle, and blood, which the circulating fluid of the Vertebrata undergoes, the blood of that class of the Invertebrata which he had particularly studied, the Annelida, is, according to Wagner, simple chyle, coloured chyle; the receptacles of chyle in different parts of the body are true lymphatic hearts like those found in the Vertebrata: this kind of circulation is found in the Articulata and Mollusks with few exceptions, some Echinoderms, &c. In the Medusæ and Polyyps, instead of chyle, chyme mixed with water is circulated: this circulation is found in

* Proc. Bost. Soc. Nat. Hist. 1850, p. 206.

some Mollusks and intestinal worms ; it may be seen plainly in *Beroë*. Prof. Agassiz thinks that the embryological development of the higher animals shows a similar succession in the circulating function. He also examined the connection of respiration with the circulation : in Vertebrata, the gills are found between branches of the blood system ; in Invertebrata, the chyliiferous system is acted on by the respiration ; the gills of fishes, then, cannot be compared to the gills of Crustacea, Articulata and Mollusks. No gills are connected with the chymiferous circulation ; animals having this circulation have no true respiration ; they have only tubes to distribute freely aerated water to the different parts of the body.—*Silliman's American Journal for July 1850.*

METEOROLOGICAL OBSERVATIONS FOR DEC. 1850.

Chiswick.—December 1. Slight haze : overcast : drizzly rain. 2, 3. Overcast. 4—6. Foggy. 7. Foggy : fine : dense fog. 8. Foggy. 9. Foggy : slight fog at night. 10. Foggy. 11. Foggy : overcast. 12. Rain : cloudy and fine : foggy. 13. Very dense fog : cloudy and fine. 14. Clear : boisterous, with rain. 15. Overcast . slight rain : warmer at night than at noon. 16. Clear : overcast . squally. 17. Clear : rain. 18. Frosty : fine : rain. 19. Foggy : overcast : clear. 20. Frosty : fine : frosty. 21. Frosty and foggy : slight rain at night. 22. Frosty : fine : foggy. 23. Frosty and foggy : hazy : foggy. 24. Hazy : foggy : overcast. 25. Clear and very fine. 26. Hazy. 27. Overcast : exceedingly fine : overcast. 28. Clear : very fine. 29. Fine. 30. Fine : cloudy : overcast. 31. Overcast : rain : drizzly.

Mean temperature of the month	38°·47
Mean temperature of Dec. 1849	37 ·17
Mean temperature of Dec. for the last twenty-four years ...	39 ·85
Average amount of rain in Dec.	1·58 inch.

Boston.—Dec. 1. Fine. 2, 3. Cloudy. 4. Cloudy : rain A.M. and P.M. 5. Cloudy. 6. Fine. 7, 8. Cloudy. 9. Foggy. 10—12. Cloudy. 13. Foggy. 14. Fine : rain and hail P.M. 15. Cloudy : rain P.M. 16, 17. Fine : rain P.M. 18. Fine. 19. Rain : rain A.M. 20—23. Fine. 24. Cloudy. 25. Fine. 26. Cloudy : rain A.M. and P.M. 27—31. Cloudy.

Applegarth Manse, Dumfries-shire.—Dec. 1. Frost, hard : cloudy P.M. 2. Rain and high winds all day. 3. Dull and moist : rain preceding night. 4. Mild : rain heavy A.M. : fog. 5. Wet, though not heavily, all day. 6. Fair and fine : moist P.M. 7. Frost A.M. : fog P.M. 8. Frost : fog all day. 9. Frost, hard : clear and sharp. 10. Frost hard : barometer falling. 11. Fair A.M. : rain at noon. 12. Fair and clear. 13. Heavy rain and high wind. 14. Heavy rain : boisterous. 15. Fair, but cloudy and threatening. 16. Occasional dropping. 17. Moist : snow on the hills. 18. Frost keen : snow on the hills. 19, 20. Frost hard. 21. Rain for twelve hours : cleared P.M. 22. Frost, raw : cloudy. 23. Fair, but cloudy : shower P.M. 24. Rain : high wind P.M. 25. Fair and temperate : wind strong. 26. Fair : preceding night wet. 27. Fair A.M. : shower P.M. 28. Fair and drying. 29. Drizzling all day. 30. Rain very heavy. 31. Continued rain and high wind.

Mean temperature of the month	39°·5
Mean temperature of Dec. 1849	37 ·1
Mean temperature of Dec. for twenty-eight years	38 ·3
Rain in Dec. 1849	4·20 inches.

Sandwick Manse, Orkney.—Dec. 1. Clear : hazy. 2. Rain : clear : aurora. 3, 4. Clear. 5. Cloudy : rain. 6. Cloudy : clear : aurora. 7. Fine. 8. Fine : hoar-frost : fine : aurora. 9. Fog : clear. 10. Bright : drops. 11. Cloudy : drops. 12. Bright : showers. 13. Cloudy : clear. 14. Clear : cloudy. 15. Bright : showers. 16. Showers : clear. 17. Sleet-showers. 18. Frost : clear : frost. 19. Showers : clear : frost. 20. Frost : rain. 21. Showers. 22. Hazy. 23. Hazy : damp. 24. Cloudy : fine : showers. 25. Showers : cloudy. 26. Drizzle. 27, 28. Sleet-showers. 29. Cloudy : damp. 30. Showers : clear : showers. 31. Cloudy : showers.

THE ANNALS
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[SECOND SERIES.]

No. 39. MARCH 1851.

XIV.—*Note on some Bones and Eggs found at Madagascar, in recent Alluvia, belonging to a gigantic Bird.* By M. ISIDORE GEOFFROY-SAINT-HILAIRE*.

WE received the day before yesterday from M. Malavois, a planter in the Island of Réunion †, some objects of such great interest, that we deem it a duty to submit them immediately to the attention of the Academy. They prove the existence at Madagascar, geologically recent, of a bird of gigantic size, new to science, but with regard to which there existed, as will presently be seen, some indications.

The discovery of these objects was made, in 1850, by M. Abadie, captain of a merchantman. During a stay at Madagascar ‡, M. Abadie one day observed, in the hands of a Madagascan, a gigantic egg, which the natives had perforated at one of its extremities, and which they employed for various domestic purposes. The accounts which M. Abadie received from the Madagascans soon led to the discovery of a second egg, of nearly the same size, which was found, perfectly entire, in the bed of a torrent, amongst the debris of a land-slip which had taken place a short time previously. Not long afterwards was discovered, in alluvia of recent formation, a third egg, and some bones, no less gigantic, which were rightly considered as fossil, or rather, according to an expression now generally adopted, as subfossil. All these objects were immediately forwarded, unfortunately without the necessary precautions, from Madagascar to the Ile de la Réunion, and thence to Paris: one of the eggs arrived broken into a multitude of fragments, but it can be restored; the two others are in a perfect state of preservation.

* Translated from the *Comptes Rendus* for Jan. 27, 1851.

† Commonly called Bourbon.—H. E. S.

‡ On the south-west coast of the island, according to M. Malavois. It will be seen hereafter that another egg has been discovered at the north-west extremity of the island.

The objects which I have the honour to place before the Academy, are the two entire eggs, a piece of the shell of the broken egg, and some osseous fragments, one of which especially, as will be seen, is of great interest to science.

The two eggs which are now before the Academy differ little in size, but much in form. One of them has the two ends very unequally convex; the other represents almost exactly an ellipsoid of revolution. The following are the dimensions:—

	Ovoidal egg.	Ellipsoid egg.
	metre.	metre.
Long diameter	0·34*	0·32
Transverse diameter	0·225	0·23
Large circumference	0·85	0·84
Small circumference	0·71	0·72
Size	„	c. m. 0·008887

The thickness of the shell is about 3 millimetres.

We shall give comparatively the principal measures, taken or calculated in the same manner, with the Ostrich and the other large birds of the same group, and with the Hen:—

	Ostrich.	Rhea.	Casowary.	Emu.	Hen.
	m.	m.	m.	m.	m.
Large circumference	0·46	0·35	0·365	0·335	0·16
Small circumference	0·425	0·30	0·29	0·27	0·14
Size	c. m. 0·001527	c. m. 0·000735	c. m. 0·000532	c. m. 0·00526	c. m. 0·000060

The thickness of the shell, larger in proportion, is in that of the Ostrich 2 millimetres. It is 1 millimetre with the Casowary, and less with the other birds.

According to the preceding measures, it appears that the capacity of the egg of the large bird of Madagascar is about $8\frac{3}{4}$ litres†, and that, to represent its size, it would require nearly 6 eggs of the Ostrich, 12 of the American Ostrich or Rhea, $16\frac{1}{2}$ of the Casowary, 17 of the Emu, and 148 of the Hen. We may add, contrasting with each other the two extremes of the series, that this same bulk is equal to that of 50,000 eggs of the Humming-bird.

Are the eggs which have just come to us from Madagascar, those of an immense reptile or of a gigantic bird? This was the first question which suggested itself on their discovery. The examination of their shells, the structure of which is similar to that which is observed in those of the large birds with rudimentary wings, and particularly of the Emu, would have sufficed for the solution of this question; but it is given much more directly and completely by the bony fragments which have come

* In English measure the ovoidal egg is about $13\frac{1}{2}$ inches by $8\frac{3}{8}$ inches.—H. E. S.

† A litre is =61·028 English cubic inches.—H. E. S.

with the eggs. One of them is the lower extremity of the large metatarsal bone of the left side: it has the three trochlear apophyses; two of them are even almost untouched. It is enough to cast a glance upon this eminently characteristic piece to recognise that it belongs to a bird. Moreover, on examining it with some attention, we soon arrive at the following conclusions. The great bird of Madagascar differs considerably from the Dodo; it wanted that greatly developed thumb, by which the large bird of the Mauritius differed from the Struthionians and the Casowarians; this we are authorized to conclude from the non-existence, at the bottom of the large metatarsal bone, of the indentation which corresponds with the insertion of the thumb in the Dodo and the other birds whose foot presents the same conformation. In this point of view, the Madagascar bird approaches the *Dinornis*; but it differs from it, as well as from the other allied genera recently discovered in New Zealand, in the very dilated and depressed form of the lower portion (and probably of the greater part) of the metatarsal bone*.

As for the *Ornithichnites*, on the one part, and the Ostrich and other allied genera, no one would assuredly be induced to assimilate them to the gigantic bird of Madagascar, which henceforth should become the type of a new genus in the group of the Rudipens or Brevipens. We shall give to this genus the name of *Æpyornis*†, and to our species the epithet of *maximus*.

The consideration of the other osseous fragments will confirm, we may already assert, the inductions to which we have just been led by the examination of the great metatarsal—the portion to which we have first directed our attention, as eminently proper to characterize not only the class and order, but even the genus to which the precious fragments transmitted by M. Malavois are to be referred. Such a study will doubtless enable us to discuss (that which we could not as yet do with advantage) the value of the affinities which connect the *Æpyornis* with the various genera of the same group, and to determine with some accuracy the dimensions of this ornithological giant. Meanwhile, and with a view to answer the questions which have been addressed to us from all quarters, we shall restrict ourselves, on this last point, to some remarks, intended especially to prevent the exaggerations in which some might be apt to indulge.

The long diameters, in the eggs of *Æpyornis* and Ostrich which we have compared, are, in the one case, 32 centimetres,

* Immediately above the trochlear apophyses, this bone is near 1 decimetre across, and its thickness scarcely exceeds 3 centimetres. A decimetre higher up, we find 0·07 metre again for the transversal diameter, and only 0·0375 for the antero-posterior diameter.

† *Alta* or *magna avis*. From *αἰνός*, tall, large; and *ὄρνις*.

and, in the other, 16; they are therefore to one another as $2 : 1$. With respect to their bulk, it has been seen above that these eggs are nearly $6 : 1$. Are we to suppose that the two birds have the same proportions as their eggs? The Ostrich being 2 metres high, the height of the *Æpyornis* would then reach 4 metres. We think that it would be erroneous to admit this proportion. If we possessed no other elements of determination than the eggs of the *Æpyornis*, we should have to recollect that, even amongst birds very nearly allied, the dimensions of the eggs are far from being exactly proportional to the size of the species which produce them: the estimate therefore which we have mentioned, would for this reason alone be very doubtful. But we can go still further: we think that even at present we are warranted in reducing this estimate*. According to the comparison of the osseous parts, the *Æpyornis* must be a less slender bird and with legs proportionally shorter than the Ostrich. Possibly its size was, with relation to that of the latter bird, almost in the proportion of 6 to 1; but its body was not supported on limbs quite double the height.

The estimate of the stature of the *Æpyornis*, as founded on a comparison of that bird with other Rudipens than the Ostrich, with the Emu, for example, confirms this inference. Calculated according to the long diameters of the eggs, it would give, for the *Æpyornis*, no longer 4 metres, but only about 3·8 metres, the Emu being 1·50 metre high, and its egg 0·125 metre long. From the comparison of the terminal portion of the metatarsal in the Emu, and the corresponding part in the *Æpyornis*, the one measuring 5 centimetres, and the other 12 centimetres, we should deduce a result which agrees very well with the preceding: the height of the *Æpyornis* would be about 3·6 metres.

We thus arrive, in various ways, at this conclusion, that the stature of the *Æpyornis* would be comprised between 3 and 4 metres, and consequently greater than that of the *Dinornis giganteus* itself; since the stature attributed to this last by Prof. Owen† is a little less than 3 metres. We must remark, that the comparison of the extremity of the metatarsal of our *Æpyornis* with the same part in the *Dinornis*, gives, in fact, a dif-

* And it would even be reduced, by a comparison of the eggs, made, not according to the long diameters, but after the transverse, or from the circumferences. The egg of the *Æpyornis* is proportionally a little more elongated and less arched than that of the Ostrich.

† On *Dinornis*, in the 'Transact. of the Zool. Society of London.' The last of the plates of this remarkable memoir (pl. 30), *Scale of altitude*, gives the *Dinornis giganteus* a height of $9\frac{1}{2}$ feet (English), that is to say, 2·9 metres. This estimate is, however, lower than that which other authors admit.

ference of dimension in favour of the first; but this difference is very slight, and might be explained as well by the diversities of proportion as by an inequality of height.

Can so gigantic a species, which has lived without doubt in times not far remote from our own, and of which it cannot even be asserted that it has entirely disappeared from the surface of the globe*, have remained so long, to the present day, without anything having revealed its existence to the naturalists of Europe? We could not postpone, until the appearance of the memoir which we intend to publish on the *Æpyornis*, adverting to some indications relative to this bird which science already possesses.

Shall we place Flacourt amongst the number of the authors who have known, at least by hearsay, the gigantic bird of Madagascar? Is it the *Æpyornis* which that celebrated traveller mentioned, two centuries ago, under the name of *Vouron-Patra*? "It is," he says †, "a large bird which haunts the Ampatres, and lays eggs like an Ostrich; it is a species of Ostrich. Those of the said places are not able to take it: it seeks the most desert places." It is hardly necessary to add, that a passage so vague may quite as well, and better, apply to a bird of a high stature, but nevertheless lower than that of the Ostrich, as to a species so gigantic as the *Æpyornis*.

If Flacourt did not know the *Æpyornis*, there is at all events another French traveller, who unquestionably heard speak of it, and who even saw one of its eggs, very similar to those which we have described above. In one of the additions which Mr. Strickland has recently made ‡ to his remarkable work on the Dodo §, is found a document formerly considered as fabulous, but whose scientific interest is now placed beyond a doubt. Under the title "Supposed existence of a gigantic bird at Madagascar," Mr. Strickland has given a curious relation, made in 1848, by a French merchant, M. Dumarele, to Mr. Joliffe, Surgeon of the *Geyser*, and which the latter extracted from his private journal: M. Dumarele stated that at Port-Leven, on the north-west end of the Isle of Madagascar, he saw a gigantic egg, the shell of which was as thick as a Spanish dollar, and which held "the almost incredible quantity of thirteen wine quart bottles of fluid." M. Dumarele offered to purchase the egg and send it to Europe; but the natives declined selling it, as it

* The *Notornis*, at first known by subfossil debris, and regarded as an extinct species, has lately been found alive in New Zealand. See Ann. Nat. Hist. for November 1850, p. 398.

† Histoire de la grande Ile de Madagascar, edit. of 1758, p. 165.

‡ The Annals and Mag. of Nat. Hist. No. 23 (November 1849), p. 338.

§ The Dodo and its Kindred, London, 1848.

belonged to their chief, and on account of its extreme rarity. Thus M. Dumarele was unable to produce any proof in support of his statement, and, without casting any suspicion on his veracity, it was thought that he might have been imposed upon by the natives.

According to these natives, who were of the race of Sakalavas, the gigantic bird of Madagascar still existed, but was extremely rare. In other parts of the island, on the contrary, its present existence is not credited; but at least a very ancient tradition is met with, relative to a bird, of colossal size, which threw down an ox and devoured it; it is to this bird that the Madagascans attribute the gigantic eggs which are occasionally found in their island. We take this statement from an interesting letter, in which M. Lépervanche Mézière, a well-informed naturalist of the Isle of Réunion, kindly informed the Museum of Natural History of the discovery of the eggs of *Æpyornis*, immediately on its having been made*.

It is scarcely necessary to add, that the tradition which we have just mentioned would attribute to the *Æpyornis* habits which are far from having belonged to it: it is a fable quite similar to that which exists in New Zealand, on the subject of the Moa, and which has no more serious foundation. The *Æpyornis*, like the *Dinornis*, was a Rudipen, and that species, of which popular belief has made a gigantic and terrible bird of prey, like to the *Roc* or *Ruc* of the Eastern tales†, had neither talons, nor wings adapted for flying, and must have fed peaceably on vegetable substances.

* This new letter informs us, positively, that one of the eggs at least comes from the same bed as the osseous fragments.

† The fables respecting the *Roc* may not indeed be unconnected with these discoveries of gigantic eggs, made no doubt from time to time in the island of Madagascar, and with the belief to which they have given rise among the natives. But it would be going too far to make of the *Roc*, with Mr. Strickland, a Madagascan bird, which we might then be induced to refer completely to the *Æpyornis*. Mr. Strickland has misunderstood Marco Polo, the only authority whom he has here cited. Marco Polo, in his celebrated account (book iii. chap. 40), speaks of the *Roc* immediately after having treated of Madagascar, but not as belonging to that island. Quite the contrary, he makes it an inhabitant of *quelques autres isles oultre Madagascar sur la coste du Midy* (French edit. of 1556, p. 115); *aliarum insularum ultra Madaigascar* (Latin edit. of 1671, p. 157).

[I can only say that in Marsden's edition of Marco Polo (4to, London, 1818, p. 707), I read as follows:—"The people of the island (viz. Madagascar) report that at a certain season of the year, an extraordinary kind of bird, which they call a *ruk*, makes its appearance from the southern region;" &c. Polo states that the "other numerous islands lying further south" were unfrequented by ships, and his account of the *Roc* unquestionably refers to Madagascar.—H. E. STRICKLAND.]

XV.—*Descriptions of some new Mountain Limestone Fossils.* By FREDERICK M'COY, Professor of Geology and Mineralogy in Queen's College, Belfast.

Cyathopsis? eruca (M'Coy).

Sp. Char. Corallum very small, subcylindrical after a diameter of 3 lines, which it reaches at 6 lines from the apex, slightly curved; length of large example 1 inch 2 lines, diameter $3\frac{1}{2}$ lines; surface marked with coarse, longitudinal, obtuse lamellar striæ, three in the space of 1 line; radiating lamellæ strong, slightly irregular, connected by several curved thick transverse vesicular plates in the horizontal section, one of the lamellæ stronger than the rest, and extending through the centre, where it is either thickened or confounded with a slight mesial boss of one of the transverse septa: *vertical section*, middle third traversed by thick, subregular, transverse diaphragms, convex upwardly, three interdiaphragmatal spaces in 1 line; outer third on each side formed of one or two rows of irregular large cells, formed by the junction and occasional duplicature of the deflected edges of the diaphragms.

This so exactly resembles the *Cyathaxonia cornu* in size, shape and general external appearance, that it might be very easily confounded with it; even externally, however, it might be distinguished by the smaller number in a given space of its much coarser lamellar vertical striæ; internally it is easily distinguished by wanting the solid styliiform axis, by the distinct transverse vesicular plates between the lamellæ in the horizontal section, and the transverse septation, &c. of the vertical section.

Very common in the black carboniferous limestone and shale of Beith, Ayrshire.

(Col. University of Cambridge.)

Caninia subibicina (M'Coy).

Sp. Char. Corallum much curved, increasing, when young, at the rate of 6 lines in 1 inch to a diameter of 1 inch 3 lines, after which it remains nearly cylindrical for 2 or 3 inches more; surface with a thin, nearly smooth epitheca, marked with obsolete transverse undulations of growth; when the epitheca is removed, the very fine, equal, costal striæ are brought into view, five in 2 lines at a diameter of 1 inch 2 lines; the outer, small, vesicular area is rather more than a line wide, within which the sixty-five thick primary radiating lamellæ extend, about 4 lines towards the centre, leaving the broad, flat, smooth, slightly undulated central portion of the diaphragms about 6 lines in diameter in parts of the circum-

ference; short secondary lamellæ appear one between each of the primary; lateral siphonal depression strongly marked: *vertical section* shows the outer vesicula. area (at about the above diameter) $1\frac{1}{2}$ line wide, composed of about four very oblique rows of small rounded cells, extending upwards and outwards, from the broad deflected edges of the diaphragms, which latter are thick, tolerably regular, nearly horizontal in the middle, about three interdiaphragmatal spaces in 2 lines.

This species is most nearly like Fischer de Waldheim's figure of his *Turbinolia (Caninia) ibicina*, from which it differs in the greater number of the lamellæ, &c. It differs from the *C. gigan-tea* in its smaller size, slender form, more regular and smoother surface, much finer cells of the narrow outer area. I suspect this may be the coral quoted occasionally by authors from mountain limestone, under the name of the Devonian *Cyathophyllum flexuosum*, to the figures of which it bears some resemblance in external form, but from which it differs in its greater size, coarser lamellar striæ, deflected edges to the diaphragms, &c.

Not uncommon in the carboniferous limestone of Kendal, Westmoreland.

(Col. University of Cambridge.)

Diphyphyllum gracile (M'Coy).

Sp. Char. Corallum forming large masses of cylindrical tubes 2 lines in diameter, dichotomously branching and occasionally coalescing laterally; surface marked with sharp longitudinal lamellar striæ, about four in 1 line: *vertical section* shows transverse, very slightly convex, thick, smooth, regular diaphragms reaching nearly across the tube, two interdiaphragmatal spaces in 1 line, bent downwards at the circumference; lateral vesicular area extremely narrow (less than one-fourth the diameter), of about one layer of cells: *horizontal section*, primary radiating lamellæ thick, equal, extending less than halfway to the centre, leaving the broad smooth diaphragms or clear space in the middle nearly two-thirds the diameter; between each pair of primary in some specimens is an extremely minute marginal lamella.

The small diameter of the tubes distinguishes this species easily from any other *Diphyphyllum* I know, and gives the whole much the appearance of *Siphonodendron aggregatum* (M'Coy), but the lamellæ do not extend nearly to the centre; there is no axis, and the dichotomous fission of the star and tubes may be distinctly observed.

Not uncommon in the impure limestone of Lowick, Northumberland.

(Col. University of Cambridge.)

Clisiophyllum turbinatum (M'Coy).

Sp. Char. Corallum simple, turbinate, very rapidly enlarging, attaining the adult diameter of about $1\frac{1}{2}$ inch at 2 inches from the point of attachment; surface of the strong external wall or epitheca marked by coarse, numerous, imbricating transverse striæ, and a few larger inequalities of growth (no distinct longitudinal striæ except when abraded): *horizontal section*, central area or axis nearly equalling one-half the diameter of the coral, composed of a close crumpling of fine vesicular plates, crossed by a few radiating irregular extensions of every fourth or fifth of the radiating lamellæ, one of which, stronger than the rest, is usually seen to cross the middle (forming a thick mesial line in the vertical section, and a prominent crest in the cup); lamelliferous axis rather less than one-third of the whole diameter, radiated by about fifty-four strong, equal lamellæ (at a diameter of 1 inch), connected by numerous delicate transverse vesicular plates; four lamellæ in the space of 2 lines near the margin; outer or perithecal area less than one-fourth the width of the lamelliferous zone, from which it is separated by a thin definite boundary; it is composed of about two obscure rows of small, compressed cells, more or less crossed by costal extensions of the lamellæ: *vertical section* shows a strong, solid line down the middle of the axis or middle area, a thinner solid line defining the axis on each side, and a similar one between the middle and external areas; external area very narrow, of about two rows of minute cells; middle of about three rows of large rhomboidal cells formed of thin, moderately curved vesicular plates converging upwards and inwards at a low angle; inner area composed on each side of about three rows of cells, converging upwards to the mesial line, much smaller and more compressed than those of the middle area: *terminal cup* of moderate depth, lined by the thick, equal, radiating lamellæ, the axis forming a moderately prominent boss in the bottom, crossed by a small prominent crestiform plate.

This is easily distinguished from the other known species by its short, rapidly expanding turbinate form; it resembles the *C. bipartitum* in the crest-like median plate on the boss or central area (axis), but differs in having the axis much smaller, the middle area much larger, the perithecal area smaller, and the fewer lamellæ, besides the difference in shape. The *C. Keyserlingi*, like the last species, has short secondary lamellæ between the longer ones; it also differs from this in its very slender form, and wants the crest across the axial boss in the cup, but is otherwise nearly allied, although very distinct as a species.

Common in the carboniferous limestone of Beith, Ayrshire ; rare in the carboniferous limestone of Derbyshire.

(Col. University of Cambridge.)

Pteronites persulcatus (M'Coy).

Sp. Char. Transversely trigonal, right valve gently convex, left valve diagonally tumid, posterior end broad, rounded, flattened anterior end and beaks forming a small, convex, obtusely pointed extremity ; a small space of the anterior extremity smooth, all the rest of the shell covered with small, coarse, rugged, flexuous, irregular ridges, for the most part alternately larger and smaller, and less than their thickness apart, those of the posterior wing nearly straight, radiating, those of the body arching downwards towards the ventral margin. Length of hinge 10 lines, greatest depth at right angles to the hinge $5\frac{1}{2}$ lines.

This species is distinguished from the *P. sulcatus* (M'Coy) and the *P. semisulcatus* (M'Coy) (of which latter it has the exact form) by having all the posterior part of the shell striated ; in its ridging it agrees with the *Lanistes rugosus* (M'Coy, Synop. Carb. Foss. Ireland, t. 10. f. 8), but the above form, and broad beak and anterior end seem to separate the latter. It grows larger than the above measure.

Not uncommon both in the main limestone of Derbyshire and the black limestone resting on it : of large size in the impure limestone of Lowick, Northumberland.

(Col. University of Cambridge.)

STREBLOPTERIA (M'Coy), n. g.

Etym. στρεβλός, *perversus*, and πτερόν, *ala*.

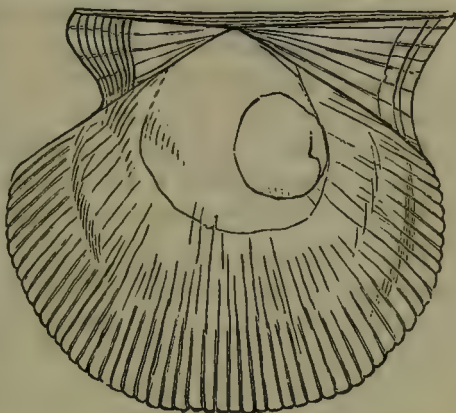
Gen. Char. Ovate or rounded, obliquely extended towards the anterior side ; posterior wing broad, undefined, nearly rectangular, extending nearly as far as the posterior margin of the shell ; anterior ear small, deeply defined ; surface smooth or radiatingly ridged ; one large, faintly marked muscular impression a little behind the middle ; one short, narrow tooth slightly diverging from the hinge-line on the posterior sides of the beaks ; ligament confined to a narrow simple facet on the hinge-margin.

These shells differ from some of the short-winged group of *Avicula* (or *Pteria*), to which they are most allied, by the obliquity of the body of the shell being towards the anterior instead of the posterior side—the reverse, in fact, of what occurs in nearly all shells except the *Limæ*. There are many species in the carboniferous limestone, to which formation the genus seems at pre-

sent confined, unless the *Pterinea posidoniaformis* (M'Coy), (Syn. Sil. Foss. of Ireland, t. 2. f. 10) of the Upper Silurian strata belongs to it.

AVICULOPECTEN (M'Coy), n. g.

Gen. Char. Inequivalve, more or less inequilateral, straight, or slightly extended obliquely towards the posterior side; anterior ear flattened, smaller than the posterior, sharply and deeply defined, with a deep notch in the right valve between it and the body of the shell for the passage of the byssus; posterior ear slightly pointed, extending about as far as the margin of the shell, defined or not; ligament and cartilage confined to a narrow facet along the hinge-margin, no medial cartilage-pit; muscular impression and pallial scar as in *Pecten*.



Internal cast of *Aviculopecten*.

It was only on seeing the fine suite of fossils from the dark limestone of Lowick, Northumberland, recently presented by the Rev. Mr. Jenkins to Prof. Sedgwick, and now in the collection of the University of Cambridge, that I recognized the characters by which the great bulk of the so-called Pectens of the middle and upper palæozoic rocks are distinguished from the true Pectens of the more recent formation and present sea. In the present fossils the *posterior* ear is largest, thus differing in an external character from *Pecten* and approaching *Avicula*, an affinity greatly increased by the internal structure exposed by the Lowick (and some Irish) specimens, showing that there is no mesial ligamentary pit beneath the beak as in the former genus, but, as in the latter, the ligament is confined to the hinge-margin, while in general form and little or no obliquity of the shell the resemblance of the species to *Pecten* is so very striking that most writers agree in placing them in that genus. The discovery of this character fixes the zoological place of numerous carboniferous shells constantly varying hitherto in the systems between *Pecten*, *Avicula* and *Meleagrina*.

Aviculopecten plano-radiatus (M'Coy).

Sp. Char. Ovate, apical angle 80° in young specimens, 95° in adults from an upward curve of the anterior side, length and

width nearly equal, gently convex; beaks small, prominent; ears very deeply defined from the body of the shell by a narrow very steeply inclined plane, left anterior one rotundato-quadrate, obscurely radiated, posterior ones longer, falcately pointed, radiated by a few slender ridges crossed by the lines of growth; surface radiated with numerous ribs (thirty to forty at $1\frac{1}{2}$ inch from beak) which are smooth, broad, flat, more or less irregular in width, and separated by a very narrow impressed line towards the margin and body of the shell, but nearer the beak they are sharp, narrow and alternately larger and smaller; the ears are sharply striated, parallel with the margin, and have a few narrow distinct radiating ridges. Width from $1\frac{1}{2}$ to nearly 4 inches.

The radiations vary from $1\frac{1}{2}$ line to $\frac{1}{2}$ a line wide in different specimens at the margin. This species differs from the *P. planicostatus* (M'Coy) in its being oblique and the much greater number of its ribs.

Common in the carboniferous limestone of Derbyshire.
(Col. University of Cambridge.)

Aviculopecten Ruthveni (M'Coy).

Sp. Char. Suborbicular; apical angle about 110° in the adult, from the upward curve of the sides, only 85° in the young; length slightly exceeding the width, tumid; surface radiated by about fifteen thick, rugged ridges, between each pair of which are usually three smaller ridges, each pair separated by a concave space about equal to the thickness of the ridges; ears large, the posterior one broad, extending as far as the margin of the shell, with three or four distant radiating ridges crossed by coarse lines parallel with the concave extremity; anterior ear similar, but slightly smaller, both defined. Width from beak to opposite margin about 2 inches, length (at right angles to the width) about the same.

Fragments of this species bear some resemblance to portions of the *Pecten? quinquelineatus* (M'Coy), but it is distinguished by the much less number of the ridges, &c. I have dedicated it to Mr. John Ruthven of Kendal, the well-known enthusiastic collector of palæozoic fossils.

Rare in the impure carboniferous limestone of Dent, and one small specimen from the similar limestone of Lowick, Northumberland.

(Col. University of Cambridge.)

Sanguinolites clava (M'Coy).

Sp. Char. Elongate, claviform, three times longer than wide,

anterior end large, obtusely rounded, dorsal and ventral margin with a slight upward curvature, no byssal furrow; posterior end slightly narrowed, subtruncate, rounded; beaks large, obtuse, a broad ovate striated lunette beneath them on the anterior side; posterior lunette, the largest of the hinge-line, wide, hollow, bounded by the obtuse ridges of the dorsal margins; valves very convex in front, their depth beneath the beaks five-sixths of the width from them to the ventral margin, gradually becoming more compressed towards the posterior end, where the depth is only half the width; posterior slope gently convex, undefined, diagonal ridge not marked; surface covered with thick, rugged, subequal ridges, arising a little behind the anterior lunette, and slightly thickening towards the posterior slope, which is defined by their termination, and only marked by fine striæ of growth parallel with the end; anterior lunette and a small portion of the anterior extremity also nearly smooth; the ridges, where the outer surface is preserved, are covered with a minute irregular striation approximately parallel with the margin. Length from anterior to posterior end about 5 inches 2 lines, width from beak to opposite ventral margin 1 inch 11 lines, depth of both valves 1 inch 9 or 10 lines.

This fine species is remarkable for the clavate form produced by the gibbosity of the valves near the anterior end and the tapering towards the posterior extremity. Of the internal impressions I have only seen the anterior adductor, which is broad, rounded, and shallow. The only approximation to this species published that I know is an imperfect fragment of one end of a shell called *S. maxima* by Portlock, Geol. Rep. t. 36. f. 1, which is flatter with smaller beaks, a more truncate anterior end, &c.

Not uncommon in the carboniferous limestone near Llangollen, North Wales.

(Col. University of Cambridge.)

Sanguinolites subcarinatus (M'Coy).

Sp. Char. Elongate oblong, tumid; beaks very large, obtuse, near the small, rounded, anterior end, in which there is an abruptly hollowed space beneath the beaks; posterior end narrow, square, truncated; diagonal ridge angular, slightly sigmoid, strongly defined from the beak to the respiratory angle; posterior slope smooth, slightly concave; sides slightly flattened, with coarse irregular striæ and irregularities of growth parallel with the margin; ventral margin nearly straight; hinge-line as long as the shell, its inflected margins broad, slightly concave, nearly at right angles to the plane of

the margin of the valves; cardinal ridge thick, obtuse, diverging nearly half the width of the posterior slope from the hinge-line. Length 1 inch 4 lines, proportional width from beak $\frac{4.5}{100}$, width at posterior end $\frac{2.6}{100}$, length of anterior end $\frac{1.0}{100}$, depth of one valve (greatest about the middle of the diagonal ridge) $\frac{1.5}{100}$.

This rare species is remarkable for its narrow square posterior end and strong angular diagonal ridge. It is proportionally shorter and less regularly ridged than the *S. angustatus* (Phill.). Goldfuss's figure under this latter name nearly agrees with our shell and is no doubt identical.

In the impure carboniferous limestone of Lowick, Northumberland.

(Col. University of Cambridge.)

Sanguinolites variabilis (M'Coy).

Sp. Char. Oblong, tumid, nearly closed at the ends; averaging twice as long as wide (sometimes a little more, sometimes a little less); beaks large, tumid, oblique, close to the anterior end, which varies from one-ninth in large, to one-seventh of the length in smaller specimens; anterior lunette large, smooth, oval, contracting the round anterior end; ventral margin nearly straight, or commonly with a wide shallow sinus, very rarely with a slight convexity; valves evenly tumid or with a slight broad mesial concavity or flattening; posterior slope flattened, smooth, defined by a diagonal slightly sigmoid ridge, sharp and angulated near the beak, gradually becoming rounded and obscure towards the inferior posterior (respiratory) angle in old specimens; greatest depth of the valves along this line and about half-way from the beak; hinge-line with a slight upward curvature, posterior lunette very wide, concave, nearly horizontal; surface marked by concentric wrinkles, variable in size and strength, usually thickening slightly on reaching the diagonal posterior ridge, almost always undulated and irregularly interrupted about the middle and anterior third of the sides (averaging five or six in the space of 3 lines from the beak, about the middle of the shell); periostraca sharply marked with close interrupted striæ and a few minute scattered points, very rarely falling into close regular radiating lines; usual width 9 lines, length 1 inch 3 lines, greatest depth (a little behind the middle) 7 lines (occasionally 2 inches long).

The irregular interruption and undulation of the concentric wrinkles in front of the middle of the sides is often very striking and beautiful and is always recognizable. It is very variable in the thickness and regularity of the ridges; it most nearly approaches the *S. regularis* (King sp.), from which it differs in the

undulatory interruption of the ridges at the place mentioned, and in being shorter, and the greatest gibbosity of the shell being along the anterior boundary of the posterior slope—it being much nearer the anterior end, and the posterior portion being compressed in that species, in which also the greatest gibbosity is nearer to the dorsal margin, giving a much less tumid character to the lower part of the valves. From the *S. sulcatus* it differs in the wrinkles not uniting into few large wrinkles in passing to the posterior slope, &c.

Rare in the carboniferous limestone of the Isle of Man; not uncommon at Lowick, Northumberland.

(Col. University of Cambridge.)

Leptodomus costellatus (M'Coy).

Sp. Char. Oblong, very tumid, width three-fifths of the length, depth of both valves about equal to the width; anterior and posterior lunettes large, defined; beaks large, tumid, incurved, terminal, anterior side obtuse, subtruncate, slightly oblique beneath them; a small sinus in the ventral margin close to the anterior end, from which a narrow concavity extends nearly to the beaks close to the anterior edge; hinge-line nearly as long as the shell, with a slight upward curvature; posterior end wide, slightly oblique, subtruncate, rounded; ventral margin strongly convex behind the sinus; posterior slope abruptly compressed, smooth, or with a few lines of growth parallel with the margin, divided nearly in the middle by a small furrow from behind the beaks; sides marked with numerous small, regular, close, narrow, rounded ribs parallel with the margin (about four in the space of 2 lines); these abruptly disappear on reaching the edge of the posterior slope, and unite on the anterior edge in front of the sinus in parcels of two or three to form a row of short thick wrinkles on that part. Length 1 inch 4 lines, width 10 lines, depth 10 lines, width of posterior lunette $1\frac{1}{2}$ line.

I long imagined this to be the *Hiatella sulcata* of Fleming, but it seems Dr. Fleming agrees with Prof. Phillips as to that being identical with the *Sanguinolaria sulcata* of the latter. The present species differs from the *Sanguinolites sulcatus* (Phill. sp.) in its thin shell, short inflated form, want of the thick internal cardinal ridges, the more regular sharp ribs on the sides, and their uniting into large wrinkles on the anterior instead of the posterior end.

Common in the carboniferous shales of Craige near Kilmarnock; carboniferous shales near Glasgow; in the shaly beds of Lowick, Northumberland.

(Col. University of Cambridge.)

XVI.—*Notices of British Fungi*. By the Rev. M. J. BERKELEY, M.A., F.L.S., and C. E. BROOME, Esq.

[Continued from p. 102.]

[With three Plates.]

538. *Dendryphium curtum*, n. s. Effusum tenue; floccis erectis, sursum in ramulos breves furcatos divisus; sporis curvulis 3-7-septatis articulis constrictis. On dead stems of nettles, Dundee, W. M. Ogilvie, Esq.

Black, forming very thin effused patches. Fertile flocci springing from creeping filaments, erect, straight, septate, divided above into a few short furcate or trifid ramuli, which are surmounted by curved 3-7-septate spores, whose articulations are strongly constricted.

A small but neat species, remarkable for the short forked ramuli. The tips of these are often greatly constricted at the articulations when the spores begin to grow. *D. atrum* is far more loosely branched, though its spores resemble greatly those of our species. *D. comosum* is evidently a far less delicate species.

PLATE VI. fig. 9. *a*. Flocci magnified; *b*. tips of ditto more highly magnified; *c*. spores.

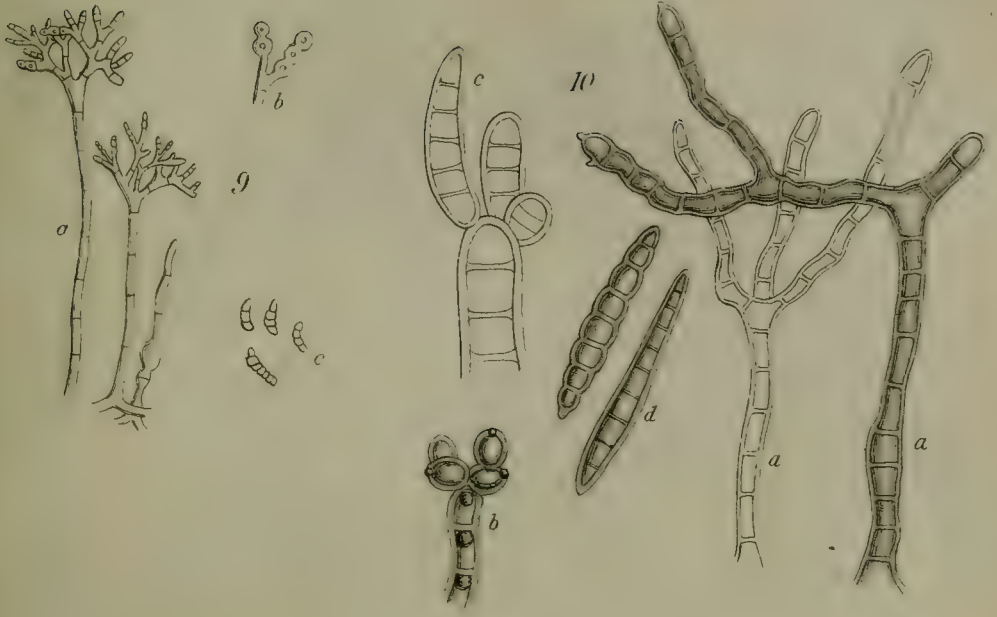
539. *D. laxum*, n. s. Stipitibus brevibus sursum laxè ramosis; sporis elongatis subflexuosis 7-11-septatis. On dead stems of *Inula viscosa*, King's Cliffe.

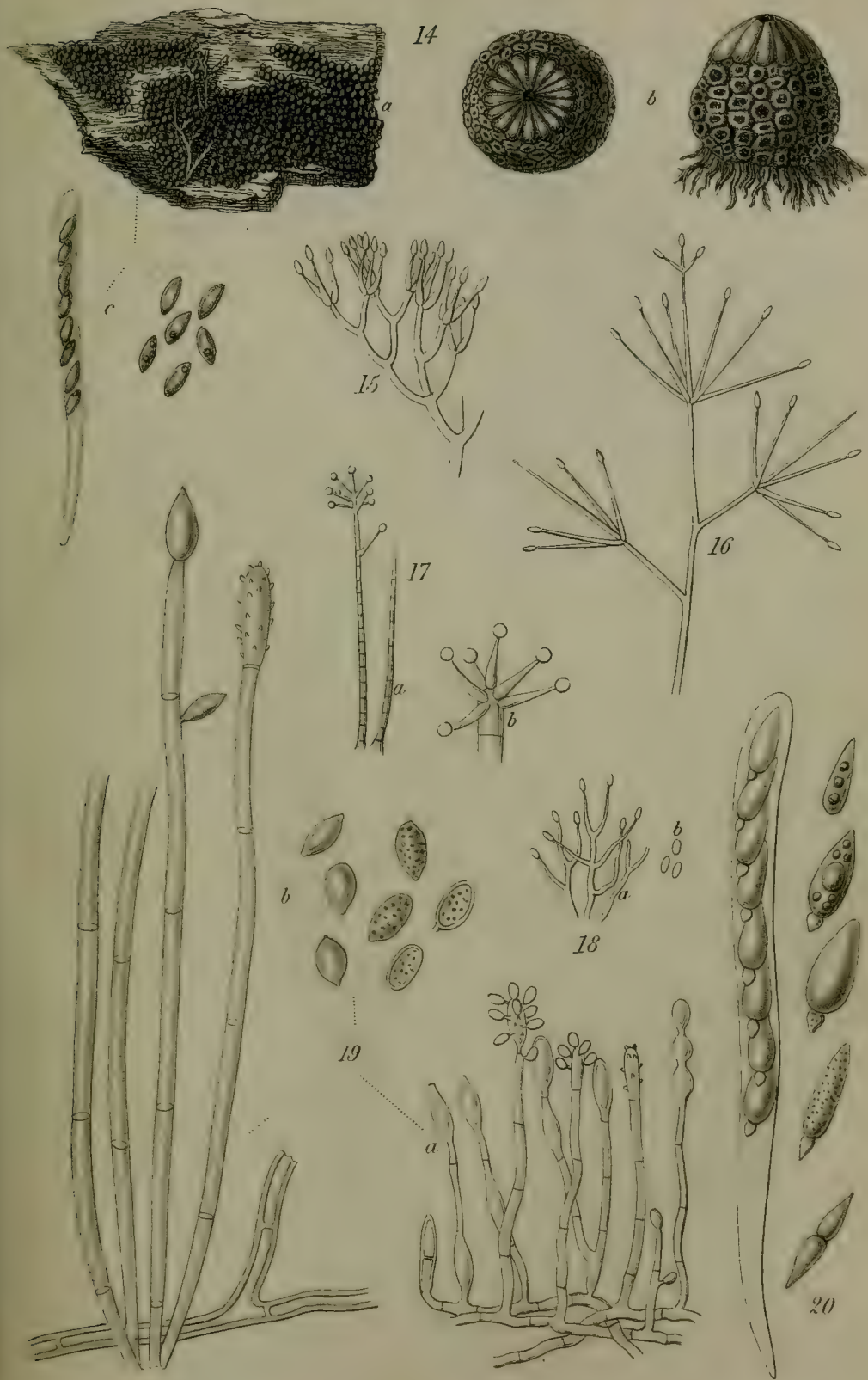
Patches effused, black. Flocci short, erect, articulated, sending off loose branches, which either spring at once from them or are replaced by a few swollen joints. Spores linear, curved, or somewhat flexuous, multiseptate, springing often from the forked tips; articulations slightly constricted; endochrome frequently containing a nucleus.

This agrees in some points with *Dendryphium comosum* as figured by Corda, but less so with Wallroth's description. The spores are more frequently septate, and the branches are even less completely disposed in a head than in Corda's figure.

The spores in this genus sometimes form moniliform threads, and sometimes exhibit the more usual mode of growth in *Septonema*. In the present case we have not seen them very clearly spring from one another, but the whole structure is that of *Dendryphium*, and indeed in certain states of the described species of the genus they are not proliferous, or only become so at a more advanced period of growth. *Dactylium atrum* belongs apparently to the same genus.

PLATE VI. fig. 10. *a, a*. Flocci magnified: in one thread the spicules are apparent to which the spores are at first attached; *b*. tip of fertile thread; *c*. tip of another thread highly magnified; *d*. spores.







540. *D. griseum*, n. s. Griseum ; floccis parce ramosis ; sporisque cylindricis concatenatis, demum uniseptatis hyalinis. On dead nettle stems, King's Cliffe, March 1850.

Bluish gray, forming little patches ; flocci sparingly branched almost from the base, as far as we have seen inarticulate ; spores cylindrical, apiculate at either end, elongated, arranged in dichotomous chains, at length divided by a central septum.

This is not like the other species, dark and opaque. The line of demarcation between the chains of spores and threads is strongly marked.

PLATE VI. fig. 11. *a.* Flocci magnified ; *b.* one of the spores to show the mode of attachment ; *c.* perfect spores less highly magnified.

541. *Rhizotrichum Bloxami*, n. s. Sparsum candidum ; floccis fertilibus sursum clavatis ; sporis candidis subellipticis. On dead wood, Rev. A. Bloxam, Twycross. We have either this or a very closely allied species from South Carolina.

Patches irregularly effused, seldom continuous, white or cream-coloured. Mycelium decumbent, white, septate. Fertile flocci erect, sometimes very sparingly divided ; tips clavate, bearing scattered spicules surmounted by subelliptic or slightly obovate spores, which are sometimes obtuse, sometimes apiculate. Occasionally the ultimate articulations of the fertile threads are moniliform and present the characters of *Oidium*. Very rarely the penultimate joint has one or two spicules.

This species comes near to *R. repens*, Preuss, but differs in the white, not cinereous mycelium, and subelliptic, smooth, white, not broadly obovate, wrinkled cinereous spores.

PLATE VII. fig. 19. *a.* Flocci in various states springing from mycelium ; *b.* ditto, mycelium and spores more highly magnified.

542. *R. Thwaitesii*, n. s. Epigæum flavum effusum ; hyphasmate contexto, floccis fertilibus adscendentibus dichotomis apicibus leviter incrassatis ; sporis globosis echinulatis. On the bare soil, Leigh Woods, Bristol, Aug. 2, 1848.

Patches suborbicular or confluent, Thelephoroid, yellow with a pale margin. Hyphasma consisting of closely packed decumbent articulate threads, the ends of which rise up and are branched dichotomously, their apices swelling slightly and clothed with globose echinulate shortly pedicellate spores.

This beautiful fungus raises the genus *Rhizotrichum* almost to an equality with *Aspergillus*, some of whose species it closely resembles, differing in fact principally in the spores being single and not arranged in moniliform threads.

PLATE VI. fig. 12. *a.* Fertile flocci from a sketch by Mr. Thwaites ; *b.* tip of thread with spores highly magnified.

543. *Sporodum Conopleoides*, Cord. = *Dematium hispidulum*, Fr. *Ann. & Mag. N. Hist.* Ser. 2. Vol. vii.

544. *Oidium Tuckeri*, Berk. in Gard. Chron. 1847, p. 779 cum ic. On the leaves, young branches, and fruit of vines. Extremely common and destructive.

A form or species with still larger spores occurs on *Chrysanthemum Indicum*.

545. *O. abortifaciens*, Lk. On the spikes of grasses, causing the diseased state of the ovule known under the name of Ergot. The production has been referred to a new genus *Ergotetia*, but not, we think, with sufficient reason.

546. *O. porriginis*, Mont. MSS.; Robin, tab. 4. fig. 10. On the scales of *Porriago lupinosa*, Bristol, H. O. Stephens.

547. *O. concentricum*, nob. = *Cylindrosporium concentricum*, Unger, Exanth. tab. 2. fig. 9 = *Fusisporium Urticæ*, Desm. no. 930. On leaves of various plants: common.

A variety of forms, as *Fusisporium calceum*, Desm., on ground ivy, *F. Urticæ*, Desm., on nettles, another on violets, primroses, lettuces, docks, *Trientalis*, *Helleborus*, *Ranunculus*, &c. occur, scarcely differing from one another. These are what Unger considered as *Cylindrosporium concentricum*, Grev. That is however a very different thing.

Should it be found that the various forms present really distinct characters, the species may be separated. At present however it appears best to include all in one comprehensive name. In all the forms we believe that the threads protrude through the stomata. Amongst the spores, some occur which are larger and uni-septate. It is possible that after the spores fall they may increase in size, as is, we believe, the case in many fungi, as in the genera *Cladosporium*, *Fusisporium*, &c., and as is ascertained to be the case in *Elaphomyces*.

548. *Fusisporium bacilligerum*, n. s. Griseo-album, hyphasmate obsoleto, sporis longissimis 5-7-septatis deorsum attenuatis apice subclavatis. On leaves of *Alaternus*, West of England.

Occupying the centre of little brown spots. Hyphasma obsolete; spores very long, hyaline, 5-7-septate, strongly attenuated below, obtuse and slightly clavæform above, somewhat curved.

A very distinct species, remarkable for its spores, which resemble in form those of *Hymenopodium sarcopodioides*, Corda.

549. *F. roseolum*, Steph. MSS. sub Fusidio. Roseolum, floccis brevibus; sporis curvis elongatis 3-6-septatis. On decayed potatoes, Bristol, H. O. Stephens.

Of a delicate rose-red, forming thin floccose patches; fertile threads short. Spores curved, elongated, slightly obtuse, 3-6-septate, often slightly projecting at each dissepiment.

This approaches *Dactylium*, especially in the rosy tint which is so common in that genus. The spores however are those of a *Fusisporium*.

550. *F. fœni*, n. s. Hyphasmate parco floccis fertilibus brevissimis sporis oblongis rectis obtusis 1-2-septatis. On the cut surface of a hay stalk, Apethope, Norths., Dec. 1848.

Orange-red, spreading in wide patches many feet in width. Hyphasma creeping, sparingly articulate. Fertile flocci very short. Spores oblong, obtuse at either extremity, 1-2-septate.

Agreeing in habit with *F. avenaceum*, but differing from all other species in the straight obtuse oblong spores.

*551. *Psilonia Arundinis*, Desm. Exs. no. 460 = *Psilonia Festucæ*, Libert = *Chloridium Festucæ*, Corda. Spye Park, on *Carex paniculata*, Feb. 1850. It is not uncommon on *Arundo Phragmites*.

We can see no difference between the plant of M. Desmazières and that of Madame Libert, except that the spores in the latter are rather longer and more curved. The colour and general appearance are exactly the same.

552. *Helvella Ehippium*, Lév. Ann. d. Sc. ser. 2. vol. xvi. p. 240; Desm. Exs. no. 1414. On the ground in woods and groves, spring and autumn: common.

This species is very near to *H. elastica*, and differs principally in its dwarf size and decidedly velvety coat. Schæff. tab. 321 is evidently the same thing. This figure does not seem to be quoted by Fries.

553. *Morchella esculenta*, δ . *conica*, Fr. Syst. Myc. vol. ii. p. 7. Woods at Westbury near Bristol.

This is considered as a distinct species by Persoon and other authors, but it seems to us nothing more than a well-marked variety.

554. *Peziza Babingtonii*, n. s. Minor; supra convexa murinofusca margine affixa, subtus concava pallide aquosa rugosiuscula fibrillis obsoletis. On rotten wood, Grace Dieu Wood, Leicestershire, Rev. C. Babington.

Cup half an inch or more broad, contracting greatly in drying, irregular in outline, convex above, mouse-brown, concave beneath and slightly wrinkled, pale watery brown, fixed by the border. Asci linear, spores broadly elliptic. Paraphyses linear, their apices clavate.

This curious production has occurred only once, and resembles a *Rhizina* more than any *Peziza*, but it has not the peculiar roots of that genus. We are unwilling to pass it by altogether, hoping that some one may meet with it and give more perfect information. It should be observed that the spores in *R. lævigata* are naviculæformi.

555. *P. viridaria*, n. s. Media mycelio expanso lanoso albo; cupulis primum globosis demum hemisphæricis sero expansis aquose cinereis. On damp walls of a greenhouse, King's Cliffe,

Nov., Dec. 1845. Apparently the same species occurs on damp wood, on water-butts, &c.

Cups at first globose, then hemispherical, at length expanded, $\frac{1}{4}$ – $\frac{1}{2}$ an inch broad, pale watery brown or cinereous, sessile, springing from a white cottony effused stratum. Asci linear; sporidia widely elliptic, endochrome uniform, without any distinct nucleus.

This resembles somewhat *Peziza muralis*, but it has no stem.

556. *P. luteo-nitens*, n. s. Conferta, luteo-nitens, cupulis concavis subregularibus demum flexuosis. On the bare ground, King's Cliffe.

Bright orange-yellow, when very young globose, then concave, gradually becoming irregular, and at length flexuous, smooth externally, $\frac{1}{4}$ – $\frac{1}{2}$ inch broad. Asci linear, sporidia elliptic with two nuclei. Paraphyses filiform; apices slightly clavate.

Resembling at first sight stunted specimens of *Pez. aurantia*, but essentially different, not only as proved by the habit, but the smooth, not echinulate or pointed spores. We cannot find any description of this species.

557. *P. hirta*, Schum, Sæll. p. 422. On the ground, Wimbledon Common; South Wales, C. E. Broome; Wareham, Rev. W. Smith.

Differing from *P. trechispora* in its smooth elliptic sporidia. *P. umbrosa*, Rab. no. 1011, appears to be the same species. We have a similar species from South Carolina with globose smooth spores which has been named *P. sphaeroplea*. Whatever Schrader's species may be, it cannot be the species of Rabenhorst, which certainly belongs to a different section.

558. *P. livida*, Schum, Fl. Sæll. vol. ii. p. 422; Fl. Dan. tab. 1915. fig. 3. On fir chips, Lockerbie, Sir W. Jardine, 1834.

A beautiful species with the habit of *P. scutellata*, but with a livid disc and more convex.

559. *P. ciliaris*, Schrad. Journ. 1799, vol. ii. p. 63; Fr. Syst. Myc. vol. ii. p. 89. On dead oak-leaves, King's Cliffe, &c.

560. *P. albo-testacea*, Desm. Exs. no. 1415. On dead stems of grass, July 1840, King's Cliffe.

561. *P. apala*, n. s. Minuta sparsa vel conferta, cupulis cum stipite obconicis extus furfuraceo-villosis cervinis; hymenio plano obscuriore; ascis clavatis, sporidiis elongatis filiformibus flexuosis. On dead rushes, Spyc Park, Batheaston, Feb. 1850: abundant.

Minute, scattered or crowded; stem not very distinct, confluent, with the cup obconical or subcylindrical, shaggy with flexuous hairs, as is the cup, pale fawn-coloured. Hymenium flat, darker. Asci clavate, sporidia filiform, flexuous, almost as long as the asci.

Externally closely resembling *P. diminuta*, Rob., in Desm. Exs. no. 1538, but more shaggy, of a less vinous tint, and with a plane, not concave, hymenium. The asci are larger, and the sporidia, like those of many *Hysteria*, filiform, and not merely oblong as in the *P. diminuta*. The hairs too in that species are strongly pointed, whereas in the present they are obtuse.

562. *P. corticalis*, Pers. Obs. 1. p. 28, et add. p. 112. On bark, Rudloe, Wilts, C. E. Broome.

563. *P. Clavariarum*, Desm. Ann. d. Sc. Nat. ser. 2. vol. viii. p. 8. tab. 2. fig. 1. *P. nigra*, Sow. tab. 307. On decayed *Clavaria*, Rudloe, Oct. 1841.

This species was omitted in the 'English Flora' from want of specimens and sufficient information. It is now inserted with the name given to it by M. Desmazières.

564. *P. mutabilis*, n. s. E macula minuta fusca villosa erumpens; primum hemisphærica extus fusca, demum expansa concava pallide albida glabrescens; sporidiis elongatis curvulis. On leaves of *Aira cæspitosa*, Derry Hill, Wilts, Feb. 1850.

Minute, at first presenting little brown villous specks, from which the cups burst forth. Cups scattered, brown externally, hemispherical, villous, as they increase in size becoming smooth and changing to a dirty white. Sporidia minute, elongated, somewhat curved, containing two nuclei. Endochrome sometimes retracted to either extremity.

We have not placed this curious species amongst the *Tapezia*, as the cups are essentially solitary. When old it bears some resemblance to pale forms of *P. atrata* or *P. palustris*.

565. *P. Chavetia*, Libert, no. 26. "Gregaria sessilis, cupulis minutis membranaceis hemisphæricis concavis tomentosissimis albis basi pilis longis in subiculum instar telæ aranæ intertextis concoloribus; disco subtremelloso fusco-nigrescente; sporidiis globosis." On oak chips, Rockingham Forest.

This species resembles *P. casia*, but is known at once by the yellowish or tawny tint which it assumes in drying.

566. *P. Bloxami*, n. s. Dense aggregata, mycelio niveo insidens; cupulis concavis pallide cervinis extus farinaceis, disco concolore. On fallen branches, Twycross, Rev. A. Bloxam.

Very densely crowded so as nearly to conceal the white cottony mycelium, in which the cups are half immersed. At first globose, white and densely pruinose, acquiring as they expand a pale fawn colour and gradually becoming nearly smooth. Disc fawn-coloured. In dry specimens bundles of the cup are collected in little patches so as to expose the white mycelium between them.

This species has much resemblance to *P. pruinata*, Schwein., but the cups are not black. It cannot be confounded with any other species. We have it from South Carolina.

567. *P. echinophila*, Bull. tab. 500. fig. 1. On fallen involucres of the common eatable chestnut, King's Cliffe : abundant.

568. *P. striata*, Fr. Syst. Myc. vol. ii. p. 122. On dead stems of herbaceous plants : not uncommon.

569. *P. Cacaliae*, Pers. Myc. Eur. vol. i. p. 285. On seed-vessels of *Cheiranthus incana*, Guernsey, Rev. T. Salwey.

570. *P. nitidula*, n. s. Firmula, minuta ; aquose pallida stipite brevi æquali, cupula subhemisphærica irregulari farinacotidula. On dead leaves of *Aira cæspitosa*, Batheaston, Jan. 1850.

Scattered pale watery tan, firm, minute ; stem short, equal ; cup slightly concave, at first subhemispherical, then nearly plane, often irregular, covered with glistening mealy particles. Asci filiform ; spores minute, cymbiform ; endochrome sometimes retracted to either extremity.

Allied to *P. clavellata*, *striata*, *Cacaliae*, &c., but distinguished by its uniformly mealy surface, irregular shape, and depressed, not clavate, cup.

571. *P. Straminum*, n. s. Cupula hemisphærica sessili concava, margine incurvo, extus pallida farinacea, intus carneo-lutea. On the dead sheaths of wheat and other *Gramineæ*, Fotheringhay, King's Cliffe, Norths. ; Rudloe, Wilts ; on *Juncus*, Oxton, Notts.

Minute, not exceeding $\frac{1}{3}$ of a line in diameter ; cups hemispherical, concave, sessile or at length expanded, margin incurved ; externally densely farinaceous, pale ; internally of a pinkish yellow or flesh colour.

A very pretty species, which is distinguished from several allied *Pezizæ* on *Juncus* and *Gramineæ* by its farinaceous, not hairy, coat.

572. *P. caucus*, Reb. Neom. p. 386. tab. 4. fig. 17. *P. amentalis*, Fl. Dan. tab. 2084. fig. 2. On fallen catkins, King's Cliffe.

Our specimens agree exactly with the figure in Pers. Myc. Eur. vol. iii. tab. 30. fig. 2, to which we can find no reference. *Peziza amentacea*, Balb. in Act. Taur. vol. ii. tab. 2 ; Rab. Exs. no. 1019, is probably the same thing, and *Peziza sclerotiorum*, Libert, appears scarcely to differ.

573. *P. helotioides*, Fr. Syst. Myc. vol. ii. p. 135 ; Fl. Dan. t. 1855. fig. 3. On a dead branch, King's Cliffe, Oct. 1837.

Our plant agrees very nearly with that of Schumacher, who has alone described and figured the species. It is however of a dull ochre rather than umber ; the stem is very thick, obconical, and merely a prolongation of the pileus ; the hymenium convex, the asci clavate, and the sporidia oblong, sublanceolate, with two or more nuclei. If it be not the same with that of Schumacher, it is certainly undescribed.

573*. *P. salicella*, Fr. Syst. Myc. vol. ii. p. 133. On willow twigs, King's Cliffe, 1840.

574. *P. rudis*, Berk. in Proc. Nat. Hist. Soc. Berwick, p. 190. Fasciculata turbinato-stipitata hymenio plano hic illic depresso rugoso flavo-fusco subvinoso; externe subtiliter fibrilloso-striata; stipite elongato lacunoso vel striato. On shallow gravel and peat, Pease Bridge Dean, with *Polytrichum aloides*, Dr. Johnston, June 1846. A full description will be found in the place quoted above.

PLATE VI. fig. 13. *a*. Plants of the nat. size; *b*. asci and sporidia magnified.

575. *P. Clavus*, A. & S. p. 306. Apethorpe, April 1841; Hartham, March 1843.

Sporidia regularly oblong, elliptic, with a sporidiolum at either extremity.

576. *P. testacea*, Moug. Fr. El. 2. p. 11. On an old nail-bag, King's Cliffe. Twycross, Rev. A. Bloxam.

577. *P. Sphærioides*, Pers. Myc. Eur.; Desm. Exs. no. 174. On stems of *Lychnis dioica*: very common.

578. *P. cornea*, n. s. Minima gregaria sessilis primum globosa flavo-cornea demum breviter obconica aurantio-fusca. On dead stalks of *Carex paniculata*, Spye Park, March 1850.

Extremely minute, gregarious; at first globose, yellow horn-coloured, then somewhat obconic or turbinate, becoming of a rich orange-brown, sometimes slightly hollow, but more generally flat and granulated; margin rather jagged; sporidia fusiform, slightly curved.

An extremely pretty though minute species, which is, we believe, undescribed, and quite different from anything published by Desmazières.

579. *P. lignyota*, Fr. Syst. Myc. vol. ii. p. 150. On dead wood, Wraxall, Som., Feb. 1845.

Sporidia somewhat resembling those of a *Diplodia*.

580. *Tuber macrosporum*, Vitt. Batheaston and Munro's Wood, near Bristol.

581. *T. bituminatum*, n. s. Uterus niger, globoso-ovatus, regularis, verrucis minoribus polyedris muricatus, basi in foveam excavatus. Venæ leviter cohærentes plerumque e fovea basilari in carnem immissæ. Sporangia ovalia, longe pedicellata. Sporidia fusca, ovata, laxe cellulosa. Odor bituminis et *Cochleariæ armoraciæ* fortissimus.

Closely allied to *Tuber æstivum*, Vitt., but easily distinguished by the odour; it differs also in the general form, being much more regular and the warts smaller, and in the existence of a basal cavity prolonged into the substance of the fungus, which is

thus very light compared with *T. æstivum*, Vitt. The veins cohere very loosely, so that it is difficult to cut the plant in half without breaking it into frustules, which is not the case in *T. æstivum*, Vitt. It shrinks very much in drying: some specimens were attacked by worms, and the flesh of these became quite black when dry. The sporangia have much longer stalks than those of *Tuber æstivum*, Vitt. The sporidia closely resemble those of that species, but are slightly longer compared with their width, and have somewhat shallower cells. It ranges from the size of a walnut to that of a hen's egg.

In deep sand, Bowood, Wilts, Oct. 1847.

582. *T. scleroneuron*, n. s. Uterus rubro-fuscus, cartilagineus, globoso-lobatus, minute verrucosus etiam sublævis, rimis strictis exaratus; venæ irregulares, præruptæ, c rimis et variis peridii puncti exortæ, centrum versus cinereæ, superficie tamen a sporidiis maturis rubro-fusæ. Odor debilis subaromaticus. Sporidia rubro-fusca ovata minute cellulosa.

This species differs from *Tuber rufum*, Vitt., in its firmer cartilaginous texture, deep red-brown colour, in the form of its sporidia, which are ovate, not elliptic-clongate, and in its faint aromatic odour. The venation also is more broken and interrupted. *Tuber rufum*, Vitt., appears to be its nearest ally. When dried, *Tuber scleroneuron* becomes as hard as a piece of wood.

Bowood, Wilts, Oct. 1847.

Onygena apus, n. s. Peridium album, sessile, globosum, mycelio tenui candido insidens, extus tomentosum, gleba matura rubro-fusca. On decaying bones under dead leaves and moss, Bristol, Nov. 1847.

Peridia globose, white, sessile, seated on a delicate white mycelium, about the size of rape-seeds, under a lens tomentose, but even, not rugose; sporidia ovate-elliptic, containing one or two granules colouring the internal mass of a dark chocolate.

Onygena corvina, Alb. & Schwein., an analysis of which is given in the 'Annales des Sciences' for June 1844, closely resembles this species in structure. The only differences apparent are the absence of a stipes, and of the outer stratum of globose cells, as also of the asperities of the surface in that plant.

583. *Patellaria citrina*, n. s. Cupulis planis extus pallidis, hymenio citrino; sporidiis filiformibus. *Ascobolus citrinus*, Chev. Fung. Ill. Fasc. 1. tab. 31. On rose-twigs lying in a running stream, Penllergare near Swansea, M. Moggridge, Esq., April 1847.

Our plant answers exactly in outer appearance to that of Chevallier, having a broad flat yellow hymenium with a pale border. The asci are clavate and contain long filiform sporidia. We suspect that these are what M. Chevallier calls asci, consi-

dering the included granules as sporidia, exactly as Madame Libert has done in *Stictis Sesleriæ*.

We have another pezizæform fungus from Mr. Moggridge also found in water, with no definite margin, of a grayish tint, sparkling from the prominent asci, which contain elliptic sporidia. This curious plant belongs apparently to the genus *Psilopezia*.

584. *Tympanis saligna*, Tode, Fung. Meck. tab. 4. fig. 37. On twigs of privet, Lucknam, Wilts.

A very curious circumstance has occurred in this species, which we presume from Tode's figure to be identical with his plant. In the same hymenium the fruit of a *Diplodia* and that of a *Tympanis* were present. This is somewhat analogous to the occurrence of more than one species or genus in the same spot of *Uredo*, and Fries informs us that he has observed a similar fact in *Hendersonia Syringæ*.

585. *Cenangium Ribis*, Fr. Sc. Suec. no. 131. On dead branches of currant-trees, Thame, Dr. Ayres.

586. *Phacidium Rubi*, Fr. Scler. Suec. no. 56. On dead bramble stems, Twycross, Warwickshire, Rev. A. Bloxam.

The asci, paraphyses and sporidia are just the same as in *P. coronatum*.

587. *Hysterium curvatum*, Fr. *H. elongatum* var. $\beta.$, Fr. El. ii. p. 138. On dead rose and bramble stems, Shrewsbury, Rev. W. A. Leighton.

Certainly distinct from *H. elongatum* in its longer, more delicate spores, in addition to other more obvious characters.

588. *H. commune*, Fr. Syst. Myc. vol. ii. p. 589. On dead stems of herbaceous plants, Bristol, H. O. Stephens.

589. *H. typhinum*, Fr. l. c. vol. ii. p. 590. On *Typha latifolia*, Oswestry, Rev. T. Salwey.

OOMYCES, n. g.

Perithecia erecta in sacculo polito sursum libero recepta; ostiola punctiformia. Asci lineares; sporidia filiformia longissima. Fungus læticolor graminicola insectorum ova referens.

590. *Oomyces carneo-albus* = *Sph. carneo-alba*, Libert, Fasc. 3. no. 241. On leaves of *Aira cæspitosa*, Spye Park, Wilts.

Scattered, shining, pale flesh-coloured, conical, truncate above, and marked with the ostiola, $\frac{2}{3}$ line high. Perithecia 3-7, vertical, closely packed in the common tough receptacle. Asci elongated, cylindrical. Sporidia filiform, extremely long, flexuous.

A very pretty production, which can scarcely be forced into the genus *Sphaeria*. It resembles greatly an *Acrospermum*, though differing completely in structure, and like that genus might easily be mistaken for the egg of some insect, such as *Crioceris*. The structure is not visible until a section be made, except so far

as the perithecia are indicated by the little dimples in the truncate apex.

591. *Hypocrea myrmecophila*, Cesati, Rab. Exs. no. 1033. "Ochroleuca, stipite filiformi tenacello; clavula ovoidea ad basin sterili, superne costata acutiuscula e peritheciis summo ostiolo gibberulosa." Leigh Wood, Somerset, May, on some species of *Ichneumon*.

A single specimen only of this pretty species occurred at Leigh Wood, exactly according with the individuals published by Rabenhorst and others gathered at Breschia by Cesati, communicated by De Notaris.

592. *H. farinosa*, n. s. Late expansa candida, peritheciis confertis hyalinis farinosis. On fallen branches, Milton, Norths., Mr. Henderson; King's Cliffe. A more downy form occurred at Bâch Hall, Chester, on decayed *Stereum*, July 1848.

Spreading for some inches over decayed wood, on which it forms a thin white coat. Perithecia minute, subglobose, hyaline, nearly collapsed in the centre when dry, growing from a white mealy subiculum; at first delicately cottony. Asci filiform, containing sixteen elliptic sporidia.

A very pretty little species resembling *H. hyalina*, but far less compact. The older individuals acquire a dull yellowish tinge.

593. *H. floccosa*, Fr. Summa, p. 564. On *Agaricus torminosus*, King's Cliffe.

594. *H. luteovirens*, Fr. l. c. On *Boletus edulis*, Laxton, Norths.

595. *Sphæria marginata*, Schwein. Journ. of Ac. tab. 2. fig. 8. On wood in the great stove at Chatsworth, Mr. R. Scott.

The wood on which this species was developed had merely been placed in the stove, and was not of foreign growth. The perithecia agree precisely with those of the American species, except that they are somewhat smaller, as are also the sporidia. We have however no doubt about the species, which is very variable, and the sporidia are known to vary in different individuals of *Sphæria* which have been grown under different circumstances. The sporidia are sometimes separated by a globose cell like the connecting cells in *Anabaina*. This structure occurs in other species occasionally.

596. *Sph. coprophila*, Fr. in Kz. Myc. Heft 2. p. 38. *S. incana*, Stephens in Ann. of Nat. Hist. Ser. 1. vol. iv. p. 252. On cow-dung in dense patches, Stapleton Wood, Bristol, H. O. Stephens, Esq.

A very pretty species, much smaller, but resembling *S. confluens*, Tode. Asci clavate; sporidia filiform, flexuous, containing a row of nuclei.

597. *S. confluens*, Tode, Fung. Meck. t. 10. fig. 87. On decayed wood, as oak, willow, &c., near Bristol.

*598. *S. irregularis*, Sow. = *S. gastrina*, Fr.

599. *S. Ulicis*, Fr. in Linn. v. 5. p. 544. On dead branches of *Ulex Europæa*, Penzance, J. Ralls, Esq.

600. *S. podoides*, Pers. Syn. p. 22; Moug. & Nest. no. 1074. On dead branches, Bristol, H. O. Stephens, Esq., Jan. 1845.

Sporidia large, elongated, curved, 6-7-septate.

601. *S. Kunzei*, Fr. in Kze. Myc. Heft 2. p. 45. On fallen branches of larch, Whittering, Norths., March 1850.

602. *S. controversa*, Desm. Ann. d. Sc. Nat. ser. 2. vol. xvii. p. 102; Exs. no. 1255. On dead twigs of ash, *Sophora Japonica*, stems of herbaceous plants, &c.: not uncommon.

Varying somewhat in external appearance on different plants, a greater or less number of perithecia being collected together, and the spots are of a more or less deep black. All however agree in the fructification.

*603. *S. arundinacea*, Sow. t. 336.

An examination of the authentic figured specimen shows it to be identical with *S. Godini*, Desm. no. 439. Unfortunately our specimen of *S. arundinacea*, Desm. no. 438, contains no fructification. It clearly belongs, according to the character given in 'Ann. des Sc. Nat.' ser. 3, Jan. 1846, to the genus *Hendersonia*. The species, however, published under the name as a variety on *Triticum*, no. 1262, contains distinct asci and long curved septate sporidia.

604. *S. caricis*, Fr. Syst. Myc. vol. ii. p. 435. On leaves of *Carices*, West Water, Forfarshire, Mr. W. Gardiner.

*605. *S. phæostroma*, D. R. & M. Fl. Alg. t. 26. f. 2 = *S. tristis* β , Berk. Eng. Fl.

606. *S. exilis*, A. & S. t. 9. f. 4. On pine twigs, Wraxall, Som.

607. *S. ochraceo-pallida*, n. s. Peritheciis ochraceo-pallidis ovatis obtusis, ostiolo minuto papillæformi, ascis clavatis, sporidiis elongatis subfusiformibus triseptatis. On elm branches, Rockingham Forest. Gregarious, scattered or crowded; perithecia pale ochre, ovate, obtuse, with a minute papillæform orifice, more or less collapsed when dry. Asci clavate; sporidia elongated, fusiform when seen from behind, subcymbiform when seen laterally, triseptate.

This was formerly considered as a state of *Sphaeria sanguinea*, but the clavate asci and longer sporidia clearly distinguish it. We do not find any tangible distinction in the fructification of *S. coccinea* and *sanguinea*: in both the asci are linear, and the sporidia elliptic and uniseptate. They vary indeed a little in breadth and length, and perhaps more so in *S. coccinea*, but we have had more specimens to examine of that species. *S. epispheeria* agrees with them in fructification, as does *S. Peziza*. We

take this opportunity of stating that Mr. Thwaites has found both *Stigonema atrovirens* and *mamillosum* in fruit, and in both instances perfect asci and sporidia exist. The genus then does not belong to *Algæ*, but to *Collemals*. It appears that *Sp. affinis* is nothing more than the fruit of the *Stigonema*.

608. *S. muscivora*, n. s. Mycelio effuso niveo lanoso peritheciis congestis aurantiis semi-immersis ovatis; ostiolo papillæformi ascis clavatis; sporidiis breviter fusiformibus. On mosses upon the mud tops of walls in winter, King's Cliffe.

Mycelium forming white lanose patches 2 inches or more in diameter, and rapidly destroying the moss on which it grows. Perithecia collected in little groups more or less connate, half immersed in the mycelium, bright orange, ovate, sometimes collapsing laterally, orifice papillæform. Asci clavate; sporidia elliptic, pointed at either end, with a central septum, and the endochrome in either articulation bipartite, so that there are probably three septa when the sporidia are quite mature.

Readily distinguished by its peculiar habit. The spores differ from those of *S. Peziza*, which collapses more and more regularly. We have this species from South Carolina on *Jungermannia*.

*609. *S. cucurbitula*, Tode.

This is easily distinguished from all similarly coloured species by its asci being filled with numerous minute curved sporidia. In our copy of 'Scler. Suec.' no. 183, it is substituted for *Sph. coccinea*.

610. *S. flavida*, Corda, Fasc. iv. t. 8. f. 117. *Nectria flavida*, Fr. Summa, p. 388. On the decayed trunk of a tree, Leigh Wood, Bristol.

The sporidia of this are totally different from those of *Hypocrea farinosa*, which it resembles much in outward appearance. In the latter they are minute and elliptic, in the present species elongated, fusiform and curved.

611. *S. funicola*, n. s. Peritheciis sparsis aurantiis ovatis sursum attenuatis pilis sparsis brevibus obtusis vestitis; ascis clavatis, sporidiis oblongo-ellipticis triseptatis. On decayed rope, King's Cliffe, Oct. 1841.

Minute, scattered; perithecia ovate, attenuated above, clothed with short obtuse colourless hairs; orifice obtuse, without any distinct papilla. Asci clavate; sporidia oblong-elliptic when seen from the back, subcymbiform when seen laterally. The endochrome is more or less perfectly divided by septa into four parts.

612. *S. papaverea*, n. s. Conferta; peritheciis globosis excepto ostiolo maximo plano orbiculari radiato-sulcato albo velatis areolatis; ore rotundo. On rotten stumps, Batheaston, March 1850.

Widely effused, crowded, springing from a brown mycelium;

perithecia globose, black, finely areolated, covered, with the exception of the orbicular, multisulcate ostiolum, with a white filmy veil. Asci linear; sporidia elliptic, subnavicular, brown.

Of this most beautiful species we can find no trace. Its ostiolum, which resembles the stigma of a poppy, being separated by an abrupt line from the perithecium, is much like that of *S. decipiens*, Dec., though less deeply umbilicated; but the perithecia, though crowded, do not form a confluent mass, but are distinct, not rigid, and far more delicate, not to mention other obvious points of distinction. Its external resemblance to *S. pulvis pyrius* is rather apparent than real; the sporidia in that species are triseptate. This species appears more naturally associated with the *Denudata*, though there is certainly some brown byssoid matter from which the perithecia grow.

PLATE VII. fig. 14. *a.* Plant nat. size; *b.* perithecia as seen from above and laterally magnified; *c.* asci and sporidia highly magnified.

613. *S. appendiculosa*, n. s. Peritheciis sparsis globosis subepidermide nigrefacta polita maculis minoribus orbiculatis centro pertusis nidulantibus; sporidiis ovato-lanceolatis appendiculosis. On dead twigs of bramble.

Perithecia globose, scattered, nestling under small orbicular black shining specks, and penetrating them by the ostiolum, round which there is often a little white meal. Sporidia ovato-lanceolate, at first hyaline with an apiculate process, which gradually separates by a constriction and ultimately falls off.

Resembling closely *S. tomicum*, Lév., but differing materially in the much larger and more highly developed sporidia. *S. clypeata*, Nees, again is externally very close, but the sporidia are triseptate, the endochromes being all drawn from the concave to the convex side. *S. clypeiformis*, De Not., is the same thing. *S. clypeata*, Fries, no. 398, is very different in habit, being much smaller and confluent, with torulose triseptate sporidia. We have also an unpublished species from Dr. Montagne, in which the perithecia are strongly collapsed.

PLATE VII. fig. 20. Asci and sporidia of *Sphæria appendiculosa* highly magnified.

614. *S. culmifraga*, Fr. Syst. Myc. vol. ii. p. 510.

Two very distinct varieties of this species are published by Desmazières. A third has occurred at Rudloe more highly developed, the perithecia crowded and slightly hispid, and the acute ostiola elevating the cuticle. We have seen foreign specimens marked *S. trichostoma*, with the description of which, however, our plant does not agree. In all the three varieties the sporidia are curved, fusiform, and multiseptate, one of the articulations sometimes projecting beyond the rest, like the band on the body of the common earth-worm.

XVII.—On Dr. Nardo's Classification of the Spongiæ, and further notices of the *Spongilla fluviatilis*. By JOHN HOGG, Esq., M.A., F.R.S., F.L.S. &c.

My attention having been lately called to the October Number, 1849, of the 'Annals and Magazine of Natural History,' I read at p. 242, that Dr. Nardo had proposed, at the Scientific Congress held at Lucca in 1843, a new classification of the *Spongiæ*, dividing them into five families, as follows:—

- Family I. *Corneo-spongia*.
- Family II. *Silico-spongia*.
- Family III. *Calci-spongia*.
- Family IV. *Corneo-silici-spongia*.
- Family V. *Corneo-calci-spongia*.

By comparing these with my "proposed divisions of the order *Spongiæ*," published two years before, at pp. 5 and 6 of the September Number, 1841, of the 'Annals and Mag. Nat. Hist.,' it will be seen that Dr. Nardo's classification is in most essentials much the same as mine; the only *new* part appearing to me to be his last or *fifth* family, which I suppose comprises those species wherein horny fibres combined with calcareous spicula may have been detected; and which, at the time of my writing the communication above referred to, were not known to exist, as I have stated at p. 3, from M. Milne-Edwards's observation, and again at p. 6 of the same September Number of the 'Annals.'

On a recent perusal of Mr. Carter's papers on the Freshwater Sponges of Bombay, as reprinted and published in the 'Annals and Mag. Nat. Hist.,' April Number 1848 and August Number 1849, I found that his descriptions are not very clear, but contain some ambiguity and difficulty; and that the author had, during the progress of his examination, changed (as other authors had previously done, when engaged upon the same remarkable and puzzling substances) his opinion respecting their nature. I was however happy in noticing that he had confirmed my accounts in several important particulars, especially with regard to the sporidia or seed-like bodies of the spongilla, to the modes of development and growth from them, and to the power of the sun in turning the yellow sponges green when exposed to his rays.

Following some of the French naturalists, Mr. Carter considers, with them, that the freshwater sponges consist of a congeries of animals identical with the infusorian *Proteus* (April Number 1848, Ann. and Mag. Nat. Hist. p. 310), which is the *Anæba* of Ehrenberg. Now, as I have before remarked (Linn. Trans. vol. xviii. p. 397) that this *Proteus*, or *Amæba*, is an animalcule of complex organization, possessing, according to that

distinguished German zoologist, with other true organs of animals, several stomachs or gastric sacs; so then, before these naturalists shall have decided that the animal-like pieces or fragments of the sponge are in reality infusorian animalcules, it is necessary to prove that these pieces or fragments are such organized beings, and that they are in fact furnished with one or more gastric sacs:—for it is not sufficient to state that they resemble the infusorian *Amœba*.

Every known animal is possessed of a stomach, or stomachical, or gastric sac, and therefore the sponge, or spongilla, if an animal, must of necessity be endued with, at least, one of such sacs,—otherwise it cannot possibly be esteemed as belonging to the animal kingdom. If unfurnished with that organ, it can only be strictly considered as an animal-like being,—*i. e.* one bearing greatly the resemblance of a lower or infusorian animal. Consequently those who assert the affirmative of this question, viz. that sponges are animals, are bound to prove that they are so; for, according to the general rule, the affirmative is alone capable of proof.

Mr. Carter, indeed, having first written (p. 306, April Number 1848, Ann. and Mag. Nat. Hist.), that “as to the animality of the freshwater sponge I think there can be no doubt whatever;” at a later period says (in a subsequent Number, August 1849, p. 98), “Respecting the position which *Spongilla* holds among organized bodies, I feel incompetent to offer an opinion.” But he has previously (in the same paper and Number, p. 82) asserted—“The time appears to have arrived for abandoning the question of the animality or vegetability of *Spongilla*, for the more philosophical consideration of the position it holds in that transitionary part of the scale of organized bodies which unites the animal and vegetable kingdoms.” From this view of the subject I must totally differ, for there surely can be no true philosophy in considering these, or any other like natural bodies, as partaking of both animal and vegetable natures,—that is to say, not strictly pertaining either to the animal or to the vegetable kingdom—yet uniting both, or in a state of transition between the two, or in what may be termed, an *animal-vegetable* province.

If such philosophy be admissible, we may then expect to hear of some natural substances being considered as partaking of, and so uniting, the animal, vegetable, and mineral kingdoms; as for instance, what were formerly named *Lithophyta*, or more fully, *Lithophytozoa*, and therefore to be classed in a new division—the *Animal-vegetable-mineral* province. Thus, instead of three kingdoms in Nature, we should have five; or possibly as some might prefer to style them—three kingdoms and two subkingdoms or two provinces.

Wishing to repeat some of my former experiments on the *Spongilla fluviatilis*, I this summer procured a fine piece growing upon a brick, and kept it in fresh water from July 13 to July 25. Obtaining from it many of the locomotive sporules, I placed some of them whilst they were fresh and in full activity in a little water under the highest power of my microscope; but I could not say positively that their motions were effected by means of cilia. I now, however, strongly lean to that opinion; for I fancied that I could at times, in a strong light, discern some cilia. My microscope is an old one (by Jones), and not having sufficient magnifying power I could not satisfy myself of the presence of cilia: indeed the sporules themselves are so small and delicate that they require much skill in observing, a great light and a powerful microscope to enlarge sufficiently such exceedingly minute organs as cilia, and especially when continuing in rapid motion. So also, the existence of the same organs in other parts of the sponges may probably hereafter be ascertained by the assistance of a microscope of a recent and improved construction.

I have lately been enabled to witness through the microscope the curiously formed spicula much resembling cotton-reels, which were taken from the spicular crust of the sporidium or seed-like body of our freshwater sponge. See Mr. Carter's Pl. III. fig. 6 *f* and *d*, August Number 1849, 'Ann. and Mag. Nat. Hist.'

On again submitting this summer a living mass of the *Spongilla*, placed in fresh water, to the direct and full influence of the sun, I found the same results, which I have before detailed, to occur with regard to the development of the green colour. The same mass, which, as far as I could perceive, was entirely devoid of any Confervæ, or other minute plants growing upon it, likewise gave out in the sun's rays numerous bubbles of gas: many of these I collected with care and put them into a little phial; I then inserted a small lighted taper, which I observed to burn with increased clearness and beauty when it came in contact with the gas derived from those bubbles within the phial; thus showing, as it appeared to me, that the gas so evolved was oxygen.

I may, moreover, mention that the same *Spongilla* was inhabited by a great many of the remarkable green sponge-insects which have been previously described by Mr. Westwood, and which I have usually noticed as accompanying that living substance.

Communications have not long ago been made relative to the powers of "certain sponges" in excavating holes in the valves of shells, which are highly interesting; yet they appear to me to require much further investigation. Can these holes and perforations be chiefly caused by the "sponges," or rather *Cliona* secreting or giving out a strong acid, which, acting on the lime

of valves of the Mollusca, would readily create, or materially assist in creating, such excavations? But I must note, these perforating "sponges" do not seem to be true sponges—merely species of *Cliona*—a genus, according to the accurate accounts of Dr. Grant, Dr. Johnston, De Blainville, &c., belonging to the class Zoophytes, and which is described by them as a polype furnished with about eight short tentacula.

POSTSCRIPT.—In addition to the green insects above mentioned, I observed in July last, numerous other insects, or rather larvæ or *Caddises*, enveloped in cases made of the *Spongilla* itself, and living parasitically on that substance, but which I do not remember to have seen before in any other mass of the *Spongilla*. I preserved several of these in spirits, and recently forwarded them for examination to Mr. Westwood. In a letter, dated February 5, 1851, this gentleman has informed me, that "the second kind is truly a Caddis, and will turn to a species of *Phryganea* or *Mystacida*. It is quite certain that it has no sort of relationship with the former green insects. It would be very interesting if you could observe the *Spongilla* now and at a later period, so as to determine the *pupa* state of these insects, and if possible, to rear them to the perfect state. I have looked carefully over Pictet's 'Researches on the *Phryganidæ*' without being able to find any larvæ precisely agreeing with yours—which are not very remarkable, seeing the peculiar nature of their habitat."

XVIII.—On the genus *Jeffreysia*. By JOSHUA ALDER, Esq.

To Richard Taylor, Esq.

DEAR SIR,

Newcastle, February 13, 1851.

IT is with great reluctance that I again trouble you with any observations of a controversial nature, but in justice to others as well as to myself, I think it necessary to say a few words in defence of a genus of mollusks described by me in Forbes and Hanley's 'British Mollusca' under the name of *Jeffreysia*. An account of the animal on which it is founded was published in the 'Annals of Natural History' for May 1844, when I pointed out the propriety of raising it to the rank of a genus. The same view was taken by Professor E. Forbes, and at his request I drew up the generic characters inserted in the 'British Mollusca'; the privilege of naming it being politely conceded to me as the discoverer. More recently Mr. Clark, in a late Number of the 'Annals,' has redescribed the same animal, and has placed it in his genus *Chemnitzia** (including the *Chemnitzia*, *Odostomia*,

* To avoid circumlocution I shall here use the name *Chemnitzia* in the sense that Mr. Clark takes it, though I do not agree in the propriety of adopting this name for the whole group.

and *Eulimella* of Forbes and Hanley), stating that he can see in it no deviation from the generic characters of that tribe, but "only the specialties of individual animals," and he considers that "the soft parts give such *decisive proofs* of identity with the genus *as to leave no alternative.*" Occasion is hence taken to censure those naturalists who make new genera out of species that have already provided for them "suitable and characteristic generic receptacles." It may therefore be necessary to examine more carefully into the suitability of *Chemnitzia* as a generic receptacle for the species in question, especially as, so far from considering it so, I had previously no idea that any naturalist, who had examined the two, would have placed it even in the same family with that genus.

With respect to the shell, Mr. Clark says, that "the reflection of the apical turn alone would almost have determined him to allocate it in *Chemnitzia.*" I agree with Mr. Clark in the value of this character in determining the genus (or rather family) to which a species belongs. But the question is, has the shell of *Jeffreysia* this character? According to my observations, it has not: and I am supported on this point by the testimony of Mr. Jeffreys, who has stated in the 'Annals' for January last, that he has examined about a hundred specimens without finding such a character in any of them.

We now come to the operculum, which, as I have stated in the description of the genus, is very peculiar. Mr. Clark says that this species has "the *usual* corneous operculum" of *Chemnitzia*; but what that gentleman considers the usual form we have some difficulty in making out from his imperfect descriptions of this part. It may be as well, therefore, to state what the real character of the operculum in *Chemnitzia* is. There are two principal types of form in this part—the spiral and the annular: to these may be added the unguicular, which perhaps may generally be reduced to a rudimentary or abnormal form of one of the others. The operculum of *Chemnitzia* is formed on the spiral type; that of *Jeffreysia* on the annular. These differences will be better understood by giving a figure of each, which I the more willingly do as the operculum of *Chemnitzia* (or *Odostomia*) is not figured in any British work. The spiral form in most of the species is incomplete, consisting of about half a turn, and the nucleus is terminal: in those species where there is a complete volution the nucleus is brought a little nearer the centre, but is never central. The striæ of growth run across the opercular disc, and there is an impressed line down the centre*. Very



C. Rissoides. J. diaphana.

* I have figured the operculum of *Chem. Rissoides*, because Mr. Clark, in describing that species, compares it to the operculum of *Jeffreysia dia-*

different from this is the operculum of *Jeffreysia*. The nucleus is central, or equally distant from both ends, and placed close to the inner margin; and from it concentric lines of growth are seen to emanate. On the side next the pillar there is a strong rib, from which a process rises at right angles to the opercular disc, projecting internally. It is thus noticed by Mr. Clark: "It (the operculum) has marked striæ of increment proceeding from a minute apophysis, which is the nucleus." In what position is not mentioned. That the apophysis or process, which is large in proportion to the disc, is not the nucleus of the operculum, I think any one may satisfy himself by a careful inspection. The nucleus is the point on the side of the disc from which the concentric lines of growth originate. The lines of growth on the apophysis increase in an opposite direction.

We now come to the soft parts of the animal, which, according to Mr. Clark's views, can alone furnish generic characters. The head of *Jeffreysia* is elongated into a kind of muzzle, which is cleft in front and produced into two tentacular processes; the mouth has a pair of denticulated jaws, and a spinous tongue, similar to what is seen in *Rissoa* and other phytophagous gasteropods, to which tribe it belongs. The head of *Chemnitzia* is very short, without muzzle or additional tentacular processes; the mouth has no jaws, but is furnished with a long, retractile proboscis, as in the zoophagous gasteropods; and there are no spines on the tongue, or at least none have ever been detected. The true tentacles in *Jeffreysia* are linear and a little flattened: those of *Chemnitzia* are ear-shaped or longitudinally folded; a peculiarity confined to this group among the testaceous mollusca. The eyes in the latter are sunk in the head at the inner angles of the tentacles, appearing externally as black spots: the eyes in *Jeffreysia* are largely developed, raised on slight bulgings, and placed on the back a considerable distance behind the tentacles. The foot in *Chemnitzia* is furnished with a conspicuous fold on the upper anterior surface, generally bilobed, forming what M. Lovén calls the mentum. The use of this organ is not understood, but in some genera it shows a folliculated structure internally. The mentum is absent in *Jeffreysia*. Mr. Clark, in all his descriptions of the animals of *Chemnitzia*, has made the mistake of taking this organ for the muzzle, and hence his com-

phana, "the nucleus," he says, "being at the centre of the pillar edge." This is not the case in my specimens. Again, in describing another *Chemnitzia*, which he supposes to be my *Odost. nitida* (Brit. Moll. vol. ii. p. 282), Mr. Clark says, the structure of the operculum is altogether similar to that of *Jeffreysia diaphana*. The other part of the description, however, seems to contradict this, as it is stated that "the striæ of increment radiate conspicuously to the outer margin."

parison of it with the elongated muzzle of *Jeffreysia* is quite erroneous.

From this review it would appear that almost every external organ is dissimilar in the two animals: *Jeffreysia* in fact belongs to the family of *Littorinidæ* among the phytophagous gastropods, *Chemnitzia* to the *Pyramidellidæ* among the zoophagous tribes.

In conclusion I would ask, who is most open to censure in this case? The authors of the 'British Mollusca' and myself for having introduced a genus on what Mr. Clark thinks insufficient characters, or that gentleman himself for confusedly mixing up characters essentially distinct?

I am, dear Sir, yours very truly,
JOSHUA ALDER.

XIX.—*Contributions to the Botany of South America.*

By JOHN MIERS, Esq., F.R.S., F.L.S.

COLEOPHORA.

THIS is a new genus evidently belonging to *Thymeleaceæ*, which I established a few years ago, upon some very singular floriferous buds sent to me from Rio de Janeiro by my son, who found them growing upon the trunk of a large and lofty tree in the dense forest that covers the ascent of the Serra d'Estrella, above Iguassù, that being a continuation of the celebrated Organ Mountain range, and not far from Mandioca, a place well known to all botanical travellers as the residence of Baron Langsdorff. Owing to the extreme height of the trunk, its branches were far beyond reach, so that it was impossible to procure a single leaf-bearing specimen. We can hardly imagine that the buds here described form a distinct plant, parasitic upon the lofty tree alluded to, as we have no instance of any such parasiticism in that family; on the contrary, it consists mostly of large trees, and we may conclude from analogy, that these are floriferous buds, emanating from the parent trunk: this is the more probable, from the structure of the involucreting bracts that constitute the buds, which are imbricate upon one another, broad, concave, 4-lobed, destitute of any midrib or nervure, and marked by numerous parallel or radiating veins, somewhat like those seen in the fronds of *Adiantum*; from this, they would seem to partake more of the nature of involucreting bracts than of leaves. The chief peculiarities in its floral structure are the long filiform support of the ovarium, which is inclosed in a tubular petaloid hypogynous nectarium, whence its generic name, from *κολεός*, *vagina*, and *φοπέω*, *fero*. The only instance I can find of any

similar vaginiform tube in this family is in the genus *Erioselena* of Blume.

COLEOPHORA, gen. nov.—*Flores* hermaphroditi. *Perigonium* coloratum, infundibuliforme, tubulosum, imo usque ad medium coarctatum, illic intus hirsutum, fauce extusque omnino glabrum, limbo 4- rarius 5-fido, laciniis acutis, reflexis, margine ciliato-fimbriatis, apice inflexis, per æstivationem alternatim imbricatis. *Stamina* 8-10, exserta, biseriata, 4-5 ad faucem corollæ laciniis opposita, 4-5 paullo inferiora in sinu-bus cum laciniis alterna; *filamenta* brevia, subincurva, inflexa; *antheræ* ovato-rotundatæ, introrsæ, subversatiles, 2-loculares, loculis connectivo crasso dorsali affixis et longitudinaliter dehiscentibus. *Pollen* globosum, reticulatum. *Nectarium* infundibuliforme, coloratum, glabrum, ovarium stipitatum cingens, perigonio dimidio brevius, imo e toro glanduloso parvo basi perigonii adnato ortum, ore 4-fissum, laciniis inæqualibus, linearibus, erectis: *stipes* filiformis, glaber. *Ovarium* oblongum, gibbosum, utrinque attenuatum, pilosum, 1-loculare, 1-ovulatum, *ovulo* anatropo ex apice appenso. *Stylus* erectus, filiformis, ovario æquilongus, glaber. *Stigma* capitatum, inclusum. *Fructus* ignotus.—Arbor *Brasiliensis*, *procera*; *foliis ignotis*, *trunco gemmulifero*: *gemmae aggregatæ, globosæ, e bracteis complurimis imbricatim convolutis*: *racemus glaber, sesquiuncialis, pluriflorus*.

1. *Coleophora gemmiflora*;—*gemmae involucrentis, pisi magnitudine, conglobatis, e cortice ortis, bracteis concavis, suborbiculatis, 4-lobatis, lobis rotundatis, crenato-incisis, 2 inferioribus minoribus, pilosis, fusco-rubris, margine ciliis albidis longis fimbriatis, rachi venisque destitutis, venis creberrimis, e basi subparallelis; racemo sesquiunciali, erecto, glabro, plurifloro; pedicellis alternis, nudis, cum flore articulatis; perigonio aurantiaco; vagina flava.*—In sylvis primævis procul Igassù, Prov. Rio de Janeiro*.

TESSARANDRA.

With the exception of a single instance, recorded by Aublet, all the plants belonging to the family of the *Oleaceæ*, including the *Fraxineæ*, possess unsymmetrical flowers, *i. e.* a small 4-partite calyx, a corolla cleft to the base into four divisions, and only two stamens: it will not therefore excite surprise, if we find a plant offering the normal number of stamens. This indeed occurs in the case of a very pretty shrub that I found near Rio

* A drawing of this plant, with full generic details, will be given in the 'Illustrations of South Amer. Plants,' vol. ii. plate 61.

de Janeiro, for which some years ago I proposed a new genus under the name of *Tessarandra*, from τέσσαρα, *quatuor*, ἀνήρ, *stamen*. Aublet describes his *Mayepea* as having the calyx and corolla of a *Chionanthus*, with four stamens opposite to the petals, an arrangement quite contrary to their usual position, which is alternate with them. In Aublet's figure the stamens are shown to possess a distinct connective, both longer and broader than the anther-cells, a character at variance with the usual structure of the order. This also partly occurs in *Tessarandra*, where the filaments terminate in a fleshy connective exceeding the length of the anthers which are affixed to it on its external face, thus offering another anomaly in their extrorse aspect and dehiscence. It also differs from other Oleaceous genera in its ovarium being seated and partly immersed in a fleshy disc which is adnate upon the torus. In all other essential respects, more particularly in the structure of the ovarium and of the fruit, *Tessarandra* resembles *Chionanthus*, so that it belongs evidently to *Oleaceæ*, and to the tribe *Chionantheæ*.

The following is an outline of its generic features:—

TESSARANDRA (gen. nov.).—*Calyx* parvus, urceolatus, 4-fidus, dentibus obtusiusculis, persistens. *Petala* 4, hypogyna, æqualia, linearia, apice obtusa. *Stamina* 4, æqualia; *filamenta* brevissima, dilatata, extus carinata, petalis alterna et iis basi subconcreta; *antheræ* extrorsæ, 2-loculares, loculis oblongis, appositis, parallelis, ad connectivum crassiusculum angustiozem filamento continuum et ultra eos productum dorso affixis, extus longitudinaliter dehiscentibus. *Ovarium* oblongum, subconicum, toro carnosio imo subimmersum, 2-loculare, 4-ovulatum, ovulis geminis, collateralibus, infra apicem dissepimenti utrinque suspensis. *Stylus* brevis. *Stigma* 2-lobum, lobis crassis, divaricatis. *Drupa* baccata, abortu 1-locularis, 1-2-sperma, *putamine* chartaceo, venoso-striato, *endopleura* tenui, *chalaza* apicali incrassata. *Semina* solitaria, rarius gemina, loculo conformia, exalbuminosa, *cotyledonibus* magnis, carnosis, plano-convexis, *radicula* minima, discoidea, iis immersa, supera. —Arbuscula *Brasiliensis*, *glaberrima*: folia *opposita*, *adpressa*, *sessilia*, *integerrima*, *ovata*; paniculæ *axillares et fere terminales*, *laxe brachiatae*; *pedicellis imò bracteatis*.

1. *Tessarandra Fluminensis*;—foliis sessilibus, ovatis, subcordatis, apice obtusis et emarginatis, decussatis, erecto-adpressis, coriaceis, venis prominentibus, subtus glaucis, ad axillas venarum barbatis, rachi prominente basi nodoso-incrassato; calyce extus pubescente, dentibus ciliatis, intus nervo prominente pilosulo; petalis luteo-viridescentibus; bacca majuscula, violacea.—Rio de Janeiro, v. v.

This is a small tree with dense opaque foliage, which I found growing upon the Morro Flamengo, a hill at the point of Botafogo Bay, near Rio de Janeiro. Its opposite leaves are erect, almost adpressed to the stems, sessile, ovate, somewhat cordate at base, rounded, with a small emarginature at the summit; they are 2 to $2\frac{1}{2}$ inches long, and $1\frac{1}{2}$ to 2 inches broad, with internodes distant $\frac{1}{2}$ to $\frac{3}{4}$ of an inch; they are thick and coriaceous, the upper surface dark green, rather polished, with raised venations, and a minute pubescence scarcely visible by the naked eye; beneath they are of a pale glaucous green, the midrib being thick and prominent, and tumid at base; a tuft of hairs adjoins the midrib at the base of each nerve. The inflorescence is generally terminal in the branchlets, in the axils of the young leaves, in slender panicles about 2 inches long, with oppositely divaricating bracteated branchlets; the pedicels being very short and square, with a small oblong, concave, reflected bract at base, with ciliated margins. The persistent calyx, scarcely a line in length, has a short cup-shaped tube, rising from a small fleshy torus, with its border divided into four unequal, rather obtuse, erect segments, the two lateral ones being somewhat broader; these have on the inner face a very prominent midrib, which, as well as the margin, is beset with white ciliate hairs. The corolla consists of four alternate equal, linear, white, revolute petals, with a rounded apex and an inflected margin, about half an inch long and 1 line broad. The stamens are very small, barely a line in length; the filaments being very short, broad, fleshy, expanding at the base, and though free, form a sort of hypogynous tube around the ovarium and within the base of the petals, with which they alternate; they terminate in a fleshy connective that exceeds the anthers, forming an obtuse appendage at their summit; the anthers are coriaceous, oblong, with two distinct parallel cells fixed at the back of the connective, the dehiscence being thus extrorse, by a longitudinal fissure in each cell; the pollen is minute, yellow, granular, and marked with rounded prominences at triangular distances. The ovarium is oblong, 2-grooved, 2-celled, the cells being lateral and opposite the broader segments of the calyx, each containing two ovules, suspended collaterally on the dissepiment a little below its summit. The style is very short and thick, terminated by a stigma, with two fleshy, obtuse, divaricate lobes. The berry is dark purple, oval, about $\frac{3}{4}$ of an inch long and $\frac{5}{8}$ of an inch in diameter, with little pulp, inclosing a single coriaceous putamen, marked outside by several reticulated venous threads, branching from the base; it contains two seeds, which are often unequal in size, without any intervening dissepiment, or sometimes only one by abortion; the testa is thin, brown, with a slender adhering integument, and marked with a

small chalaza on the apex over the radicle; the cotyledons are large and fleshy, filling the entire cavity of the testa, flat within and convex without; the radicle is superior, very short and small, and appears like an umbilicate disk. The plant in Gardner's Brazilian collection, no. 760, is identical with the above*.

APTANDRA.

The last collection of Mr. Spruce from the neighbourhood of Obidos, on the river Amazon, contains among many very interesting plants one of very singular and anomalous structure. It is arborescent, with slender, smooth branchlets and somewhat copious foliage, its leaves being alternate, smooth and petioled, but without stipules. Its inflorescence is axillary, in long slender branching panicles, the flowers numerous and minute, each being supported upon a long filiform ebracteated pedicel. The calyx is a short fleshy cup, quite free, with four short teeth, and hence almost quadrate. The corolla consists of four fleshy, linear petals many times longer than the calyx, with their apex enlarged by a concave pointed expansion, valvate in æstivation, forming in bud a clavate head, surmounting a terete cylinder; this at first opens like four reflexed valves, showing the anthers, but they gradually separate to the base, becoming coiled and revolute, like the corolla of a *Hamamelis* or a *Chionanthus*. The stamens consist of a thick, fleshy, cylindrical tube, nearly the length of the corolla, which has a clavate globular head, exhibiting the anthers, arranged externally upon this, almost solid, fleshy, globular connective; this has a very narrow orifice, and is perforated down the middle for the style and stigma, which are closely embraced by it. The anther-cells, eight in number, and equal in size, are imbedded upon the external face of this connective, forming an annular ring, each cell opening extrorsely, by the separation of its external membranaceous valve, which remaining hinged at its base opens from top to bottom, and thus all become alike permanently reflected. The pollen is composed of white farinaceous granules, somewhat aggregated, and inclosed in the inner imbedded valves of the anther-cells; examined under a microscope every granule is singularly cruciform, each arm being terminated by a small rounded extremity, with a similar globular elevation in the centre. Four small, fleshy, very distinct and free hypogynous scales invest the base of the staminal tube, and intervene between it and the petals, with which they alternate; they have a rounded and submarginated summit, are striately grooved and marked on both sides with lines of inter-

* A figure of this species, with generic details, will be shown in the 'Illustrations of South Amer. Plants,' vol. ii. plate 62.

mingling red spots. The ovarium is oblong, seated on a short stipitate support, is somewhat conical and compressed, with a groove along each flattened side, the style being continuous with its apex, and surmounted by a compressed, obtuse, oblong stigma, which is closely invested by the globular connective, so that it is difficult to extract it without breaking the style. The ovarium is unilocular at its summit and bilocular at the base, the incomplete dissepiment corresponding with the grooves; a single ovule is suspended in each cell from the summit of the flattened axile placenta, which is an extension of the half-dissepiment, and each ovule appears enveloped by a distinct membrane, which is marked on its dorsal face below the middle with short parallel lines of reddish dots; the lower part of the style, for the third of its length, is hollow, this vacuity being an extension of the unilocular space in the summit of the ovarium, showing distinctly that there exists no direct communication between the placenta and the style. The fruit is yet unknown, but the calyx evidently enlarges considerably, and the pedicel lengthens with the growth of the ovarium, as in *Heisteria*. These characters, of which the following is a diagnosis, evidently belong to no known genus: I therefore propose for it the name of *Aptandra*, from ἀπτω, *necto*, and ἀνήρ, *mas*, on account of the very curious union of the stamens into a single organ.

APTANDRA (gen. nov.).—*Calyx* brevissimus, patelliformis, 4-sulcatus, 4-dentatus, carnosus, fructu augescens. *Petala* 4, æqualia, calycis lobis alterna, carnosula, lineari-lingulæformia, summo latiori concava, apiculo inflexo, æstivatione valvata, demum spiraleriter reflexa. *Squamæ petaloideæ* 4, liberæ, crassæ, rotundatæ, petalis alternæ, inter eadem et tubum staminalem sitæ. *Stamen* integrum (forsan e quatuor staminibus coalitis, petalis exterioribus oppositis compositum), cylindraceum, longitudine corollæ, tubo tereti, carnosus, pistillum presse cingente; *antheræ* ex loculis 8, oblongis, æqualibus, arcte in anulum extrorsim dispositis et in connectivum fere globularem crasso-carnosum, summo pervium immersis, singulatim valvula exteriori membranacea ab apice ad basin valvatim soluta, et hinc diutine omnino reflexa. *Pollen* subfarinaceum, cruciformi-lobatum, granulis amplis. *Ovarium* conico-oblongum, subcompressum, 2-sulcatum, imo biloculare, summo uniloculare, loculo cum cavo styli longe continuo; *ovula* in loculis solitaria, anatropa, obovata, apice placentæ centralis liberæ dissepimento adnatæ utrinque suspensa. *Stylus* filiformis, erectus, longitudine fere staminis, imo conicus et cavus. *Stigma* oblongum, compressum, obtusum, inclusum. *Fructus* ignotus.—Arbor *biorgyalis*, *Amazonicus*, *glaber*; folia *alterna*, *elliptica*, *penninervia*, *reticulata*,

petiolata, exstipulata; inflorescentia *dichotome paniculata, axillaris, multiflora*; pedicelli *filiformes, subumbellatim aggregati, uniflori*; flores *minimi*.

1. *Aptandra Spruceana*;—foliis ellipticis, subreflexis, apice subito attenuatis, utrinque glabris, subtus punctis minutissimis lentiginosis et pellucidis notatis, rachi nervisque rubentibus; paniculis folio 3-plo brevioribus, pedicellis gracilibus, subfasciculatis, in fructu valde elongatis et crassioribus; bracteis linearibus e dichotomiis minutis et caducis.—Fluv. Amazonicus circa Obidos (Spruce)*.

I have little to add to the previous description, except that the leaves are about $1\frac{1}{2}$ inch apart, $4\frac{1}{2}$ inches long, $2\frac{1}{4}$ inches broad, on a reflexed petiole of $\frac{1}{4}$ inch in length; they are thin in texture, with the margin turned back, especially toward the base, somewhat polished above, dull and pale beneath. The inflorescence, about 2 inches long, throws out four or five lateral branches, which are again dichotomously divided, each branchlet having a number of very fine filiform pedicels almost umbellately fasciculated, about 3 or 4 lines long, which subsequently grow to the length of an inch, and probably much longer when the fruit is matured; the flowers are $1\frac{1}{2}$ to 2 lines long, and $\frac{1}{3}$ of a line in diameter before opening. I may here add an observation relative to the stamen, which has eight equal anther-cells: now as the calyx, corolla and petaloid scales are all 4-merous, it is to be presumed that this staminal organ is composed of four united stamens, each with two anther-cells, placed opposite to the petals, and alternate with the intervening petaloid scales and the teeth of the calyx; and this is further proved by the fact, that no one anther-cell is exactly opposite to or alternate with the petals, but two cells are situated before each petal.

From the foregoing details it will be seen that the exact position of *Aptandra* in the system is not easily determinable. At first view, from the very peculiar structure of the stamens, it seems to approach *Cissampelos*, but independently of other circumstances, one fact, that of a simple biovular ovary, at once excludes it from the *Menispermaceæ*.

The several families included in the *Columnifera* of Endlicher, viz. *Sterculiaceæ, Büttneriaceæ, &c.*, present the analogy of their filaments being more or less coherent at base into a hypogynous tube; but there, a portion of the filaments is always free, as are also the anthers, which are very differently constructed, besides which, the ovary consists of numerous carpels, united round

* A representation of this plant, with generic details, will be given in the 'Contributions to Botany, Iconographic and Descriptive,' vol. i. plate 1.

a central axis, upon which ovules more or less numerous are attached by their ventral face; there also, for the most part, the corolla has a torsive or imbricated æstivation, and in their general habit they do not agree.

In like manner, the *Meliaceæ* present stamens, formed of a cylindrical tube, but this is many-toothed at its apex, and the 2-celled anthers, double the number of the petals, are quite distinct, affixed within the mouth of the tube, and burst introrsely by longitudinal fissures. They have also a free calyx, but its segments are distinct and imbricated. The corolla consists of four or five petals, sometimes valvate in æstivation, though often imbricated, but they have no indication of any such petaloid scales as are seen in *Aptandra*. The ovarium is frequently stipitate, but most generally is imbedded at base in a fleshy cup; it is plurilocular, with two or more ovules in each cell. The style is simple and the stigma clavate. Here are therefore some few points of resemblance, while others are again at variance with *Aptandra*, the general habit of which does not at all conform with the *Meliaceæ*, which, for the most part, have pinnated or bipinnated, and often dentated leaves.

In the *Humiriaceæ* we do not find any satisfactory analogies, for although the stamens there are partly monadelphous, or rather polyadelphous at base, and the anthers have a large fleshy connective, there is nothing approximative in the structure of these organs to what we find in *Aptandra*. The calyx consists of distinct sepals, which are decidedly imbricate, and the petals have a twisted, imbricated, and almost convolute æstivation: the nectary is tubular, investing the base of the ovarium, is thin and membranaceous, and is interior with respect to the staminal tube, and bears no analogy with the petaloid scales of the genus under consideration. The ovarium is 5-celled, with two superimposed ovules in each cell, attached to a central point of an axile column, which point enlarges to form a transverse spurious dissepiment across each cell; and finally, their leaves are very thick and coriaceous.

The *Hamamelidaceæ* offer several strong points of resemblance, more especially in having four linear petals, which, when expanded, are in like manner spirally revolute; the anthers sometimes open by deciduous valves, they have an ovarium with two suspended ovules, and they possess also four hypogynous scales. But the ovarium is bilocular, and is decidedly adnate to the tube of the calyx, so that it is two-thirds inferior; the calycine segments are large in proportion; the æstivation of the corolla is torsively imbricate; the ovules are in most cases several in each cell, although only one is generally matured, or when single they are suspended from the apex: there are two distinct styles; the

hypogynous scales are not exterior to the stamens, but alternate with them, forming one common whorl; the anthers are introrse and somewhat 4-celled, and their mode of dehiscence, although sometimes valvular, is very different, and finally the leaves are furnished with stipules.

In *Bruniaceæ* we meet with extrorse stamens, but they offer few other points of analogy; the ovarium is there inferior, and they have quite a different habit.

The *Alangiaceæ* present some few points of resemblance, in the form and æstivation of their corolla, in the union of the anthers into a tube, and in their ovarium with two suspended ovules; but the calyx is wholly adnate with the ovarium, the filaments are free, the introrse anthers burst by longitudinal slits, and the ovarium is distinctly bilocular.

The *Oleaceæ*, especially *Chionanthus*, *Linociera*, and *Tessarandra*, offer some degree of similitude, in the form of the calyx and corolla, but their ovarium is bilocular, the ovules are placed collaterally in pairs in each cell, the stamens are few and free, they want the petaloid scales, and finally they have opposite leaves.

Leonia presents stamens with the filaments united at base, but the tube thus formed is adnate upon a gamopetalous corolla, and the structure of the anthers is wholly different.

The same objections may be offered to the *Styraceæ*, although they have often extrorse stamens.

The anomalous genus *Diclidanthera* has its anthers furnished with reflexed valves, which, as in *Aptandra*, open from the top to the bottom; but they are introrse, and by the adhesion of the filaments to the petals, appear sessile in the mouth of a gamopetalous corolla, and it offers otherwise few analogies.

There are some points of accordance in the *Sauvagesiaceæ*, in their internal row of petaloid scales, sometimes combined into a tube, and in having the stamens opposite to the petals. The anthers are extrorse, and even confluent into an incomplete tube in *Luxenbergia*; there exists also some analogy in their ovarium being 3-celled at base and unilocular at summit, but they differ in their imbricated calyx and corolla, distinct stamens, the parietal placentation of the ovarium, and their remarkably stipulate leaves. *Luxenbergia* however is placed by M. Planchon, with much reason, among the *Ochnaceæ*.

The *Olacaceæ* present many strong points of resemblance, for we have there, as in the genus under consideration, a small calyx with minute teeth, equal in number to the petals, which are generally four in number, often linear, of thickened texture, and valvate in æstivation; they have also free appendages of various forms alternating with the stamens; these last-mentioned organs

are frequently monadelphous at base; they have an ovarium wholly superior in regard to the external calyx, often stipitate, and sometimes presenting two suspended ovules; the inflorescence accords, and the pedicels have deciduous bracts at their base; and the leaves are alternate with similar venation. Added to these, it appears that in *Aptandra* the pedicel lengthens and the calyx enlarges with the growth of the ovarium after impregnation, as in *Heisteria*, and the resemblance in size and shape of its flowers to those of *Gomphandra* is very remarkable. But on the other hand, in *Olacaceæ*, the appendages are evidently sterile stamens, and in no degree partake of the nature and position of the petaloid scales of *Aptandra*; the stamens are very differently constructed, the filaments are always separated from each other, often indeed more or less slightly agglutinated to the corolla, the bilobed anthers are distinct and introrse, and never open by reflected valves, and the structure of the pollen is very different; the fully developed disk, that generally forms so striking a feature in that family, is also wanting in *Aptandra*. In *Olacaceæ* we find the flowers generally issuing from bracteated, imbricated buds, but in *Aptandra* we see nothing of this kind. In the internal structure of the ovarium of this genus a considerable difference is there seen from that existing in most of the genera of the *Olacaceæ*. In the former the pericarpial covering is so very thin and transparent, that by transmitted light its internal structure may easily be distinguished, and the vacuity in the conical base of the style is thus seen to be continuous with the cell of the ovarium, in the upper part of which the apex of the placenta is there seen to be quite free. In most of the genera of the *Olacaceæ* the ovarium is half enveloped by, and is partially adnate to a fleshy cup-shaped disk, which rises to half the height of the ovarium, and which supports the stamens and corolla, while the upper moiety of the ovarium is surmounted by a very thick fleshy gland, but no trace of any such hypogynous disk or epigynous gland is visible in *Aptandra*. In the internal structure of the ovarium it presents however one of the strongest points of approach to the *Olacaceæ*, but it must be remembered that such a structure is not peculiar to that family, for it is found to exist equally in the *Santalaceæ*, *Styraceæ* (excluding of course *Symplocaceæ*), *Ebenaceæ*, *Myrsinaceæ*, and *Theophrastaceæ*. We must therefore look to this general character of an unilocular ovarium, with a central placenta wholly distinct from the style, and more or less free or combined with spurious dissepiments, as belonging to a class composed of several orders, just as we unite into groups or classes, numerous other families, possessed of a bilocular or plurilocular ovarium, and others again that are unilocular with parietal placentations; and it does not follow, that

we must associate other plants in *Olacaceæ*, merely because they have an ovarium constructed in a somewhat similar manner. The existence of an inner whorl of petals, the union of the stamens into a thick columnar tube, the anthers imbedded extrorsely in an annular and almost globular fleshy connective, the peculiar mode of the dehiscence of the anther-valves, the curious structure of the pollen, the absence of the deep hypogynous disk and of the thick epigynous gland, are points quite at variance with all we find in the *Olacaceæ*, where we meet with nothing in the smallest degree analogous to the very peculiar features that mark *Aptandra*. However striking its points of approach, it is evident that this genus cannot be referred to that family, although its position in the system may be proximate.

There is yet another group of plants offering some features of resemblance, to which it is worth while to direct our attention; I mean the *Canellaceæ* of Von Martius, the characters and real affinities of which are yet too imperfectly understood. It consists of three genera, all with their stamens united into a tube, as in *Aptandra*, and with extrorse anthers, although the cells are said to open longitudinally, but they vary greatly in their other characters, and evidently belong to three several families. *Platonia* is clearly referable to the *Guttiferae*, with which it agrees in having opposite leaves; *Canella* probably has a considerable affinity with the *Humiriaceæ*; and *Cinnamodendron* (the *Canella axillaris*, Mart. Nov. Act. 12. tab. 3) may perhaps be found to be allied to *Aptandra*, for besides its synantherous stamens, it has a similar whorl of petaloid scales intervening between the staminal tube and the petals.

Hornshuckia has also a small truncated calyx, a corolla of six petals in two series, the inner smaller and carinated, extrorse stamens, and a 3-locular (?) ovarium, with a single ovule in each cell.

Much will depend upon the structure of the fruit and seed before any final decision can be made in regard to the nearest affinities of *Aptandra*, but taking the above-mentioned facts into consideration, we may draw the legitimate inference, that if, from its indubitably peculiar characters, it be considered as the type of a yet unknown group of plants (*Aptandraceæ*), it may probably find its station, in the arrangement of Endlicher, following the *Berberidaceæ*, taking its rank among that portion of the polypetalous *Thalamifloræ*, with the segments of the corolla often in more than one series, and with an ovarium composed of two or more united carpels, and with one or few ovules attached to a placenta of somewhat gynophorous origin. It would thus stand at no great distance from the *Menispermaceæ*, which it resembles in its synantherous stamens with extrorse anthers and scale-like

inner row of petals; not very far from the *Anonaceæ*, because of their 2-seried petals, with valvate æstivation and extrorse stamens; and near the *Berberidaceæ*, on account of their corolla in two series, of the valve-like dehiscence of their anthers, which are also extrorse, their stipitate ovarium, entire style and stigma, and the structure of the seed and embryo.

In this same projected division, it appears to me, some other groups will before long find their place, and will thus mark a better gradation, and form a more complete link between the *Polycarpicæ* of Endlicher and those syncarpous orders with simple series of floral envelopes, which now exhibit too wide a space of transition between them. These will probably form a distinct class (*Coniospermæ* from the development of the ovules on a central and more or less columnar placenta) intermediate between the *Polycarpicæ* and *Rhœades*, and into it will enter more naturally the *Berberidaceæ*, which in truth are never polycarpic, for they have generally a solitary unilocular ovarium, with the placenta either central or by partial suppression, adhering parietally to the sides of the cell. We may consider this alliance as presenting a development of one or more carpellary leaves, with the sterile margins often somewhat partially introflexed, so as to form spurious dissepiments, and the ovuliferous placenta emanating from their basal or hypothetically petiolar supports, and united in a basal or columnar trophosperm. In this respect, it will be seen to be an intermediate stage of development between the *Polycarpicæ* and the *Rhœades*, in which last class the margins of the carpellary leaves are placentiferous, and there simply united together, and being elevated on their petiolar supports, thus form a distinct gynophorus: they offer some analogy with the Gynobasic classes, which at the same time exhibit a gynophorous origin, with the axile union of the introflexed placental margins of the carpels. In the class I have here suggested, the *Olacaceæ*, *Styraceæ*, *Ebenaceæ*, *Myrsinaceæ*, &c. may probably find a better position than the stations assigned to them in most of the modern systems of arrangement, and I shall take an early opportunity of demonstrating the facts, and offering the reasons, upon which such an opinion is grounded, as I propose soon to publish the description of several curious genera belonging to the *Olacaceæ*, *Styraceæ*; &c.

XX.—*Descriptions of some new species of Exotic Homopterous Insects.* By J. O. WESTWOOD, F.L.S. &c.

THE following descriptions were forwarded some months since by me to Dr. Schaum for his memoir on the family *Fulgoridæ* in Ersch and Gruber's 'Encyclopadie.' As however that memoir

was restricted by its authority to a summary of the already published species, I have thought it better to forward them to the 'Annals of Natural History' than to allow them to remain any longer in my portfolio.

Genus *CYSTOSOMA*.

Subgenus *Chlorocysta*, Amyot, MS. in Coll. Jard. des Plantes.

Differt e *Cystosoma typica* (*C. Saundersii*) cellulis alarum anticarum minus numerosis, scil. serie unica cellularum 10 inter cellulas magnas 5 basales et cellulas 13 longas apicales. Aliter simillima.

Cystosoma (Chlorocysta) vitripennis, W.

C. pallide flavescenti-virescens, alis omnibus pellucidis vitreis viridi tinctis, abdomine maximo inflato, tympanis transverse sulcatis.—Long. corp. unc. $1\frac{1}{6}$. Expans. alar. antic. unc. $2\frac{1}{2}$.

Hab. in Nova Hollandia (M. Verreaux). In Mus. Jard. des Plantes, Paris.

Aphana sanguinalis, W.

A. sanguinea, capitis rostro filiformi recurvo supra prothoracem recumbenti, nigro; alis anticis nigro maculatissimis, costa maculis circiter 10 majoribus quadratis, apicibus castaneis immaculatis; alis posticis albo-farinosis, maculis apicibusque pallide albidis; abdomine supra dense albo farinoso, corpore toto subtus cum promuscide sanguineo; tibiis tarsisque 4 anticis nigris. *A. discolori* Guer. proxima. Expans. alar. antic. unc. $2\frac{1}{2}$.

Hab. in insula Ceylon. D. Templeton.

Aphana Madagascariensis, W.

A. capite thoraceque fuscis; abdomine lato sanguineo, capitis rostro tenui, oblique porrecto, apice acuto, capite fere duplo longiori; alis anticis fulvo-fuscis maculis numerosis parvis nigris, singula punctum album includente, tertia parte apicali immaculata; alis posticis rufo-fulvis, apice externo, limbo tenui maculisque tribus discoidalibus nigris.—Long. corp. cum rostro fere unc. 1. Expans. alar. antic. unc. $2\frac{1}{2}$.

Hab. in insula Madagascar. In Mus. Jardin des Plantes, Paris.

Eurybrachis crudelis, W.

E. pallide fusco-albida, alis anticis dilatatis margine antico sinuato, venis obscurioribus, strigis punctisque numerosis minutissimis nigris; alis posticis niveis, dimidio basali coccineo, maculisque tribus nigris rotundatis, prope marginem apicalem; pedibus corpore concoloribus, tibiis dilatatis, nigro parum irroratis, posticis interdum nigris; promuscide ad pedes intermedios tantum extensa. *E. insigni*, Westw. (Hope, Linn. Trans.) proxima. Expans. alar. antic. unc. 2.

Hab. in insula Ceylon. D. Templeton.

Omalocephala morosa, W.

O. capite et parte antica thoracis obscure luteis, hujus parte postica

et abdomine nigris, segmentis sanguineo marginatis; alis anticis sordide rufo-luteis, nigro irroratis, costa flavicanti, maculis 5 nigris; alis posticis sanguineis apicibus nigris, pedibus obscure carneo-fuscis, abdomine subtus flavo, maculis lateralibus nigris.—Expans. alar. antic. unc. $1\frac{1}{4}$.

Hab. apud Portum Natalensem Africæ merid. Mus. Brit. et Westwood.

Derbe substrigilis, W.

D. luteo-fulva, segmentis abdominis carneo marginatis, prothorace utrinque pone antennis macula sanguinea, mesonoto punctis duobus fuscis utrinque ad basin alarum; alis flavescenti-albidis, costa anticarum magis flavescenti, venis anticis sanguineis, reliquis castaneis, strigis nonnullis tenuissimis fuscis in cellulis basalibus et postcostalibus alarum anticarum, alis posticis venis minus numerosis quam in *D. semistriata* et *strigipenni*; cellula antica elongata venas duas simplices (anteriore haud furcata) emittente; cellula postica etiam venas duas simplices ad apicem emittente; pedibus gracillimis, pallide concoloribus.—Expans. alar. antic. unc. $1\frac{1}{6}$.

Hab. in Brasilia. Mus. D. W. W. Saunders.

Derbe (Phenice) mæsta, W.

D. nigra albo-variegata, capitis carina angusta frontali antennis et promuscidis articulo penultimo albis; mesonoti carinis tribus tenuissimis margineque postico in medio latiori albis, pedibus albis, alis anticis nigris, costa dimidioque postico albo maculatis, posticis infumatis; cercis analibus lateralibus maris rectis apicibus incurvis et acuminatis.—Expans. alar. antic. lin. $6\frac{1}{2}$.

Hab. in India orientali (DD. Downes et Boys). Mus. Westwood, &c.

Derbe (Phenice) tessellata, W.

D. piceo-nigra albo-variegata, carina angusta faciei, antennis et promuscidis articulo penultimo longo albidis, mesonoto glabro carinis tribus gracillimis margineque postico albidis; alis omnibus nigris albo valde tessellatis, anticis plaga magna communi triangulari alba versus basin marginis interni; cercis lateralibus analibus maris curvatis apice clavatis spinaque interna brevi terminatis.—Expans. alar. antic. lin. $6\frac{1}{2}$.

Hab. in Sierra Leone. Mus. Westwood.

Derbe (Phenice?) biclavata, W.

D. luteo-albida, antennis brevibus, carina occipitali acute bifida, mesonoti carina acuta media fusciscenti; alis anticis luteo-hyalinis, costa tenuissime nigro-marginata, apiceque luteo parum tincto; alis posticis hyalinis fusco fasciatis, abdomine stylis duobus elongatis clavatis erectis terminato; pedibus luteo-albidis; femoribus nigro-striatis.—Expans. alar. antic. lin. 9.

Hab. in Africa tropicali. Congo. Mus. Brit.

Derbe (Phenice?) dilatata, W.

D. nigra, luteo-varia, antennis perbrevibus; carina occipitali pronon-

toque tenuissime luteo-marginatis, mesonoto carinis tribus tenuissimis luteis; alis anticis subhyalinis basi fuscis striga prope costam lutescente maculaque parva ovali prope basin hyalina, costa basi rotundato-dilatata, costa lutescenti guttis 13 minimis nigris marginalibus, nubila parva ante medium punctoque parvo in loco stig-matis fuscis; alis posticis subfalcatis nigris punctis duobus costalibus hyalinis; femoribus anticis luteis, tibiis tarsisque fuscis; femoribus posticis basique tibiarum piceis, harum apicibus, tarsisque albidis, promuscide luteo, basi macula magna nigra.—Expans. alar. antic. lin. 6.

Hab. in Sierra Leone. Rev. D. F. Morgan. Mus. Brit.

Derbe (Phenice?) carnosa, W.

D. tota luteo-carnosa, tibiis 4 anticis fuscis, alis flavido-hyalinis margine costali pone medium anticarum margineque externo posticarum fuscis, his puncto medio nigro; articulo apicali promuscidis nigro, cercis analibus maris elongatis curvatis forcipatis; abdomine foeminae cornubus duobus porrectis terminato.—Expans. alar. antic. lin. 7.

Hab. in India orientali (DD. Downes et Boys). Mus. Westwood, &c.

Derbe (Thracia) Essingtonii, W.

D. luteo-fulva pronoti lateribus albo-granulatis, mesonoto carinis tribus angustis pallidis, scutello albedo, abdominis segmentis intermediis piceis albedo-granulatis, pedibus albidis; alis anticis fusco-albidis fusco-maculatis, costa alba puncto majori ante apicem, maculaque obliqua apicali fuscis, antennis rufescenti-granulatis.—Long. corp. lin. 2. Expans. alar. antic. lin. 11.

Hab. in Nova Hollandia apud Portum Essingtonii. Mus. Westwood, &c.

Derbe (Thracia) Pterophoroides, W.

D. fusco-albida luteo-tincta, carina faciei et basi promuscidis fusco al-bidoque irroratis, antennis fusco-granulatis, pronoti lateribus deflexis, al-bido-granulatis, mesonoti carinis tribus fuscis al-bido irroratis fasciaque media transversa abbreviata albida, abdomine concolori al-bido-granulato; pedibus, promuscide et alis anticis obscure albidis, his maculis fuscis minutissimis undique variegatis strigaeque obliqua majori apicis alteraque angustiori abbreviata obliqua in medio marginis interni, nigricantibus.—Expans. alar. antic. lin. 14½.

Hab. in Insula Ceylon. D. Templeton.

XXI.—Notes on Chalcidites, and Descriptions of various new species. By FRANCIS WALKER, F.L.S.

[Continued from vol. v. p. 133.]

Encyrtus Petitus, fem. Flavus, antennis apice fuscis, alis vix ullis.

Body pale yellow: head and chest convex, dull, very finely sha-greened: head short, broad; crown convex: feelers clavate, shorter

than the body; first joint long and slender; second long cup-shaped; third and following joints successively increasing in breadth; club pale brown, elliptical, much broader than the ninth joint and more than twice its length: chest short, broad: abdomen nearly round, smooth, shining, depressed, rather shorter and narrower than the chest: legs pale yellow, of moderate length: wings rudimentary. Length of the body $\frac{1}{3}$ line.

Ireland. In Mr. Haliday's collection.

Myina annulipes (Haliday MSS.), mas. *Lutea, pedibus flavis, mesotibiis apice nigris, alis limpidis.*

Body luteous, linear: head and chest convex, slightly shining: head as broad as the chest: abdomen obconical, depressed, apparently quite sessile, a little shorter than the chest: eyes and eyelets pitch-colour: feelers luteous, filiform, a little longer than the body; first joint yellow, long and slender; second short; third, fourth and fifth long; sixth spindle-shaped, a little longer than the fifth: legs yellow; tips of middle shanks black: wings colourless; veins yellow. Length of the body $\frac{1}{4}$ line; of the wings $\frac{1}{2}$ line.

Found at Holywood. In Mr. Haliday's collection.

Myina livens (Haliday MSS.), fem. *Corpore antennisque lividis, pedibus flavis, alis sublimpidis.*

Body narrow, smooth, shining, pale tawny: head a little broader than the chest, prominent in front, marked above with brown: eyes dark red: feelers clavate, very pale tawny, rather longer than the chest; first joint very pale yellow, long and slender; second cup-shaped; the three following joints forming a spindle-shaped club: chest linear, nearly flat, with a channel along the middle; sutures of the segments indistinct: abdomen slightly increasing in breadth from the base till near the tip, depressed above, not keeled beneath, rather longer and broader than the chest to which it is closely applied: legs pale yellow: wings very narrow, nearly colourless; veins pale tawny, not reaching the middle of the wing; ulna hardly longer than the humerus; radius none; cubitus very short. Length of the body $\frac{1}{4}$ line; of the wings $\frac{1}{3}$ line.

Chætostricha dimidiata (Haliday MSS.). *Ferruginea, abdomine nigro, antennis pedibusque flavis, his fusco variis, alis basi fuscis.*

Ferruginous: head transverse, short, depressed in front: chest short: fore-chest extremely short: shield of the middle-chest broad; scutcheon small: abdomen black, smooth, shining, obconic, sessile, hollow above, keeled beneath, a little broader and longer than the chest: legs yellow; fore-thighs and middle-shanks brown at the base; middle-thighs, hind-thighs and hind-shanks brown, the latter yellow beneath and at the tips: feelers nearly spindle-shaped, yellow, about half the length of the body; first joint long; second long cup-shaped, brown at the base; third broad; fourth, fifth and sixth forming a spindle-shaped club; sixth joint dart-shaped: fore-wings broad, brown from the base to beyond the middle; veins brown, not

reaching beyond the middle of the wing; humerus long; ulna short; radius very short; cubitus rather short; stigma large. Length of the body $\frac{1}{4}$ line; of the wings $\frac{1}{2}$ line.

Found at Holywood. In Mr. Haliday's collection.

Trichogramma vitripennis. *Fulva, fusco varia, pedibus flavis, alis limpidis*.

Body tawny, linear, smooth, shining, paler and somewhat narrower than that of *T. evanescens*: head and chest convex, slightly varied with brown: abdomen obconical, depressed, apparently quite sessile, a little broader but not longer than the chest, slightly keeled beneath: feelers tawny, clavate, not half the length of the body; the club is pointed: legs yellow: wings colourless; fore-wings very broad; veins tawny, not reaching beyond the middle of the wing; humerus moderately long; ulna very short; radius none; cubitus long; stigma small. Length of the body $\frac{1}{4}$ line; of the wings $\frac{1}{2}$ line.

Holywood. In Mr. Haliday's collection.

Oligosita collina (Haliday MSS.), fem. *Lutea, antennis pedibusque flavis, alis limpidis*.

Body rather narrow, bright pale luteous: head hardly broader than the chest: eyes and eyelets piceous; the former very large: feelers pale yellow, subclavate, brown towards the tips, much more than half the length of the body; first joint very long; second cup-shaped; third and following forming a spindle-shaped club: chest short, nearly flat; sutures of the segments indistinct: abdomen spindle-shaped, depressed above, hardly keeled beneath, nearly twice the length of the chest to which it is closely applied: legs yellow, slender; four hinder feet pale yellow with brown tips: wings colourless, very narrow, deeply fringed; veins yellow, reaching a little beyond the middle of the fore-wing; ulna rather longer than the humerus; cubitus a little longer than the radius, with which it forms a very acute angle; wing-brand small, pale brown. Length of the body $\frac{1}{6}$ line; of the wings $\frac{1}{4}$ line.

On a mountain heath near Belfast. In Mr. Haliday's collection.

Synopsis of the TRICHOGRAMMINI.

“ Trib. *Trichogrammini*. Tarsi trimeri. Tibiæ anticæ calcari apice inciso. Antennæ articulis 6, 3 extremis in clavam coarctatis (an semper?): abdomen subsessile: statura *Aphelini* (*Myinæ*) fere, et huic magis affines videntur quam *Eulophinis*; *Oligosita* vere pedibus gracilibus, tarsis 2^{di} paris elongatis, alis longe fimbriatis *Thysani* speciem mentitur.

“ *Generum conspectus.*

* Alæ anticæ seriatim pubescentes.

† Vena costam sinu tantum attingens ad ortum radii. 1. *Trichogramma*, *Westwood*.

†† Vena costam longius decurrens ante ortum radii. 2. *Chætostricha*, n. g.

** Alæ vage pubescentes.

† Alæ anticæ latæ, margine subtiliter ciliatæ. 3. Brachista, n. g.

†† Alæ anticæ angustæ, longe fimbriatæ (plumatæ). 4. Oligosita, n. g."—Haliday MSS.

Cea Irene, fem. *Ænea, capite æneo-viridi, scutello purpureo, abdomine violaceo cupreo, antennis pedibusque nigris, genibus tarsisque basi piceis, alis fusco bifasciatis.*

Female. Body convex, smooth, shining: head coppery green, transverse, a little broader than the chest; crown convex; front impressed: eyes black, rather large: eyelets three, placed in a triangle on the crown: feelers nine-jointed, slender, nearly filiform, inserted near the mouth, a little shorter than the body; first joint long and slender; second rather long, slightly spindle-shaped; third rather longer than the second; fourth and following joints of nearly equal length, each somewhat shorter than the third; three terminal joints somewhat shorter than the preceding: chest coppery, spindle-shaped: fore-chest small, concave behind: shield of the middle-chest rather large; sutures of the parapsides distinct; scutcheon purple, obconical, rather large: hind-chest large, declining, and narrower towards the tip: petiole very short: abdomen spindle-shaped, violet-copper, slightly compressed, keeled beneath, having a few bristles at the tip, narrower but not shorter than the chest; first segment long; second much shorter than the first; third and following segments still shorter: sheaths of the oviduct black, hairy: legs black, rather long and slender; trochanters, knees, and base of the first joint of the feet pitch-colour: wings narrow, somewhat dusky, deeply fringed like those of the *Mymaridæ*; each fore-wing traversed by two broad brown bands; ulna a little shorter than the humerus; radius much shorter than the ulna; cubitus very short; stigma small. Length of the body 1 line; of the wings $1\frac{1}{2}$ line.

Allied to *Gastrancistrus*, and is perhaps one of the links that form a passage thence to the *Mymaridæ*.

Found by Mr. Haliday, in September, on the sand-hills at Portmarnock near Dublin.

Iphitrachelus Lar, Haliday.—*Female.* Body black, convex, broad and short: head and chest dull: head broader than the chest; front convex: feelers brown, stout, club-shaped, inserted near the mouth, shorter than the body; first joint luteous, long and very robust; second cup-shaped; third and fourth elliptical, rather longer than the second; fifth, sixth and seventh very small; eighth, ninth and tenth soldered together, forming a spindle-shaped club without a trace of division: chest short and broad: fore-chest not visible above: shield large; sutures of parapsides very distinct; scutcheon small, obconical: hind-chest large, dark tawny, furrowed: abdomen elliptical, smooth, shining, shorter than the chest, and hardly more than half its breadth; first segment very large, and occupying the whole back: legs tawny: wings slightly brown; fore-wings very broad. Length of the body $\frac{1}{2}$ line; of the wings $\frac{2}{3}$ line.

Found by Mr. Haliday near Belfast.

Megastigmus Atedius, fem. *Niger, antennis, abdomineque piceis, pedibus fulvis, femoribus piceo-vittatis, alis limpidis, oviductu corpore vix longiore.*

Head and chest black, convex: head slightly punctured, almost smooth, tawny about the mouth, nearly as broad as the chest: feelers piceous, slender, very slightly increasing in breadth towards the tips, rather shorter than the chest; first joint long, slender, tawny; second cup-shaped, tawny; third and fourth yellow, very small; the following joints from the fifth to the eleventh slightly increasing in breadth and decreasing in length; club conical at the tip, more than twice the length of the tenth joint: chest very long, spindle-shaped, very finely shagreened; it is also transversely rugulose, but the furrows are scarcely perceptible: fore-chest large, subquadrate, very slightly rounded and narrower in front, somewhat convex on each side; its length nearly equal to its breadth: shield of the mid-chest very long with a scarcely perceptible ridge along the back; sutures of the parapsides very distinct, converging together; axillæ parted by rather less than one-third of the breadth of the chest; scutcheon long and narrow, irregularly elliptical, having an indistinct suture along the back and a distinct transverse suture near the tip which is almost smooth: hind-chest large, obconical, declining, dull, roughly punctured, with a slight ridge along the back: petiole very short: abdomen spindle-shaped, convex, smooth, shining, slightly compressed, dark piceous, somewhat tawny on each side, a little shorter and narrower than the chest; metapodeon occupying about one-fourth of the back; octoon short; ennaton and following segments longer: oviduct tawny; its sheaths black, pubescent, very little longer than the body: legs tawny; a slender piceous streak along each thigh; tips of feet piceous: wings colourless; veins brown; ulna nearly one-third of the length of the humerus; radius much longer than the ulna; cubitus very short, one-third of the length of the ulna; brand small, emitting a short branch, and in conjunction with a large round dark piceous spot. Length of the body $1\frac{3}{4}$ line; of the wings $3\frac{1}{2}$ lines.

England. In the collection of Mr. Dale.

Callimome Frontinus, fem. *Viridis, abdomine cyaneo-purpureo basi viridi, antennis nigris, pedibus viridibus, tarsis piceis basi flavis, alis limpidis, oviductu abdomine vix brevior.*

Body short, stout, compact, convex: head and chest green, finely shagreened: head as broad as the chest: eyes and eyelets red: feelers black, subclavate, rather stout and compact, shorter than the chest; first joint green, long, slender; the following joints with the usual proportions: chest elliptical, also with the usual proportions; tip of the scutcheon purple: abdomen long-oval, smooth, shining, bright bluish purple, bright green at the base, shorter and rather narrower than the chest; metapodeon occupying about one-third of the back, slightly concave at the base; all the following segments are shorter: sheaths of the oviduct black, pubescent, very nearly as long as the abdomen: legs green; trochanters, knees and fore-feet tawny; four

hinder feet tawny, pale yellow at the base, piceous at the tips : wings colourless ; veins tawny ; ulna full half the length of the humerus ; radius about one-third of the length of the ulna ; cubitus not half the length of the radius ; brand very small, paler than the veins. Length of the body $1\frac{1}{4}$ line ; of the wings $2\frac{1}{2}$ lines.

England. In the collection of Mr. Dale.

Entedon Syma. In two specimens of this species from the neighbourhood of Aix la Chapelle, and given to me by M. Foerster, the shanks are more or less brown.

Encyrtus Antistius, mas. *Æneo-iridis*, abdomine purpureo-cupreo, basi apiceque viridi, antennis nigris, pedibus fulvis, metapedum femoribus viridibus tibiis piceis, mesopedum tibiis basi femoribusque fuscis, alis limpidis.

Head and chest convex : head green, very finely shagreened, convex in front, nearly as broad as the chest : feelers black, hairy, filiform, rather slender, nearly as long as the body ; first joint spindle-shaped, tawny, piceous above ; second cup-shaped ; third and following joints long, linear ; club slender, slightly pointed, much longer than the preceding joint : chest coppery green, very finely punctured : fore-chest short, distinct above, narrow and rounded in front, its length about half its breadth : shield of the mid-chest short, rather flat, with no appearance of the sutures of the parapsides ; axillæ nearly meeting on the back ; scutcheon green, obconical, with a rim on each side to the tip : hind-chest coppery, shining, transverse, very short, nearly smooth, declining : petiole extremely short : abdomen oval, flat, smooth, shining, purplish bronze, bright green at the base, brassy green towards the tip, where it is thinly clothed with hairs, shorter than the chest and hardly equal to it in breadth : metapodeon occupying full one-fourth of the back ; octoon and following segments shorter : legs tawny ; tips of feet brown ; hips and hind-thighs green ; hind-shanks piceous ; middle legs dilated as usual, their thighs and the base of their shanks mostly brown : wings colourless ; veins brown ; ulna rather thick, somewhat less than one-fourth of the length of the humerus ; radius much shorter than the ulna ; cubitus very little shorter than the radius ; brand extremely small. Length of the body 1 line ; of the wings $1\frac{3}{4}$ line.

England. In the collection of Mr. Dale.

Encyrtus Saccas, mas. *Nigro-æneus*, abdomine cupreo-iridi, antennis fulvis, apice piceis, pedibus piceis, tarsis flavis, metatarsis fuscis, alis limpidis.—Fem. Abdomine purpureo basi apiceque cupreo-iridi.

Male. Head and chest convex, brassy black : head finely shagreened, convex in front, nearly as broad as the chest : eyes and eyelets piceous : feelers tawny, filiform, very hairy, tips piceous ; first joint spindle-shaped ; second cup-shaped ; third and following joints linear : chest rather long, nearly linear : fore-chest extremely short, hardly visible above : shield of the mid-chest long ; its length nearly equal to its breadth, with no appearance of the sutures of the par-

apsides; axillæ just meeting on the back; scutcheon large, obconical, green at the tip: hind-chest and petiole very short; abdomen obconical, smooth, shining, flat, coppery green, brighter at the base, hardly more than half the length of the chest; metapodeon longer than the following segments: legs piceous; knees and feet yellow; tips of the latter piceous; hind-knees tawny; hind-feet brown: wings colourless; veins brown; ulna rather thick, not one-eighth of the length of the humerus; radius full twice the length of the ulna; cubitus shorter than the radius; brand extremely small.

Fem. Feelers clavate, tawny, shorter than the chest; first joint spindle-shaped, green; second cup-shaped, piceous; the following joints from the third to the eighth successively increasing in breadth; club piceous, short, flat, much broader than the eighth joint and more than twice its length: abdomen flat, nearly round, purple, bright coppery green at the base and at the tip, very much shorter and somewhat broader than the chest. Length of the body 1 line; of the wings 2 lines.

England. In the collection of Mr. Dale.

Entedon Philiscus, fem. *Cyaneo-viridis, abdomine cupreo-purpureo, basi apiceque viridi, antennis nigris, pedibus viridibus, genibus tarsisque fulvis, proalæ cuique macula magna fusca.*

Head and chest convex, thickly and finely shagreened, dark greenish blue: head hardly broader than the chest: eyes and eyelets dark red: feelers black, clavate, much shorter than the chest; first joint long, slender, green; second cup-shaped; the following joints successively decreasing in length; club conical, much longer than the preceding joint: chest elliptical, rather short: fore-chest very short, but distinct; its length about one-sixth of its breadth: shield of the mid-chest short and broad; its length about half its breadth; sutures of the parapsides indistinct; axillæ parted by full one-third of the breadth of the chest; scutcheon large, nearly short, oval: hind-chest declining, transverse, rather short, almost smooth, with a ridge along the middle and a rim on each side: petiole very short: abdomen short-elliptical, smooth, shining and dark bronze-purple, green at the tip, bright green at the base, scarcely keeled beneath, hardly narrower but much shorter than the chest; metapodeon occupying rather less than one-third of the back; octoon and all the following segments of moderate and nearly equal size: legs green; knees and feet tawny; tips of the latter and the whole of the fore-feet piceous: wings colourless, broad; a very large pale brown spot occupying nearly the whole of the disc of each fore-wing; veins brown; ulna longer than the humerus; radius very short, not more than one-tenth of the length of the ulna; cubitus also very short, but a little longer than the radius; brand very small. Length of the body 1 line; of the wings 2 lines.

Var. β. Chest coppery: hind-chest varied with green: abdomen bronze at the tip, varied with copper-colour at the base.

England. In the collection of Mr. Dale.

BIBLIOGRAPHICAL NOTICES.

An Introduction to Conchology, or Elements of the Natural History of Molluscous Animals. By GEORGE JOHNSTON, M.D., LL.D. Van Voorst, 1850.

TWENTY years ago the author of this delightful volume commenced a series of letters with the view of converting the shell-collector into a man of science, and of rendering conchology more intellectually interesting by describing in readable language the relations of shells to the animals which make them, and the several matters of interest presented by the oeconomical, physiological, and systematical relations of the Mollusca. He aspired to do the like service to malacology which Kirby and Spence did for entomology. These letters were published in that delightful mixture of science and gossip, Loudon's 'Magazine of Natural History,' a publication which, by spreading the taste for natural-history pursuits, did much to bring about the love for and distinction in natural-history science, now so honourably distinguishing Great Britain among the nations of Europe. Those who were young and commencing their studies at the time the letters in question appeared remember well the interest they excited, alike from the excellence of their matter and the elegance of their style.

Dr. Johnston has now carried out the idea he then projected, and a more charming volume has not been presented to naturalists for a very long time. Moreover it is so pleasantly written, so full of collateral information and literary illustration, that if put into the hands of a person unacquainted with science, it cannot fail to be read with delight, and to inspire a taste for the studies to which it is devoted.

The discursive manner in which Dr. Johnston has treated his subject is very favourable to a development of the interest appertaining to it. Conchology has got a bad name among the educated ignorant on the supposition that the study of shells is a mere trifling agreeable amusement, fitter for idlers than thinking persons. This notion is as false as unfair, and we are greatly mistaken if the volume before us does not go far to instil a better estimate of this pleasant branch of zoology; not merely pleasant too, but important, for without a close study of it the palæontologist cannot proceed with his investigations of extinct creatures, and, consequently, the geologist be seriously thrown out in his comparisons of strata and determination of their relative age. In the end, the neglect of what the mass of the public esteem trifling, may tell seriously on that most sensitive organ common to a large portion of civilized mankind, viz. *the pocket*, since a very slight geological mistake arising from an error in the determination of a few fossil shells, may involve the fortunes of thousands and plunge whole families from wealth into penury. But mere conchology, in the old sense of the term, could scarcely effect much good, and one great service done by Dr. Johnston in his "Introduction" is the indissolubly linking in the mind of the student the study of the shell and that of its animal constructor. In a few years there will be no mere conchologists—all will be malacologists.

An excellent feature of these chapters is an outline of the history of conchology, setting before us very clearly the progression of the ideas of the naturalists who have devoted themselves to the working out of the systematic relations of the Mollusca. The details of a system of malacology cannot be said yet to have been attained, but every day fresh knowledge of molluscous animals is pouring in upon us, and in a few years there will be sufficient materials accumulated to enable the zoologist to attempt the construction of a natural arrangement of them.

A work of this kind does not admit of extract within the limits of a brief notice, otherwise we could ornament our pages with many passages abounding in the finest eloquence, and warmed by that earnest and enthusiastic love of the beauties of creation, characteristic of one who has rendered so many and various services to British science.

We might, were we disposed to be hypercritical, indicate a few deficiencies, and venture on a few differences of opinion, but we have derived too much pleasure from the perusal of this 'Introduction to Conchology' to suggest faults or make petty corrections. The volume is beautifully got up, and so far as external aspect and printing can go, is as well adapted for the drawing-room as for the study.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

February 12, 1850.—W. Yarrell, Esq., Vice-President, in the Chair.

AN ARRANGEMENT OF STOMATELLIDÆ, INCLUDING THE CHARACTERS OF A NEW GENUS, AND OF SEVERAL NEW SPECIES.
By ARTHUR ADAMS, R.N., F.L.S. ETC.

STOMATELLIDÆ.

Head broad, proboscidiform; tentacles subulate, with a fimbriated lobe at their inner bases; eyes on peduncles at their outer bases; mantle with the front edge entire; muscle of attachment crescentic, open in front; foot with a lateral membrane. Operculum rudimentary or none. Shell imperforate, with a crescentic muscular impression, open in front.

The family *Stomatellidæ* differs from that of *Haliotidæ* in the mantle not being fissured anteriorly, in the muscle of attachment being in the form of a horseshoe round the sides and posterior part of the mantle, instead of being oval and central, and in the shell not being perforated. In their habits they are littoral, living on coral reefs and attached to stones near the shore. Some of the genera, as *Gena*, *Stomatella* and *Stomatia*, have considerable locomotive powers, and glide, especially *Gena*, with some degree of celerity. The latter genus and *Stomatia* possess the faculty, common to some other kinds of mollusca, of spontaneously detaching a considerable portion of the hind part of the foot when disturbed or irritated.

STOMATELLA, Lamarck.

Animal spiral, retractile within the shell; tentacular lobes triangular, with the front edge fringed; foot small, not tubercular, not produced posteriorly, operculigerous, lateral membrane very wide, the circumference regularly fimbriated. Operculum orbicular, thin, horny, multispiral. Shell spiral, suborbicular, depressed, transversely ribbed or sulciferous; spire more or less elevated, whorls rounded; aperture large, wider than long, pearly within.

STOMATELLA IMBRICATA, Lamarck.

Hab. Torres Straits; *Jukes.* (Mus. Cuming.)

Stomatella imbricata, Lamk. Ency. Méth. p. 450. f. 2; Hist. Nat. An. s. Vert. vol. vi. p. 209.

STOMATELLA CANCELLATA, Krauss.

Hab. Table Bay, Cape of Good Hope. (Mus. Cuming.)

Stomatella cancellata, Krauss, Sudafrican. Moll. tab. 5. fig. 26.

STOMATELLA COSTELLATA, Adams. *S. testá suborbiculatá, convexo-depressá, albidá, imperforatá, costellis transversis obtusis striisque elevatis longitudinalibus decussatá; spirá subprominulá; aperturá magná, obliquá, oblongá.*

Hab. —? (Mus. Metcalf.)

STOMATELLA ARTICULATA, Adams. *S. testá suborbiculari, imperforatá, convexá, tenui, grised, costulis transversis nigro-articulatis, interstitiis lineis longitudinalibus elevatis ornatá; spirá prominulá, anfractibus rotundatis; aperturá oblongo-ovali, longiore quam latiore.*

Hab. Australia; Lord Hood's Island, South Seas, on the pearl oyster; *H. C.* (Mus. Cuming.)

STOMATELLA SULCIFERA, Lamarck.

Hab. Philippines, Catbalonga; island of Samar, under stones; isle of Ticao, on the reefs, low water; *H. C.* (Mus. Cuming.)

Stomatella sulcifera, Lamk. Hist. Nat. An. s. Vert. p. 210.

STOMATELLA MACULATA, Quoy and Gaimard.

Hab. Catanuan, province of Tayabas, island of Luzon, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATELLA MONILIFERA, Adams. *S. testá suborbiculari, convexo-depressá, imperforatá, albidá, rufo-punctatá, costellis moniliferis confertis transversis ornatá; aperturá obliquá, suborbiculari.*

Hab. —? (Mus. Metcalf.)

STOMATELLA DECOLORATA, Gould.

Hab. Mangsi Island; *Gould.*

Species unknown to me. "Allied to *S. maculata*, Quoy, but the spire is less elevated, aperture more round, and a plain white lunate area adjacent to the columella."

Stomatella decolorata, Gould, Expedition, Shells, p. 51.

STOMATELLA PAPYRACEA, Chemnitz.

Hab. China Sea and Sooloo Archipelago. (Mus. Cuming.)

Turbo papyraceus, Chemnitz. *Stomatella tumida*, Gould, *Expedition, Shells*, p. 51.

STOMATELLA MALUKANA, Adams. *S. testá suborbiculatá, convexá, imperforatá, transversim sulcatá, longitudinaliter striatá, costulis transversis striatis cinctá, musteliná rufo-fusco variegatá, subtus costis albo rufoque articulatis; spirá prominulá; aperturá ovali, longiore quam latiore.*

Hab. Molluccas.

STOMATELLA ORBICULATA, Adams. *S. testá suborbiculari, convexá, virescenti, castaneo variegatá, transversim sulcatá, longitudinaliter striatá, costis confertis rotundatis; spirá prominulá, anfractibus rotundatis; aperturá subcirculari, intus viridescenti.*

Hab. Mosambique, under stones, low water; *Rev. W. V. Hemmer.* (Mus. Cuming.)

STOMATELLA JAPONICA, Adams. *S. testá suborbiculari, imperforatá, convexá, fuscá, transversim costulatá, costulis confertis nodulosis, interstitiis tenuissimè longitudinaliter striatis; spirá prominulá, anfractibus costatis rotundatis; aperturá subcirculari, intus margaritacéa.*

Hab. Japan. (Mus. Cuming.)

STOMATELLA HALIOTIDEA, Sowerby.

Hab. Philippines, Oalaguete; Loon, isle of Bohol, under stones, low water; San Estevan, prov. South Ilocos; *H. C.* (Mus. Cuming.)

Stomatella haliotidea, Sowerby, *Genera*.

STOMATELLA FULGURANS, Adams. *S. testá suborbiculari, subperforatá, convexá; spirá acuminatá, apice acuto rosed, transversim sulcatá, carinulis transversis albo maculatis, longitudinaliter striatis, striis subtus obsoletis, albidá lineis fuscis undulatis variegatá; aperturá ovali, obliquá, intus margaritacéa, valdè sulcosá.*

Hab. Bais, island of Negros, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATELLA SANGUINEA, Adams. *S. testá orbiculatá, depressá; spirá prominulá, acutá, coccinea, transversim tenuissimè sulcatá, longitudinaliter obliquè striatá, carinulis transversis subdistantibus nodulosis; aperturá ovali, obliquá; columellá subcallosá, areá umbilicali albd, intus margaritacéa sulcosá.*

Hab. Island of Ticao, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATELLA SPECIOSA, Adams. *S. testá orbiculato-conicá, albd sanguineo maculatá, transversim carinatá, longitudinaliter valdè striatá, carinis obtusis prominentibus carinulis intermediis; spirá prominulá, anfractibus tricarinatis; aperturá ovali, intus margaritacéa.*

Hab. Grimwood's Island; *H. C.* (Mus. Cuming.)

STOMATELLA COCCINEA, Adams. *S. testá orbiculato-conicá, subperforatá, coccineá, maculis albis seriatim dispositis in anfractu ultimo ornatá, transversim tenuiter sulcatá, anfractu ultimo subangulato; spirá prominente, anfractibus bicarinatis; aperturá subcirculari, labio posticè reflexo, calloso.*

Hab. St. John's; Mr. Hartweg.

STOMATELLA TIGRINA, Adams. *S. testá orbiculato-conicá, perforatá, albidá, fasciis rufis radiatim dispositis ornatá, bicarinatá, carinis elevatiusculis, obtusis, transversim striatá, striis regularibus; spirá prominente, anfractibus angulatis; aperturá subcirculari, labio subreflexo, calloso; umbilico distincto, subobtecto.*

Hab. — ?

STOMATELLA MARGARITANA, Adams. *S. testá turbinatá, spirá elevatá, anfractibus rotundatis, rubrá longitudinaliter substriatá, transversim costulatá, costulis subnodulosis inæqualibus; aperturá suborbiculari, intus margaritacéá, labro semicirculari; umbilico callo, obtecto.*

Hab. in littoribus Australiæ. (Mus. Cuming.)

A small, red, transversely ribbed species, having very much the appearance of a *Margarita*.

STOMATELLA BIPORCATA, Adams. *S. testá turbinatá, subdepressá, rubrá, albo obscurè variegatá, transversim sulcatá; spirá acuminatá, anfractibus quatuor, anfractu ultimo porcis duabus prominentibus instructá; aperturá subquadratá, intus margaritacéá, labio subrecto, labro in medio biangulato, umbilico callo, obtecto.*

Hab. in littoribus Australiæ. (Mus. Cuming.)

A small red species with two rounded ridges on the last whorl and a subquadrate aperture.

STOMATIA, Helbling.

Animal spiral, too large to entirely enter the shell, tentacular lobes digitated. Foot large, tubercular, greatly produced behind; lateral membrane fringed, ending anteriorly on the left side in a fimbriated crest under the eye-peduncle, and on the right in a slightly projecting fold or gutter leading to the respiratory cavity. Operculum none. Shell subspiral, oblong, or suborbicular, carinated or tuberculated; spire prominent; aperture wider than long, pearly within.

STOMATIA PHYMOTIS, Lamarck.

Hab. Philippine Islands, Matnag, province of Albay, Luzon, on the reefs; *H. C.* (Mus. Cuming.)

STOMATIA AUSTRALIS, Adams. *S. testá haliotidéá, ovato-oblongá, sublatá, olivacéá, dorso lævigatá, transversim tenuè striatá, carinis duabus rotundatis, inferiori tuberculatá; aperturá anticè dilatatá, labro supra ultimum anfractum ascendente.*

Hab. Darnley's Island, Torres Straits, under stones; Jukes. (Mus. Cuming.)

STOMATIA DUPLICATA, Sowerby.

Hab. Cagayan, province of Misamis, island of Mindanao, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATIA ANGULATA, Adams. *S. testá orbiculato-convexá, subdepressá, viridulá, transversim valdè costulatá, interstitiis longitudinaliter striatis, carinis duabus elevatis simplicibus angulatis; aperturá transversá, subcirculari, labro in medio biangulato.*

Hab. San Estevan, province of South Ilocos, island of Luzon and island of Ticao, under stones, low water; *H. C.* (Mus. Cuming.)

STOMATIA DECUSSATA, Adams. *S. testá ovato-oblongá, longitudinaliter et transversim decussatè striatá, carinis duabus simplicibus aut subtuberculatis angulatis prominentibus, pallidá maculis fuscis variegatá; spirá elevatá; aperturá obliquá, ferè orbiculari, labro biangulato in medio.*

Hab. Sorsogon, province of Albay, island of Luzon, on smooth stones, 6 fathoms; *H. C.* (Mus. Cuming.)

STOMATIA ACUMINATA, Adams. *S. testá haliotidèá, suborbiculatá, subfuscá, cancellatá, transversim costatá, costis tribus prominentibus, mediá valdè prominulá tuberculatá, valdè plicatá prope suturam, longitudinaliter elevatè striatá; spirá prominulá, acuminatá, anfractibus quatuor angulatis, labro in medio triangulato.*

Hab. Philippine Islands. (Mus. Cuming.)

STOMATIA LIRATA, Adams. *S. testá orbiculato-convexá, liris transversis subæqualibus elevatis vix nodulosis, interstitiis valdè longitudinaliter striatis, prope suturam subplicatá, pallidá, fusco radiatim marmoratá; spirá subprominulá, anfractibus rotundatis; aperturá obliquá, oblongo-ovali, labro convexo, rotundato.*

Hab. —? (Mus. Cuming.)

STOMATIA RUBRA, Lamarek.

Hab. Philippine and Corean Archipelago. (Mus. Cuming.)

STOMATIA NOTATA, Adams. *S. testá suborbiculari, depressá, pallide roséá, maculis purpureis valdè distinctis ornatá, transversim carinatá, carinis acutis prominentibus subdistantioribus, longitudinaliter valdè obliquè striatá; spirá subprominulá, anfractibus carinatis, apice acuto; aperturá subcirculari, intus margaritacèá et transversim sulcatá.*

Hab. —? (Mus. Cuming.)

STOMATIA CANDIDA, Adams. *S. testá suborbiculatá, depressá, candidá, transversim totá carinatá, carinulis parvis confertis permultis elevatiuseculis subnodulosis, interstitiis longitudinaliter tenuissimè striatá; spirá depressiuseculá, anfractibus rotundatis; aperturá obliquá, subcirculari, longiore quam latiore.*

Hab. Korean Archipelago, coral reefs; *A. H.* (Mus. Cuming.)

STOMATIA PALLIDA, Adams. *S. testá suborbiculari; spirá acuminatá, albá, radiis pallidis longitudinalibus pictá, transversim*

*liratâ, interstitiis decussatè striatis; aperturâ transversâ, sub-
ovali, intus porcellanâ, labio subrecto, calloso.*

Hab. ad Insulam Lord Hood, dedicav. (Mus. Cuming.)

A species somewhat resembling in colouring the striped variety of *S. notata*, but which differs materially in form and sculpture.

MICROTIS, new genus.

Animal as in *Stomatia*, but the foot with a deep anterior fissure for the head, and the front edge bilobed. Operculum none. Shell spiral, suborbicular, depressed, with two tuberculated ridges; spire slightly prominent; aperture very large, wider than long, pearly within, columellar margin spiral, visible as far as the apex of the spire.

MICROTIS TUBERULATA, Adams. *M. testâ suborbiculari, halio-
tided, valdè depressâ, viride variegatâ, transversim striatâ, bi-
carinatâ, carinis tuberculatis, prope suturam nodulosim plicatâ;
spirâ vix elevatâ, anfractibus carinatis; aperturâ magnâ, ovali,
intus bisulcatâ margaritacâ.*

Hab. Island of Capul, on the sands, high water; *H. C.* (Mus. Cuming.)

GENA, Gray.

Animal subspiral, oval, depressed, too large to enter the shell; tentacular lobes plumose. Foot very large, tubercular, posteriorly produced; lateral membrane not fimbriated, more or less extended, and covering the shell. Operculum none. Shell subspiral, oblong, ear-shaped, depressed, smooth or striated; spire flattened, nearly obsolete; aperture large, pearly within.

GENA PLANULATA, Lamarck.

Hab. Isle of Camaguin, under smooth stones, low water; Gindulman, isle of Bohol, under stones; *H. C.* (Mus. Cuming.)

Stomatella planulata, Lamarck, *Hist. An. s. Vert.* vol. vi. p. 210; *Encyclop. Méth.* pl. 40. f. 4 a, b.

GENA AURICULA, Lamarck.

Hab. Eastern Seas; Red Sea; Celebes. (Mus. Cuming.)

Stomatella auricula, Lamk. *Hist. An. s. Vert.* vi. p. 210. *Patella lutea*, Linn.

GENA NIGRA, Quoy and Gaimard.

Hab. Eastern Seas. (Mus. Cuming.)

Stomatella nigra, Quoy & Gaimard, *Voy. de l'Astr.* v. 3. pl. 66 bis, fig. 10-12.

GENA PLUMBEA, Adams. *G. testâ haliotided, ovato-oblongâ,
dorso latere dextro gibbosâ, sinistro planulatâ, plumbeâ, decus-
satè totâ striatâ; spirâ prominulâ, anfractibus rotundatis,
anfractu ultimo ad suturam gibboso; aperturâ posticè subcana-
liculatâ, labro in medio flexuoso.*

Hab. Java. (Mus. Cuming.)

GENA STRIGOSA, Adams. *G. testâ haliotided, ovato-oblongâ,*

dorso subplanatá, totá striatá, striis irregularibus subconfertis, olivacé lilaceo alboque variá, fasciis subfuscis, pallidis alternantibus longitudinaliter ornatá, labro haud sinuoso.

Hab. —? (Mus. Cuming.)

GENA STRIATULA, Adams. *G. testá haliotidéa, ovato-oblongá, dorso planiusculá, totá striatá, striis profundis subdistantibus, rubrá, flaveolo aurantiaco fuscoque variè pictá; spirá prominulá, nunquam subdistortá; labro valdè flexuoso.*

Hab. Calapan, island of Mindoro, on small stones, 9 fathoms; *H. C.* Swan River, *Lieut. Preston*; Australia. (Mus. Cuming.)

GENA VARIA, Adams. *G. testá haliotidéa, ovato-oblongá, politá, dorso æqualiter convexá, latere sinistro striatá; luteo, rubro alboque variegatá; spirá prominulá, erectá, acuminatá.*

Hab. Calapan, island of Mindoro, on small stones, 9 fathoms; *H. C.* Acapulco, on the sands, *Col. Moffat*; Australia. A pretty little species usually confounded with *G. auricula*. (Mus. Cuming.)

GENA CONCINNA, Gould.

Hab. Sandy Island.

GENA MINIMA, Dufo.

Hab. Seychelles, dredged from 6 fathoms; *Dufo*.

Stomatella minima, *Dufo*, *Ann. Sc. Nat.* Oct. 1840, p. 202. Species unknown to me.

GENA IRASATA, Dufo.

Hab. Seychelles.

Stomatella irasata, *Dufo*, *Ann. Sc. Nat.* Oct. 1840. Species unknown to me.

GENA PULCHELLA, Adams. *G. testá convexo-depressá, ovali, albá, rufo maculatá, dorso convexá, totá striatá; spirá prominulá, anfractibus rotundatis; aperturá magná, ovali, intus margaritacéa, iridescente.*

Hab. —? (Mus. Metcalf.)

GENA LINTRICULA, Adams. *G. testá haliotidéa, oblongá, dorso convexá, totá tenuissimè striatá, tenui, fragili, carneolá, rubro maculatá; spirá subterminali, minimá, ad latus decumbente; aperturá apertá, valdè elongatá.*

Hab. Calapan, island of Mindoro, on smooth stones, 9 fathoms; *H. C.* (Mus. Cuming.)

GENA ASPERULATA, Adams. *G. testá haliotidéa, dorso convexá, rufo-fuscá cingulá albá latá longitudinali ornatá, lineis elevatis subconfertis, striisque longitudinalibus obliquis decussatá; spirá posticá, subprominulá, albá; aperturá elongatá, ovali.*

Hab. —? (Mus. Metcalf.)

GENA NEBULOSA, Adams. *G. testá haliotidéa, ovato-oblongá, dorso totá striatá, albá rufo-fusco nebulosá; spirá prominulá, anfractibus angulatis; aperturá elongatá, ovali; columellá callo crasso rimam umbilicalem obtegente.*

Hab. Australia. (Mus. Cuming.)

GENA ORNATA, Adams. *G. testá subturbinaced, ovali, lævi, politá, dorso convexá, fusco-rubrá, lineis nigris albo-articulatis longitudinalibus; spirá prominulá, roséá; aperturá ovali; columellá curvatá, simplici; labro reflexo, posticè subflexuoso.*

Hab. Island of Ticao, Philippines, on the reefs, low water; *H. C.* (Mus. Cuming.)

GENA LINEATA, Adams. *G. testá subturbinaced, solidá, lævi, politá, convexá, ovali, carneolá lineis rubris longitudinalibus ornata; spirá prominulá, anfractibus rotundatis; aperturá subrotundatá; columellá planulatá, callosá, labro simplice.*

Hab. —? (Mus. Cuming.)

BRODERIPIA, Gray.

Animal unknown. Operculum? Shell ancyliiform, nonspiral, oblong-ovate, flattened, apex posterior, involute; aperture very large, ovate, pearly internally.

Scutella, *Broderip* (pars).

BRODERIPIA IRIDESCENS, Broderip, sp.

Hab. Pacific Ocean, Grimwood's Island. (Mus. Cuming.)

Scutella iridescens, *Broderip*, *Proc. Zool. Soc.* June 1834.

BRODERIPIA ROSEA, Broderip, sp.

Hab. Pacific Ocean, Grimwood's Island. (Mus. Cuming.)

Scutella rosea, *Broderip*, *Proc. Zool. Soc.* June 1834.

BRODERIPIA CUMINGII, A. Adams. *B. testá ovatá, depressoconvexá, subpellucidá, pallidá, radiis rubris pictá, concentricè corrugato-striatá, striis granulosis, vertice postico excentrico-submarginali; aperturá patulá, intus margaritacéá, margine albo limbo maculis rufis picto; margine columellari acutè angulato prominente, posticè subrecto.*

Hab. in insulis Philippinis (Capul). (Mus. Cuming.)

Distinguished from *B. iridescens* by its prominent angulated columellar margin and granulato-corrugose surface.

SCISSURELLA, D'Orbigny.

Animal unknown. Operculum none. Shell very small or minute heliciform; spire depressed; aperture suborbicular, effuse; outer lip with a narrow fissure or slit; umbilicus open.

? *Anatomus*, *Montfort*.

SCISSURELLA ANGULATA, Lovèn.

Hab. Scandinavia.

Scissurella angulata, Lovèn, *Index Moll. Scand.* p. 20.

SCISSURELLA PLICATA, Philippi.

Hab. Shores of the Peninsula of Thapsi.

Scissurella plicata, *Phil. En. Moll. Sicil.* vol. i. p. 187, vol. ii. tab. 25. fig. 18.

Scissurella d'Orbigny, *Scacchi*.

SCISSURELLA STRIATULA, Philippi.

Hab. Peninsula of Magnisi.

Scissurella striatula, *Phil. En. Moll. Sicil.* vol. ii. p. 160. *Ann. & Mag. N. Hist.* Ser. 2. Vol. vii.

SCISSURELLA DECUSSATA, D'Orbigny.

Scissurella decussata, *D'Orbigny, Mém. Soc. d'Hist. Nat. de Par. i.*
p. 340.

SCISSURELLA CRISPATA, Fleming.

Scissurella crispata, *Fleming, Brit. An.* p. 361-366.

MONOGRAPH OF THE GENUS ANATINELLA.

BY ARTHUR ADAMS, R.N., F.L.S. ETC.

ANATINELLA, Sowerby.

Shell ovate equivalve, nearly equilateral, anterior side rounded, posterior slightly beaked and subtruncated. Ligament internal, fixed to a spoonshaped process in each valve, on the anterior side of which are placed two rather elongated cardinal teeth. Muscular impressions two, lateral, distant, the anterior oblong and irregular, the posterior nearly circular. Palleal impression entire, without any sinus. No testaceous appendage within the hinge.

ANATINELLA SIBBALDII, Sowerby. *A. testâ solidiori, subopacâ, lævi, valdè concentricè corrugatâ, longitudinaliter obsoletè substriatâ; latere postico, acuminato, subtruncato; margine dorsali posticè declivi; processu cochleariformi crasso lato; margine ventrali valdè arcuato.*

Hab. Ceylon, on the sands. (Mus. Cuming.)

ANATINELLA DILATATA, Adams. *A. testâ tenui, fragili, concentricè corrugatâ, longitudinaliter striatâ, latere postico dilatato, obliquè valdè truncato, margine dorsali posticè horizontali recto, processu cochleariformi parvo tenui, dentibus cardinalibus valdè divergentibus; margine ventrali arcuato.*

Hab. Puteao, Philippines, on sand-banks, at low water; *H. C.* (Mus. Cuming.)

ANATINELLA VENTRICOSA, Adams. *A. testâ tenui, ventricosâ, semipellucidâ, concentricè corrugatâ, longitudinaliter conspicuè striatâ, striis elevatiusculis, latere postico rotundato; margine dorsali posticè declivi; processu cochleariformi tenui, angusto; margine ventrali leviter arcuato.*

Hab. Puteao, Philippines, on sand-banks, at low water; *H. C.* (Mus. Cuming.)

February 26.—W. Spence, Esq., F.R.S., in the Chair.

The following paper was read:—

MONOGRAPHS OF CYCLOSTREMA, MARRYAT, AND SEPARATISTA, GRAY; TWO GENERA OF GASTEROPODOUS MOLLUSKS. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

CYCLOSTREMA, Marryat.

Animal ignotum. Operculum — ? *Testa depressa, perspective-umbilicata; apertura circularis.*

CYCLOSTREMA CANCELLATA, Marryat. *C. testâ albâ, lineis longitudinalibus et transversis elevatis decussantibus inde cancel-*

latá; aperturá labiis cancellatis; cancellis transversim striatis.

Hab. Baszay, island of Samar, 6 fathoms, coral sand; *H. C.* (Mus. Cuming.)

Cyclostrema cancellata, *Marryat, Trans. Linn. Soc.* 1818, vol. xii. p. 338.

CYCLOSTREMA NIVEA, Chemnitz. *C. testá orbiculari, nived, pel-lucidá; spirá depressá, anfractibus transversim costellatis, costellis regularibus, superis distantioribus; interstitiis leviter concavis; suturis profundis subcanaliculatis; labro simplici; umbilico peramplo.*

Hab. Seas of India. (Mus. Cuming.)

Turbo niveus, Chemnitz, *Conch. Cab.* vol. x. pl. 165. f. 1587 and 1588. *Delphinula nivea*, *Reeve. Delphinula lævis*, *Kiener.*

CYCLOSTREMA REEVIANA, Hinds. *C. testá orbiculari, subdiscoïdèd, muticá; spirá depressiusculá, anfractibus convexis, longitudinaliter carinulatis, carinulis numerosis, superis distantioribus; interstitiis liris obliquis corrugato-clathratis; labro simplici; umbilico peramplo.*

Hab. Straits of Malacca, 17 fathoms. (Mus. Cuming.)

Delphinula Reeviana, *Hinds, Proc. Zool. Soc.* 1843.

CYCLOSTREMA COBIJENSIS, *Reeve. C. testá turbinatá, minutá, anfractibus convexis, carinulis transversis et longitudinalibus æquidistantibus regulariter clathratis; umbilico mediocri; labro simplici.*

Hab. Port of Cobija, Peru, under stones in rocky places, low water; *H. C.* (Mus. Cuming.)

Delphinula Cobijensis, *Reeve, Proc. Zool. Soc.* 1843.

CYCLOSTREMA SPIRULA, Adams. *C. testá orbiculari, discoïdèd, evolutá; spirá depresso-concavá, anfractibus rotundatis, primis contiguis, ultimá distinctá, transversim costulatis, costellis subconfertis, æquidistantibus; interstitiis tenuissimè longitudinaliter striatá; aperturá circulari; peritremate continuo.*

Hab. Philippine Islands. (Mus. Cuming.)

CYCLOSTREMA CINGULIFERA, Adams. *C. testá orbiculari, nitidá; spirá depressá, anfractibus rotundatis, carinulis transversis, acutis, æquidistantibus; interstitiis (sub lente) tenuissimè longitudinaliter striatis; aperturá subcirculari, supra subangulatá; umbilico mediocri.*

Hab. Dumaguete, island of Zebu, 4 fathoms; *H. C.* (Mus. Cuming.)

CYCLOSTREMA NITIDA, Adams. *C. testá orbiculari, lævi, tenui, nitidá; spirá elevatiusculá, anfractibus prope suturam subangulatis; suturis profundis, subcanaliculatis; aperturá subcirculari, supra angulatá; umbilico magno, peromphalo angulato, acuto.*

Hab. Catanuan and Sual, island of Luzon, 10 fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CYCLOSTREMA PLANORBULA, Adams. *C. testá orbiculari, planorbula; spirá depressá, anfractibus lævibus, rotundatis, suturis distinctis; aperturá subcirculari, supra angulatá; umbilico permagno, patulo.*

Hab. Sual, island of Luzon, 10 fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CYCLOSTREMA PLANA, Adams. *C. testá orbiculari, dorso planoconvexá; spirá depressá, anfractibus planis, supra transversim striatis, infra lævibus; aperturá subcirculari, supra angulatá; umbilico peramplo, anfractibus intus conspicuis.*

Hab. Dumaguete, island of Negros; *H. C.* (Mus. Cuming.)

CYCLOSTREMA MICANS, Adams. *C. testá turbinatá, minútá, albá, nitidá, anfractibus convexis, longitudinaliter obliquè costellatis, transversim carinulatis, carinulis nodulosis; umbilico mediocri; aperturá circulari; peristomate continuo, incrassato.*

Hab. Port Lincoln; *Metcalf.* (Mus. Cuming and Metcalf.)

CYCLOSTREMA ELEGANS, Adams. *C. testá orbiculari, discoïded, tenui, semipellucidá; spirá depressá, anfractibus rotundatis, transversim omnino striatis; suturis distinctis; aperturá subcirculari, supra angulatá; umbilico peramplo.*

Hab. Sibonga, island of Zebu, 10 fathoms, sandy mud; *H. C.* (Mus. Cuming.)

CYCLOSTREMA SULCATA, Adams. *C. testá orbiculari, discoïded; spirá planiusculá, anfractibus convexis, costellis transversim confertis regularibus, interstitiis profundè sulcosis; suturis profundis canaliculatis; umbilico patulo; peromphalo lævi.*

Hab. Tambay, island of Negros, coarse sand, 6 fathoms; *H. C.* (Mus. Cuming.)

CYCLOSTREMA ANGULATA, Adams. *C. testá orbiculari, discoïded; spirá depressá, anfractibus transversim costellatis, costellis regularibus, æquidistantibus, interstitiis tenuissimè striatis; anfractu ultimo biangulato, supra costellato, in mediá plano, infra costellato; aperturá subangulatá; peritremate interrupto; umbilico permagno.*

Hab. Sibonga, island of Zebu, 10 fathoms, sandy mud; *H. C.* (Mus. Cuming.)

SEPARATISTA, Gray.

Animal ignotum. Operculum — ? *Testa orbicularis, subdiscoïdea, anfractibus primis contiguis, ultimo distincto; aperturá patulá, effusá, angulis subcanaliculatis; umbilicus magnus, infundibuliformis, usque ad apicem.*

The *Cornu* of Schumacher and the *Lippistes* of Montfort, founded upon the *Argonauta cornu* of Fichtel, appear to belong to *Carinaria* of Lamarek. *Steira* of Eschscholtz would seem by the figure given in Oken's 'Isis' to be an *Atlanta* badly drawn in an inverted position, and indeed is founded upon the "Corne d'Ammon vivant" of Lesueur, *Atlanta Peronii*.

Separatista, Gray (not described).

SEPARATISTA GRAYII, Adams. *S. testá spirá depressá, anfractibus carinulis quinque transversis; aperturá oblongo-transversá; labio reflexo, anticè rotundato.*

Hab. Cape of Good Hope. (Mus. Cuming.)

SEPARATISTA CHEMNITZII, Adams. *S. testá spirá elevatá, anfractibus carinulis tribus transversis; aperturá subcirculari; labio subreflexo, anticè producto, angulato.*

Hab. Island of Bureas, Philippines; *H. C.* (Mus. Cuming.)
Turbo separatista, Chemnitz.

Professor Owen communicated a Memoir*, in continuation of his previous papers published in the Zool. Trans. (vol. iii. pp. 243, 307, 345), on the Gigantic Wingless Birds of New Zealand.

Having in the previous Memoirs determined and referred to their genera and species the different bones of the leg, he made those of the foot the subject of the present communication, which was illustrated by the exhibition of an extensive series of remains from both the North and South (or Middle) islands of New Zealand; comprising the entire series of phalanges of one and the same foot of the *Palapteryx robustus*, a gigantic species from Waikawaite; a similarly complete series of the phalanges of the *Dinornis rheides*; and series more or less incomplete of the phalanges of the *Dinornis giganteus*, *Palapteryx ingens*, and other genera and species of the singular extinct wingless birds of New Zealand. The characteristics of the different phalanges were minutely detailed, and the different proportions of the toes characteristic of different species, especially of the two most gigantic, viz. the *Dinornis giganteus* of the North island, and the *Palapteryx robustus* of the turbary deposits of the Middle island. The adaptation of the claw-bones for scratching up the soil was obvious from their shape and strength. The generic distinction of *Palapteryx* had previously been indicated by a slight depression on the metatarsus, supposed by the author to be for the articulation of a small back-toe, as in the *Apteryx*; and he had since received a specimen of the principal bone of that toe, which was exhibited and described. A nearly entire sternum, a portion of a minute humerus, and a cranium of one of the smaller species of *Dinornis*, were also exhibited and described.

This magnificent series of remains of great New Zealand birds had been collected chiefly by the late Colonel Wakefield, and had been transmitted to the author through the kind interest of J. R. Gowen, Esq., a Director of the New Zealand Company.

March 12.—W. Spence, Esq., F.R.S., in the Chair.

The following paper was read:—

FIRST THOUGHTS ON A PHYSIOLOGICAL ARRANGEMENT OF BIRDS. BY EDWARD NEWMAN, F.L.S., F.Z.S. ETC.

The systematic arrangement of the Class Aves is more unsettled than that of any other portion of the animal kingdom, a circumstance

* This paper will be printed in the Zool. Trans. vol. iv. Part 1.

that may fairly be attributed to our attaching too high a value to characters purely structural or admensural, while we neglect others more intimately connected with reproduction; in a word, to the substitution of physical for physiological characters. In mammals, reptiles and fishes, we have a primary division based entirely on physiology: thus mammals are placental or marsupial; reptiles are oviparous or spawning; fishes are viviparous or spawning; and this primary division of these classes is admitted by all physiologists to be strictly natural. Notwithstanding, however, the purely physiological character, on which these primary divisions depend, it is found that physical characters harmonise with physiological, and that intimate structure in each instance bears out physiological difference. It were not wise altogether to discard structural differences even in the outset of an inquiry into system, but it is necessary to use them rather as corroborative than as indicative; and above all to draw a distinct and permanent line between such as are truly intimate and such as are purely adaptive. It has always appeared to me that one of the chief advantages of an extensive Vivarium like that possessed by our Society is the opportunity it affords for studying animated nature in an animated state, for ascertaining physiological as well as physical characters. If then we avail ourselves of the opportunities which are or ought to be thus afforded us, we shall find that in the very outset of life a physiological character of the most obvious kind will divide birds into groups as distinct as are the placental and marsupial mammals, or the cartilaginous and bony fishes. Prior to the extrusion of the egg, observed facts bearing on this subject are so few and so unconnected that they cannot be rendered available as affording evidence on the question to be considered; it is therefore compulsory that our comparisons begin at that moment when the condition of the young becomes patent by the breaking of the shell. Commencing the inquiry at this point, which may safely be regarded as analogous to the birth of a placental animal, we have this obvious grand division of the class:—

1. *Hesthogenous Birds*.—In these, immediately the shell is broken the chick makes its appearance in a state of adolescence rather than infancy: it is completely clothed, not with such feathers as it afterwards wears, but still with a close, compact, and warm covering: it possesses the senses of sight, hearing, smelling, &c. in perfection: it runs with ease and activity, moving from place to place at will: it perfectly understands the signals or sounds uttered by its parent, approaching her with alacrity when invited to partake of food she has discovered, or hiding itself under bushes, grass, or stones, when warned of danger; in either case exhibiting a perfect and immediate appreciation of its parent's meaning: it feeds itself, pecking its food from the surface of the earth or water, and not receiving it from the beak of its parent: although entering on life in this advanced state, it grows very slowly, and is long in arriving at maturity. When full-grown it uses its feet rather than its wings: it trusts much to its legs for means of escape: when it flies, it moves through the air by a series of rapid, powerful, laboured strokes of the wing, and invariably takes the earliest oppor-

tunity of settling on the land or water, not on trees; it never takes wing for recreation or food, but simply as a means of moving from place to place: it is polygamous in its habits; the number of females predominating over the males: the males are pugnacious, they accompany the females only until incubation has commenced, and abandon the duties of incubation and the care of the young solely to the females: the females make little or no nest, a depression scratched on the surface of the soil generally sufficing: the eggs are large in comparison to the size of the bird: neither sex sings, or attempts to imitate the voice of men or animals. Birds included in this division approach more nearly to mammals than do those which it excludes: for instance, the habitual use of land or water for progression, the swiftness of foot, the strength and muscular development of the legs, the polygamous habits, the want of the extraordinary instinct of nest-making, are characters which, while they seem to degrade these birds as birds, certainly raise them in the list of animals, because they are thus brought nearer those animals which suckle their young, and which are always placed at the head of the animal kingdom. In an economical point of view, and considered in reference to man, the flesh of these birds is wholesome, nutritious, and is generally considered highly palatable. The division comprises the following orders, in each of which partial exceptions to one or other of these general characters occur:—

1. Gallinæ, or the Poultry order.
2. Brevipennes (*Cuvier*), or the Ostriches.
3. Pressirostres (*Cuvier*), or the Plovers.
4. Longirostres (*Cuvier*), or the Snipes.
5. Macroductyli (*Cuvier*), or the Rails.
6. Plongeurs (*Cuvier*), or the Divers.
7. Lamellirostres (*Cuvier*), or the Ducks.

2. *Gymnogenous Birds*.—In these, when the shell is broken, the chick makes its appearance in a state of helpless infancy: it is naked, blind, and incapable of locomotion: it cannot distinguish its parent by means of its senses: it gapes for food, but does not distinguish between proper food offered by its parent, and a stick or a finger held over it: it cannot feed itself, and would die were not food placed in its mouth: it rapidly attains its full size, often before leaving the nest. When full-grown it uses its wings rather than its feet: it flies with a succession of deliberate and easy strokes: it takes wing for recreation and for food, and not merely for the purpose of moving from place to place: it is strictly monogamous; the sexes being equal in number: males share with females the cares of incubation and feeding the young until these are able to shift for themselves. Birds possessing these characters build elaborate nests in trees, and perch in trees rather than on the ground: many of them sing melodiously; others imitate, with wonderful facility, the voice of man or of animals. As an economical character in connexion with man, their flesh is bitter and unpalatable, often offensive and disgusting; hence man has never domesticated them for purposes of food. These are

birds *par excellence*: they possess in perfection the essential characters of birds: in the habitual use of air for progression and of trees for resting, in the want of abilities for terrestrial progression, in strength and bulk of pectoral muscle, in monogamous habits, in the fabrication of nests, in power of song, they are raised as birds, but degraded as animals, since in all these characters they recede from those animals which suckle their young. The division comprises the following groups, in each of which exceptions to one or other of the general characters occur:—

1. Totipalmes (*Cuvier*), or the Pelicans.
2. Longipennes (*Cuvier*), or the Gulls.
3. Accipitres, or the Birds of Prey.
4. Cultrirostres (*Cuvier*), or the Herons.
5. Passeres, or the Sparrow order.
6. Grimpeurs (*Cuvier*), or the Climbing birds; and
7. Columbæ, or the Pigeons.

ROYAL INSTITUTION.

Feb. 14, 1851.—“On Recent Researches into the Natural History of the British Seas.” By Professor Edward Forbes.

The Natural History of the British Seas has for a long time been a favourite subject of investigation. Within the last fifteen years, however, fresh inquiries have been set on foot, and the details of their zoology and botany worked out to an extent beyond that to which the examination of any other marine province has been carried. Numerous and beautifully illustrated monographs, treating of their fishes, cetacea, portions of the articulata, the mollusca, radiata, zoophytes, sponges, and algæ, have been published, either at private cost, or by patriotic publishers, or by the Ray Society, such as the scientific literature of no other country can show. As these have all been the results of fresh and original research, they present a mass of valuable data sufficient to form a secure basis for important generalizations.

From these materials, and from the results of the inquiries into the distribution of creatures in the depths of our seas, conducted by a committee of the British Association, a clear notion may be formed of the elements of which our submarine population is composed. Extensive tables exhibiting the sublittoral distribution of marine invertebrata, from the South of England along the western coasts of Great Britain to Zetland, mainly constructed from the joint observations of Professor E. Forbes and Mr. MacAndrew, are now preparing for publication as a first part of a general report from the committee referred to. The data embodied in these tables are the produce of researches conducted during the last eleven years, and registered systematically at the time of observation.

British marine animals and plants are distributed in depth (or bathymetrically) in a series of zones or regions which belt our shores from high-water mark down to the greatest depths explored. The uppermost of these is the tract between tide-marks; this is the LITTORAL ZONE. Whatever be the extent of rise and fall of the tide,

this zone, wherever the ground is hard or rocky, thus affording security for the growth of marine plants and animals, presents similar features and can be subdivided into a series of corresponding sub-regions; through all of which the common limpet (*Patella vulgata*) ranges, giving a character to the entire belt. Each of these sub-regions has its own characteristic animals and plants. Thus, the highest is constantly characterized by the presence of the periwinkle *Littorina rudis* (and on our western shores, *Littorina neritoides*) along with the sea-weed *Fucus canaliculatus*. The second subregion is marked by the sea-weed *Lichina* and the common mussel (*Mytilus edulis*). In common with the third subregion it almost always presents rocks thickly encrusted with barnacles, so that where our shores are steep, a broad white band entirely composed of these shell-fish may be seen when the tide is out, marking the middle space so conspicuously as to be visible from a great distance. In the third subregion the commonest form of wrack or kelp (*Fucus articulatus*) prevails, and the large periwinkle (*Littorina littorea*) with *Purpura Capillus* are dominant and abundant. In the fourth and lowest subregion the *Fucus* just mentioned gives way for another species, the *Fucus serratus*; and in like manner the shells are replaced by a fresh *Littorina (littoralis)* and peculiar *Trochi*.

Once below low-water mark the periwinkles become rare, or disappear, and the *Fuci* are replaced by the gigantic sea-weeds known popularly as tangles (species of *Laminaria*, *Alaria*, &c.), among which live myriads of peculiar forms of animals and lesser plants. The genus *Lacuna* among shell-fish is especially characteristic of this zone. In sandy places the *Zostera* or grass-wrack replaces the *Laminaria*. The LAMINARIAN ZONE extends to a depth of about fifteen fathoms, but in its lowest part the greater sea-weeds are comparatively few, and more usually the prevailing plant is the curious coral-like vegetable called Nullipore.

From 15 to 50 or more fathoms we find a zone prolific in peculiar forms of animal life, but from which conspicuous vegetables seem almost entirely banished. The majority of its inhabitants are predacious. Many of our larger fishes belong to this region, to which, on account of the plant-like zoophytes abounding in it, the name of CORALLINE ZONE has been applied. The majority of the rarer shell-fish of our seas have been procured from this region.

Below 50 fathoms is the REGION OF DEEP-SEA CORALS, so styled because hard and strong true corals of considerable dimensions are found in its depths. In the British seas it is to be looked for around the Zetlands and Hebrides, where many of our most curious animals, forms of zoophytes and Echinoderms, have been drawn up from the abysses of the ocean. Its deepest recesses have not as yet been examined. Into this region we find that not a few species extend their range from the higher zones. When they do so they often change their aspect, especially so far as colour is concerned, losing brightness of hue and becoming dull-coloured or even colourless. In the lower zones it is the association of species rather than the presence of peculiar forms which gives them a distinctive character. All recent re-

searches, when scientifically conducted, have confirmed this classification of provinces of depth. When we have an apparent exception, as in the case of the submarine ravine off the Mull of Galloway, dredged by Captain Beechey and recorded by Mr. Thompson, in which, though it is 150 fathoms deep, the fauna is that of the coralline zone, we must seek for an explanation of the anomaly by inquiring into the geological history of the area in question. In this particular instance there is every reason to believe that the ravine mentioned is of a very late date compared with the epoch of diffusion of the British Fauna.

When we trace the horizontal distribution of creatures in the British seas, we find that though our area must be mainly or almost entirely referred to one of the great European marine provinces, that to which the lecturer has given the name of *CÉLTIC*, yet there are subdivisions within itself marked out by the presence or absence of peculiar species. The marine fauna and flora of the Channel Isles present certain differences, not numerous, but not the less important, from that of the south-western shores of England, which in its turn differs from that of the Irish Sea, and it again from that of the Hebrides. The Cornish and Devon sea fauna and that of the Hebrides are marked by redundancies of species; that of the eastern coasts of England, on the contrary, by deficiencies. Along the whole of our western coasts, whether of Great Britain or Ireland, we find certain creatures prevailing, not present on our eastern shores. In the depths off the south coast of Ireland we find an assemblage of creatures which do not strictly belong to that province, but are identical with similar isolated assemblages on the west coast of Scotland. In the west of Ireland we find a district of shore distinguished from all other parts of our coast by the presence of a peculiar sea-urchin, to find the continuation of whose range we must cross the Atlantic to Spain. In such phenomena the lecturer sees evidences of conformations of land, of outlines of coast, and connections of land with land under different climatal conditions than at present prevail within our area, for an explanation of which we must go back into the history of the geological past. If we do so, we can discover reasons for these anomalies, but not otherwise.

The dredging researches about to be published go to show that among our sublittoral animals the northern element prevails over the southern,—a fact indicated by the number of peculiar northern species; at the same time the southern forms appear to be diffusing themselves northwards more rapidly than the northern do southwards. This diffusion is mainly maintained along our western shores, and appears to be in action, not only in the British seas, but also along the shores of Norway. We must attribute it to the influence of warm currents flowing northwards, originating probably in extensions of the Gulf-stream. The body of colder water in the depths of our seas preserves the original inhabitants of this area, remnants of the fauna of the glacial epoch, overlain and surrounded by a fauna of later migration, and adapted to a higher temperature. A curious fact respecting the marine creatures of the Arctic seas of Europe, viz.

that the littoral and laminarian forms are peculiarly arctic, whilst the deeper species are boreal or celtic, may be explained also by the influence of warm currents flowing northwards and diffusing the germs of species of more southern regions in the coralline and deep-sea-coral zones; for in the arctic seas the temperature of the water is higher at some depth than near the surface. On the other hand, we find in a region farther to the south than Britain, an outlier of the Celtic fauna preserved in the bays of Asturias, where it was discovered in 1849 by Mr. MacAndrew; a very remarkable fact, and one appealed to by the lecturer as confirmatory of his theory of an ancient coast-extension between Ireland and Spain.

There is still much to be done in the investigation of the natural history of our seas, and many districts remain for more minute exploration. It is chiefly among articulate animals, and especially among worms, that fresh discoveries may be looked for. Yet even now, new and remarkable forms of mollusca may occasionally be procured, and during the autumn of last year, in a cruise with Mr. MacAndrew, no fewer than twenty additional mollusca and radiata were discovered in the Hebrides, and have just been described by the lecturer in conjunction with Professor Goodsir. Among these is one of the largest, if not the largest, compound Ascidiæ ever discovered. In our southernmost province fresh and valuable researches have been conducted during the past year by Professor Acland and Dr. Carus, who, selecting the Scilly Isles as a field for exploration, have filled up a blank in our fauna.

The lecturer concluded by an expression of gratification at the spread and progress of natural-history studies in Great Britain among all ranks, and at the love of science manifested in the systematic manner in which our fauna and flora have been explored, and the beautiful works which have been produced in illustration of them.

MISCELLANEOUS.

LARUS TRIDACTYLUS.

To the Editors of the Annals of Natural History.

GENTLEMEN,

The Willows, Swansea, Feb. 15, 1851.

On the 28th ult. I picked up on the sand-hills in Swansea Bay, far above high-water mark, "*Larus tridactylus*; condition good; no shot marks; position natural; dead, but not rigid."

Upwards of a dozen were found within two miles, some still living, and others a considerable distance inland.

In addition to these, many were washed up by the tide.

I believe that all these birds were of the same species; certainly all that came under my own observation were; and I would therefore wish to ask, through the medium of your widely circulated Journal, whether a similar fact has been noticed at that time elsewhere? for it appears strange that death should have overtaken this *one species*

alone, and that *suddenly*, as shown by "condition good," in the extract from my note-book.

I am, Sir, your obedient servant,
MATTHEW MOGGRIDGE.

Descriptions of new Entophyta growing within Animals.
By JOSEPH LEIDY, M.D.

ECCRINA. (Gen. nov.) Characters same as *Enterobrus**, except that it divides into numerous cells at the free extremity.

Eccrina longa. Filaments long and delicate, hyaline, or faintly brownish, at first forming a simple curve, or a single spiral turn, and then passing in a straight line to the free extremity. Peduncle very short. Frond cell usually filled with globules, and a few granules, except at free end, where it is usually filled with granules to the exclusion of the globules. End cells as many as thirty in number, at first consisting of elongated divisions of the frond cell contents, but becoming distinct elliptical cells, from two to three times longer than the breadth; contents usually granular, occasionally with a few globules. End cells finally separating from the parent. Length from three to seven lines, breadth 1-2000th to the 1-517th in., not usually corresponding to the length. End cells 1-517th to the 1-357th in. in length.

Hab. Grows in very great profusion from the mucous membrane of the posterior part of the intestine of *Polydesmus virginienensis*.

[Dr. Leidy exhibited to the Academy a preserved fragment of mucous membrane, with filaments of this species six lines in length growing from it.]

Eccrina moniliformis. Filaments hyaline or yellowish, forming a double or treble spiral. Peduncle short. Frond cell filled with globules and granules, except towards its free extremity, where it is filled with granular matter divided into distinct and separate masses, usually a little shorter than broad, and containing each a globular nucleolated nucleus. Divisions progressively passing towards the end into globular cells with granular contents. Divisions and globular cells from twenty to fifty in number.

Length from 1 to 1½ line, breadth average 1-1500th in. Divisions of frond cell contents and globular cells from 1-1875th to 1-1500th in. Nucleus of cells 1-3750th in.

Hab. Grows in moderate quantity from the mucous membrane of the intestine of 50 per cent. of *Polydesmus granulatus*.

Arthromitus nitidus. Filaments very long, hyaline, grow usually in twos or fours, pointed at the origin, rounded at the termination. Articuli very distinct, length equal to the breadth of the filament. Sporuli formed within the articuli, solitary, usually oblique, oval, amorphous.

Length 1 line by 1-5000th in. broad. Spores 1-7·111th in. long, by 1-12·500th in. broad.

Hab. Grows in considerable quantity with a profusion of young of

* Ann. Nat. Hist. Jan. 1850.

Enterobrus elegans, from the mucous membrane of the posterior portion of the rectum of *Julus marginatus*.

Remarks.—Since I established the genus *Arthromitus** I have observed the formation of its sporuli. These originate in the amorphous matter of the articuli, apparently by a very gradual aggregation and condensation of the contents. They are always single, and usually lie oblique, and frequently alternate with each other in this position in the different articuli. When they first appear they are larger than when fully formed, are frequently bent, or clavate in form, and very indistinct; but as they ripen, they become more regular, oval, distinct, and quite refractile of light. Usually they are observed at the extremity of the filaments only, but frequently they are found existing in the whole length of the latter.

A species of *Arthromitus*, and also of *Cladophytum*, is found in the intestine of *Polydesmus virginiensis*.

The *Higrocrocis intestinalis* found by Valentin in the *Blatta orientalis*, I could not find in our domestic cockroach, although I found numerous simple, phytoid, inarticulate filaments, growing from an *Oxyuris* infesting this animal.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. v. p. 35.

ON FOSSIL RAIN DROPS.

Mr. Desor communicated some observations made by Mr. Whitney and himself in reference to the probable origin of the so-called fossil rain drops, which in this country are found on slabs of new red sandstone, as well as Potsdam sandstone.

He said it had already been noticed by Mr. Teschemacher that these so-called rain drops, when closely examined, are found to differ in several respects from the impressions made by the rain on a beach, where each drop produces an impression surrounded by a rough crest, more or less elevated according to the force of the rain. The fossil impressions on sandstone, on the contrary, are generally flat and smooth. Besides, there is hardly a shower in which the rain drops are not numerous enough to cover the whole or nearly the whole ground, whereas the fossil impressions are generally scattered and so few in number that it seems almost impossible to ascribe them to rain.

Mr. Desor said, that whilst encamped on the border of Lake Superior, they had several opportunities of studying the action of the waves on the beach during a heavy surf, when they are driven beyond their usual range. It was noticed that when the waves retired from the higher part of the beach, where the slope was less steep, there could be seen several kinds of impressions in the act of forming, some large and flat, others small and deep, (like those which on the sea-shore are generally ascribed to worms or shrimps,) and others likewise deep, but surrounded by a sort of annular, smooth rim. These different kinds of impressions are all produced by the same cause, operating in the same way, namely air-bubbles, which are formed in the waves of the surf, when rolling over the beach. If an air-bubble becomes

* *Ann. Nat. Hist.* Jan. 1850.

buried in the sand, so that in order to escape it has to make its way through the new-formed stratum of sand, it forms a deep and narrow hole. If the air, instead of escaping at once, bubbles up several times, then it raises around the hole a small and smooth rim, which may be compared to a miniature crater of a volcano. If, on the contrary, the air-bubble remains at the surface and bursts, then it causes a flat and rather large impression. According to Messrs. Whitney and Desor, these different forms of impression arising from air-bubbles are sufficient to account for most impressions which have hitherto been considered as the effect of rain. Such impressions of air-bubbles are most perfect where the slope of the beach is very gentle. Where the slope is more or less steep, the sand becomes too much hardened under the pressure of the waves to allow these delicate impressions to be produced.

A sketch was exhibited, showing these different forms of impressions, and their striking contrast with impressions of rain drops from the same beach, mouth of Carp River, Lake Superior.

Mr. Teschemacher said, that he had seen fossil rain drops, so-called, with an elevated ridge crossing them; an appearance easily explained by Mr. Desor's hypothesis, but incompatible with the supposition that they were caused by rain.

Prof. Agassiz said, that on the mud flats at Cambridge, he had noticed impressions made in the way described by Mr. Desor at Lake Superior.—*Proc. Bost. Soc. Nat. Hist.* 1850. p. 200.

On the Occurrence of Crystalline Bodies in Animal Tissues.

Dr. Leidy remarked that crystalline bodies had been detected in most of the tissues of many plants, but that their occurrence in animal tissues was much more rare. The deposit of earthy salts in many tissues, such as bone, enamel and shell, though analogous, was not homologous with crystallization. The earthy deposit in the shell of the egg of many animals is probably an instance of true crystallization within an animal tissue, for in those animals which have eggs with a semi-membranous shell, as many helices, &c., we can detect the carbonate of lime deposited in the form of regular rhombohedrons. He stated that he lately met with a remarkable instance of crystallization within animal organic cells. In examining the stomach of the larva of *Arctia Isabella*, a Lepidopterous insect, he found that the nucleus of every epithelial cell contained an octohedral crystal, the axes of which measured about the 1-3750th of an inch. The cells were colourless, (not white,) containing some faintly granular matter, which in many instances was collected into distinct rounded masses. The nuclei were round, elliptical, or lenticular, transparent, and measured the 1-1666th of an inch when round. The following day, upon examining some of the cells, which had been preserved between two slips of glass hermetically sealed, the crystals had disappeared, and the nuclei had become distinctly and opakely granular. Acetic acid rendered the granular matter more translucent, and brought into view the nucleolus, which, not being visible the preceding day, probably served as the nucleus of the crystalline body. The animal, when examined, was in a state of hibernation, at which period organic activity is

reduced, which would predispose to the crystallization of any salt in solution in an organic cell; for it appears that the frequency of the existence of crystalline bodies in the organic kingdom, is, to a considerable extent, dependent upon an inverse ratio of activity of life.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. v. p. 32.

METEOROLOGICAL OBSERVATIONS FOR JAN. 1851.

Chiswick.—January 1. Densely clouded: boisterous, with slight rain. 2. Overcast: cloudy: densely overcast. 3. Hazy: heavy rain: overcast. 4. Hazy: clear. 5. Very fine. 6. Dense fog. 7. Foggy: cloudy and fine. 8, 9. Very fine. 10. Rain. 11. Fine: drizzly. 12. Densely overcast: drizzly. 13. Densely clouded. 14, 15. Fine: cloudy. 16. Very fine. 17. Fine: heavy rain at night. 18. Clear: very fine. 19. Fine: cloudy: overcast. 20. Densely overcast: boisterous, with rain. 21. Overcast: very fine: heavy rain at 8 P.M. 22. Clear: very fine. 23. Frosty: fine: clear and frosty. 24. Dense fog. 25. Cloudy: overcast. 26. Fine: overcast: rain. 27. Clear: very fine. 28. Very fine: rain. 29. Overcast: boisterous, with rain at night. 30. Rain: fine: rain at night. 31. Sleet: rain.

Mean temperature of the month	40°40
Mean temperature of Jan. 1850	33·11
Mean temperature of Jan. for the last twenty-five years .	36·60
Average amount of rain in Jan.	1·60 inch.

Boston.—Jan. 1. Cloudy: stormy P.M. 2. Cloudy: rain A.M. and P.M. 3. Cloudy: rain P.M. 4. Cloudy. 5. Cloudy: rain early A.M. 6, 7. Foggy. 8. Fine: rain P.M. 9. Fine. 10. Rain: rain A.M. and P.M. 11—15. Cloudy. 16—19. Fine. 20. Fine: rain P.M. 21, 22. Fine. 23, 24. Cloudy. 25. Cloudy: rain P.M. 26. Fine. 27, 28. Fine: rain P.M. 29, 30. Cloudy: rain P.M. 31. Fine.

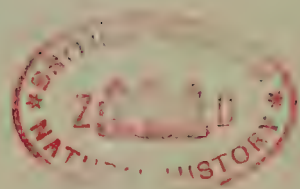
Applegarth Manse, Dumfries-shire.—Jan. 1. Boisterous day of darkness, wind and rain. 2. Fearful night of wind and rain: calm A.M. 3. Frost hard: thick fog all day. 4. Thaw: rain: high wind P.M. 5. Wet all day. 6. Frost preceding night: moist. 7. Frost: thaw: rain P.M. 8. Snow-shower: rain again. 9. Frost: clear: fine. 10. Rain: fog: continued drizzle. 11. Rain all day. 12. Rain heavy during night: day fine. 13. Drizzle all day: wind high. 14. Rain heavy: drizzle: flood. 15. Rain A.M.: rain again P.M. 16. Rain and high wind. 17. Fair A.M.: rain and wind P.M. 18. Frost slight A.M.: fine day. 19. Showers: dull and cloudy. 20. Rain heavy all day: flood. 21. Rain during night: fine A.M. 22. Frost slight: occasional showers. 23. Fair and mild all day. 24. Fair A.M.: rain again P.M. 25. Rain heavy night and morning. 26. Rain during night: fair noon: wet P.M. 27. Fair: calm: high wind P.M. 28. Fair A.M.: rain and wind P.M. 29. Rain nearly all day: flood. 30. Fair A.M.: heavy snow P.M. 31. Frost: fog: snow lying: calm.

Mean temperature of the month	40°4
Mean temperature of Jan. 1850	30·8
Mean temperature of Jan. for the last twenty-nine years ...	34·7
Average rain in Jan. for twenty-four years	2·60 inches.

Sandwick Manse, Orkney.—Jan. 1. Showers. 2. Showers: sleet: showers. 3. Showers: clear. 4. Frost: cloudy. 5. Showers: clear. 6. Fine: clear: showers. 7. Fine: frost: cloudy. 8. Bright: showers. 9. Showers: large halo. 10. Rain. 11. Cloudy. 12. Rain: clear. 13. Rain: cloudy: clear. 14. Cloudy: rain: cloudy. 15. Cloudy: drizzle. 16. Clear: rain. 17. Clear: large halo. 18. Clear: sleet-showers. 19. Cloudy: clear: aurora. 20. Cloudy: showers. 21. Bright: cloudy: showers. 22. Sleet-showers: showers: aurora. 23. Bright: cloudy: aurora. 24. Rain: cloudy. 25. Rain: cloudy. 26. Rain: clear: cloudy. 27—29. Rain: clear: aurora. 30. Showers: clear: hoar-frost. 31. Clear: frost: sleet-showers.

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.		Boston.		Dumfries-shire.		Orkney, Sandwick.			
	Max.	Min.	8 $\frac{1}{2}$ a.m.	9 a.m.	9 p.m.	9 $\frac{1}{2}$ a.m.	8 $\frac{1}{2}$ p.m.	Max.	Min.	8 $\frac{1}{2}$ a.m.	Max.	Min.	9 a.m.	9 $\frac{1}{2}$ p.m.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.		
1.	29.707	29.646	29.18	29.18	29.00	28.96	29.08	54	51	53	50	46 $\frac{1}{2}$	44	43	54	s.	sw.	sw.	.02	.....	.....	.....	.13
2.	29.801	29.707	29.20	29.38	29.67	29.21	29.57	53	43	54	45 $\frac{1}{2}$	43	44	43	53	sw.	sw.	sw.	.....	.....	.....	.....	.42
3.	29.949	29.831	29.63	29.88	29.81	29.82	29.91	46	35	44	37	28 $\frac{1}{2}$	44	40	35	calm	calm	nw.	.56	.34	.....	.....	.21
4.	29.846	29.648	29.40	29.63	29.40	29.77	29.57	47	39	43.5	44	27 $\frac{1}{2}$	35	41 $\frac{1}{2}$	39	ws.w.	e.	e.	.02	.20	.....	.....	.....
5.	29.554	29.512	29.16	29.30	29.32	29.34	29.46	47	24	44	44	41	44 $\frac{1}{2}$	42	44	sw.	sw.	s.-sw.	.....	.04	.....	.....	.08
6.	29.581	29.520	29.30	29.48	29.48	29.56	29.61	45	31	29	39 $\frac{1}{2}$	30 $\frac{1}{2}$	42	37	44	w.	w.	sw.	.....	.....	.....	.....	.....
7.	29.560	29.447	29.27	29.33	29.15	29.45	29.29	47	27	35	42	28 $\frac{1}{2}$	47	40 $\frac{1}{2}$	27	ese.	ese.	se.	.02	.....	.....	.....	.12
8.	29.516	29.478	29.20	29.28	29.15	29.25	29.40	49	27	32	39	31 $\frac{1}{2}$	47	38	32	sw.	sw.	se.	.08	.....	2.10	.....	.26
9.	30.038	29.781	29.40	29.48	29.72	29.62	29.79	45	23	37.5	42	33 $\frac{1}{2}$	38	34	45	w.	w.	w.	.07	.09	.....	.....	.14
10.	30.054	29.944	29.60	29.58	29.70	29.46	29.48	50	39	40	48	32	42	50 $\frac{1}{2}$	34	s.	sw.	w.	.21	.17	.....	.....	.14
11.	30.108	30.034	29.73	29.71	29.61	29.57	29.66	49	45	48	48	45	48	44 $\frac{1}{2}$	48	ws.w.	sw.	sw.	.02	.12	.....	.....	.29
12.	29.959	29.937	29.48	29.50	29.68	29.50	29.66	51	47	47	46	44	41	41	41	sw.	sw.	sw.	.01	.....	.....	.....	.29
13.	29.826	29.717	29.40	29.36	29.27	29.13	29.04	49	44	46	49	39	43	48	48	s.	s.	s.	.....	.....	.....	.....	.32
14.	29.552	29.263	29.20	29.18	29.08	29.25	29.15	48	40	43.5	48	43 $\frac{1}{2}$	46	45	46	se.	se.	se.13
15.	29.449	29.111	28.82	28.92	28.87	29.10	29.00	51	28	42.5	46 $\frac{1}{2}$	40	44	45	45	sse.	e.	e.	.20	.....	1.54	.....	.05
16.	29.744	29.474	29.37	29.30	28.83	29.27	28.80	50	40	35	49 $\frac{1}{2}$	35	39	46	46	s.	ese.	se.	.48	.....	.....	.....	.23
17.	29.641	29.571	29.16	29.18	29.38	28.85	29.11	51	27	42.5	43	40	44 $\frac{1}{2}$	41	43	sw.	w.	sw.	.....	.....	.....	.....	.04
18.	30.081	29.927	29.55	29.63	29.72	29.51	29.66	48	28	35	43 $\frac{1}{2}$	35	41 $\frac{1}{2}$	43	43	sw.	w.	sw.	.....	.....	.....	.....	.07
19.	30.067	29.940	29.66	29.67	29.43	29.48	29.28	49	35	39	48 $\frac{1}{2}$	41	46 $\frac{1}{2}$	45	45	s.	s.	s.	.....	.....	.....	.....	.48
20.	29.882	29.422	29.43	29.37	29.00	29.18	28.86	50	40	39	47 $\frac{1}{2}$	43 $\frac{1}{2}$	43	42 $\frac{1}{2}$	42	s.	s.	s.	.48	.....	.....	.....	.05
21.	29.527	29.465	29.07	29.10	29.20	29.06	29.06	50	30	40	47 $\frac{1}{2}$	35	37	37	37	ws.w.	s.-sw.	sw.	.09	.24	.....	.....	.05
22.	30.144	29.808	29.46	29.40	29.83	29.10	29.69	46	22	33	41 $\frac{1}{2}$	33	41	45	45	sw.	sw.	w.	.....	.....	.....	.....	.....
23.	30.328	30.310	29.95	30.04	30.05	29.96	29.93	47	22	32	45	35	42	43	43	sw.	sw.	sw.	.....	.....	.....	.....	.....
24.	30.219	30.045	29.87	29.97	29.81	29.92	29.76	34	25	33	43 $\frac{1}{2}$	40	45	43	43	s.	se.	se.	.....	.....	.....	.....	.....
25.	29.946	29.892	29.66	29.68	29.53	29.69	29.64	42	29	33	42	36 $\frac{1}{2}$	40	41	41	s.	se.	se.	.....	.....	.....	.....	.....
26.	29.829	29.690	29.50	29.51	29.43	29.56	29.71	42	28	33	43 $\frac{1}{2}$	39	43	42	42	se.	se.	e.	.02	.02	.....	.....	.09
27.	29.979	29.868	29.50	29.49	29.55	29.57	29.64	48	27	32.5	45	34	41	37	37	sw.	s.	w-se.	.02	.08	.....	.....	.13
28.	29.789	29.691	29.38	29.41	29.36	29.45	29.44	49	39	40.5	46	38 $\frac{1}{2}$	44	40 $\frac{1}{2}$	40	sse.	s-se.	se.	.12	.08	.....	.....	.04
29.	29.722	29.463	29.27	29.20	29.09	28.97	28.97	52	32	45	48	39	44 $\frac{1}{2}$	40	40	sw.	sw.	w.	.20	.02	.....	.....	.25
30.	29.520	29.252	29.11	29.15	29.06	29.00	29.09	46	30	36	40	35	39 $\frac{1}{2}$	35	35	sw.	sw.	sw.	.38	.14	1.51	.....	.07
31.	29.289	29.194	28.86	29.02	29.15	29.25	29.45	45	28	31	36 $\frac{1}{2}$	29	34	39	39	w.	w.	w.	.07	.08	.....	.....	.....
Mean.	29.811	29.664	29.38	29.429	29.395	29.377	29.411	47.74	33.06	39.3	45.1	36.8	41.74	41.70	3.07	1.54	7.12	4.29						



MAP
OF THE
GEOGRAPHICAL DISTRIBUTION
OVER THE GLOBE
of the
BULIMI,
A GENUS OF TERRESTRIAL MOLLUSCA



THE ANNALS
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[SECOND SERIES.]

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XXII.—*On the Geographical Distribution of the Bulimi, a genus of terrestrial Mollusca, and on the modification of their Shell to the local physical conditions in which the species occur.* By LOVELL REEVE, F.L.S. &c.

[With a Map.]

THE *Bulimi* are distributed over the equatorial, tropical and warm temperate regions of the globe in assemblages of species, limited in their range, and of very distinct typical character; and being of sluggish habits with few means of transport, little migration occurs even where there are no such natural boundaries as seas, deserts, or mountain chains. Of the *Bulimi* known from all parts of the world, the localities of nearly 600 species are now well authenticated. They are all described and figured in the 'Conchologia Iconica'; most of them with the particular circumstances of habitation. Their area of geographical distribution lies between 40° S. and 35° N. in the new world, and between 42° S. and 52° to 55° N. in the old world;—that is, between the southern borders of Chili and Texas in the former, and between Van Diemen's Land and Germany, if not Sweden, in the latter. And there is no country within this area of which the genus of snails under consideration does not form part of the zoology. There is one abnormal species, *B. lubricus*, removed from the genus by British authors, which obtains a more northerly range and a greater elevation in both hemispheres.

Regarding the differences of form, composition and disposition of colour in the shell, the *Bulimi* are distributed over this area in seven provinces, comprising about forty typical assemblages of species. Of these three-fifths inhabit the western hemisphere, principally Central America, and two-fifths have a wider range and greater local variety of character, in conformity with the more varied arrangement of the land, in the eastern. Taking the size and substance of the shell at different elevations and in

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different degrees of temperature, it may be remarked that the calcifying energies of the *Bulimi* are most strongly exerted in thickly wooded districts, in the midst of plenty of decaying vegetable matter, close and humid, with a mean heat of from 80° to 85° , among shady thickets or in ravines. Near the sea-level in thin calcareous soil, and in sandy plains, where the vegetation is scanty and parched, and in grassy savannahs, the shell is thin and often vividly coloured. In those species whose habit it is to burrow in the ground, the shell is mostly small, patternless, and of glassy tenuity, even in localities remote from each other and differing materially in physical character.

I. THE WESTERN HEMISPHERE.

The Western Hemisphere comprises four grand provinces of distribution, the Venezuelan, the Brazilian, the Chilian, and the Bolivian, and from these may be further distinguished the districts of the Gelepagos Islands and of the Great Antilles. The first province includes the countries of New Granada and Venezuela; the second comprises the empire of Brazil and Buenos Ayres; the third comprises Chili and West Peru; and the fourth province includes Bolivia and the Argentine Republic. About three hundred and fifty species are known.

1. The Venezuelan Province.

The highest condition of the genus is in intertropical America, which yields about one half of the number of species known from all parts of the world. In the luxuriant districts of New Granada and Venezuela, watered by the tributaries of the Magdalena and Orinoco rivers, with a temperature varying from 70° to 100° in the shade, about sixty species have been collected at different altitudes. On the mountain sides near the sea, away from the land breezes, with little vegetation, where the thermometer never falls below 80° , are a few species, *B. erectus*, *Cacticolus*, &c., of which the shell is extremely thin and sombre from the want of moisture for the animal, which is curiously spotted and painted, and attaches in clusters to the parched Cacti, eating into their fleshy substance. The animals of the beautifully variegated shells of the Philippine *Bulimi* are of a uniform dull gray colour. These contrasts between animal and shell are worth noting. Higher up on the mountains of Venezuela for the space of about 2000 feet, the country being still of a sandy and stony nature, with little vegetation except Cacti and other dry prickly shrubs, and a few trees in the ravines, the *Bulimi* are still comparatively small, but the shell is more brilliant in colour. *B. Curianensis*, *Knorri*, and *Studeri* are beautiful examples of this type,

of which the darker varieties inhabit the higher and woodier situations. They are rarely found at a greater elevation or in a lower temperature than about 76° within doors. Proceeding upwards on the mountains of Venezuela, the plants are now thicker, and give place to large trees with underwood of broad green leaves, enveloped in clouds and mists which occasion considerable humidity. In these situations at an elevation of from 4000 to 6000 feet are the richly-coloured *B. fulminans* and *Blainvillanus*, and at a still greater altitude reaching to 8000 feet, with a proportionably lower temperature of from 65° to 70° , under decayed leaves in thick moist woods, in ravines and in crevices of the mountains, are the large stout dark-painted *B. Moritzianus*, *astropoides*, *pardalis*, *Funckii*, &c., representing the most highly calcified condition of the genus hitherto discovered.

2. The Brazilian Province.

Passing in a south-easterly direction into the great territory of Brazil, we have no information of the presence of any typical assemblages of *Bulimi* until reaching the countries of Bahia and Minas Geräes. It can hardly be doubted, however, that in Guayana, Pará, and all that country constituting the great basin of the Amazon, many fine species occur, in addition to *B. Bensoni*, which belongs to the widely spread *B. zebra* type, as well as in Piauhy, Goyaz, and the more sterile parts of Pernambuco. From Bahia southwards to Rio Janeiro, the genus is represented by about sixty species, in six characteristic typical groups, extremely local, and of which the shell differs remarkably in its plan of convolution. In no part of the American continent is the theory of specific centres of creation, advocated by Professor E. Forbes, so distinctly recognized as in this area of ten degrees. On the Corcovado and other lofty mountains in the vicinity of Rio, in dense woods at an elevation of 1000 to 1500 feet, is a singular group, *B. Pantagruelinus*, *exesus*, *odontostoma*, *Pupoides*, &c., of which the shell differs from all other types of the new world, in having a number of tooth-like processes developed within the aperture of the last whorl on arriving at maturity. The only country in which this character again appears is in the centre of the old world, among the smaller and more temperate species of Syria and Hindoostan. In this part of Brazil we have also another type, peculiar to the locality, in which the last whorl is produced in front into a longitudinally angled channel, as in *B. goniostroma*, *egregius*, *angulatus*, *fusiformis*, &c. Upon the leaves of damp underwood, at an elevation of about 2000 feet, is another distinct and brilliantly coloured group, *B. multicolor*, *Miersii*, and the large *B. ovatus*, which inhabits also the neighbouring island of St. Catharina. In the lower grounds upon orange-trees and in the

coffee plantations about Tejuca at 1000 feet above the sea-level, the *Bulimi*, as in the lower parts of Venezuela, have their shells characteristic of less moisture and fewer opportunities of retirement. *B. papyraceus* may be quoted as an example. The more lofty and thickly wooded parts of Minas Gerães produce a type with shells of solid growth and intertropical brilliancy of colour, represented by *B. Milleri*, *bilabiatus*, *planidens*, *melanostoma*, &c. In the vicinity of Bahia is a group with shells of totally different construction and of lighter substance, *B. navicula*, *auris-leporis*, &c., in which the last whorl is peculiarly convoluted at a right angle with the axis of the spire. Lastly, at Caravelhas, below Bahia, and at the little island of Coxaprego, at the mouth of the Iguaripe river, is a remarkable type, represented by *B. calcareus*, *obeliscus*, *sylvaticus*, &c., of which the shell, presenting a singular contrast with the preceding group, is composed of a large number of whorls, drawn out into the elongated form of a *Turritella*. This partial grouping of opposite forms, within a comparatively limited area having few natural boundaries, will doubtless become broken up to a certain extent with the advancement of human progress. Already have the climate and natural vegetation of Rio been modified by the clearing away of the neighbouring forests of the Corcovado range of hills, which tends to reduce the humidity and other circumstances that combine to favour the growth and calcification of the terrestrial mollusca.

Owing probably to the recent geological disturbances that are supposed by Lyell, Darwin and others to have taken place in the southern extremity of the American continent, there are no typical provinces of *Bulimi* below Rio. The genus is represented by one or two scattered species in Buenos Ayres extending in the widely distributed *B. sporadicus* to the banks of the Rio Negro, but none are recorded from the sterile riverless plains of Patagonia. That the genus should be suddenly arrested at this point in a tropical condition, without any of the graduated states which abound in the north temperate countries of both hemispheres, is doubtless owing to the upraising of the land in this part of South America, which Mr. Darwin considers to have occurred within the period of the now-existing sea-shells. Mr. Cuming collected worn shells of *Voluta Brasiliana* (a species living on the shores of Buenos Ayres) in a bank of other dead shells fifty miles inland. The climate is many degrees warmer in Patagonia and Tierra del Fuego than in the same latitude of the northern hemisphere. "Evergreen trees," says Mr. Darwin, "flourish luxuriantly under it, humming-birds may be seen sucking the flowers, and parrots feeding on the seeds." Snails being of less fugitive character than birds, and offering fewer means of transport than plants, appear not to have migrated thither. The

sea which washes the shores of Patagonia is peopled with a fauna of more tropical character than the land, owing to the warmth of the great equatorial current, which flows southward along the eastern coast of South America, and causes a bend in the system of isothermal lines laid down by Humboldt of nearly ten degrees. A fine large richly painted *Volute*, *V. Magellanica*, in common use among the Patagonians as a drinking-cup, inhabits their shore abundantly. Yet the northern limit of this genus does not approach the Mediterranean nor any part of Europe. It is right however to add, that a species of *Cymba*, to which genus *V. Magellanica* is the nearest allied form of *Volute*, has been very recently dredged off Lisbon by Mr. McAndrew.

3. The Chilian Province.

Crossing to the west side of the American continent and returning northward, we are impressed with the marked difference between those on the west and those on the east side of the mountain chain of the Andes. In the sandy plains of Chili, where there is little moisture beyond that arising from the dews, the *Bulimi*, about thirty-five in number, are mostly small, with thin, often transparent shells, having little of colour or marking. Towards the mountains at the roots of shrubs, on dead trunks of trees or under Cacti, are several species distributed somewhat miscellaneously in respect of form, as *B. granulatus*, *erythrostoma*, *Pupiformis*, &c. Near the sea-shore they assume a more distinct typical character, of which the shell, *Succinea*-like, is widely inflated, and owing to the dry calcareous nature of the soil and absence of vegetation is extremely thin, brittle, and simply dark-speckled. The *B. Broderipii*, *punctulifer*, *rupicolus*, and *reflexus* are characteristic examples. Surrounded with few of the conditions which serve for the formation of shell, the calcifying functions of this group are but feebly exercised. They exist for many months together in the crevices of rocks in a state of torpidity, and are only roused during the excessive dews. "Wait till the dews come," said a Chilian to Mr. Cuming, "and they will all come to life again."

In the warmer, but still comparatively rainless district of Peru, the *Bulimi* have more brightly-coloured shells, with more variety of pattern. They are about as numerous in species as those of Chili, under as many types. In the more arid parts of Peru, upon the mountains, the shell is thin, as in *B. varians*, *tigris*, *lemniscatus*, and *tumidulus*, compared with those inhabiting more woody districts on the eastern side of the Andes. They have, moreover, a colder aspect than those of the same latitude in Brazil, on account of the more scanty nature of the vegetation, the lesser

humidity of the atmosphere, and the cold precipitated from the cold antarctic drift current which flows in a northerly direction along the western shores of South America nearly to the equator. The effect of moisture and consequent amount of decaying vegetable matter in promoting the formation of shell is curiously illustrated by the presence of a stout richly-coloured species of large size, *B. phasianellus*, on the rainy border of Peru, where they crawl up the stripped trees in great abundance; and by the *B. Tupacii*, dwelling on bushes and garden walls on the Bolivian side of the Andes at an elevation of 9000 feet, which has a robust dark-painted shell similar to those of the lofty Venezuelan type. *B. rosaceus*, which inhabits a wide range of country, extending from the environs of Valparaiso, near the sea, to Cocapata in Bolivia, crouches under stones in the sand in the first-named locality, and has a pale smooth calcareous shell. But in the woods of Cocapata, where it lives in more humid situations among the trunks of trees, the shell is larger, stouter, more richly coloured, and with more of epidermis. Thus we have the change which characterizes different species, presented in the same species under different conditions. Another remarkable instance is presented in *B. zebra*. This species inhabits an area of Central America enclosing Honduras, Nicaragua, the West Indies, and Pernambuco, reaching to the shores of Peru, and produces a shell varying so much in character according to the physical conditions under which it is formed, that it has been described as several species. The same has occurred with *B. regina*, which in its range from New Granada and Guayana to Bolivia and the interior of Peru, affects a condition partaking in each instance of the local conchological character of the country.

4. *The Bolivian Province.*

From Bolivia and the Argentine Republic about forty *Bulimi* are described, illustrative of six types. The large Brazilian *B. ovatus*, living near the coast, is here represented in the heart of the continent, at Santa Cruz, by the gigantic *B. maximus* and *Valenciennesii*, inhabiting the dense forests of the Cordilleras with *B. lacunosus* and a few other allied forms. Another type with shells of stout growth is represented by *B. Tupacii*, *thamnoicus*, and *inca*; and an extremely interesting form is presented in *B. onca*, found by M. D'Orbigny at the bottom of a deep ravine near Tutulima. A few species with delicately painted shells, constituting another group, inhabit the woods in the vicinity of Cochabamba, *B. linostoma*, *xanthostoma*, *fusoides*, &c.; and a characteristic group with shells of light structure, freely marked but not highly coloured, is typified by *B. pæcilus*, *hygrohyleus*, *marmarinas*, *orcales*, &c. The ground-burrowing species, with ex-

tremely thin shells devoid of colour or pattern, consist of *B. bacterionides*, *lichnorum*, *turritella*, &c. Two or three species have been collected on the mountains surrounding the Lake of Titicaca, which is itself 14,000 feet above the level of the sea. Of these *B. Pentlandi* and *Hamiltoni* may be quoted as examples. In the high lands of the Cordillera range, commencing at the Lake of Titicaca, passing along the region of medicinal barks, as laid down by Weddell, to Cuzco, Chachapoyas, and the Andes of Caxamarca, and extending across the equator by Quito, Bogota, and Merida, nearly to Caraccas, many fine species have been collected, but of too miscellaneous a variety of form to show any typical assemblages. From this extensive and little-explored region we have *B. labeo*, *Adamsoni*, *Thompsoni*, *rhodolarynx*, *Hartwegii*, *Alto-Peruvianus*, *alutaceus*, *Taylorianus*, *murrinus*, *Lobbii*, *Clausilioides*, and *columellaris*, singularly different from each other, and differing altogether from the *Bulimi* of Bolivia and La Plata. There is, however, one well-defined group inhabiting the southern extremity of the Cordillera range at Merida and Bogota, of which *B. Cathcartiæ*, *Veranyi*, *Succinoides* and *quadricolor* are characteristic examples. They have peculiarly inflated richly coloured shells, and are covered with a delicate hydrophanous epidermis disposed in hieroglyphic patterns after the manner of the Philippine *Bulimi*.

5. Central America.

Of the remaining *Bulimi* of the American continent, about ten species inhabit the central neck of land which comprises the provinces Veragua, Panama, Costa Rica, Nicaragua, Honduras and Guatemala. Fourteen species have been collected in the hilly parts of Mexico; and two or three species scattered in California, Texas, and Alabama constitute the northern limit of the genus in the new world. The *Bulimi* of Central America are very distinct from those of which we have been speaking hitherto. *B. Panamensis*, *vevillum*, *translucens* and *unicolor* from Panama, *B. corneus* from Real Llejo, *B. discrepans* from Conchagua, and *B. Hondurasanus* and *Dysoni* from Honduras, are all characterized by a thin transparent horny shell of the same type. They have little pattern or variety of colour, and live upon the trunks of trees or under fallen leaves. None of the South American types have any representatives in Central America. There is, however, a single species in Honduras, *B. Kieneri*, belonging to a singular *Cyclostoma*-like type, which belongs evidently to Jamaica, where it is represented by *B. Gossei*, *turricula*, *unicarinatus*, *cylindricus*, and *Guildingii*. In Mexico the *Bulimi* are more varied. Five species, *B. Mexicanus*, *serperastrus*, *livescens*, *Humboldtii* and *nite-linus*, in which the shell is of a light brittle structure, oblong

form and simply dark-banded, belong to a type quite peculiar to this locality, extending in *B. Californicus* to the opposite peninsula. At Vera Cruz, on the eastern side of Mexico, a Bolivian type appears in *B. Lattrei*, *Jonasi* and *fenestratus*. A very remarkable type is presented in the Mexican *B. Dombeyanus*, which is at present unique. *B. labiatus* and *Schiedianus*, which are almost colourless, partake of the typical character of *B. confinis* and *liquabilis* inhabiting Texas, and *B. dealbatus* inhabiting Alabama, which is the northern limit of the genus in the new world.

6. Islands of the Western Hemisphere.

The terrestrial conchology of the islands of the western hemisphere is for the most part typically distinct from that of the continent, and the more so in each particular group of islands in proportion to their distance from the main land. This receding gradation of types is distinctly shown in the *Bulimi* of the Great and Little Antilles. In the first group of islands this genus has but a meagre share in the conchology, which comprises more of *Cyclostomata*. In the latter group the *Bulimi*, passing southward, are gradually larger and more painted, and exhibit a relationship with those of the neighbouring continent. Jamaica, Cuba, and Tortola yield a few species of the *Cyclostoma* type, *B. Gossei*, *turricula*, &c., just spoken of as appearing at Honduras in *B. Kieneri*; but there are more of the ground-burrowing *Glandina* type, such as *B. subula*, *octonoides*, *Goodhalli*, and *pauperculus* inhabiting the savannahs. *B. immaculatus* is a rather large species, and *B. mirabilis*, remarkable for its squamate growth, is quite unique as a type. In Guadaloupe and Martinique, connecting the Leeward and Windward of the West India Islands, a few species occur with shells of darker and more solid growth, as *B. Guadaloupensis*, *Martinicensis* and *chrysalis*. In the principal islands of the Little Antilles approximating to the South American continent, the *Bulimi* increase in size and colouring, gliding most distinctly into the types of the Venezuelan province. The richly painted *B. fulminans* and *Blainvilleanus* of Merida are represented in the island of St. Vincent by *B. auris-Sileni*; the delicate *B. roseatus* and *xanthostoma* of Bogota by *B. stramineus* and *Vincentinus* in the same island; and *B. glaber*, a robust species of Trinidad, is represented in the nearest main land of Venezuela by *B. distortus* and *euryomphalus*, and in New Granada by *B. perdis*.

The Gelepagos Islands contribute about ten species of *Bulimus*, small in size and of a dusky hue, agreeing in this respect with what has been observed by Mr. Darwin in reference to the dusky colour of the birds and insects. *B. eschariferus* and *rugulosus* from Chatham Island, *B. ustulatus*, *nux*, and *unifasciatus* from Charles Island, *B. Jacobi* and *rugiferus* from Jacob Island, *B.*

calvus from James Island, and *B. Darwinii* and *sculpturatus*, of which the particular island has not been noted, are all typically distinct from the *Bulimi* of the neighbouring continent. A species has however been very recently discovered, *B. achatellinus*, partaking of the character of *Achatinella*, an allied genus of snails confined to some of the Polynesian Islands. The *Bulimi* of the Gelepagos Islands seem, nevertheless, to be purely aboriginal, living among dried tufts of grass, upon comparatively leafless bushes, or under detached pieces of lava, and presenting indications of the volcanic nature of the soil and desert character of the vegetation.

The Polynesian Islands have no *Bulimi* except one or two small transparent ground-burrowing species, *B. Antoni* and *Oparanus* from the island of Opara, *B. Tuckeri* from Hardy's Island, and *B. Sandwicensis* from the Sandwich Islands. Their absence is, however, compensated by the presence of two other genera of land snails which are not found anywhere else. In the Society Islands the *Bulimi* are represented by the *Partula*, and in the Marquesas, Friendly, Sandwich, and Navigators' Islands, by the *Achatinellæ*.

II. THE EASTERN HEMISPHERE.

The *Bulimi* of the eastern hemisphere are more partial in their character and distribution than those of the western, owing to there being less explored land within the parallels of latitude inclosing the conditions most favourable to their existence. In West Africa they are replaced by a tribe of large *Achatina*. But in the localities which they inhabit within this intertropical area, comprising chiefly the islands of the Indian Archipelago, they are more numerous in species in proportion to the extent of land. The *Bulimi* of the old world have a wider range in the warm temperate regions, and the geographical position of the genus is more insular than continental. As many species have been collected in the Philippine Islands alone as in the whole extent of continent between Sweden and Cochin China. The eastern *Bulimi*, comprising about two hundred and fifty species, present three grand typical provinces of distribution, which may be termed the Caucasian, the Malayan, and the African. The limits of these provinces are well-marked, and they possess no species in common. The species are all distinct from those of the western hemisphere.

1. The Caucasian Province.

The Caucasian province has its centre in Asia Minor, and occupies an area extending west and east over the southern countries of Europe and Asia to the opposite shores of North Africa.

At the eastern limit of this province in the British Isles and at the western limit in the Meia-co-shimah Isles, the shell is of the same form, substance and colour. The shell of the Caucasian *Bulimus* is small, mostly white or dusky brown, sometimes convoluted sinistrally, and partakes very much of the character of *Pupa*, which is the predominant genus of this district. At the north-western extremity of the Caucasian province the genus is represented in the British Isles, Germany, France, Spain, and Portugal by the small *B. obscurus*, *montanus* and *acutus*. The first of these extends to South Sweden, fifteen to twenty degrees nearer the Arctic Circle than in the new world, agreeably with the curve of Humboldt's isothermal lines in that direction, and confirms the warmer comparative temperature of this portion of the eastern hemisphere. In *B. ventrosus* and *decollatus* the genus obtains a more southern range, extending into Sicily and the Canary Islands. The *Bulimi* of the Canary Islands are, however, for the most part indigenous. Of the following species inhabiting this group, *B. variatus*, *Moquinianus*, *obesatus*, *bæticatus*, *Bertheloti*, *subdiaphanus*, only the last is found in any other locality, the Cape de Verd Islands. No Canary Island *Bulimus* has been collected in Portugal, Spain or Sicily, but a species has been found to range along with *B. barbarus*, *rupestris*, and *Bergeri* over Greece and the eastern islands of the Mediterranean to Algeria and the borders of Egypt. *B. detritus*, *subtilis*, and *quinquedentatus* may be noted as belonging more especially to Austria and Central Europe, and *B. Varnensis*, *Frivaldskyi*, and *Chersonesicus* to Turkey and the Crimea. Towards the vicinity of the Caucasus the *Bulimi* are more numerous, of larger and more solid growth and more divided into groups. Owing to the dry juiceless thorny character of the vegetation, their habits differ from those of the humid and woody countries of intertropical America. Their shells are comparatively small with little colouring matter or epidermis, and they live under stones or blocks of wood, or suspended for a long season in a state of torpidity from the shrubs. The difference between the shell of the Caucasian and that of the Malayan or Venezuelan *Bulimi* is very characteristic of the physical conditions with which the animal is surrounded in each instance. *B. labrosus*, *labiosus*, *Alepi*, *Syriacus*, and *Ehrenbergi* are true Caucasian types. In *B. Sprattii* and *Lycicus* the shell has a light and ventricose growth, but in *B. spoliatus*, *zebriolus*, and *Tournefortianus* it has an elongated *Pupa*-like form.

Passing the south-western countries of Asia we find no species of *Bulimus* recorded from any locality between Syria and Afghanistan. Of the terrestrial conchology of Persia, Tartary and Beloochistan, nothing is at present known, and very little of that

of China. South of Syria a natural boundary is imposed to the range of the genus in that direction by the rainless and riverless deserts of Arabia. A few species make their appearance in the more fertile parts near the Gulf of Bab-el-mandeb and the Indian Ocean. *B. latireflexus*, a fine species inhabiting the vicinity of Muskat on the Gulf of Oman, has a polished shell of solid stony composition, without colour or marking, of precisely the same type as *B. labiosus* and *labrosus* of Asia Minor. *B. fragosus* and *Forskalii* inhabiting Yemen, also patternless, assimilate to the tumid tribe of *Pupæ* of Asia Minor. Abyssinia and the neighbouring island of Socotra, marking the eastern boundary of the Caucasian province, contribute two species from each locality, one of which species in both instances belongs to an Indian type, the other being remote from it. *B. Olivieri* of Abyssinia has an inflated shell with a dark fibrous epidermis very distinct in character from any Asiatic or European species, while *B. Abyssinicus* from the same locality has been collected also in Central India, north of the river Nerbudda. It is allied in form with *B. Jerdoni* from the hilly districts of the Deccan peninsula, and both species agree in typical character with *B. fragosus* of Arabia. *B. Socotrensis*, inhabiting the island of Socotra, off Cape Guadafui, has a peculiar little solid pea-shaped shell unique as a type; but associated with it in the same locality is an oblong cylindrical form, *B. contiguus*, belonging to a type of Hindoostan, represented by *B. pullus* inhabiting the environs of Delhi and Bundelkhund and extending into the Gangetic plains.

In the south-western countries of Asia the genus is very meagrely represented, but the species are peculiar in their circumstances of habitation. Two of comparatively large size occur on the hills of Afghanistan, *B. Griffithsii* and *eremita*, with opaque colourless shells partaking of the Syrian type. From the whole of Hindoostan, including the Himalaya range, the Punjab, Scinde, Nepaul, Bhotan, Assam, the Deccan and Carnatic, only five-and-twenty species have been collected, limited apparently in number of individuals. In the plains watered by the numerous branches of the Ganges, with a temperature varying in the season of the hot winds from 85° to 90° at night, to 130° or 140° in the sun, the *Bulimi* are scattered and of miscellaneous character. On the wooded hills rising into a moist and cooler atmosphere they are more abundant. *B. rufistrigatus* at an elevation of 4000 feet has a fulvous horny oblong shell. *B. cænopictus* and *tutulus* inhabiting a lower level are minute delicate brown species, the latter being convoluted in the form of a rounded *Cyclostoma*. *B. pullus* is a light cylindrical form, *B. cercus* and *gracilis* are thin horny species, and *B. punctatus*, *Bontiae*, and *Bengalensis* have light inflated shells of a type altogether different. The most

characteristic *Bulimi* inhabiting this part of Asia are those of the Himalaya range, *B. Kunawurensis*, *pretiosus*, *vibex*, *nivicola*, *cælebs*, and *arcuatus*. Their shells are of a fulvous brown colour, mostly streaked with opaque white marks, all of one type, distinct from the Syrian, but sufficiently allied to come into the same province of distribution. Occupying a loftier situation than the species before mentioned, they have, as in Venezuela, stouter shells, but are still comparatively small and sombre. On the mountain slopes, where the flora, represented by the rhododendron and juniper, is of a subarctic character, the genus inhabits a much colder temperature in elevation than it reaches in either hemisphere in latitude. Two species, *B. arcuatus* and *nivicola*, are found in the Liti Pass at an elevation of 14,000 feet on juniper bushes among patches of snow at the hottest period of the year. This is the only locality in which the genus approaches the snow-line. The physical conditions of India below the Emodic or Alpine region of vegetation are not calculated to favour the growth of *Bulimi*. In the plains there is a scarcity of wood and forest, such as we have noticed to serve so materially for the production of these snails in South America; and the burning of the thickets in the hill countries for the pasturage of cattle, offers the same obstacles to their growth and increase as the clearing away of the virgin forests in Brazil.

2. The Malayan Province.

The Malayan province of the genus, which comprises the islands of the Indian Archipelago, commences on the southwestern corner of the Asiatic continent, where it is represented at Burmah by *B. Sylheticus* and in Siam by *B. atricallosus*. These species are of a totally different type from any of the *Bulimi* of Hindoostan, and agree precisely with that characteristic Malayan type which appears at Java, Timor, Celebes and Amboyna in *B. citrinus*, *lævus*, *contusus*, *chloris* and *sinistralis*, at Borneo in *B. Adamsii*, at Ceylon in *B. Ceylanicus*, and at Mindanao, the most southern of the Philippine Islands, in *B. maculiferus*. *B. fulguratus* and *malleatus*, having an inflated shell with a winding plait upon the columella, represent a type peculiar to the Feejee Islands. *B. miltocheilus*, with a wax-like fusiform shell and brilliant vermilion lip, from Christoval Island, one of the Solomon's Group, is unique as a type. *B. fibratus* and *Caledonicus* with large robust shells of dark chestnut-brown colour, red internally, represent another very distinct type in the island of New Caledonia, but this appears again twelve degrees further south at Auckland, North Island of New Zealand, in the only species inhabiting that group, *B. Shongii*. It is worthy of notice, that this large stout tropical-looking *Bulimus* is under the same

latitude of the eastern hemisphere which is characterized in the western hemisphere by the delicate species of the dry sandy countries of Chili and Buenos Ayres.

The *Bulimi* of the Philippine Islands, which are very numerous and of large size, belong chiefly to one type, represented by *B. pythogaster*, *bicoloratus*, *lignarius*, *fulgetrum*, *nimbosus*, and others. The shell of this type is not so much distinguished by colour, as by the presence of a double membranous epidermis, to which the different species are indebted for their characteristic patterns. *B. Cumingii*, *Leaii*, and a few others belong to another type of which the shell is inflated, and mostly shining white with only a very slight single epidermis. About eighty species of *Bulimus* have been collected in the twenty-two islands of the Philippine group, all extremely local in their range of habitation. With the exception of about half a dozen out of eighty, each species is confined to its particular island. The equable climate of these islands, the excessive rains, and woody character of the vegetation combine materially to favour the growth of snails. They live some on the branches of the trees and in shady recesses, and others among light thickets on the outskirts of the woods. The large species are strictly arboreal, and deposit their eggs standing on end in parallel rows upon a leaf. The transparent horny ground-burrowing type which appears at Hindoostan in *B. cereus* and *gracilis*, and at Java in *B. Achatinaceus*, is here represented by *B. elongatulus* and *Panayensis*.

The only species collected in China are *B. decorticatus* belonging to the ground type, which is universal, and *B. Cantori*, from the environs of Nanking. They belong to the Caucasian type, which reaches the islands of Ty-pin-san and Koo-Kien-san of the Meia-co-shimah group of the Yellow Sea in *B. Anglicoides* found under decayed leaves among the loose stones which surround the tombs.

Of the *Bulimi* of Australia little is at present known. One species, *B. atomatus*, with a large dark-coloured inflated shell, has been collected at Port Macquarrie, one small species, *B. trilineatus*, at Port King George, and two, *B. Kingii* and *inflatus*, of which the precise locality is unknown. Two species with thin dusky shells, *B. melo* and *Dufresnii*, inhabiting Van Diemen's Land, constitute the southern limit of the genus in the eastern hemisphere.

3. The African Province.

The African province includes all that explored portion of the continent below Senegal on the west side, and Zanzibar, including the islands of Mauritius and Madagascar, on the east. In the intertropical area along the west coast of Africa, extending from latitude 15° S. to 15° N., the *Bulimi* are replaced in great mea-

sure by a group of large *Achatinæ*, which inhabit principally the hot and swampy districts on the banks of the Gambia, Nun, Gaboon and Niger rivers, and reach in a modified form to the sandy plains of Loanda. The shells are large, inflated, and richly dark-painted, and the shells of the few *Bulimi* that are associated with them belong to the same characteristic type. The two genera meet at this point. *Bulimus torridus* of Liberia and *Achatina Sauleydi* belong to the same natural type, notwithstanding that they are referred to different genera. *B. Adansoni*, *Africanus*, *tenebricus*, *turbinatus*, *flammeus*, *Numidicus*, and *interstinctus*, belong also to the *Achatina* type. *B. neuricus*, *Guineensis*, and *vivipara* are three fragile species of different habits from the same country, and another type is presented in *B. tumefactus* and *pemphigodes* with peculiarly globose inflated shells. As an instance of the mingling of types on the confines of the great provinces of distribution which meet in North Africa, it may be remarked that *B. Ruppellianus* inhabiting the eastern confines belongs to this *Achatina* type, and *B. reticulatus* inhabiting the western belongs to the Syrian *Bulimus* type, which is exactly the reverse of the general typical character of the *Bulimi* in these localities. *B. Downsii*, found abundantly at Princes Island off the coast of Guinea, inhabits also the nearest main land. At St. Helena a small brown species is found, *B. Helena*; and in the more elevated parts of the island, in an apparently semifossil state, the remains of an extinct type, *B. aurisvulpina*, are found. Mr. Darwin, who observed this well-known species at St. Helena imbedded in the soil, attributes the extinction of it to some recent geological disturbances, which caused the entire destruction of the woods and consequent loss of food and shelter to the snails.

Nothing is known of the *Bulimi* of Africa, south of the tropics, excepting those described by Dr. Krauss from the neighbourhood of Natal. Eight species collected in this part are of very miscellaneous character, but typically distinct from those of the west coast. *B. Natalensis*, *conulus*, and *spadiceus* are thin and globose convoluted, *B. Burchellii* and *meridionalis* are of light ovate form, and *B. linearis* and *turraefornis* are elongated. They are all small. A very remarkable species has, however, been discovered in this locality, *B. Kraussii*, nearly equal in size to the largest *Bulimus* of tropical America and as brilliant in colour. From Mozambique we have but one small light species, *B. Mozambicensis*. In Madagascar are two species of large size and elongated form, *B. clavator* and *obtusatus*, differing essentially from any of the continental types; and in the Seychelle Islands are two, *B. fulvicans* and *velutinus*, partaking in some measure of the smaller Natal species. In Mauritius there is only one small ground species, *B. clavulinus*.

Western Hemisphere.

General Localities.	Venezuelan Province.	Brazilian Province.	Chilian Province.	Bolivian Province.	Miscellaneous.	WESTERN HEMISPHERE.
Venezuela and New Granada	62	..	..	..	..	62
Brazil and Buenos Ayres	70	..	..	..	70
Chili	19	..	..	19
Peru	34	..	..	34
Ecuador and Alto-Peru....	26	26
Bolivia	42	..	42
Central America	17	17
Mexico	17	17
Honduras	4	4
Texas and Alabama	4	4
West Indies	34	34
Gelepagos Islands	10	10
Hardy and Opara Islands..	3	3
	62	70	53	42	115	342

Eastern Hemisphere.

General Localities.	Caucasian Province.	Malayan Province.	African Province.	Miscellaneous.	EASTERN HEMISPHERE.
British Isles and Southern Europe	9	..	..	..	9
Greece, Syria, and Asia Minor	32	..	..	..	32
Sicily, Canary and De Verd Islands	10	..	..	..	10
Arabia and Abyssinia	10	..	..	..	10
Tartary and China	4	..	..	..	4
Hindoostan	30	..	..	..	30
Burmah and Siam .....	..	2	..	..	2
Borneo, Java, and Molucca Islands	..	10	..	..	10
Philippine Islands .....	..	83	..	..	83
North Africa	3	..	..	..	3
West Africa .....	..	..	17	..	17
East Africa and Madagascar .....	..	..	18	..	18
St. Helena .....	..	..	..	2	2
New Zealand .....	..	..	..	1	1
New Caledonia .....	..	..	..	3	3
Feejee Islands .....	..	..	..	2	2
New Holland and Solomon's Group	..	..	..	6	6
Van Diemen's Land .....	..	..	..	2	2
	98	95	35	16	244

XXIII.—*A Catalogue of British Spiders, including remarks on their Structure, Functions, Economy, and Systematic Arrangement.* By JOHN BLACKWALL, F.L.S.

SINCE the publication of the excellent 'Tractatus de Araneis' of Dr. Lister, comprised in his 'Historia Animalium Angliæ,' little has been effected by British naturalists to extend our acquaintance with the animals constituting the order *Araneidea*. In palliation of this negligence it may be urged that the subject is beset by numerous and great difficulties, and that such is the case cannot be denied; but let it be borne in mind that formidable as these obstacles are, they have not deterred distinguished cultivators of natural science in France, Sweden, and Germany from bestowing much time and attention upon this highly interesting department of zoology, and that their arduous labours have been rewarded by well-merited success.

Anxious to induce some of the zealous and intelligent investigators of nature among my countrymen to assist in removing this occasion of reproach, I have arranged all our indigenous spiders, hitherto recorded, in the form of a systematic catalogue, and have also cited the synonyma of several arachnologists of eminence, together with the titles of the works in which they occur. The utility of an undertaking of this kind mainly depends upon the accuracy of its details; but when descriptions of species in different languages have to be consulted, and that, in numerous instances, without the aid to be derived from the inspection of recent specimens or of carefully drawn and coloured figures, exemption from error is not to be expected.

In drawing up the catalogue, which I now submit to the candid consideration of zoologists, I have used my best endeavours to render it as complete as the limited means at my command would permit; and I trust that it will be found to contribute in some measure to promote the knowledge and facilitate the study of our native spiders.

Class ARACHNIDA. Order ARANEIDEA.

Tribe OCTONOCULINA.

Family *Mygalidæ*.

Genus *ATYPUS*, Latreille.

1. *Atypus Sulzeri*.

Atypus Sulzeri, Latreille, Genera Crustaceorum et Insectorum, tom. i. p. 85. tab. 5. fig. 2; Hahn, Die Arachniden, Band i. p. 117. tab. 31. fig. 88.

Oletera atypa, Walckenaer, Histoire Naturelle des Insectes Aptères, tome i. p. 243. pl. 1. fig. 5.

— *picea*, Koch, Uebersicht des Arachnidensystems, erstes Heft, p. 35.

Specimens of this remarkable spider, which is the only species belonging to the family *Mygalidæ* at present known to be indigenous to Great Britain, have been captured by Dr. Leach in the vicinity of London and Exeter. See the Supplement to the 4th, 5th, and 6th editions of the 'Encyclopædia Britannica,' article *Annulosa*.

Family *Lycosidæ*.

Genus *LYCOSA*, Latr.

2. *Lycosa agretyca*.

Lycosa agretyca, Walck. Hist. Nat. des Insect. Apt. tom. i. p. 308 ; Blackwall, Transactions of the Linnæan Society, vol. xix. p. 118. — *ruricola*, Latr. Gen. Crust. et Insect. tom. i. p. 120 ; Sundevall, Kongl. Vetenskaps-academiens Handlingar, för år 1832, p. 192. *Trochosa trabalis*, Koch, Die Arachn. (Fortsetzung des Hahn'schen Werkes), B. xiv. p. 141. tab. 492. fig. 1371–1374.

Lycosa agretyca occurs in old pastures and on heaths in England, Wales and Scotland. In the month of June the female excavates an elliptical cavity in the earth beneath stones, into which she retires with her cocoon, which is globular, composed of fine white silk of a compact texture, and is encircled by a narrow zone of a slighter fabric; it measures $\frac{1}{4}$ th of an inch in diameter, and contains about 110 spherical eggs of a pale yellow colour, not agglutinated together. The cocoon is attached to the spinners of the female by short lines of silk, and the young, when they quit it, mount upon her body, and so accompany her in all her movements. This species frequently passes the winter in a torpid or semitorpid state in the cavities which it forms in the earth under stones.

An adult female *Lycosa agretyca*, taken in the spring of 1849, was destitute of the posterior eye on the right side.

The genus *Trochosa*, which M. Koch has proposed to constitute with this and some other species of *Lycosæ*, is based on specific characters solely.

3. *Lycosa campestris*.

Lycosa campestris, Walck. Hist. Nat. des Insect. Apt. t. i. p. 309. — *ruricola*, Hahn, Die Arachn. Band i. p. 103. tab. 26. fig. 77 (misnumbered 76 in the text); Koch, Uebersicht des Arachn. Syst. erstes Heft, p. 21. *Trochosa ruricola*, Koch, Die Arachn. Band xiv. p. 138. tab. 491. fig. 1369, 1370. *Titulus* 26, Lister, Historiæ Animalium Angliæ tres Tractatus, De Araneis, p. 78. tab. 1. fig. 26.

Meadows and pastures in England and Wales are the favourite haunts of this species, which pairs in May. In June the female

fabricates a spherical cocoon of compact white silk measuring $\frac{1}{5}$ th of an inch in diameter; it is encompassed by a narrow zone of a slighter texture, and usually comprises about 115 spherical eggs of a pale yellow colour, not agglutinated together. This cocoon, which is connected with the spinners of the female, and is conveyed by her wherever she goes, has the appearance of being embossed in consequence of its close application to the eggs. On quitting it, the young mount upon the body of their parent. Both sexes sometimes excavate elliptical cavities in the ground, generally under stones, and remain concealed in them during the winter months.

In the summer of 1836 an adult female was captured, which had a short but perfectly formed supernumerary tarsus connected with the base of the tarsal joint of the right posterior leg on its outer side.

4. *Lycosa andrenivora*.

Lycosa andrenivora, Walck. Hist. Nat. des Insect. Apt. t. i. p. 315; Blackw. Linn. Trans. vol. xix. p. 118.

This spider frequents commons and old pastures in various parts of England and Wales. The palpal, or sexual, organs of the male are fully developed in autumn.

5. *Lycosa rapax*.

Lycosa rapax, Blackw. Linn. Trans. vol. xviii. p. 609.

The customary haunts of this species are woods, pastures and commons; but I have occasionally found it on the summits of Broad Crag, Helvellyn, Snowdon and Carnedd Llewelyn, the highest mountains in England and Wales. It pairs in May, and in June the female deposits sixty or seventy spherical eggs of a pale yellow colour, not agglutinated together, in a globular cocoon of pale yellowish brown silk of a compact texture, measuring $\frac{5}{4}$ ths of an inch in diameter. The cocoon is connected with the spinners by short lines of silk, and the young, when extricated from it, attach themselves to the body of their parent.

M. Walckenaer considers *Lycosa rapax* to be merely a variety of *Lycosa vorax* (Hist. Nat. des Insect. Apt. tom. iv. p. 392); but, though nearly allied to that species, it differs from it in size, structure and colour.

6. *Lycosa allodroma*.

Lycosa allodroma, Walck. Hist. Nat. des Insect. Apt. tom. i. p. 330; Koch, Die Arachn. Band v. p. 106. tab. 172. fig. 410, 411; Koch, Uebersicht des Arachn. Syst. erstes Heft, p. 22; Blackw. Linn. Trans. vol. xix. p. 118.

Lycosa cinerea, Sund. Vet. Acad. Handl. 1832, p. 190.

— *lynx*, Hahn, Die Arachn. Band ii. p. 13. t. 42. fig. 104.

— *leucophæa*, Blackw. London and Edinburgh Philosophical Magazine, Third Series, vol. x. p. 104.

Arctosa cinerea, Koch, Die Arachn. B. xiv. p. 123. tab. 488. fig. 1358.

In the spring of 1836 I discovered a light-coloured variety of this fine spider among water-worn stones and fragments of rock on the banks of the river Llugwy, near Capel Curig, Caernarvonshire; and, supposing it to be unknown to arachnologists, I described it in the 'London and Edinburgh Philosophical Magazine,' under the appellation of *Lycosa leucophæa*.

The genus *Arctosa*, proposed by M. Koch for the reception of this and several other species of *Lycosæ*, like his genus *Trochosa*, is founded solely on specific characters.

7. *Lycosa picta*.

Lycosa picta, Hahn, Die Arachn. Band i. p. 106. tab. 27. fig. 79; Blackw. Linn. Trans. vol. xix. p. 119.

Arctosa picta, Koch, Die Arachn. B. xiv. p. 130. tab. 489. fig. 1362, 1363.

M. Walckenaer, regarding this handsome spider as identical with *Lycosa allodroma*, has placed the name given to it by M. Hahn among the synonyma of that species (Hist. Nat. des Insect. Apt. tom. i. p. 330). Of the specific distinctness of *Lycosa picta*, however, no doubt can be entertained by those observers who have had an opportunity of inspecting adult individuals. It is found in Cheshire, Lancashire and Denbighshire, frequenting sandy districts on the sea-coast.

8. *Lycosa saccata*.

Lycosa saccata, Walek. Hist. Nat. des Insect. Apt. tom. i. p. 326; Hahn, Die Arachn. Band i. p. 108. tab. 27. fig. 81; Latr. Gen. Crust. et Insect. tom. i. p. 120.

— (*Pardosa*) *saccata*, Koch, Die Arachn. Band xv. p. 51. tab. 517. fig. 1451, 1452.

— *amentata*, Sund. Vet. Acad. Handl. 1832, p. 177.

Titulus 25, Lister, Hist. Animal. Angl. De Aran. p. 77. tab. 1. fig. 25.

In most parts of Great Britain this is a common species. It pairs in spring, and the female deposits about fifty spherical eggs of a pale yellow colour, not agglutinated together, in a lenticular cocoon of compact silk of a yellowish brown hue, which measures $\frac{1}{2}$ th of an inch in diameter, and is encircled by a light-coloured zone of a slight texture. The young, on leaving the cocoon, attach themselves to the body of their parent.

9. *Lycosa lugubris*.

- Lycosa lugubris*, Walck. Hist. Nat. des Insect. Apt. tom. i. p. 329 ;
 Blackw. Linn. Trans. vol. xix. p. 119.
 — *sylvicola*, Sund. Vet. Acad. Handl. 1832, p. 176.
 — *sylvicultrix*, Koch, Die Arachn. B. iii. p. 25. tab. 82. fig. 182, 183.
 — (*Pardosa*) *alacris*, Koch, Die Arachn. Band xv. p. 39. tab. 514.
 fig. 1443, 1444.

The description of *Lycosa lugubris*, given by M. Walckenaer, is applicable to the male only, which differs greatly from the female in size and colour. Among the synonyma of this species he has included the *Lycosa meridiana* of M. Hahn (Die Arachn. Band i. p. 20. tab. 5. fig. 16), a spider decidedly superior in size and unlike it in colour, and has placed the *Lycosa sylvicultrix* of M. Koch, which is identical with *Lycosa lugubris*, among the synonyma of *Lycosa vorax* (Hist. Nat. des Insect. Apt. t. i. p. 313).

In the description given by M. Koch of the male of *Lycosa alacris* (*Lycosa lugubris*) the following passage occurs:—"Fresszangen, Brust und Spinnwarzen sind schwarz, ebenso die Taster, vorn auf dem Rücken des Endgliedes aber befindet sich ein schöner rother Fleck" (Die Arachn. Band xv. p. 41). Now, though I have seen several thousand males of this species, not one having a red spot on the digital joint of the palpi has ever come under my observation.

Lycosa lugubris abounds in the woods of Denbighshire and Caernarvonshire. The sexes pair in April and May, and in the latter month the female deposits about fifty spherical eggs of a pale yellow colour, not agglutinated together, in a cocoon of a lenticular form and compact texture, composed of silk of a dull greenish or yellowish brown hue, and measuring $\frac{1}{3}$ th of an inch in diameter; it is encircled by a whitish zone of a slight texture, and is connected with the spinners by short silken lines. When the young desert the cocoon they climb upon the body of the female.

10. *Lycosa obscura*.

Lycosa obscura, Blackw. Linn. Trans. vol. xviii. p. 611.

In autumn, females of this species may be seen among short grass and heath in pastures and on commons in various parts of England, Wales and Scotland, with their cocoons attached to their spinners. The cocoon is lenticular, and measures $\frac{1}{7}$ th of an inch in diameter; it is constructed of compact pale brown or dull greenish brown silk, is surrounded by a narrow whitish zone of a slight texture, and contains about twenty-five spherical eggs of a yellow colour, which are not agglutinated together. On abandoning the cocoon the young distribute themselves upon the body of their parent.

On the 12th of September 1838, a minute black insect of the family *Ichneumonidæ* came out of a cocoon belonging to this species, which I had placed in a phial.

Differences in size, colour, habits and haunts serve to distinguish *Lycosa obscura* from *Lycosa paludicola*, though their specific identity is assumed by M. Walckenaer (Hist. Nat. des Insect. Apt. tom. iv. p. 396).

11. *Lycosa exigua*.

Lycosa exigua, Blackw. Lond. and Edinb. Phil. Mag., Third Series, vol. viii. p. 490.

Heaths and pastures are the localities most frequented by this spider, which is found in such situations in many parts of Great Britain. In June the female constructs a lenticular cocoon of compact yellowish or greenish brown silk, encircled by a whitish zone of a slighter texture; it measures $\frac{1}{6}$ th of an inch in diameter, and contains between fifty and sixty yellowish white eggs of a spherical figure, not agglutinated together. This cocoon is always connected with the spinners of the female, and the young on quitting it attach themselves to her body.

Both immature and adult individuals of this species, which is nearly allied to the *Lycosa (Pardosa) monticola* of M. Koch (Die Arachn. Band xv. p. 42. tab. 515. fig. 1445–1447, and tab. 516. fig. 1448, 1449), employ their silken lines to effect aërial excursions, ascending currents of rarefied air frequently acting on the lines with sufficient force to raise the adventurous aëronauts into the atmosphere. Preparatory to making an ascent, the spinners are brought into close contact, and viscid matter is emitted from the papillæ or spinning tubes; they are then separated by a lateral motion, which extends the viscid matter into fine filaments connecting the papillæ; against these filaments the ascending current of air impinges, drawing them out to a length which is regulated by the will of the animal; and on the spinners being again brought together, the filaments coalesce and form a compound line.

12. *Lycosa pallida*.

Lycosa pallida, Walek. Hist. Nat. des Insect. Apt. tom. i. p. 334; Blackw. Linn. Trans. vol. xix. p. 119.

Lycosa (Leimonia) Wagleri, Koch, Die Arachn. Band xv. p. 19. tab. 509. fig. 1427.

This is a common spider on the banks of rivers in Denbighshire and Caernarvonshire. It pairs in May, and in June the female deposits about sixty pale yellow eggs of a spherical figure, not agglutinated together, in a lenticular cocoon of dull green or yellowish brown silk of a compact texture, measuring $\frac{1}{5}$ th of an inch in diameter; which is connected with her spinners; the

young, when extricated from it, attach themselves to the body of their parent.

Like other species belonging to the same genus, *Lycosa pallida*, in constructing its cocoon, slightly connects the margins of the two compact portions, beneath which the thin fabric of the zone is folded. This simple contrivance affords an admirable provision for the development of the young in the foetal state by an increase in the capacity of the cocoon consequent on the margins of the compact parts becoming detached by means of the expansive force within, the eventual liberation of the young being effected by the rupture of the zone, which is the weakest part. This interesting fact in the œconomy of the *Lycosæ* appears to have escaped the observation of arachnologists.

XXIV.—*Descriptions of new Land Shells from St. Helena, Ceylon, and China.* By W. H. Benson, Esq.

1. *Succinea imperialis*, nobis, n. s.

Testa ovata, tenui, rugoso-striata et remote plicata, striis spiralibus obsoletis et rugis nonnullis prope marginem anteriorem munita, diaphana, nitidula, sub epidermide rubra, epidermide strigis virentiluteis et purpureo-fuscis alternantibus ornata; spira brevissima, apice prominulo, obtuso, sutura impressa; anfractibus 2 convexis, penultimo superne perconvexo, ultimo amplo, $\frac{5}{8}$ longitudinis æquante; columella arcuata; apertura amplissima, ovali, vix obliqua, intus aurantia, nitida; peristomate simplici, acuto, basi leviter emarginata, marginibus callo angulum superiorem aperturæ implente junctis, columellari filari, reflexiusculo, intrante.

Long. 19, diam. 13 mill.; long. apert. $15\frac{1}{2}$, lat. 11 mill.

Hab. in insula St. Helenæ. Lieut. Lefroy.

I have ventured to describe this handsome shell as new, although a *Succinea* (*Helisiga* St. *Helenæ*) has been described by Lesson from the same place; but his short description* and the measurement differ so much from the characters above given, that, notwithstanding my not having seen his figure, I can hardly err in considering my species as new.

2. *Succinea orientalis*, nobis, n. s.

Testa ovato-conica, tenui, striata, nitidula, sordide cornea, apice rutilo, papillato, sutura distincta; anfractibus $3\frac{1}{2}$ convexis, ultimo pone columellam nullo modo attenuato, $\frac{3}{5}$ longitudinis æquante; columella subcallosa; apertura mediocri, ovali; peristomate simplice, marginibus callo tenui junctis, columellari subverticali.

Long. 10, diam. 6 mill.; long. apert. 6, lat. 4.

Hab. ad Macao, Imperii Sinensis. Cantor.

* "*Helisiga* St. *Helenæ*. T. glaberrima ampla ovata, unispirata, fuscorubella, fragillima. Diam. 7, alt. 3 lin."—Lesson, Voy. Coquille, p. 316, as quoted by L. Pfeiffer, Monogr. vol. ii.

This shell, which exhibits in some degree the port of a *Lymnæa*, is distinguished from any *Succinea* with which I am acquainted by the breadth of the body whorl behind the columella, a part which is generally attenuated in the genus, although the Indian species, *S. crassiuscula*, nobis, approaches it in this respect; the vertical direction of the columellar lip is also peculiar.

3. *Helix remota*, nobis, n. s.

Testa subaperte umbilicata, depressa, glabra, translucente, lutescente-cornea, fasciis tenuibus pallidis vix apparentibus circumdata; spira subplanulata, sutura submarginata; anfractibus $4\frac{1}{2}$ convexiusculis, sensim accrescentibus, ultimo subtus convexo; apertura vix obliqua, nullo modo depressa, subrotundato-lunari; peristomate recto, acuto, simplice, superne arcuato, margine columellari non reflexo.

Diam. major 7, minor $5\frac{1}{2}$, axis $2\frac{1}{4}$ mill.

Hab. in insula St. Helenæ in locis elevatis.

This shell belongs to the group which includes the European species *Helix cellaria*, *alliaria*, and *nitida*. The absence of any oblique depression of the mouth, and its colour, sufficiently serve to distinguish it from the two first; while its colour, more depressed form, and the umbilicus, separate it from the last. In 1832 I took three specimens under moist stones, between Plantation House and St.itch's ridge, as well as in the mountain valley which then contained the Tomb of Napoleon.

This may be the snail noticed in Cooke's first Voyage as found on the top of the highest ridges at St. Helena, and which excited the wonder of the narrator "how it could find its way to a place so severed from the rest of the world by seas of immense extent." The only other land shell which occurred to me in a day's excursion over the island was a minute *Pupa*, in form resembling some of our smaller English species, which I unfortunately lost, owing to the efforts made by a *Carabus*, with golden puncta in the furrows of the elytra, to escape from imprisonment. This loss was the more vexatious, with reference to the scarcity of extra-European species, and more especially of that particular type.

Bulimus Helena, Quoy, is another recent terrestrial species belonging to the island. It may be the shell referred to by Capt. Grey (Journal of two Expeditions in Australia) as lying on the sides of the hills, on the road from Flagstaff Hill to Jamestown. The shell described by Pfeiffer as this species is represented by Lovell Reeve, 'Conch. Icon.' fig. 308, as *Bulimus digitalis*, R., but Pfeiffer still holds to the opinion that he himself is correct in his reference. In this case, and if the shell figured by Reeve, No. 306, as *B. Helena*, be truly an inhabitant of the island, it will make the number of its known recent land shells amount to six. I have evidence that the shell, to which Pfeiffer refers Quoy's species, inhabits the assigned locality.

To these may be added the well-known subfossil *Bulimus auris vulpina*, besides *Achatina exulata*, nobis, No. 77 of Reeve's 'Monograph,' figured as No. 572 in the 78th plate of *Bulimus*, and *B. relegatus* of the present paper. I have also inspected a subfossil *Helix* from the same deposit, which, though not in a sufficient state of preservation to admit of a diagnosis, exhibited tokens of relationship to a series of Madeiran and North African species typified by *H. tectiformis*, Sowerby. We can scarcely hope, notwithstanding the hitherto imperfect exploration of the island, that living examples of the larger species should be discovered. However, a series of specimens in my possession of *B. auris vulpina* and *B. Helena* (as described by Pfeiffer), showing great variation in the size and figure of the former, and considerable thickening of the peristome, and angularity at its base, in the latter, tends to establish a striking approximation between the two forms; and leads to the conclusion that the extinct species was the analogue of the recent shell during a former period, when the mountains were covered with an indigenous tree-fern forest, now restricted to the highest point. Capt. Grey mentions that bones, apparently of birds, are found in the thin seam of calcareous earth in which the shells occur. These bones are well deserving of examination in relation to the extinct ornithology of the Mascarene Islands, and of New Zealand. The recent appointment, to the government of St. Helena, of a gentleman attached to the pursuit of natural history, especially of conchology, will, it is to be hoped, be productive of more extended information.

4. *Bulimus relegatus*, nobis, n. s.

Testa perforata, ovato-acuminata, longitudinaliter striata, striis transversis elevatis obsolete decussata, albida; spira elongato-conica, apice obtuso, rutilo; sutura impressiuscula; anfractibus $5\frac{1}{2}$ convexiusculis, ultimo spira breviori, sensim descendente; columella strictiuscula; apertura ovali, peristomate simplici, marginibus subconniventibus, callo junctis, margine columellari expanso, appresso. Long. 30, diam. 14 mill.; long. apert. $14\frac{1}{2}$, lat. $9\frac{1}{2}$ mill.
Hab. in insula St. Helenæ, subfossilis. Lieut. Lefroy.

5. *Bulimus Sinensis*, nobis, n. s.

Testa perforata, sinistrorsa, ovato-conica, glabra, lutescente, subtus purpureo-castaneo bifasciata; spira conica, apice obtusiusculo; anfractibus $5\frac{1}{2}$ convexiusculis, ultimo spiram æquante, fasciis submediani basaliq̄ue intra aperturam productis; columella subtorta; apertura obliqua, oblique ovata, peristomate planato-reflexo, livide purpureo, postice livide fusco, marginibus callo albido vix junctis, columellari albido breviter superne dilatato.
Long. 30, lat. 18 mill.; long. apert. 16; lat. 12 mill.
Hab. in Imperio Sinensi australi. Received by Dr. Cantor, to whom I am indebted for the specimen, from the south of China.

The obliquity and proportion of the aperture to the spire, independently of the colouring, distinguish this species from *Bulimus levus* and its allies; and the distinct perforation, and the convexity of the whorls, separate it from the smaller Javanese species *B. Galericulum*, Mousson, with which it has several characters in common.

6. *Cyclostoma halophilum*, nobis, n. s.

Testa umbilicata, globoso-turbinata, glabra, obsolete longitudinaliter striata, cornea, translucente, fasciis 1-3 rufo-castaneis (submediana angusta semper existente) ornata; spira conica, apice exsertiuscula, sutura impressa; anfractibus 4-4½ convexis, ultimo rotundato; apertura circulari, superne leviter angulata, peristomate tenui, expansiusculo, margine columellari leviter emarginato; umbilico profundo. Operculo corneo, tenui, planato, multispirato.

Diam. major 5, minor 4½, axis 4¼ mill.

Hab. ad Point de Galle, Ceylon.

This pretty and distinct little species I found creeping among grass, and on the inner foot of the sea-wall of the Fort at Point de Galle, in April 1847. It was also lying concealed under stones, as well as the common Indian shells *Bulimus gracilis* and *Pupa bicolor*, Hutton. The situation is exposed and bare of trees, only a solitary palm crowning one of the isolated rocks which battle with the surge outside the rampart. On the other side of the harbour, in a mangoe grove beyond the hill of Bonavista, *Cyclostoma Hoffmeisteri**, Troschel, with its curious operculum, and numerous examples of *Cyclostoma Involvulus*, Müller (var. with a double peristome), crept among the fallen leaves on the moist ground; among them were strewn perfect, but deserted shells of *Bulimus trifasciatus*, Brug., and *Achatina Ceylanica*, Pfr. The surrounding trunks of the mangoe trees were literally incrustated with living specimens of *Helix hamastoma*, with its gorgeous red peristome and chestnut and milk-white bands, the splendour of which was invariably concealed by a coating of green fæcula, which served in some measure to screen the shells (which would otherwise, by the contrast of colours, have been too conspicuous to their ene-

* Then recently discovered by the Physician after whom it was named, who fell, soon after, in the deadly field of Ferozshehr. The characters are shortly given in the Zeitschr. für Malak. for Feb. 1847, pp. 44, 45.

Troschel makes it the type of his genus *Aulopoma*, with reference to the solute aperture, and to the operculum, which laps over the edge of the peristome, all round, and is incapable of being withdrawn into the shell, as in other *Cyclostomata*. I add the characters of the animal from my notes:

Tentacula short, obtuse, and black. Eyes (at the base of the tentacula) prominent, and hemispherical, jet-black anteriorly, whitish posteriorly. Foot livid.

mies,) from observation. On a single tree I counted thirty specimens within reach. When I examined this neighbourhood early in the previous March, the ground was dry, as well as the vegetation; *H. hamastoma* was only to be obtained by getting a Cingalese to climb trees in their search, and but a single flat slug (probably a *Vaginulus*) was to be found under stones: before my second visit the sun had passed to the north of the island, and the consequent showers had liberated the testaceous tribes from their hiding-places. With reluctance I quitted a field so imperfectly explored by conchologists, and where doubtless other new species remained to reward researches uninfluenced, as mine were, by the warning flag and rising smoke of the Suez steamer.

One of the specimens of *Helix hamastoma* laid a single egg while in my possession. In its calcareous covering and size*, it resembled that of a small bird. It formed a curious contrast with the numerous small ova, with a pergamenous integument, extruded, in a mass, by the large Mauritian *Achatina Fulica*, a shell possessed of a much more extensive aperture. The name given to a shelled snail, by the Cingalese at Galle, is "Gombēla."

Aix la Chapelle, Feb. 22nd, 1851.

XXV.—*On the Composition of the Ash of Armeria maritima, growing in different localities, with remarks on the geographical distribution of that Plant; and on the presence of Fluorine in Plants.* By Dr. A. VOELCKER, Professor of Chemistry in the Royal Agricultural College, Cirencester†.

THE relation of the inorganic constituents of the soil to the plants is exhibited in a very distinct manner by those plants which are confined to perfectly distinct geognostic formations; for it is evident that their growth is influenced in a great measure by those inorganic matters found in their ashes, which form constituent parts of the soil upon which they grow. If we find, for instance, that a plant which requires a considerable quantity of common salt for its perfect development will not thrive in a soil destitute of common salt, or that plants the ashes of which have been found to contain invariably a certain amount of phosphoric acid, do not grow vigorously on land which contains few traces of this acid; further, if we find the condition of such plants greatly improved by the addition of common salt or phosphoric acid to their respective soils, we cannot remain doubtful for a moment as to the cause of the failure in the first instance.

There are however very few plants characterized by particular

* Length $\frac{1}{15}$, diam. $\frac{5}{20}$ inch.

† Read before the Botanical Society of Edinburgh, Feb. 13, 1851.

inorganic constituents; in fact the only plants which are so are the maritime plants; in the ashes of which we invariably find iodine and bromine, two substances which are not generally met with in the ashes of other plants*. All other plants on burning leave ashes which contain almost always the same number of inorganic substances, but in different relative proportions. The complexity of the composition of the plant-ashes with which we have to deal in the investigation of the exact relations of the inorganic matters to the growing plant, is the chief cause of the great difficulty we experience in assigning to each of them its proper function in the vegetable organism. It appears to me that we cannot arrive at anything like a rational method of cultivation until we shall have become acquainted with the functions of every one of the inorganic substances found in the ashes of plants, and until we shall have learned how far one substance is capable of replacing another in the vegetable organism; and lastly, how far a change in the chemical composition of a soil affects the natural habits of plants. I do not mean to say that these are the only points which require to be settled, but I consider them as questions, a satisfactory answer to which would prove useful to practical agriculturists.

With regard to the second question we possess several analyses, which prove clearly that soda can be replaced by potash, and lime by magnesia to some extent, and *vice versâ*; and as it appeared to me useful to contribute a few facts towards our knowledge on this subject, I took advantage of Dr. G. Wilson's kindness, to whom my best thanks are due for the use of his laboratory, and made a few ash-analyses of *Armeria maritima*, which I trust will be found not without interest in several points of view. My attention was first directed to this subject by a "notice of the presence of iodine in some plants growing near the sea," by Dr. Dickie of Aberdeen, now Professor of Natural History in Belfast. The author found by chemical examination of specimens of *Armeria maritima* from the sea-shore, and of others from inland and higher districts in the neighbourhood of Aberdeen, that the former only contained iodine; and having taken the precaution to wash the specimens previous to analysis, and having thus removed any objections which might have been made, namely that the iodine was derived from saline incrustations, Dr. Dickie has been led to conclude that marine Algæ are not the only plants which pos-

* M. Chatin and several other French chemists, as well as Prof. Marchand of Halle, have satisfactorily proved the existence of iodine in a great many inland plants. The ashes of inland plants, however, by no means universally contain iodine; those plants in which its existence has been proved, further contain but mere traces of iodine, whereas this element *invariably* occurs in sea-weeds and other exclusively maritime plants, and always in *notable* quantities.

sess the power of separating from sea-water the compounds of iodine and condensing them in their tissue, without any detriment to their healthy function. In the same notice the author states that soda was more abundant in the specimens of *Armeria maritima* grown on the sea-shore, and potash prevailed in those grown in the inland higher places of Aberdeenshire.

The plants which I used for ash-analyses were grown in the neighbourhood of Edinburgh, and collected when in flower in the month of June; roots, leaves, and flowers were burned together.

No. 1. Ash of specimens grown close to the sea-shore and during high water exposed to the sea-spray.

No. 2. Ash of specimens grown on an elevated, partially decomposed trap-rock opposite the former locality.

No. 3. Ash of specimens grown in Mr. Lawson's nursery near Edinburgh, upon light sandy soil.

No. 4. Ash of specimens grown in the Scottish Highlands.

Dr. Dickie's experiments I found perfectly confirmed by my own. With the exception of those specimens which were exposed to the sea-spray, the examination for iodine of *Armeria maritima* grown in other localities, gave me negative results; and a comparison of the composition of the ash of No. 1 and 2 likewise proves the correctness of Dr. Dickie's statement respecting the prevalence of soda or potash.

I endeavoured to determine the quantity of iodine in the ash of specimens of *Armeria* grown near the sea-shore; but though I used large quantities of ash, I had to give up the attempt on account of the minute quantity of iodine present in the ash.

The iodine reaction made with large quantities of ash, compared with the much more intense blue colour which a much smaller quantity of the ash of sea-weed produces with starch, renders it evident, that the proportion of iodine in the ash of *Armeria maritima* amounts to mere traces; and I am inclined therefore to differ from Dr. Dickie's conclusion in ascribing to this plant a power of separating from the sea-water iodine compounds and condensing them in its tissue—a power similar to that possessed by marine Algæ. The power which marine Algæ possess of extracting iodine from sea-water appears to me altogether different: iodine is an essential element for the healthy condition of sea-weeds; without it these plants cannot exist, and hence we can well imagine that their peculiar organism possesses a power of extracting iodine from sea-water, of assimilating the same, and perhaps of storing it up. *Armeria maritima* on the contrary does not require iodine as a necessary element, and grows equally well in a soil destitute of iodine as on the sea-shore. I am therefore inclined to ascribe the occasional presence of iodine in *Armeria maritima*, not to a power similar to that possessed by marine

Algæ, but to an endosmotic action of the roots of *Armeria*, by means of which small quantities of iodine-compounds present in the sea-water are taken up by the plant in the same manner in which any other soluble salt would be absorbed, when presented to the roots of this plant in a watery solution.

Notwithstanding the repeated washings of the plants, a considerable quantity of fine sand remained concealed between the fibres and scales of the roots, as will be observed in the following analyses:—

Ash Analyses.

No. I. Ash of specimens of *Armeria maritima* grown close to the sea-shore in the neighbourhood of Edinburgh:—

Actual result.	After deduction of sand, carbonic acid, and calculating for 100.
Potash	6·73
Soda	3·39
Chloride of sodium	18·22
Iodine	traces.
Lime	10·24
Magnesia	8·33
Oxide of iron	6·01
Alumina	1·50
Phosphoric acid	4·27
Sulphuric acid	6·01
Carbonic acid	1·73
Silicic acid	11·06
Sand	23·20
	<hr/>
	100·69
	<hr/>
	100·00

No. II. Ash of specimens grown on an elevated rock opposite the former locality:—

Actual result.	Deducting sand, carbonic acid, and calculating for 100.
Potash	6·32
Chloride of potassium	5·88
Chloride of sodium	13·19
Lime	10·33
Magnesia	8·55
Oxide of iron	4·89
Phosphoric acid	8·40
Sulphuric acid	6·21
Silicic acid	7·76
Carbonic acid	2·87
Sand	25·12
	<hr/>
	99·52
	<hr/>
	100·00

No. III. Ash of specimens grown in Mr. Lawson's nursery, near Edinburgh, upon sandy soil:—

Actual result.	Without sand, carbonic acid, calculated for 100.	
Potash	9·29	13·81
Chloride of potassium	17·94	26·65
Lime	6·14	9·12
Magnesia	2·88	4·28
Oxide of iron	4·46	6·62
Phosphoric acid . . .	14·18	21·07
Sulphuric acid	4·93	7·33
Silicic acid	7·48	11·12
Carbonic acid	2·37	
Sand	30·90	
	100·57	100·00

Several observations are suggested by the inspection of the above analytical results:—

1. The proportion of alkaline chlorides, as well as that of silica in all three ashes, is considerable.

2. The quantity of soda is more abundant in the ash of specimens grown near the sea-shore, whilst potash prevails in the ash of plants grown on the solid rock near the sea-shore.

3. Soda is entirely replaced by potash in the ash of *Armeria* grown in the nursery.

4. The quantity of phosphoric acid in No. III. is considerable when compared with that in No. I. and No. II.

5. The proportion of magnesia in the ashes of *Armeria maritima* in its natural state is larger than in the ash of specimens grown in the nursery.

I must observe, that the character of the specimens grown in the nursery was somewhat altered. The plants appeared a great deal more vigorous, their leaves were brighter green and broader than those of the wild-growing plants, and the specimens on the whole had lost much of the rigidity of the plants in their natural state.

The above analytical results are well calculated to throw light on the causes which contribute to chain this plant to a particular well-defined geological formation.

We are informed by Prof. Schleiden, in his beautiful work 'Biography of a Plant,' that the *Armeria maritima* grows everywhere upon the arid sand-dunes on the northern coasts of Germany, and is universally distributed over the sandy plains of northern Germany, but that it is not met with on the granite,

clay-slate, and gypsum of the Hartz Mountains, nor on the porphyry and Muschelkalk of Thuringia, and is only found again when we arrive at the Keuper-sand plains on the further side of the Maine in the neighbourhood of Nuremberg. It extends further south through the Palatinate, till the Muschelkalk of the Swabian Alps again sets a limit to it.

Neither on the Swabian Alps nor in the whole Alpine region is the sea-pink seen, but it appears at last again on the sandy soils of Northern Italy. Schleiden in the above-mentioned work, after having directed attention to some other plants, which are confined to well-defined geognostic formations, asks the questions: "How is it that these plants everywhere disdain the richest soils in their range of geographical distribution, and are confined to perfectly determinate geognostic formations? Must not the lime, the salt, the silica, have a most distinct influence in the matter?"

The above analytical results point out clearly that *Armeria maritima* requires not only a considerable amount of silicic acid, but also of alkaline chlorides for its healthy condition, and we can now conceive easily why this plant will refuse to grow on a soil which does not contain these substances in sufficient quantities. The fact that the sea-pink is not found on every sandy soil in Germany, would suggest the idea that those localities where it occurs are rich in salt, and that some of the observed places in all probability have been the beds of some ancient dried-up sea.

In England and Scotland *Armeria maritima* is found universally on the sea-shore, but, with a few exceptions, we do not find it to extend to any distance in the inner regions of the island*. As a most remarkable exception to this general rule of its geographical distribution in England, we find the appearance of *Armeria maritima* on the summits of several inland mountains of the Scottish Highlands. Now, how does it happen that we do not meet with it in the Lowlands in localities much nearer to the sea-shore? I was anxious to ascertain whether the composition of the ash of plants grown on Highland mountains showed any marked difference, and am much indebted to Professor Balfour for furnishing me with the material for analyses. The plants were collected by Professor Balfour himself on the top of Little Craigindal and other lofty mountains in the Braemar district. The analyses of the ash furnished the following results:—

* Dr. W. Francis informs me that *Armeria maritima* occurs in profusion with *Cochlearia officinalis* at Nappa in Wensleydale, Yorkshire.

No. IV. Ash of *Armeria maritima* grown on Little Craighindal in Braemar:—

		Deducting carbonic acid and sand.
Chloride of sodium	2·64	4·89
Potash	7·25	13·44
Lime	22·29	41·34
Magnesia	1·08	2·01
Oxide of iron and a little alumina	2·46	4·56
Phosphoric acid	5·28	9·79
Sulphuric acid	4·05	7·51
Silicic acid	8·87	16·46
Sand	37·74	
Carb. acid and loss	8·34	
	<hr/> 100·00	<hr/> 100·00

The composition of this ash differs from that of plants grown in other localities, particularly with respect to the lime, which appears to replace in part the alkaline salts. However, silica and chloride of sodium, two substances which are essential to the healthy growth of *Armeria*, are present in considerable quantity.

The circumstances connected with the occurrence of *Armeria maritima*, *Plantago maritima*, *Cochlearia officinalis*, and some other marine plants in the Scottish Highlands, deserve to be well investigated. Not having had an opportunity of examining myself the localities in which *Armeria*, *Plantago*, and other marine plants are found in the Highlands, it does not become me to offer an explanation of this curious fact. I may however be allowed to urge those interested in this subject to pay attention to the meteorological condition of those places in the Highlands where maritime plants are said to occur. It is a well-ascertained fact, that the spray of the sea is carried into the air to a considerable height, from which the salt in it is sent down again to the earth with the rain. The quantity of rain in mountainous districts being generally much greater than in the lowlands, it appears to me not unreasonable to suppose, that particularly those sides of elevated points in the Highlands which are exposed to frequent sea-winds will be provided with a quantity of salt, sufficiently large to supply the wants of the sea-pink, which plant, as indicated above, always contains a notable quantity of common salt.

In conclusion, I beg to offer a few observations respecting the occurrence of fluorine in plants. Dr. Will of Giessen has the merit of having first discovered fluorine in plants. Comparatively few examinations of plants have been made in reference to the occurrence of fluorine in them. Most examiners have confirmed

Will's observations, and have found distinct traces of fluorine. Some however have denied its presence in plants. Amongst the former is Dr. Wilson, who, in an able paper read before the Royal Society of Edinburgh in 1846, "On the solubility of fluoride of calcium in water," states that he had detected distinct traces of fluorine in crude American potashes. Until lately, I must confess that I looked with suspicion on the statements referring to the occurrence of fluorine in plants; but I have now had ample opportunity of convincing myself of the truth, that there are plants which contain fluorine. In my former investigations I failed in detecting fluorine, owing to the presence of silica; for I find that this substance interferes with the usual method of testing for fluorine.

The plan which I found to answer the purpose is one suggested by Dr. G. Wilson. He recommends to precipitate the hydrochloric acid solution of the ash of a plant with ammonia, to collect the precipitate on a filter, and to add chloride of barium to the clear solution filtered from the ammonia precipitate. The two precipitates thus obtained are well dried, and separately examined for fluorine in a platinum or leaden vessel in the usual manner.

Following Dr. Wilson's plan of procedure, I was enabled to detect distinct traces of fluorine in the ash of specimens of *Armeria maritima* grown near the sea-shore, and also in the ash of the same plant grown in the nursery near Edinburgh. I likewise found fluorine in *Cochlearia officinalis* and *Plantago maritima*, but was unable to detect it in Canaster tobacco. If we recollect that tobacco leaves are soaked in a considerable quantity of water in the manufactories, and if we bear in mind that fluoride of calcium is soluble in water, as shown by Dr. Wilson, we cannot be surprised that no fluorine should be present in the ashes of Canaster.

XXVI.—*Notices of Australian Fish*. By SIR JOHN RICHARDSON, M.D., F.R.S.*

IN the third volume of the 'Zoological Transactions;' the 'Annals and Magazine of Natural History,' vol. ix.; a report on the "Fish of New Zealand," made to the British Association in 1842; the Ichthyology of the Voyage of the Sulphur, and especially in the Ichthyology of the Antarctic Voyage of the Erebus and Terror, completed in February 1848, I have described various species of Australian fish. Among other sources of information to which I had recourse, a collection of drawings, made by Deputy Assistant Commissary General Neill, in 1841, at King George's Sound, is particularly

* From the Proceedings of the Zoological Society, April 9, 1850.
Ann. & Mag. N. Hist. Ser. 2. Vol. vii. 18

valuable on account of the notices it contains of the habits and qualities of the fish. The drawings are so characteristic, that most of the species are easily recognised, but some novel forms could not be systematically described without specimens, and the opportunity now afforded me by Mr. Gray of inspecting a number of dried skins prepared on the spot by Mr. Neill, has given occasion to the present paper.

APISTES PANDURATUS, Richardson.

Radii.—B. 7; D. 17|7; A. 3|6; C. 12 $\frac{2}{3}$; P. 14; V. 1|5, spec.

Among the various forms that the genus *Apistes* presents, the present one is remarkable for the elevation of the orbit, which rises in a semicircular protuberance, so high above the occiput as to give the hinder part of the head a relative depression like a Turkish saddle, and to render the snout and forehead almost vertical.

The mouth is terminal and small, and both jaws, with the chevron of the vomer and a round patch on each palatine bone, are furnished with minute, short villiform teeth. The intermaxillaries are moderately protractile, and the maxillary, whose dilated lower end drops below the corner of the mouth, has its posterior edge turned outwards producing a ridge. The nasal spines are thick, but acute, and are bent to the curve of the forehead. There is a narrow deep groove between them. This groove widens on the top of the head, where it is bounded by smooth ridges continued from the nasal spines, and in conjunction with them the raised edges of the orbits form an exterior furrow on each side. These four furrows and ridges end in obtuse eminences which cross from the superior-posterior angle of one orbit to the other. Behind them the skull sinks perpendicularly to the level of the nearly flat, depressed occiput, on which however the middle ridges are still visible. The preorbital is small, very uneven, and emits a strong spine whose acute point reaches back to the middle of the orbit. The second suborbital in crossing the cheek to the hollow of the preoperculum forms a stout ridge of oblique, somewhat twisted and striated eminences, none of them spinous. The preoperculum has a smooth vertical upper limb, which shows as a narrow, slightly elevated ridge. At its curve or angle there is a strong spine, longer than the preorbital one, but not reaching quite to the gill-opening. A short thick spine is adnate to its base above, and a little way below it there is an acute spine half as long, which is followed by three other angular or spinous points on the lower limb of the bone. Two prominent but smooth ridges exist on the gill-plate without any spinous points. On the suprascapular region there are two ridges, the upper one having three thick, striated eminences with acute points, and the lower one has two such eminences, with two small points more posteriorly.

There are no scales on any part of the head, and there is a smooth space along the base of the dorsal, which is widest towards the shoulder; the space between the ventrals and the breast anterior to them, with the base of the pectorals and their axils, are scaleless; the rest of the body, including the belly and integuments adjoining the anal,

is densely covered with small scales. The lateral line is marked by a series of small eminences and is straight.

Judging from the numbers given in the 'Histoire des Poissons,' and also from the examination of several species not described in that work, the branchiostegous rays seem to vary in the *Apistes* from five to seven. In the species now under consideration there are seven rays, but the lowest one is very slender, and so closely applied to the following one that it can be detected only by dissection.

The dorsal commences between the second points of the suprascapular ridges and extends to near the caudal. Its spinous portion is much arched; the spines are strong and acute, and the seventh one is the tallest, being equal to two-thirds of the greatest height of the body; the other spines are slightly graduated, but the foremost three diminish more abruptly. The last spine is rather more than one-half as long as the soft rays or than the tallest spine. The last soft ray is bound at its base to the back by membrane, but this membrane does not reach to the base of the caudal. The anal terminates rather further from the latter fin, and has three strong spines, the second being the stoutest and as long as the third one; the soft rays surpass them by about a fourth part. The pectorals are large and obliquely semi-oval, the lower rays being the shortest. Their rays are forked, which is a characteristic mark of the genus, and is not common in the Cottoid family. The ventrals are also rather large, exceeding the anal a little in length and in spread. Their spine stands behind the pectoral axil and under the fourth dorsal spine.

The length of the head exceeds the height of the body, and is contained thrice and one-half in the whole length of the fish, caudal included. Length of specimen $5\frac{1}{2}$ inches.

APLOACTIS MILESII, Richardson.

Radii.—Br. 5; D. 14|14; A. 12; C. 13; P. 11; V. 1|2, spec.

This fish has the fins of a *Synanceia* with the lateral eyes and head of a *Scorpena*, but instead of the ridges of the cranium, face and gill-covers ending in spinous points, they produce only obtuse knobs. Its teeth in character and position resemble those of *Pterois*, and its dermal spine-like scales are similar to those of *Centri-dermichthys* (Zool. of Voy. of Sulphur, p. 73). I am not quite sure that it corresponds in all its general characters with the *Aploactis aspera* of the 'Fauna Japonica' (pl. 22), but it comes sufficiently near to be included in the same generic group.

The form of the fish is rather elongated, the height of the body, which is a little less than the length of the head, being nearly one-fourth of the total length of the fish, caudal included. The compression of the head is moderate, its thickness being only one-third less than its height, and equal to about half its length. The mouth is terminal, cleft only a very short way backwards, but having a moderately large gape. The intermaxillaries are slightly protractile, and their edges and those of the mandible are covered with very short and minute, densely crowded teeth. The chevron of the vomer is similarly armed, but there are no teeth on the very narrow edges of

the palate-bones, and the tongue, which is not in the least free at the tip, appears to be quite smooth. The premaxillaries are but slightly protractile, the tips of their pedicles when retracted not reaching half-way to the eye. The maxillaries have a protuberance in the centre of their lower dilated ends, and only their more slender upper halves glide under the preorbital. When the head is viewed in front, two short parallel ridges are seen covering the pedicles of the premaxillaries, above which, on the forehead, there is a deep oblong depression bounded by an elevated bony ridge, from which a side ridge formed by the prefrontals proceeds to each orbit. The margins of the orbits themselves are elevated and uneven, and there is a prominent bend upwards on the edge of each postfrontal bone; the rest of the top of the head is occupied by the front rays of the dorsal fin. The preorbital sends one obtuse ridge forwards over the middle of the maxillary, and another and a larger one backwards in the situation of the spine of an *Apistes*; this one is knobbed at the end and curved upwards. The suborbital chain is elevated and very uneven throughout, particularly the ridge which traverses the cheek to the hollow of the preoperculum. There is a blunt process from the angle of the latter bone, representing the spine common in this family, and three smaller knobs below it, the edge of the bone being also raised in a slighter degree. Two slightly diverging ridges, ending bluntly, cross the operculum; there is a small blunt point on the interoperculum, and four obtuse eminences between the eye and shoulder, representing the two ridges shown in that part in the *Scorpenæ*. The parts between the bony eminences on the head are covered with small spines like those of the body, and the whole, in the recent state, seems to have been enveloped in soft skin, which in the dried specimen has left traces of a short skinny fringe on the lower jaw and of filamentous points elsewhere. There are several open pores on the limbs of the mandible. The gill-membrane is smooth and is sustained by five curved rays. The gill-openings are closed above the gill-plate, but extend from the point of the operculum downwards and forwards to opposite the articulation of the mandible, being sufficiently ample.

The whole skin of the body and the lower parts of all the fins are studded with straight acute spines, each enveloped in a skinny sheath. The lateral line is nearly straight, having merely a slight rise over the pectoral. It is marked by a smooth furrow and a series of ten or twelve skinny processes.

The dorsal extends from between the eyes the whole length of the back, but is not actually connected to the caudal fin. It is highest anteriorly, lowest over the pectoral, and of medium height and nearly even posteriorly, its end being rounded off. The second spine, which stands over the middle of the orbit, is the tallest, its height being but a little less than that of the head; the first and third rays are only a little shorter, while the fifth and sixth are much lower, producing a deep notch in the fin. The eighth and following spines are very slightly graduated, and from thence to its rounded extremity the outline of the fin is even. The membrane is notched between the rays, and the tips of the jointed rays curve backwards. The first

seven or eight spines are pungent, but the six following ones are less so, and are not easily distinguishable in the dried specimen from articulated rays in which the joints have become obsolete. The fore-part of the dorsal shows some small membranous points on the spines. The anal is similar to the soft dorsal, but terminates further from the caudal, and if it be furnished with a spine it is concealed at the base of the first soft ray, there being no appearance of one externally. The caudal when fully spread is almost circular in outline. Its rays are simple, with the tips projecting beyond the membrane, especially those of the extreme pairs above and below. The pectoral has the oblique semi-oval form of that fin in *Synanceia*, but is less adnate to the side. Its rays are simple, with projecting tips. The ventrals, formed of one spine and two unbranched rays, stand exactly under the base of the lowest pectoral rays, and are small.

The only vestiges of colour remaining in the dried specimen are brown and purple bands and blotches on the dorsal, caudal and pectorals, with one or two rows of white spots on the two latter fins.

CHEILODACTYLUS CARPONEMUS, Cuv. et Val. v. p. 362. pl. 128.

Radii.—Br. 6; D. 17|31; A. 3|19; C. 14 $\frac{5}{8}$; P. 8 et VII.; V. 1|5, spec.

This fish is the "Chettong," No. 39, of Neill's drawings, and the "Jew-fish" of the sealers who frequent King George's Sound. Mr. Neill informs us that it is an inhabitant of rocky shores, and that individuals are often taken which weigh more than 16 lbs. It is readily captured by the hook.

The specimen described and figured in the 'Histoire des Poissons' was obtained by Messrs. Quoy and Gaimard in the same locality with Mr. Neill's, and the latter accords perfectly with it; but I am persuaded that the references in that work referring to Solander and Forster's accounts of a New Zealand species ought to be struck out. Some notices of the discrepancies between the memoranda of these authors and the history of *Ch. carponemus* in the 'Histoire des Poissons' have been given in the 'Zoological Transactions,' vol. ii. p. 101, and since the date of that publication the examination of various Australian specimens has strengthened the reasons I had for coming to that conclusion.

The *Cheilodactyli* do not accord well with the typical *Scienidæ*, and the evidences of the ptenoid structure of their scales are often deficient, the teeth on the disks becoming perfectly obsolete, and none existing on the margins of the scales of any species we have examined. In Mr. Neill's specimen the length of the head is contained four and a half times in the total length of the fish, in which the caudal is included. The height of the preorbital equals the diameter of the orbit; and its length is considerably greater, being about equal to one-third of the length of the head. The teeth on the jaws are needle-shaped, small, and arranged in a narrow, not crowded band. The vomer is smooth. The dorsal fin is low, the sixth and tallest spine being only equal to a quarter of the height of the body, and the fifth and seventh spines are scarcely shorter. The spines lower a little

towards the soft rays, but there is no decided notch. None of the spines are stout. The second anal spine is as long as the third one and is thicker. The tenth or long pectoral ray reaches beyond the first third of the anal; the caudal is deeply forked. The transverse diameter of the scales generally exceeds the longitudinal one.

Mr. Neill's drawing represents five yellowish lines on each side of the face, reaching backwards to the occiput, the three lower ones crossing the upper part of the preorbital and being interrupted by the eye. The under and fore edge of the preorbital is marked by a blue line, which is prolonged to the temples, and there is also a short blue streak immediately under the orbit, the iris itself being likewise of that colour. Two blue lines traverse the summit of the back close to the dorsal, disappearing under the middle of the soft portion of that fin. The same colour exists on the membrane joining the first three dorsal spines, on the spines of the anal, the ventrals, the long pectoral ray, and the upper and under edges of the caudal, the tint in all these cases being a pure indigo. The rest of the fins are of a paler colour, approaching to mountain-blue.

CHEILODACTYLUS MACROPTERUS, Forster.

Sciænoides abdominalis, Solander MSS. *Pisces Australiæ*, p. 11.

Sciæna abdominalis, *Idem*, *op. citat.* p. 29; *fig. pict. Parkins.* 2-40.

Sciæna macroptera, Forster, *Descrip. Anim.* p. 136. *fig.* 206. *Georgio Forst. picta.*

Radii.—Br. 6; D. 17|26; A. 3|14; C. 17; P. 15; V. 1|5, Soland.

Br. 6; D. 17|26; A. 3|14; C. 30; P. 9 et VI.; V. 1|5, Forst.

Of this species I have seen no example, and it is known to me only by the descriptions and figures above referred to. It inhabits the bays of the middle island of New Zealand, and was taken on Cook's first and second voyage in Queen Charlotte's Sound and Dusky Bay. At the latter place its native appellation was ascertained to be "Taraghee," but the seamen called it "Cole-fish." That it is different from the *Ch. carponemus* of the 'Histoire des Poissons' I am inclined to believe, from the dissimilarity of the figure in the latter work with those drawn by Parkinson and George Forster, and from the more notched dorsal and stouter dorsal and anal spines than we find in authentic specimens of *Ch. carponemus* from King George's Sound. These discrepancies, and the smaller number of dorsal and anal rays, authorise us to keep it distinct until an opportunity occurs of examining the New Zealand fish. The broad black band which descends from the shoulder not quite as far as the pectoral is a good distinctive mark. The reader is referred to the 'Zoological Transactions,' vol. iii. p. 101, for extracts from Solander's notes, which may be compared with Forster's description in the 'Historia Animalium,' &c. p. 136.

Some specimens of *Cheilodactyli* from Sydney which I have seen point at a species nearly allied to the two preceding ones as existing in that part of Australia, but the materials I possess are not sufficient for the elaboration of its distinctive characters.

CHEILODACTYLUS NIGRICANS, Richardson.

Radii.—Br. —; D. 15|26; A. 3|10; C. 15 $\frac{2}{3}$; P. 9 et V.; V. 1|5, spec.

Toorjenung, *Neill's drawings*, No. 42.

This fish is the "Toorjenung" of the natives of King George's Sound, and the "Black Jew-fish" of the sealers. Mr. Neill says that it grows to a large size, feeds grossly, and that its flesh is dry and dark-coloured. It is much prized by the aborigines, and forms a principal article of food among the native families, who are expert in spearing fish. The head of a large fish is said to make good soup. It is an inhabitant of rocky points that project from sandy bays, and moves sluggishly along the bottom, ploughing the sand with its soft fleshy lips; hence it falls a ready sacrifice to the native spear.

In shape this fish approaches to *carponemus*, but is rather more elongated in the body, and has a more arched spinous dorsal. Its eye is more remote from the gill-opening, being nearer to the middle of the head, and the preorbital is shorter, its length not exceeding the diameter of the orbit. The most striking dissimilarity to the preceding species is in the longest pectoral ray, which projects only about one-sixth of its length beyond the membrane. It is the uppermost of the simple rays, and the four others are graduated and also project beyond the membrane as far in proportion. The disk of the preoperculum is broad, that of the interoperculum fully equal to it, and both these bones and the cheek are scaleless in the specimen, which has sustained some damage in the head, but not apparently in these places. *Ch. carponemus* and *aspersus* have interopercular bones rather narrower than the disk of the preorbital, and both these bones, with the cheek, are covered with small scales which do not extend to the preorbital. In *aspersus* a small part of the cheek next the preorbital is scaleless. In all these species the operculum and suboperculum are densely scaly. The integuments of the cheek of *nigricans* are full of pores, and the lips are large and fleshy. About forty-eight scales occur in a row between the gill-opening and caudal, with three or four rows in addition on the base of that fin. About seventeen compose a vertical row at the shoulder. The scales of the lateral line are, as in the other species, smaller than those above and below, which also overlap them. The exposed disk of a scale is rough, with minute points, but the exterior margin is thin and membranous. The base is faintly marked by a dozen or more slightly divergent furrows, which do not produce marginal crenatures. The sixth and tallest dorsal spine equals one-third of the height of the body and is higher than the soft rays, which rise considerably above the posterior spines. The third anal spine is more slender and considerably longer than the second one. None of them are strong. The caudal is forked to half its depth, and has acute lobes.

In Mr. Neill's drawing this fish is represented as having a dark greyish-black colour on the back, head and fins, and as being pale on the belly. The lips are flesh-coloured. Length of the specimen 21 inches. The drawing is two feet long.

CHEILODACTYLUS ASPERSUS, Richardson.

Cheilodactylus carponemus, Richardson, *Zool. Trans.* vol. iii. p. 99, *exclus. synonym.*

Radii.—Br. 6; D. 17|27; A. 3|11; C. 13 $\frac{6}{8}$; P. 8 et VII.; A. 1,5, specimens.

This fish frequents Port Arthur in Van Diemen's Land, and Dr. Lhotzky says that it is never taken at Sydney. In the 'Zoological Transactions' for 1841 (vol. iii. p. 99) there is a notice of it, to which the reader is referred; but it is necessary to state that the number of fin rays there given are those of *Ch. carponemus*, as expressed in the 'Histoire des Poissons.' I there pointed out some of the discrepancies between the examples of this fish I had then before me and the description and figure of *carponemus* in the work just referred to; but being at that time very imperfectly aware of the number and variety of the *Cheilodactyli* existing in the Australian seas, I did not venture to indicate it as a proper species. This I am now enabled to do, after a careful comparison of the specimens then commented upon with Mr. Neill's example of *carponemus* from King George's Sound, the exact locality of the specimen of the latter described by Cuvier and Valenciennes.

Ch. aspersus is a higher fish than *carponemus*, the greatest height of the body being contained only three times and one-third in the total length, caudal included. It is much compressed, with an acute back and a deeply-forked caudal. The more arched form of the spinous part of the dorsal fin, and the much stouter dorsal and anal spines, afford a ready means of distinguishing the dried specimens. The different colours and markings of the recent fish are very apparent. The first and last dorsal spines are much shorter than the corresponding ones of *carponemus*, and the notch of the fin is conspicuous from the greater height of the soft rays. The second anal spine is very stout, and it rather exceeds the third one in length. The preorbital is smaller than in that species, and its length does not exceed the diameter of the orbit. The face is therefore shorter, and the profile rises more steeply to the dorsal, owing to the greater height of the fish. The elongated pectoral ray, which is the tenth, reaches no farther back than the beginning of the anal. The scales are rather large and much tiled. About fifty-two exist on the lateral line, besides six or seven rows on the base of the caudal, and there are twenty-two rows in the height of the fish.

Mr. Lempriere, from whom we had the specimens, says that the fish is known at Port Arthur under the name of "the Perch," and has a bright silvery hue with dark spots. The specimens still exhibit many dark brown spots scattered thickly on the back and more sparingly on the sides, most of them being rather smaller than the exposed disk of a scale. The vertical fins, particularly the caudal, are more minutely spotted. The top of the gill-cover is blackish, and there is a dark mark on the humeral bone. As is usual in the genus, the inside of the mouth and lining of the gill-opening are purplish-black. Length 12 $\frac{1}{4}$ inches. Greatest height 3 $\frac{2}{3}$ inches.

The *Cheilodactylus carmichaelis* (Hist. des Poiss. v. 360) (*Chætonodon monodactylus*, Carmichael, Linn. Trans. vol. xii. p. 500. pl. 24) approaches *aspersus* in shape, in the length of its long pectoral rays, and in the number of fin rays generally, but it is distinguished by six short, broad dark bars on the back. The formula of its rays is as follows:—*Radii*.—Br. 6; D. 17|24; A. 3|12; P. 9 et VI.; V. 1|5, Carmichael.

The *Cheilodactylus fasciatus* (Cuv. et Val. v. 357) of the Cape is distinguished by four or five vertical dark bands and five transverse lines on each lobe of the caudal. Its rays are stated to be:—

Radii.—Br. 5; D. 19|23; A. 3|11; C. 17; P. 10 et V.; V. 1|5. Hist. des Poiss.

CHEILODACTYLUS GIBBOSUS, Solander. (*Chætonodon*.)

Chætonodon gibbosus, Banks, *Icon. Parkins. ined.* t. 23.

Cheilodactylus gibbosus, Richardson, *Zool. Trans.* vol. iii. p. 102.

Radii.—D. 17|36; A. 3|8; C. 14 $\frac{4}{4}$; P. 8 et VI.; V. 1|5, spec.

This fish inhabits the seas of Van Diemen's Land and the east coast of New Holland, as well as King George's Sound. A full description of it is contained in the 'Zoological Transactions' quoted above. It has the highest spinous dorsal of any described species of *Cheilodactylus*, and in the distribution of its black bands it bears a considerable resemblance to *Eques americanus*.

Mr. Neill gives a drawing of it (No. 24), and states that it is known to the aborigines of King George's Sound by the name of "Knelvek." The natives spear it on sandy banks, but say that it is rare. Its scales are smooth, and the second and third anal spines are moderately long and equal to each other. The suboperculum is narrow, and together with the other opercular bones and cheek is scaly.

CHEILODACTYLUS NIGRIPES, Richardson.

Radii.—Br. 6; D. 18|26; A. 3|10; C. 13 $\frac{6}{6}$; P. 7 et V.; V. 1|5, spec.

The aborigines of King George's Sound had no name for this species, and no drawing of it was made by Mr. Neill. The only specimen of it obtained was speared by a native named Murriane, and measures 13 inches in length. It has a conical eminence on the prefrontal bone, like that existing in *Ch. gibbosus*; its face is short, with the profile ascending almost as much as in the species just named. The length of the preorbital is rather less than the diameter of the orbit, the eye is placed midway between the gill-opening and mouth, and the interoperculum is only about half as wide as the disk of the preoperculum. The cheek and all the pieces of the gill-cover are densely scaly. The second of the simple pectoral rays is the longest and it falls short of the anus, while only about one-third of its length projects beyond the membrane. The spinous part of the dorsal is arched anteriorly. Its fifth and longest spine rather exceeds one-third of the height of the body. The preceding ones are graduated to the first, whose height is only a fifth part of the fifth one, but the de-

crease of the posterior spines is much less rapid, the last one having half the length of the fifth. The soft rays rise to nearly twice the height of the posterior spines, rendering the fin notched. The third anal spine is somewhat longer than the second one, which is stouter, but the spines generally are of moderate thickness, and are compressed. The caudal is forked to half its depth. The ventral spine is long and slender. The scales are without asperities, and the exposed part of their disk exhibits the concentric rings of structure distinctly. About sixty-one exist in a row between the gill-opening and caudal, exclusive of three or four on that fin. The teeth on the jaws are slender and closely set.

In the dried specimen the ventrals are pitch-black, and the other fins are nearly equally dark. The body is also dark, but in the absence of drawings or descriptions of the recent fish we cannot state its proper tints.

CHEILODACTYLUS ZONATUS, Cuv. et Val.

Cheilodactylus zonatus, *Cuv. et Val.* vol. v. p. 365; *Rich. Rep. Brit. Assoc.* 1845, p. 239.

Radii.—D. 17|31; A. 3|8; C. 14 $\frac{5}{5}$; P. 8 et VI. spec.

This fish, which is common to the China and Australian seas, appears to be called the "Zebra-fish" by the sealers who frequent King George's Sound, though that name is most generally appropriated by them to the *Crenidens zebra*. Its prefrontal bone projects behind the nostril, but not so acutely as in *Ch. nigripes* or *gibbosus*. There is however a difference in this respect in different individuals. The width of the interoperculum is about half that of the preopercular disk, and these bones and the cheek are densely scaly. The scales of the cheek however are imbedded in spongy porous skin. The length of the preorbital equals the diameter of the orbit. In the relative sizes of the opercular bones and preorbital, and in the form of the dorsal, *zonatus* and *nigripes* closely resemble each other, but there is a difference in the anal spines, in the rays of the pectoral, in the shape of the caudals, that of *zonatus* being only sparingly excavated, and a striking one in the colours.

The dried specimen of *zonatus* shows very distinctly eight dark oblique bars on the body, the first crossing the nape and the last the base of the caudal, the intermediate pale spaces being equal to the bars in breadth. The entire head, including the preorbital, is thickly marked by round dark spots of the size of duck shot. There are large spots on the caudal, which are so crowded on the margin of the fin as almost to form a continuous bar. Two or in some parts more rows traverse the dorsal, and there are dark marks on the tips of the anal and ventrals. The simple rays of the pectoral are orange. Mr. Reeves's drawing of the Chinese fish represents it as dressed in very lively colours during the breeding season.

The dorsal is highest at the fifth spine, as in *zonatus*, and is in other respects similar in form; but the anal spines are shorter, especially the second, which is also stouter in proportion. Rather less than one-third of the longest pectoral ray projects beyond the mem-

brane, and the membrane is less deeply notched between the other simple rays than in *nigripes*. The scales differ from those of the last-named species, being finely granulated on the disk, as in *nigricans*.

The rays are somewhat differently enumerated in the 'Histoire des Poissons,' from a Japanese specimen. *Radii*.—Br. 6; D. 17|29; A. 3|8; P. 9 et V.; V. 1|5, Cuv. et Valenc.

The *Cheilodactylus brachydactylus* (Hist. des Poiss. p. 361) of the Cape approaches more nearly to our examples of *zonatus* in the numbers of the rays, but it does not appear to possess the prefrontal prominence, and has no other markings than a triangular black mark behind the eye. *Radii*.—Br. 5; D. 17|31; A. 3|9; C. 17; P. 8 et V.; V. 1|5, Cuv. et Valenc.

Cheilodactylus ciliaris, Richardson, Zool. of the Voy. of the Erebus and Terror, p. 37. pl. 26. fig. 6, 7 (*Latris*; *Sciæna ciliaris*, Forster, &c.), is a species which is allied to the following ones, in the shortness of its simple pectoral rays.

CHEILODACTYLUS HECATEIUS, Richardson.

Latris hecateia, Richardson, Zool. Trans. p. 106. tab. 6. f. 1.

Radii.—Br. 6; D. 18|36; A. 3|27; C. 16 $\frac{2}{3}$; P. 9 et IX.; V. 1|5, spec.

In the account of this species quoted above, I expressed doubts of the rank of *Latris* as a subdivision of the *Cheilodactyli*; but now that I have had an opportunity of examining a more complete gradation of specific forms, I am not disposed to think that it merits to be considered even a subgenus, though the non-prolongation of one of the pectoral rays (usually the tenth) makes it a convenient division of the *Cheilodactyli*, now known to be numerous.

This species inhabits the seas of Van Diemen's Land.

CHEILODACTYLUS LINEATUS, Forster (*Sciæna*).

Cichla lineata, Schneider.

Sciæna lineata, T. R. Forsteri *Descr. Anim.* p. 134. An. 1844; *Fig. pict. Georg. Forsteri in Bibl. Banks. servata*.

Radii.—Br. 6; D. 18|36; A. 1|26; C. 30; P. 17; V. 1|5, Forst. *l.c.*

This species agrees nearly with the preceding in the numbers of its fin rays, except that Forster says expressly that it has only one anal spine. It has also four dark dorsal stripes, with three intervening silvery ones; but it differs from *hecateius* in the yellowish colour of its fins, and particularly of its caudal, which obtained for it the appellation of "Yellow-tail" from the sailors. It frequents, like the other *Cheilodactyli*, rocky places, was captured by Cook's sailors with the hook, and was much approved as an article of food. It is a native of the seas washing the southern island of New Zealand. Length of specimen described by Forster, 24 inches.

Having seen no specimens we cannot institute a correct comparison with *hecateius*.

THREPTERIUS, Richardson.

(Θρεπτήριος, *ad alendum idoneus*.)

Genus piscium acanthopterygiorum *Cheilodactylis* affine. Corpus catheto-plateum, ovato-oblongum, squamosum. Caput aliquantulum parvum, cute porosâ tectum, absque spinis, angulis vel aciebus serratis osseis. Os ut in *Cheilodactylis* extensibile. Dentés in premaxillaribus, mandibulâ trigonioque vomeris unâ serie instructi, brevissimi, parvi, subconici. Ossa palatis lævia. Genæ craniumque squamosæ. Os preorbitale angustum. Operculum subtriangulare squamis tectum. Membrana branchiostega radiis sex curvis, satis validis sustentata. Squamæ læves nec dentatæ; linea lateralis recta. Radii pinnarum pectoralium inferiores simplices. Pinna dorsi e nuchâ ferè usque ad caudæ pinnam regnans, squamulis apud radios instructa, membranâ inter spinas profundè emarginatâ; lobulo tamen membranaceo e summis spinis pendente. Pinnæ ventrales thoracicæ sed a gulâ paulo remotæ.

The characters are deduced from dried specimens, and the pharyngeal teeth and structure of the intestinal canal are unknown. The jaw teeth are not strictly disposed in a single row, since a few minute ones form a row behind the others in front of the premaxillaries; but these can scarcely be visible in the recent fish. The chevron of the vomer is acute and projects a little. The orifice of the mouth is rather larger than in the *Cheilodactyli*, but the jaws are extensible in about the same degree. The maxillary bone wants the flat thin plate near its head which exists in the *Cheilodactyli* and glides beneath the preorbitar. The latter bone is narrow, its width not being equal to one-third of the diameter of the orbit. The eye is comparatively large, three diameters and a half of the orbit being equal to the entire length of the head, and two of these diameters measure the distance between the hinder edge of the orbit and the tip of the gill-cover. The position of the eye is high enough to encroach upon the profile. The cheek equals the diameter of the orbit in breadth; the disk of the preoperculum is also wide, and the interoperculum moderately so. The operculum and suboperculum conjointly have a triangular form; the former is notched, and the latter is prolonged by a membranous tip, which forms the apex of the gill-cover. Both these bones are densely scaly; there is also a row of scales on the interoperculum, partially overlaid by the thin edge of the preoperculum, and the temples are also scaly. The rest of the head is without scales, but the mucous skin, full of canals and pores, which envelopes the head, prevents us from ascertaining the exact extent of the scales, at least in the dried specimens. The top of the head is destitute of scales to the occiput, but in the *Cheilodactyli*, dense, small scales extend forward on the skull to before the eyes. In the absence of thick fleshy lips, the genus differs from *Cheilodactylus*. The preorbitar is neither wide enough nor long enough to conceal the maxillary, which however enters partially beneath its edge. The thin crescentic border of the preoperculum is striated, but not crenated. The same kind of streaks or furrows may be discerned, though not so readily, in some *Cheilo-*

dactyli. The head forms a fourth of the total length. The height of the body is also equal to a fourth of the length of the fish, caudal included. The belly is prominent, and the tail, posterior to the vertical fins, is slender. The lateral line is straight, and each of its scales is marked by a short straight tube, which is placed somewhat obliquely to the general direction of the line. About fifty-two scales compose a row between the gill-opening and caudal, the base of whose rays are also scaly, and the lateral line is prolonged as far as the scales extend on that fin.

The dorsal commences over the upper angle of the gill-opening and reaches to within an inch of the caudal. Its seventh spine, which is the tallest, is nearly equal to half the height of the body; the others are graduated very slightly posteriorly and more rapidly anteriorly. None of them are stout, and all of them are traversed on each side by a deep furrow. The membrane between them is deeply notched, as in the genus *Pelors*, and a slender process running up the back of each spine surmounts it in form of a small free lobe. The soft rays surpass the tallest spine a little, and are more than twice the height of the last one. The anal commences opposite to the beginning of the soft portion of the dorsal and ends beneath its tenth branched ray, or, in the specimens before us, about two inches and a half from the caudal. The spines are like the dorsal ones, grooved and slender, and the second one, which is scarcely shorter than the third, is not quite twice as long as the first one. The seven inferior simple rays of the pectoral have free tips, their membrane being deeply notched as in the dorsal. The ventrals are attached under the middle of the pectorals, or opposite to the sixth dorsal spine. Their spine is slender, and about two-thirds of the length of the soft rays. The caudal is rounded, with the tips of the rays projecting beyond the membrane.

THREPTERIUS MACULOSUS, Richardson.

This fish approaches the division *Latris* of the *Cheilodactyli* in the form of its pectoral fin and other characters, but differs so much in its general aspect, which reminds one of a cottoid fish, that it is well that we can find a structural difference which enables us to place it in a separate genus. This exists in the vomerine teeth, the vomer being smooth in the *Cheilodactyli*, but in this fish it is armed like the jaws by a single row of teeth, which, instead of being setiform and crowded, as in the *Cheilodactyli*, are short, somewhat conical, and confined nearly to a single row on the jaws as well as on the vomer.

The native name of the fish at King George's Sound is "Cūm-beūk," and it frequents rocky places, having apparently the same habits with the *Cheilodactyli*. The simple projecting rays of the pectoral would appear to perform the functions of an organ of touch, and are furnished to many fish that, like the *Triglæ*, swim close to the sandy bottom, which they touch with these simple rays, whether they are wholly or partially free. The Cūmbeūk is prized as an article of food, whence the generic name.

Mr. Neill's figure represents the fish as having a pale brown colour, much lighter on the belly, and thickly studded with irregular dark liver-brown spots, most crowded along the back and becoming much smaller and more scattered on the belly. The fins are rather of a redder brown, and the soft dorsal, ventral and caudal are minutely spotted. Length 9 inches.

TAUTOGA PARILA, Richardson.

Paril and "Common Rock-fish," *Neill's drawings*, No. 9; *Richardson, Ichth. Erebus and Terror*, p. 127, sub *Labro fucicolâ*.

Radii.—Br. 6; D. 9|11; A. 3|10; C. 13 $\frac{1}{4}$; P. 13; V. 1|5, specimens.

This species of *Labrus* or *Tautoga* approaches *Labrus tetricus* (*Ichth. of Erebus and Terror*, pl. 55. f. 1) in general form, but there is only a single row of scales on the temples, and they do not descend lower than the middle of the upper limb of the preoperculum. The scales covering the operculum and suboperculum are, as in the allied species, large. The cheek, preoperculum and the broad thin interoperculum show no scales, but, in common with the top of the head, are covered with a thick skin full of mucous canals and open pores. The diameter of the orbit is less than the length of the preorbital, and is contained five times and a half in the length of the head when the jaws are retracted. The preorbital lips are only slightly developed, but the intermaxillary and mandibular ones are thick and plaited. Teeth arranged in each jaw in a series gradually decreasing towards the angle of the mouth, the anterior pair above and below being considerably larger and more curved. In the upper jaw there is a complete interior series of small rounded teeth which are on a level with the soft parts. On the mandible the interior row is confined to the fore-part of the jaw, and is less regular. The tubular ramifications on the scales of the lateral line are more numerous and crowded than in *L. tetricus*, or any of the other Australian species figured in the 'Ichthyology of the Erebus and Terror.' There are twenty-four scales on the lateral line having these clusters of tubes, and the clusters do not diminish in size towards the tail, though one or two less bushy occur under the soft dorsal. The line is as usual suddenly bent downwards under the end of that fin.

In the dried skins dark brown lines radiate from the orbit over the temples, cheek, and preorbital, and there are dark spots on the jaws, top of the head and gill-plates. There are also some white blotches and bars on the cheek, preoperculum, interoperculum and lower jaw. The body is variegated with brown spots, crowded along the back, more scattered on the sides, and mixed with small round dots of the same tint. The dark marks extend to all the vertical fins. These spots have an umber-brown colour in Mr. Neill's drawing.

No. 37 of the same drawings represents the "Black-fish of the sealers" and the "Paril" or "Knhoul" of the natives, which is considered to be a variety of the preceding. There is no specimen of it in the collection, but it has the back and upper part of the sides thickly sprinkled with reddish-brown dots without any larger spots. This variety or species is said to grow to the size of 15 or 20 lbs.

COSSYPHUS VULPINUS, Richardson.

Radii.—Br. 4; D. 12|11; A. 3|12; C. 14 $\frac{2}{2}$; P. 16; V. 1|5, spec.

The height of the body is one-fourth of the total length of the fish, caudal included, and is about equal to the length of the head.

The profile rises in a slightly concave line from the acute snout to opposite the back part of the orbit at an angle of 30°. From thence to the beginning of the dorsal, which stands as far back as the axil of the ventrals, the line is almost horizontal, and judging from the dried specimen the dorsal ridge there is acute. When the jaws are protracted the face has a hollow profile, and the strong series of teeth give it a sinister look. There are two pairs of canines at the extremities of the upper and under jaws, the upper ones being inclined forwards, and also a canine at the corner of the mouth, which is bent outwards. The smaller teeth are rather widely set, and there are six of them on each maxillary and fourteen on each limb of the lower jaw; and of the latter the middle ones are somewhat longer than those towards each end of the jaw. Within the front teeth on both jaws there is a flat naked surface of bone fitted for grinding or crushing, and more interiorly a few minute granular teeth scarcely protruding from the bone. The cleft of the mouth extends backwards to the front of the preorbital bone, and is equal to the distance between the corner of the mouth and the eye.

The preorbital is covered with smooth skin, presenting an even surface in the recent fish, but in the skeleton it presents three deep notches anteriorly, separated by linear processes. The rest of the suborbital chain is narrow. The upper limb of the preoperculum is finely serrated, the serratures disappearing on the rounded angle. The disk of that bone, the other opercular pieces, the cheeks, temples and suprascapulars are scaly, but there are no scales on the limbs of the lower jaw, in which respect the species differs from the *Cossyphus maldat* of the 'Histoire des Poissons,' to which it has some resemblance in general form. There are six rows of scales on the cheek and as many on the interoperculum; the scales on the disk of the preoperculum are smaller than these, and those covering the operculum and suboperculum are considerably larger. The naked part of the scales exhibits little pits rather than granulations. There are thirty scales on the lateral line, each carrying a simple tube with its point turned upwards. The tube is more branched in *C. maldat*. There is no sudden bend in the lateral line, but it descends gradually under the soft dorsal rays to the middle height of the tail, on which there are eight rows of scales.

The anal and dorsal fins move in scaly sheaths, which are broadest on the soft rays. The spinous rays are strong, tapering, and acute. The first dorsal spine stands over the axil of the ventrals; and the ventral spine, which is as tall as the last and longest dorsal one, stands beneath the base of the lowest pectoral ray. The soft parts of the anal and dorsal are somewhat peaked, and rise above the spines. These two fins end exactly opposite to each other, and leave a considerable space of naked tail behind them. The angles of the caudal project a little beyond the straight intermediate border. The colours of the specimen have faded. Length 16 inches.

COSSYPHUS GOULDII, Richardson.

Labrus gouldii, *Rich. Ann. & Mag. Nat. Hist.* xi. p. 353.

Cossyphus, vel *Lachnolaimus gouldii*, *Idem, Ichth. of Voy. of Erebus and Terror*, p. 132.

Radii.—D. 11|10 vel 11; A. 3|10 vel 11; C. $14\frac{2}{3}$; P. 17 vel 16; V. 1|5, spec.

Mr. Neill's collection contains a young specimen of this fish, which was previously known to me only by an example of considerably greater size, brought from Western Australia by Mr. Gould. Neither specimen retained the pharyngeal bones, and I still remain in doubt as to which of the dismemberments of the Linnæan genus *Labrus* it ought to be referred.

It has the general form of *Labrus*, with the scaly dorsal and anal sheaths of *Cossyphus*, and a peculiarity in the very compressed form of the spinous rays which I have not as yet seen in any other Labroid. It has the four anterior canines in each jaw which exist in some *Cossyphi*, and on the mandibles these canines are inclined forward like the corresponding teeth in *Anampses*. There are no canines at the angle of the mouth. The lateral teeth are incorporated with the bone, and are small and uniform, not decreasing in succession, as in the *Labri*. In the young specimen the bone of both jaws is thin, and the forms of the lateral teeth are distinctly seen, cemented laterally to each other, with a few very minute granular teeth scattered on the interior surface of the bones; but in the older specimen the premaxillaries have swollen behind the canines and acquired a smooth surface by friction, and the edges of the jaws having worn down the forms of the teeth composing them, are obscured—their rounded points alone being visible. On the other hand the granular teeth on the sides of the jaws have become more conspicuous in consequence of their growth.

The cleft of the mouth is small, not exceeding the diameter of the eye. The length of the preorbital is greater. The latter bone and the suborbital chain, with the lower jaw and top of the head, are scaleless. The edge of the preoperculum is quite smooth, and its disk appears to be scaleless, but there are nine rows of small scales on the cheek, and the other gill-pieces are scaly, those on the operculum and suboperculum being larger than the rest. The uncovered disks of the scales of the body are rough, with small round points, the edges being thin, membranous, and striated or wrinkled. The descending curve of the lateral line under the soft dorsal is the gradual one of a *Cossyphus*, not the more sudden deflection of a *Labrus*. Each of the scales composing it has a loose arbuscle of sparingly branched tubes.

The dorsal spines are strong and comparatively short, and the anterior ones are compressed so as to render their front edges acute. The compression diminishes in the posterior spines, and the last and tallest one is subulate, grooved and pointed. The foremost two anal spines are even more conspicuously compressed, and the third one is subulate. The ventrals are rounded, and have a compressed spine which stands under the second and third dorsal spines and base of the pectoral—being farther forward than in *Cossyphus vulpinus*.

This fish is represented as having a dark purplish colour, and is said by Mr. Neill to bear the names of "Koojenuck," "Quejuinuck," or "Knowl," among the aborigines of King George's Sound. It attains the weight of 28 or 30 lbs. It is described more at length in the 'Ichthyology of the Voyage of the Erebus and Terror,' quoted above.

JULIS CYANOGRAMMA, Richardson.

Radii.—D. 9|13; A. 3|13; C. 12 $\frac{3}{4}$; P. 13; V. 1|5, spec.

This species is the "Knelmick" or "Kielmick" of the aborigines frequenting King George's Sound, and the "Common Rock-Cod" of the sealers. It is also an inhabitant of New South Wales, specimens of it having been sent to the Museum at Haslar by Mr. Miles. Its flesh is little prized.

In the numbers of its fin rays it comes near *Julis dussumieri*, but differs from it in having smaller scales, in form and in colours; nor have I been able to refer it to any described species. Its body is elongated; its height, which is not equal to the length of the head, being contained five times and a half in the total length of the fish, caudal included. The compression of the head is considerable, its thickness not exceeding half its height, and the occiput and nape are acute. The length of the preorbital is considerably greater than the diameter of the eye, and the cheek and interoperculum are both high. There are no scales on the temples or any other part of the head. There are fifty scales on the lateral line, each marked by six or seven short, simple, diverging tubes. The lateral line is bent downwards under the ninth, tenth and eleventh soft rays of the dorsal; it is otherwise straight, and runs near the back. The dorsal commences far forward, over the top of the gill-cover, and runs back with an even outline; its tip, which is acute, though not prolonged, reaching, when laid back, to the base of the caudal. Its spines, as well as those of the anal and ventrals, are flexible and very slender. The pectorals are not large, and the ventrals have tapering, acute, but not filamentous tips. They stand under the base of the lowest pectoral ray. The caudal is moderately rounded, and it is scaly between the rays for more than one-third of its length.

When the open mouth is viewed in front, its teeth form a rhomb; the front pair of teeth above and below are comparatively large and are curved. There is also a small curved tooth standing forwards from the angle of the mouth.

Mr. Neill's drawing represents this fish as having an aurora-red ground colour on the head, back, dorsal and anal fins, the fins being of the deepest tint. The head is ornamented by deep blue lines, which are distinctly visible on the dried specimen. These all form curves more or less bold, with the convexity forwards. The anterior one begins on the nose, runs forward to the lips, and inclines backwards again on the lower jaw; the next descends from the nostrils over the disk of the maxillary and posterior part of the lower jaw. Two descend from the orbit over the interoperculum, and there are some finer intermediate ones which vanish on the cheek. There are also

about six slender lines on the gill-cover, which are thickened on the suprascapular region. The body is traversed by seven or eight rows of short blue lines, which on the tail are superseded in part by dots. The dorsal and anal have about three rows of these short lines, and the caudal, which is reddish-orange, is streaked longitudinally with blue. The pectoral and ventrals are flesh-coloured.

Length of specimen $12\frac{1}{2}$ inches.

OLISTHOPS, Richardson.

(*Olisthops*, ex $\delta\lambda\iota\sigma\theta\eta\rho\delta\varsigma$, *lubricus*, et $\omega\psi$, *vultus*.)

Genus generis *Odacis* affine. Caput totum cute lubricâ, esquamosâ tectum (squamulæ quatuor tantum inconspicuis regioni suprascapulari utrinque insidentes). Labia simplicia cum cute faciei continua, labia preorbitalia nulla. Dentes cum ossibus lunatis premaxillaribus mandibulisque, modò *Scarorum* ferruginati. [Ossa pharyngea ab exemplaribus nostris excisa, hinc nobis ignota.] Squamæ cyloideæ. Linea lateralis simplex, e tubulis rectis facta, continua; anticè arcuata, posticè recta. Pinna dorsi unica, prope humerum incipiens, in parte spinosa, modo proprio, emarginata; radiis spinosis apicibus flexilibus. Pinnæ ventrales sub axillis pectoralium positæ. Membrana branchiostega in gutture continua, utrinque radiis quatuor sustentata.

The general form of this fish has been known to me for some years by the accurate drawing of Mr. Neill. It is an inhabitant of King George's Sound in Australia, where it is recognised by the natives under the name of "Toobitoet," or "Toobitooit," and it is said to inhabit rocky places and to be rarely captured. In the construction of its jaws and in general form it approaches most nearly to *Odax*, but it differs from that genus, and still more from *Scarus*, in the want of scales on the head, the single lips, and in the unusual form of the dorsal. The subjoined description is drawn up from a specimen prepared by Mr. Neill, which I have lately had an opportunity of inspecting.

In the shape of the jaws *Olisthops* resembles several species of *Odax* which inhabit the Australian seas, but does not agree altogether with the account of the dentition of that genus as given in the 'Histoire des Poissons' (xiv. p. 299), nor with the drawing of the jaws of *Odax pullus* (*op. cit.* pl. 408. f. 2).

The jaws of *Odax*, says M. Valenciennes, are composed, as in *Scarus*, of an assemblage of small teeth arranged in a quincuncial order and intimately soldered together, forming on each side a single body, whose cutting edge is crenulated; but these jaws are neither so broad nor so convex as in *Scarus*, and are entirely covered by the lips. They differ from those of *Scarus* in that the teeth form two spoon-bowls at the end of the mouth in front of the spinous points which crown the teeth of the jaw. *Olisthops* and several *Odaces* want these posterior marginal toothlets, the spoon-shaped masses constituting the entire dental process of the jaw, and showing their origin merely by the reflections of the incorporated, minute pearly quincuncial teeth, so

densely crowded as to form nearly the whole of their smooth exterior surfaces.

OLISTHOPS CYANOMELAS, Richardson.

Radii.—Br. 4; D. 18|10; A. 3|10; C. $12\frac{4}{5}$; V. 1|5; P. 12.

Form elongated, the greatest height of the body, which occurs just behind the ventrals, being contained five times and a half in the total length of the fish, caudal included. The bluntness of the head, produced by the form of the jaws, is intermediate between that of *Scarus* and *Odax*, and the profile, from the nostrils to the dorsal, is moderately ascending and but slightly convex. The jaws have the usual structure of those of *Scarus*, being composed of a multitude of minute teeth, arranged in a quincuncial order in many rows, and so incorporated with the bone that they produce no inequality of surface, but reflect the light in certain positions so as to reveal their structure. The two premaxillaries conjointly, and the two halves of the mandible, resemble half the bowl of a spoon with straight cutting edges, which under a lens appear to be striated and minutely crenulated. At the symphysis of the mandible, the cutting edge rises slightly, so as to seem very slightly peaked. The orifice of the mouth is comparatively small, and the small maxillaries are concealed under the skin at its corners. Interiorly there is a conspicuous velum in both jaws. The small nostrils lie in a membranous space above the pre-orbital.

The entire head is covered with smooth integument, which has no inflexed folds at the edges of the opercular pieces or preorbital, but is continuous with single lips, that are capable of covering the jaws. The gill-membrane is continuous with the edges of the interopercula, and passes over the isthmus to which it is partially adherent, leaving a small flap posteriorly. It is sustained by four flat thin rays on each side. In length the head is equal to five diameters and a half of the circular orbit, and the space between the eye and the tip of the gill-flap equals three of these diameters. The eye is near, but does not touch the upper profile of the head. A triangular preorbital, having a length equal to the diameter of the orbit, is so concealed by the integument that it is scarcely discernible in the recent fish, but in the dried specimen it shows a slightly raised disk bounded in a somewhat radiated manner by slightly prominent mucous canals. The rest of the suborbital chain goes round more than half the orbit in form of a slender line of simple mucous tubes. The two limbs of the preoperculum, equal to each other in length, meet at a right angle and inclose a broad and perfectly smooth cheek. In the dried fish the disk of the bone appears raised, and is edged irregularly with mucous prominences, but the under border of the bone is thin, and is scarcely distinguishable from the very thin, flexible interoperculum. At the temporal angle of the gill-plate there originates a bushy cluster of prominent ramifications, which disappear about the middle of the disk, and are most probably not visible at all in the recent fish. The rather narrow, very thin suboperculum is lengthened into the tip of the gill-cover, in which the flexible bone is scarcely to be distinguished from the membrane. The gill-opening is restricted above, the whole

upper edge of the operculum being attached to the side of the head by membrane. Posteriorly and above the pectoral the gill-membrane is vertically truncated, and the gill-opening slopes from the level of the upper ray of that fin downwards and forwards till it terminates opposite to the angle of the preoperculum. A row of small scales exists on the suprascapular region, but there are no other scales, nor any bony or spinous points on the head.

The scales are cycloid and of smaller size than those of *Scarus*, there being forty-eight in a longitudinal row between the gill-opening and caudal; seven rows above the lateral line anteriorly, and fourteen below it.

The scales are oblong, with parallel or converging sides, a truncated or rounded base and a rounded or conical free end. Fine striæ, from twelve to twenty in number, diverge from the centre towards the base, but do not produce lobes or crenatures on the margin; there are some fainter diverging striæ anteriorly. The lateral line is arched over the pectoral, and afterwards descends gradually, till opposite the three last dorsal spines, from whence it holds a straight course down the middle of the tail and runs out to the middle of the caudal membrane. It is formed of a series of single straight tubes, and is nearly perfectly continuous, especially posteriorly.

The dorsal spines are slender, and end in soft flexible tips. The first spine stands over the base of the lowest pectoral ray, and is the tallest; the others gradually diminish in height to the penultimate one, which is a little shorter than the last one; the soft rays are forked, and rise abruptly to nearly twice the height of the posterior spines. The anal, of similar height and shape to the soft dorsal, has its commencement and end a little posterior to those of the latter. The rather small ventrals are attached opposite to the third dorsal spine. The caudal is rather large, and is crescentic at the end with projecting points, of which the upper one is the longest.

In general colour the fish appears from Mr. Neill's figure to be blackish-green, deepening nearly to black on the back and dorsal fin. A deep prussian-blue streak covers the second pectoral ray, and there are two broader, interrupted ones on the caudal, viz. between the longest rays of the caudal above and below and the ray immediately interior to them. The iris is likewise blue, and there is a blue spot on the nostrils. These streaks are to be traced on the specimen, but have changed to green. The female differs in being much paler (a dull leek-green in the dried specimen), and in wanting the blue streaks. The lobes of its caudal also are less prolonged.

XXVII.—On the *Chemnitzia opalina* and *C. diaphana*.

By WILLIAM CLARK, Esq.

To the Editors of the *Annals of Natural History*.

GENTLEMEN, Norfolk Crescent, Bath, March 7, 1851.

I HAVE much gratification in submitting observations on a great desideratum amongst malacologists. I have just received in a bottle of sea-water, from my friend Mr. Barlee at Falmouth, live

specimens of the beautiful *Rissoa opalina*. Though somewhat torpid, I have observed the organs, an account of which I am sure will gratify many of your readers. There is no recorded description of the animal. This excellent discovery is due to the perseverance of George Barlee, Esq., whose laborious and painful journeyings—

“ per omnes
Terrasque, tractusque maris,”

of the wilds of the Ultima Thule, and Hebridean seas, have enriched science with so many rare and interesting objects; the present one is invaluable, as it clears up several doubtful questions which might long have remained unexplained, if this curious animal had continued to escape observation.

Rissoa opalina, auct. *Chem. opalina*, mihi.

Animal inhabiting a spiral subglobose shell of three volutions. Mantle of the palest azure, slightly canaliculated, otherwise even with the shell. The head is a rounded, short, contractile proboscidiform muzzle, which is rarely carried beyond the foot and tentacula; it is vertically cloven at the terminus and under part, furnished with a pair of subcircular jaws and lingual riband, which in several of the examples I frequently saw protruded after the manner of the *Rissoa*; the head and neck are brindled with fine dark lead-coloured lines.

There are a pair of tentacula on each side the neck behind the muzzle, springing from a distinct common origin or pedicle, not formed by the fissure of any part of the head, divergent, *very short*, thick, very little flattened, of nearly the same size throughout, each pair connate with their respective stamens, very moderately setose, quite blunt at their terminations, beneath pale yellow, above delicately aspersed towards the extremities with pale-coloured very minute points; the eyes are large, black, placed very far back on the neck, on, if at all, slight eminences, perhaps immersed in them, apparently in a line with the centre of each tentacular pedicle; these parts were seen with great difficulty, and only came into view in two examples; they however may be observed through the paler-coloured shells, but are not exerted on the march beyond the margin of the aperture. The foot is oval in quietude, showing a narrow lead-coloured margin, in action somewhat truncate anteriorly, with very small auricles, posteriorly forming a gradually attenuated termination, without cirrhi, but slightly emarginate in one or two specimens. The corneous operculum is suboval, marked with fine subannular striæ, with a small central process, rib and groove, sometimes with two minute raised points or nuclei contiguous to each other;

all these characters are occasionally subject to some modification. We have several in our cabinet which differ materially, the annular striæ of increment being usually permanent; the operculum is carried rather posteriorly, not on a developed operculigerous lobe; the foot is not labiated so as to produce a mentum—at least I saw none. The foot is not so slender proportionately as in the typical *Rissoa*, nor so long; beneath it is pale yellow, showing a medial line on the posterior half; above, elegantly mottled or brindled with dark close-set lead-coloured lines, which are sometimes waved; the colours on all parts vary in intensity in the different individuals. I could detect no head-lappets. These animals float and creep like the *Chemnitzia* and *Rissoa*. Habitat? Mr. Barlee omitted to name it, but I presume it is in the littoral and laminiarian zones; he has since confirmed this view. Axis $\frac{1}{20}$, diam. $\frac{1}{30}$ uncia.

The muzzle of this animal allies it to *Rissoa*, and the peculiar position of the eyes to *Chemnitzia*; further investigation is required to determine which is the most worthy character. I shall soon have a good opportunity of entering on the examination of these points. Notwithstanding the proboscidal muzzle not being a strictly retractile one, I think the balance of characters is in favour of this animal being a point of transition from the *Littorinidae*, and that it may be considered an aberrant *Chemnitzia*.

With respect to Mr. Alder's strictures in the March 'Annals' on my *Chemnitzia diaphana*, I am sorry that I cannot reply on every point as I could wish until my return from the sea-side. At present I can only say, that the comparison of his so-called *Jeffreysia* with *Chemnitzia* is incorrect in most points, as I will show hereafter. I think he will discover that he is in error respecting the proboscidal apparatus of the *Chemnitzia*; at least he is, if any reliance can be placed on M. Philippi's authorities.

Mr. Alder has attached by far too great importance to the modification of the striular form in the operculum of *Chemnitzia diaphana* in comparison with those of the *Chemnitzia*, in which they are very variable—not two are alike. Let him examine those of the *C. conoidea*, *C. pallida*, and *C. rufa*; indeed he will find throughout the tribe that these appendages are very dissimilar; notwithstanding the variation in the shape of the opercular striæ in *C. diaphana*, I consider the operculum of that species of decidedly *Chemnitzian* type, and that its characters ally it much closer to the *Muricidae*, particularly to *Murex undatus*, than to the *Littorinida*—I mean, in the subannular form of the striæ of increment.

Since the above was written I have again examined the animal and shell of the *Rissoa opalina*, and I am bound to conclude, that it is an aberrant *Chemnitzia*. The position of the eyes, far back

on the neck, at the bases of the tentacula in a line with them, sufficiently indicates its parentage, if all other characters were absent. I challenge the production of an animal of the *Littorinidæ* with a spiral shell and operculum that has any analogy to this in respect of the eyes; but the position of these organs is one of the great distinctive characters of the *Pyramidellidæ*. I may just observe, that *R. opalina* has alliance with *Truncatella* by the muzzle and short tentacula. All my shells have the true button-shaped sunken subreflexed apex of that section of the *Chemnitzia* which is represented by the dwarf littoral *Chem. rissoides*, only it is somewhat more bent on the second volution than in that species: the pillar-lip, if carefully examined, will show sometimes decided folds, but usually, as is often the case in *Chem. obliqua*, the "*decorata*" of Mr. Bean, they do not force themselves within the limits of visibility. I have dissected the columella of several examples of this species as well as of *C. diaphana*, and I find them with the lax elongated spiral wreath exactly as in *C. obliqua*, with which they are strictly congeneric in almost all points. The operculum, though modified in the shape of the striæ, is decidedly of Chemnitzian type; that of the *Littorinidæ* is usually spiral. The double tentacula of the *Chem. opalina* are only the broad longitudinally folded ones of some of the *Chemnitzia* qualified by scission. All these circumstances satisfy me that this animal is a true *Chemnitzia*, and as it is congeneric with *Chem. diaphana*, mihi, *Jeffreysia diaphana*, Alder, that disputed species will fall into the same category as this. I therefore again express an opinion that the so-called genus *Jeffreysia* is superfluous, inasmuch as an appropriate one is already formed for its species.

I am now preparing for a lengthened absence from Bath at Exmouth; in the autumn I hope to have it in my power to convince either Mr. Alder or myself of some important malacological facts.

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

Bath, March 16, 1851.

POSTSCRIPT.—I have ascertained that the opercula of probably all the *Chemnitzia* are undoubtedly characterized by an apophysis or process, with slight specialty modifications of shape and position, which has been considered a unique incident of the so-called genus *Jeffreysia diaphana* of Mr. Alder,—my *Chemnitzia*,—which in many species has nearly similar furrows and markings, both on the under and upper surface, and inflexion on the upper range next the pillar; and it would be strange if it were not so, as I will prove that the *Jeffreysia diaphana* is a true *Chemnitzia*.

With respect to the variation of the shape of the striæ of the operculum in *Chem. diaphana*, I may observe, it is not uncommon in the same genus in other families, and may be seen even in the same species; I have *Trochi* with the apparently fine annular striæ, and others with radiating lines, and as grossly spiral as in the *Littorina littorea*. I have already stated that the operculum in *Chemnitzia* shows much variation; I adduce as an example, that in some specimens of the *C. rufa*, part of the area is coarsely sub-annular, with striæ on the other part, radiating from the elliptic curves. The fact of a process in the *Chemnitzia* is placed beyond doubt, as I have examined fourteen species, having with great trouble cleansed the opercula of my dried specimens from every particle of animal matter; a difficult task from their minuteness, but of the highest importance for correctly viewing the process and other characters. I have placed them all on tablets, and shall be glad to show them to any competent observer; they are interesting from the fact that *Chemnitzia* is the only marine gasteropodan genus which has these peculiar characters. The apophysis is nothing more than an extension, sometimes from the margin, but more usually from the under surface of the operculum, of one of the callosities with which it is generally studded, assuming the modifications of shape dependent on them; it is usually situate opposite the nucleus, and is often connected with it; the process in some species appears to be of a subtestaceous character.

We will now see what Mr. Alder says of this supposed peculiar process in his *Jeffreysia diaphana*; I quote his words: "The operculum is very peculiar; the projecting internal plate I do not recollect to have observed in any other genus, though the spine in *Nerita* approaches to it." (Alder in Brit. Mollusca, vol. iii. p. 152.) It is proper to observe, that no operculum of the *Littorinidæ* has the least similarity to the present one, consequently *Jeffreysia*, as Mr. Alder thinks, cannot belong to that family.

Mr. Alder's figures of the opercula are very incorrect, particularly that of the *C. rissoides*, in which the *process* and rough under sculpture are omitted. It is strange Mr. Alder has forgotten to mark the apophysis, which in *Chem. rissoides* is quite as apparent in proportion to its minor size as in *C. diaphana*—though not large, it is sufficiently visible: I have two dissected specimens.

The apophysis is strikingly conspicuous in *Chem. conoidea* and *Chem. plicata*, much more so than in *Chem. diaphana* or its congener *Chem. opalina*; in *Chem. acuta* it approaches nearly to the two latter species, but is not quite so marginal; in *C. spiralis*, *C. decussata* and *C. interstincta*, its position and the rib are all but identical with *C. diaphana* and *C. opalina*. This fact of the essential identity of the operculum of *Chemnitzia* and the *Jeffreysia*,

I may say, from its peculiarity, is decisive, independent of the host of facts above mentioned, that Mr. Alder's genus is untenable, one of its species being, as I stated in a late paper on the *Pyramidellida*, a decided *Chemnitzia*. As the discovery of the process in *Chemnitzia* has now irrevocably satisfied me that the genus *Jeffreysia* is superfluous, I will not, as I have proposed in the autumn, trouble you in reference to Mr. Alder's memoir. I will in a subsequent paper offer a curious statement relative to the *Chemnitzia*, resulting from the present investigation.

XXVIII.—*Notes on Crustacea.* By C. SPENCE BATE.

[Continued from vol. vi. p. 111.]

[With a Plate.]

On the Fifth pair of Legs in the Anomoura.

IV. THE fifth pair of legs, which both in the *Brachyura* and *Macroura* are attached to the last thoracic ring, in the *Anomoura* belong to the first abdominal ring. Like all the others they consist of not less than six joints, though sometimes the last is so short, that with a process of the penultimate it combines to form a didactyle claw having a prehensile power, similar to the more efficient forceps of the first pair.

Although they consist of a similar number of joints to the other pairs, and are in many instances nearly equal to them also in length, yet they are powerless and not at all adapted to assist in walking; in fact, their common position is to be folded up and at rest upon the back. But though inefficient for the ordinary purposes of legs, they yet fulfill a successful part in the economy of the creature, and are useful for many purposes.

In each of the other tribes of the decapod crustaceans, the branchiæ are supplied with organs especially adapted for the purpose of keeping them free from the lodgement of foreign particles, and also to excite currents over their surfaces. These offices, which in the *Brachyura* and *Macroura* are performed by the flabellæ, are in the *Anomoura* accomplished by the fifth pair of legs, which, when necessary, are inserted into the branchial chamber; to facilitate which, all this tribe have a peculiar articulation of the carapace which gives them the power of raising their shell. This power they avail themselves of in order to admit to the branchiæ as large a body of ærating fluid as possible, when circulation of the blood has become impeded, as for instance when they have been for any length of time confined in a small quantity of water: a membrane connecting the carapace with the inner walls of the

branchial chamber and extending along the anterior edge of the first abdominal ring, precludes the admission of water into the cavity occupied by the thoracic viscera.

But the above is not the only purpose for which this imperfectly developed pair of legs are made available. The extremities besides being prehensile are more or less ciliated, forming a small brush: with these I have seen *Pagurus Bernhardus*, while lying upon its back half in and half out of its abode, mop and cleanse every joint in succession, stopping now and then to wipe the brush in the pedipalps with the greatest care.

The absence of the flabellæ from the branchial chamber is a feature peculiar to the *Anomoura*, a fact valuable as assisting to establish the position of doubtful species, and which I would here draw attention to, together with the fifth pair of legs being attached to an annular segment distinct from the carapace, as strongly supporting the opinion of Prof. Bell, who, in his 'History of the British Crustacea,' places the *Galatheans* among the *Anomoura*, in which arrangement he differs from Prof. Milne-Edwards, who classes them among the *Macroura*.

On the Development of the Shell of Crabs.

V. From the period of leaving the ova to that of old age, crabs at certain periods throw off their skins: when in the larva state this is done every few days; as the animal grows older weeks intervene, and then months, until lastly the exuviae are cast but once a year, and probably when it is getting old they may not be shed so often.

But whether it be during the larva state or that of the adult crab, the process of development under which the shell is produced must be one and the same. Immediately above the heart, a pulp consisting of nucleated cells, areolar tissue (and blood-vessels?), is formed, extending to the internal surface of the shell, from which it is separated by a layer of pigment which gives colour to the new formation. Towards the base, that is, immediately above the heart, the cells are uniformly large and distinct, as represented in Pl. X. fig. 1, while an areolar tissue ramifies throughout the whole. As advance is made from the base, cells of less size mix with them, which increase in number as they diminish in diameter until they approach the layer of pigment, immediately beneath which they adapt themselves by mutual pressure into a polygonal form. The pulp extends over the whole periphery of the crab immediately beneath the shell, the thickness of the pulp decreases with the distance from the centre, and the larger cells become fewer in number, the mass being chiefly made up of the smaller cells which become the secreting organs

of the future shell, which process commences previously, and is completed after the removal of the exuvix.

Shedding the Exuvia.

VI. The manner in which the crab seems to free itself of its extraneous covering is by the internal growth of the animal: the increased bulk acting upon the principle of a lever, the transverse growth becomes compressed within the limits of the old carapace, which induces an increase of dimension in the contrary direction, and the first sign which I have noticed of the approaching change in the animal's œconomy is an increase in its thickness, whereby the sections of the abdomen become more conspicuous from above*; as this increases the crab wanders about in search of a retired spot, and often becomes very savage, darting at anything which approaches it, until at length the moment draws near, when it hitches the point of one of its claws in some crack or crevice, and withdraws itself from its old skin, escaping between the carapace and abdomen. The moment it becomes free, the full size to which it grows, until it again throws off the shell, is attained.

I cannot help here remarking, in reference to a case mentioned by Reaumur, who watched the crayfish (*Astacus fluviatilis*) throw off its shell—he says the process was one of great labour and difficulty as well as of long duration—in all the cases which I have watched, the process was easily and quietly done, in a short period of time and without any struggle. One only exception have I to make, and that was in a crab which I frequently took into my hands, and cut away the carapace with a pair of scissors as it was loosened; after the animal had freed itself from the exuvix it hung by the eye-stalks, nor could the animal be free of them without assistance, a circumstance which makes me imagine the anterior portion is removed by force applied to the carapace by the legs of the animal.

They seem to have the power of retaining their shell at will, until suitable circumstances both as to time and place occur for casting it with security, for in many instances I have seen them both before and even after the process has commenced, and patiently watched for hours at a time without success, yet upon returning after a few minutes' absence I have found the exuvix shed.

When they have thrown off the old skeleton they are very liable to become the prey of larger animals both of their own and other species, of which they themselves seem to be aware, and

* These observations were made upon the common littoral crab, *Carcinus Mænas*.

being excited by fear are much more active and less easily caught than at any other period.

On the Reproduction of Limbs.

VII. When a limb is injured, all Crustacea have the power of rejecting it, except the wound be below the last joint*; this is done by an apparently violent muscular contraction, finishing with a blow from another limb or against some foreign body: the amputation is the work of a few seconds, except when they have but recently cast the exuviae, when, during the first few days (before the new skeleton is hardened), they have not that easy capability, and the wounded limb will sometimes remain for perhaps half an hour or longer before it is rejected.

The new limb is formed within the old shell, and lies folded up until the exuviae are shed, when it appears as a part of the new skeleton, the sac-like membrane which protected it being cast with the annual moult, and is larger or smaller in accordance with the length of time which may exist between the period of the amputation of the limb and the shedding of the skin. The condition in which the limb is then, remains, as the rest of the animal, stationary in growth, until the next period of shedding the exuviae, when the whole creature again advances in size, but the new limb more rapidly than the remainder of the animal, until it equals it in relative proportion.

It is therefore dependent upon the length of time which occurs between the accident and the next succeeding moult, to allow the new limb to develop itself, that the variety of size depends, which has given rise to the prevailing idea of the limb itself continuing to enlarge constantly.

EXPLANATION OF PLATE X.

- Fig. 1.* Nucleated cells from pulp of the new shell of *Cancer Pagurus*.
Fig. 2. Areolar tissue from same.
Fig. 3. Layer of pigment interspersed with small calcareous secreting cells and a few larger.
Fig. 4. New shell, the exuviae being just shed.
Fig. 5. Section of the shell of *Cancer Pagurus*.
Fig. 6. Ditto of *Trilobite*.
Fig. 7. Diagram of the pulp as to structure.
Fig. 8. Ditto as to form: A, shell; B, pulp of new shell; C C, branchial chambers; D, stomach; F, heart.
Fig. 9. Leg from second pair of *Pagurus Bernhardus*, showing its folded position before the exuviae are shed.

* I once cut the hand of a crab through the joint so as to remove only the thumb and finger. The limb was not rejected, and when the shell was cast, the hand continued maimed, and never was reproduced.

XXIX.—On *Lastrea uliginosa*, Newm. By THOMAS MOORE, Esq., F.L.S., Chelsea Botanic Garden*.

SOME discussion has recently taken place respecting a fern belonging to the "spinulose" group of *Lastrea*, said to be new to England, which was found not long since by Mr. Lloyd, and which Mr. Newman has described under the name of *L. uliginosa* (Phytol. iii. 679). Having had ample opportunities of observing the plant both in a living and dried state, I venture to state to the Botanical Society the conclusions at which I have arrived respecting it.

It is curious enough that six botanists "who had paid attention to ferns," and who were consulted as to the name of this plant (which for the sake of distinction I will here call Lloyd's fern), should have recorded their opinions as follows: "1. a form of *Filix-mas*; 2. *L. rigida*; 3. *L. cristata*; 4. *L. spinosa*, strong var.; 5. *L. dilatata*, rigid var.; 6. no way different from *L. spinosa*." It does not at all closely resemble *Lastrea Filix-mas* and *L. rigida*; nor can it well be confounded with *L. dilatata*. The other opinions approach nearer the truth.

Those botanists whose organs of concentrativeness hardly allow them to suffer the plants known as *L. spinulosa*, *dilatata*, and *fæniseeii*, to take rank as varieties, will of course at once bury *L. uliginosa* in some part of this accumulation of vegetable matter; but I would submit that at least with cultivators and fern-fanciers, a form recognisably distinct possesses sufficient interest to claim and ensure attention; and Lloyd's fern is at least sufficiently distinct in the growing state to be selected by the eye without hesitation from among the allied species.

Two questions however suggest themselves with respect to it: (1.) Is it really new to England, and (2.) specifically distinct? My own observations lead me to answer both questions negatively. We have however in this plant an apparent justification of those older botanists (Linnæus and others) who are charged with having confounded *L. cristata* and *L. spinulosa*, and even of including both in their idea of one species. The existence of a fern exactly intermediate between them, as Lloyd's is, and differing from both in no character whatever, seems to explain all the doubts and difficulties, the "great confusion" as Newman has it, respecting the crested fern. There are evident traces of the record of such a fern—intermediate between *L. cristata* and *L. spinulosa*—having been found formerly in this country; and probably like other doubtful questions, the determination of the plant has been postponed, until turning up again in a more con-

* Read before the Botanical Society of Edinburgh, March 13, 1851.

venient season, it has been fortunate enough to obtain consideration. For these evidences I shall merely quote Newman, who writing some years since of *L. spinulosa*, remarks: "it occurs frequently in marshes, and there mingling with *cristata*, so closely approaches it in appearance, that I have found the greatest difficulty in separating them;" the puzzling form alluded to being now identified by him as Lloyd's fern (Phytol. iii. 679). As this intermediate form is found widely distributed in England, occurring in Cheshire, in Nottinghamshire and in Norfolk, I assume that it probably exists also in Sweden, and if so, may have formed the stumbling-block of Linnæus in his idea of the species "*cristata*," and in some measure justified him in uniting, or "confounding" as it is said, if he really did intend to unite, the ferns which we moderns call *Lastrea cristata* and *spinulosa*.

As to whether Lloyd's fern is specifically distinct, different opinions will be held, no doubt. From the first it has appeared to me as being intermediate between the two species just named; but before having seen the barren fronds, which the plant I believe constantly produces, I was led to think it more closely allied to *spinulosa* than to *cristata*. Mr. Lloyd himself thinks it intermediate between these two kinds; and Mr. Newman calls it "almost precisely intermediate," which, in fact, it is. Its relationship thus seems clear enough; but I do not agree in the conclusion which has been drawn, namely, that being thus intermediate, it cannot be referred to either species as a variety, and must either combine them into one, or itself be regarded as a species.

Lastrea uliginosa is correctly said to differ from each one of its allies, in certain points in which it resembles the other. Thus the "more acuminate, more divided, more serrated, more aristate pinnules," which separate it from *cristata*, unite it to *spinulosa*; and the "adnate decurrent pinnules," together with the outline of the barren fronds which separate it from *spinulosa*, unite it to *cristata*. The "erect rigid habit," the "obovate diaphanous concolorous scales," and the "entire eglandulous" indusium, are characters common to both; and it differs from both, as we are told, *only* in the "more equal distribution of the clusters of capsules over all parts of the frond." This latter is however an unsound character, for I have gathered specimens, undoubtedly *L. spinulosa*, in which every pinna is as thoroughly furnished with perfect sori, as is the case in Lloyd's fern.

It thus appears that no tangible specific character has been pointed out by which to distinguish *L. uliginosa* (Newm.) as a species. I do not however fall back upon the alternative already mentioned—that of uniting *cristata* and *spinulosa*—though it is

possible that this may after all be the true solution of the question ; but looking upon it as a variety of one of these species, there appear to be points in its structural details which connect it more closely to one than to the other.

The characters of venation and veneration may be considered as of higher value than the mere form or incision, or mode of connection of the pinnules. Now it is in their form and mode of incision that Lloyd's fern most closely approaches *spinulosa* and diverges from *cristata* ; whilst in their veneration it exactly coincides with *cristata*, and absolutely differs from *spinulosa*. In the venation, too, it very nearly coincides with *cristata*, certainly resembling that species much more than it does *spinulosa*. I therefore regard Lloyd's fern as more nearly related to *cristata* than to *spinulosa*—a conclusion different, it will be seen, from that drawn from the inspection of a single fertile frond, and arrived at by an examination of the entire growing plant, selecting those characters which appear of the highest structural importance. I propose to rank it as a variety of *L. cristata*, and to define it thus :—

Lastrea cristata. Fronds narrow linear-oblong sub-bipinnate : pinnæ elongate triangular, with oblong serrated decurrent pinnules, the lower crenately, often deeply lobed ; lateral veins of the pinnules with several branches.

β. *uliginosa* : (fertile fronds) pinnules oblong, pointed, deeply lobed, somewhat aristato-serrate, the lowest sometimes scarcely decurrent.—*L. uliginosa*, Newm. (Phytol. iii. 679).

It should be mentioned that the plant usually, if not constantly, produces dissimilar barren and fertile fronds. The former are not to be distinguished from barren fronds of true *cristata* ; and the latter alone are scarcely to be distinguished from specimens correspondent in size of the true *spinulosa* ; occasionally, the barren form of frond is more or less fertile.

These conclusions, which have been some time formed, are somewhat at variance with the views embodied in the most recent authoritative book on British botany, namely Hooker and Arnott's 'British Flora,' in which *Lastrea uliginosa* is not allowed to take rank even as a variety ; they are however the result of careful observation, influenced no doubt by an impression that plants which are permanently different from others are deserving of record. Having mentioned the new edition of the 'British Flora,' I may just take the opportunity to remark, that an unnecessary change has been made of the name of the large variety of *Lastrea Filix-mas*, from that of *incisa* proposed for it in 'Phytol.' (1848) iii. 137.

XXX.—*Zoological Notes and Observations made on board H.M.S. Rattlesnake during the years 1846–50.* By THOMAS H. HUXLEY, Assistant Surgeon R.N.

[With a Plate.]

I. *On the Auditory Organs in the Crustacea.*

GREAT discrepancy prevails among the various authorities as to the true nature and position of the auditory organs in the Crustacea.

The older authors, Fabricius, Scarpa, Brandt, Treviranus, unanimously confer the title of auditory organs upon certain sacs filled with fluid which are seated in the basal joint of the second or larger pair of antennæ.

M. Milne-Edwards, in his elaborate researches upon the Crustacea*, adheres to this determination, and describes a very elaborate tympanic apparatus in the Brachyurous genus *Maia*.

By the majority of the earlier writers no notice is taken of the sac existing in many genera in the bases of the first or smaller pair of antennæ. Rosenthal† however describes this structure very carefully in *Astacus fluviatilis* and *Astacus marinus*. He considers it to be an olfactory organ, while he agrees with previous writers in considering the sac in the outer antennæ as the auditory organ.

Dr. Farre, in his admirable paper in the ‘Philosophical Transactions’ for 1843, gives very good reasons for exactly reversing Rosenthal’s denominations, and considering the sac in the first pair of antennæ to be the auditory organ, while the sac in the second pair is the olfactory organ. Dr. Farre doubts the existence of true auditory organs in the *Brachyura*.

Siebold in his Report upon the progress of the Anatomy of the Invertebrata for 1843–44‡, mentions Dr. Farre’s views, but seems to doubt their correctness; and they have had no better reception from Prof. Van der Hoeven§ and Erichson||.

The matter stands thus at present then. It is universally acknowledged that in the *Macroura* there exists in the basal joint of both the first and second pair of antennæ a sac containing a liquid, and that in the *Brachyura* such a sac exists at least in the second pair. According to the majority of authors the sac in the second pair is the auditory organ; and according to Rosenthal the sac in the first pair is the olfactory organ.

On the other hand, if we take Dr. Farre’s interpretation, the

* Hist. Nat. des Crustacés. Suites à Buffon.

† Ueber die Geruchsorganen d. Insekten. Reil’s Archiv, B. x. 1811.

‡ Müller’s Archiv, 1845.

§ Handbuch d. Zoologie, p. 597.

|| Erichson’s Archiv, 1844.

sac in the first pair of antennæ is the auditory organ, in the second the olfactory organ.

Although the structure of the organ contained in the first pair of antennæ in the *Macroura* departs somewhat from the ordinary construction of an acoustic apparatus in the Invertebrata, yet the argument from structure to function, as enunciated in the paper referred to, seems almost irresistible. Still, as it has obviously not produced general conviction, I hope that the following evidence may be considered as finally conclusive.

In a small transparent Crustacean (taken in the South Pacific) of the genus *Palæmon* (fig. 2 *a*), the basal joint of the first pair of antennæ is thick, and provided with a partially detached ciliated spine at the outer part of its base (fig. 3 *a*). Between this and the body of the joint there is a narrow fissure. The fissure leads into a pyriform cavity (fig. 3 *b*), contained within a membranous sac, which lies within the substance of the joint. The anterior extremity of the sac is enveloped in a mass of pigment-granules (*c*): on that side of the sac which is opposite to the fissure, a series of hairs with bulbous bases are attached along a curved line (*d*); these are in contact with, and appear to support, a large ovoidal strongly refracting otolithe (*e*).

The antennal nerve (*f*) passes internal to, and below the sac, and gives off branches which terminate at the curved line of the bases of the hairs.

The sac is about $\frac{1}{100}$ th of an inch in length; the otolithe about $\frac{1}{200}$ th in diameter.

This structure is obviously very similar to the ordinary form of auditory apparatus in the Mollusca, &c. In *Lucifer typus* however we have an absolute identity.

In this singular crustacean (Pl. XIV. fig. 1) the basal joint of the first or internal pair of antennæ is much longer than the others, and is slightly enlarged at its base. The enlargement contains a clear vesicle (*e*), slightly enlarged anteriorly, but not communicating by any fissure with the exterior. It is about $\frac{1}{600}$ th of an inch in diameter. It contains a spherical strongly refracting otolithe about $\frac{1}{1250}$ th of an inch in diameter, which does not present any vibrating or rotating motion. We have here then *Lucifer* presenting an organ precisely similar to the auditory sacs of the Mollusca, while *Palæmon* offers a very interesting transition between this and the ordinary crustacean form of acoustic organ as described by Farre, and there can I think be very little doubt that the determination of the latter (as regards the *Macroura* at least) was perfectly correct.

Since writing the above I find that the auditory organ in *Lucifer* has been recognised by M. Souleyet. All that he says about
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it is contained in the following lines:—"Bei einigen See-krustenthieren namentlich bei der Gattung *Lucifer* (Thompson) habe ich ganz neuerdings an der Wurzel der innern Fühler einen kleinen runden glänzenden Körper entdeckt der mir dasselbe Organ (auditory organ) zu seyn scheint."—*Froriep's Notizen*, 1843, p. 83.

EXPLANATION OF PLATE XIV.

Fig. 1. The line indicates the natural size of the animal in this and the following figure: *a*, internal antennæ; *b*, external antennæ; *c*, basal lobe of external antennæ; *d*, eye; *e*, otolithic sac.

Fig. 2. Head of *Palæmon*. Letters as in fig. 1.

Fig. 3. Internal antennæ of *Palæmon* enlarged: *a*, spine; *b*, auditory sac; *c*, pigment-granules; *d*, curved line to which the hairs are attached; *e*, otolithe; *f*, antennal nerve.

XXXI.—*Contributions to the Palæontology of Gloucestershire:—*
On the Strombidæ of the Oolites. By THOMAS WRIGHT, M.D.
With the description of a new and remarkable Pteroceras. By
 JOHN LYCETT, Esq.*

[With a Plate.]

AMONG the remarkable new forms of extinct gasteropodous mollusca which have from time to time been brought under the notice of the Members of this Society, there are none more interesting or more valuable as contributions to the oolitic fauna, than the winged shells belonging to the genera *Pteroceras* and *Rostellaria*.

The *Strombidæ* were first recognised as a distinct group of gasteropods by Lamarek, in which this learned zoologist assembled several forms having affinities with each other in the singular development of the outer lip of the shell; with these he formed his family *des Ailées*, and which includes the genus *Strombus* of Linnæus, and corresponds with the *Strombidæ* of modern naturalists.

This family is well characterized by the form of the shell and that of the animal. The shell in the young state is conical or spindle-shaped; after having grown in a regular manner for a longer or shorter period of time, its farther development is arrested, the outer lip becomes dilated, thickened and enlarged in a very remarkable manner, and sends out often long digitations; the anterior part of the mouth terminates in a canal accompanied with a more or less distinct sinus. The animal has the foot divided into two parts, the one posterior cylindrical and obliquely truncated and supporting a horny operculum. The other part is flat, rounded before, and adapted for attaching the mollusk to solid bodies. The head is large and thick, and is prolonged into

* Read before the Cotswold Naturalists' Club.



Pteroceras Wrightii. (Lycett.)
Great Oolite of Minchinhampton
Natural Size.



a bifurcate extensible proboscis; the tentacula are large and divergent, and carry the eyes at their extremities. In this family are grouped the genera *Strombus*, *Pteroceras*, *Rostellaria*, *Aporrhais*, *Chenopus*, and *Pterodonta*.

The *Strombidae* are first recognised in a fossil state in the different stages of the oolitic rocks. They are more numerous in the cretaceous and tertiary strata, and have attained their greatest development in the present creation. They are nearly all natives of tropical seas, and are most abundant in the neighbourhood of coral islands.

Pteroceras, *Rostellaria* and *Chenopus* are the most ancient genera of this family; they are still represented by numerous species all different from those found in a fossil state. A few species of *Strombus* have been found in the chalk; more have been met with in the different stages of the tertiary period; but this genus has attained its full development in the seas of the warm regions of our time, where the species are remarkable for their gigantic size, singular forms, and rich and varied colouring. *Pterodonta* has been found only in the chalk. Soon after Lamarck had formed the new genera of his family *des Ailées*, De Montfort* proposed his genus *Hippocrena* for the species included by Lamarck in the genus *Rostellaria* which had the labrum simple and dilated, the columella callous and forming a channel conjointly with the labrum, which ascends close to the volutions of the spire almost to its apex, the external lip with a simple straight wing inflected towards the base, and with a short pointed canal. He cited *Rostellaria macroptera* from the Barton clay as the type of his new genus, which however has not been adopted.

Philippi† recognised anatomical differences between the animal of *Rostellaria curvirostris* and that known as *R. pes-pellicani*; the latter has the eyes situated sessile on the sides of the tentacula, while in the former they are terminal and retractile; these with other zootomical characters induced him to propose the genus *Chenopus* for *R. pes-pellicani* and other allied species: it is just to observe, however, that Aldrovandus in 1623 described this typical species under the generic name *Aporrhais*, which is now adopted by British naturalists.

The living forms of *Chenopus* have the respiratory canal depressed and slightly channelled, and the labrum strongly digitated, whilst in *Rostellaria* the respiratory canal is much grooved and arched backwards, and the digitations when present are for the most part long, slender and flexuous. Many fossil shells

* Conchyliologie Systématique, tome ii. p. 523.

† Enumer. Molluscarum Siciliae.

from the oolitic and cretaceous rocks appear to occupy a position intermediate between these genera, and ought probably to be separated into a distinct genus; this in fact was suggested, and the genus *Rostrotrema* proposed, by Mr. Lycett, in a paper which he read before our Society in August 1848, for the reasons that the winged shells of the Oolite called *Rostellaria* differ from that genus in "the absence of the upper or posterior siphon upon the spire, the outer lip not extending beyond the body-whorl, or but slightly upon the penultimate, and there being no corresponding thickening upon the inner lip to form a channel."

Our esteemed associate informs me that he has now cancelled his former name and substituted *Alaria* for the reception of many of the winged shells of the Great Oolite hitherto described as *Rostellaria*.

The winged shells discovered in the oolitic strata of Europe belong to the genera *Pteroceras*, *Rostellaria*, *Chenopus*, and it may not therefore be uninteresting to make a few remarks on the fossil species of these genera. Goldfuss † and Münster figured and described two species of *Pteroceras*, *P. oceani* and *P. conica*, from the Kimmeridge and Portland stages of Germany, and five species of *Rostellaria*, *R. gracilis*, *R. subpunctata*, *R. semicarinata*, *R. tenuistria*, and *R. nodosa*, from the lias, and two species, *R. bicarinata* and *R. spinosa*, from the inferior oolite near Pappenheim.

Roemer ‡ figured and described two species of *Rostellaria*, *R. costata* and *R. caudata*, from the coral rag of Hanover.

Koch and Dunker § described and figured one species of *Chenopus*, *C. Philippi*, from the inferior oolite, and two species, *C. cingulatus* and *C. strombiformis*, with *Rostellaria nodifera*, from the middle oolites of North Germany.

Prof. Deslongchamps || figured and described ten species from the oolitic rocks of Calvados in Normandy, five of which, *P. vespertilio*, *P. ponti*, *P. sexcostata*, *P. musca*, and *P. incerta*, are from the Kimmeridge clay of Honfleur, and five, *P. antractoides**, *P. vespa*, *P. balanus*, *P. retusa*, and *P. paradoxa**, were obtained from the great oolite of Ranville. This profound and accurate observer found five species of *Rostellaria* in the lias and oolites of the same region. *R. trifida** ranges from the upper lias to the Kimmeridge clay; *R. hamus** is common to the inferior and the great oolite; *R. myurus* is found in the inferior, and *R. hamulus** and *R. cirrus** in the great oolite of Ranville.

† Petrefact. Germaniæ, tab. 169 and 170.

‡ Versteinerungen des Oolithen-Gebirges.

§ Versteinerungen des Nord-deutschen Oolith-gebildes.

|| Mémoires de la Société Linnéenne de Normandie.

Prof. John Phillips † figured *Rostellaria composita*, *R. bispinosa* and *R. trifida** from the oolitic rocks of Yorkshire.

Mr. John Lycett described in a paper read before the Members of this Society and now published ‡, five species of *Rostellaria* from the inferior oolites of Gloucestershire, which he named *R. unicornis*, *R. simplex*, *R. spinigera*, *R. solida*, and *R. gracilis*, to which may be added three undescribed species from the shelly freestone and oolite marl of Leckhampton.

Messrs. Morris and Lycett will figure and describe twelve species of *Rostellaria* (*Alaria*), and two species of *Pteroceras*, from the great oolite of Minchinhampton, in their forthcoming monograph § on the fossil shells of that locality, some of which are identical with Deslongchamps' species from Normandy. Those species which have been identified in the oolitic fauna of Gloucestershire are marked with an asterisk.

The *Pteroceras* which I have now the pleasure of exhibiting was discovered in the Great Oolite of Minchinhampton; it is by far the largest and most remarkable form of that genus which has been obtained from the oolitic strata of any country; its finely preserved spider-like digitations give the shell a most singular appearance. I am indebted to my friend Mr. T. A. Young of Dublin for the accurate drawing of the shell which accompanies this paper.

The following description is by my friend Mr. Lycett, whose extensive knowledge of fossil conchology well enables him to point out the affinities of this new species.

PTEROCERAS.

Gen. Char. Shell oval-oblong, ventricose; aperture oval, terminating in a lengthened canal at both extremities, the anterior in general bent outwards, the posterior taking the course of the spire; right border in the adult thickened and developed into a wing-shaped expansion, producing long digitate processes; an anterior sinus with a toothed border distinct from the canal; spire short, with the first digitation attached to it.

Pteroceras Wrightii. Pl. XIII.

Shell fusiform, tumid; volutions (six) convex and smooth, the last volution inflated, having three obtuse gibbosities placed opposite to the aperture, of which the first is the largest; the outer lip is expanded and divided into four branches or digitations, which in the adult state are very long, flexuose, and nearly of equal size; the first digitation is attached to the spire; it ex.

† Geology of Yorkshire, Part 1.

‡ Annals of Natural History, Second Series, vol. vi. p. 401.

§ Palæontographical Society.

tends more than an inch beyond the apex, where it is broken off; the second curves outwards and slightly backwards; the third is broken off near to the wing, but a remaining fragment shows that it curved outwards and forwards; the fourth first proceeds forwards and then suddenly curves outwards; the canal is long and curved backwards.

This fine species of *Pteroceras* appears to be nearly alone; one specimen in the cabinet of the author, without any labial expansion and otherwise imperfect about the last volution, is the only other known example. *P. Wrightii* in its perfect state would seem to have had five encircling striæ; these are partially visible upon the inferior surface of our specimen, the coarseness of the oolitic deposit in which they occur being unfavourable to the preservation of any delicate sculpture. The surface of the body-whorl near to the labial expansion is much covered up by adherent oysters, but it appears to have been destitute of any encircling carinæ.

The general figure has some resemblance to the *Pteroceras ponti* of D'Orbigny, but that species has upwards of six digitations and as many costæ upon the body-whorl. The cast figured by Goldfuss under the name of *Buccinum antiquorum* from the dolomitic oolite of Bavaria, may possibly belong to our species, or otherwise to an allied form of the same genus. The remarkable specimen here described is in the collection of Dr. Wright of Cheltenham, to whom it is respectfully dedicated.

Locality. Minchinhampton: common to the varied fossil fauna, to which it is an important addition.

XXXII.—Notes on the *British species of Curculionidæ belonging to the genera Dorytomus and Elleschus.* By JOHN WALTON, F.L.S.

Genus DORYTOMUS, *Germ., Latr., Steph., Dej.*

A. *Femora dentate.*

1. *Dorytomus vorax*, Fab., Gyll., Steph., Schönh.
 — *ventralis* (var.), Steph. sec. ej. Man.
 — *longimanus*, ♂, Marsh. sec. Mus. Kirb.
 — *Tremulæ*, ♀, Marsh. sec. Mus. Kirb.
 — *curvirostris*, Kirb. MSS.

The male of this species may be distinguished from the female by its having the anterior legs, together with the first and second joints of the tarsi, considerably elongated.

Found rather plentifully on Lombardy poplars, near Edinburgh, by Mr. R. N. Greville, and in Cambridgeshire and Northumberland by Mr. S. Stevens.

2. *D. Tremulæ*, Payk., Gyll., Steph., Schönh.
 — *fumosus*, Rossi, sec. Gyll. et Schönh.
 — *vecors*, ♂, Schönh., Steph. Man.

Described by Gyllenhal in his 'Insecta Suecica,' and by Stephens in his 'Illustrations.' The male differs from the female in having the rostrum distinctly ridged and deeply striated, the antennæ inserted nearer the apex, and the anterior tibiæ dilated in the middle internally, the part dilated forming an obtuse tooth or tubercle. The female differs from that of *D. vorax* in having the rostrum shorter, smoothish, more shining, and in having the elytra very faintly punctate-striate; the thorax moreover is much broader than long, sometimes as broad or broader than the elytra, greatly dilated and rounded at the sides, and the legs are distinctly shorter and thicker. Readily distinguished from the large individuals of *D. costirostris* by the thorax being considerably broader—in other respects it resembles that insect. Length 3 lines.

I forwarded to Schönherr two specimens of the present insect, marked as *D. tremulæ*, with a note of doubt, and these were returned as "*Erirhinus tremulæ* verus." Subsequently two other specimens of the same insect being forwarded by myself to Dr. Germar, that entomologist informed me that they agreed with specimens which he had received from Schönherr bearing the name *E. vecors*. Dr. Germar, moreover, upon returning my insects, kindly provided me with a foreign typical example of the so-called *E. vecors*—the whole are undoubtedly males of one and the same species. I may further observe that I possess two specimens of this insect which were sent me by M. Chevrolat as the *Er. tremulæ* of Schönherr.

I believe this rare insect was unknown as British until I discovered it; the females of the preceding, and the large specimens of the following, having previously been mistaken for it.

Found on young aspens (*Populus tremula*) at Birch Wood, and likewise at Swanscomb Wood, near Gravesend, in the latter end of June. "On Lombardy poplars, Knaresborough, Yorkshire; near Carlisle," T. C. Heysham, Esq.

3. *D. costirostris*, Schönh.
 — *Tremulæ*, Steph. sec. ej. Mus.
 — *bituberculatus*, Zetterst., Schönh.

Elongate, black, variegated with ferruginous, and clothed with cinereous pubescence. Head small, subglobose, piceous, punctulated, and densely pubescent between the eyes; rostrum rather thick, curved, black, glossy, carinated, and profoundly sulcated from the base to the apex. Antennæ ferruginous. Thorax

broader than long, narrowed and impressed in front, greatly dilated and rounded at the sides, somewhat pulvinate above, thickly punctured towards the sides, and rather remotely punctured on the disk, entirely black or piceous, or with the base and apex ferruginous. Elytra oblong, the shoulders elevated, the sides straight, more than three times the length of the thorax, punctate-striate, more or less distinctly bituberculated posteriorly, either totally fuscous-black or variegated with ferruginous; unequally clothed with depressed cinereous hairs. Legs rather long, stout, ferruginous or obscure piceous; femora robust, clavate and armed with a strong tooth within; the joints fuscous-black, and the basal half of the tibiæ occasionally piceous-black. Length $2\frac{1}{2}$ –3 lines.

Extremely variable in size and colour; the major part of the specimens being much larger than any of the following species.

I possess seven foreign specimens of *D. costirostris* from Schönherr, Germar and Chevrolat, and two of *D. bituberculatus* from the first-named author, all of which are specifically identical with my series of this insect.

I have received many specimens of *D. costirostris* from the Rev. Wm. Little taken in Scotland, but not accompanied with any of *D. maculatus*; also from Mr. R. N. Greville, who found them rather abundantly on the Lombardy poplar near Edinburgh. On young aspens (*Populus tremula*), Swanscomb Wood near Gravesend, Windsor Forest, and other places in June, but not found on willows.

4. *D. maculatus*, Marsh. sec. Steph.

— *fumosus*, Steph. Ill.

— *Caprea*, Chev. in litt.

Described by Mr. Stephens in his 'Illustrations' under the name of *D. fumosus* of Rossi, which he refers to *maculatus* of Marsham; he has however sunk it in his 'Manual' as a variety of *Tremulæ*; it is however decidedly smaller than the two preceding insects, appears earlier in the spring, and is constantly found upon a different plant. Although small individuals of *D. costirostris* agree nearly in size with *D. maculatus*, yet the greater part of the former are much larger than the largest of the latter; but I must state it is exceedingly difficult, between specimens of equal magnitude, to find satisfactory distinguishing characters, consequently I have separated them with some hesitation. Length $1\frac{2}{3}$ – $2\frac{1}{2}$ lines.

M. Chevrolat sent me two insects under the name of *Caprea*, which he regards as a new species; they are however the *D. maculatus* of Marsham.

Common in the south of England on willows, appearing as

early as March. "On the gray sallow (*Salix cinerea*), Wimbledon Common," Mr. S. Stevens.

5. *D. affinis*, Pk., Gyll., Steph., Schönh.

This may be known from the large specimens of *D. costirostris* by the rostrum being shorter, thicker, less curved, and pubescent; the legs moreover are shorter and stouter, especially the tibiae. From *maculatus* the *D. affinis* is distinguished by its larger size and much broader form. Length $2\frac{1}{2}$ lines.

There are two foreign specimens of *Curc. affinis* in the collection of Mr. Kirby from Gyllenhal, and five Swedish examples in my possession from Schönherr and Chevrolat.

The only British specimen that I have seen of this insect was found by the Rev. H. Clark in the latter end of May, in an excursion to Gamlingay, Cambridgeshire; it occurs in Sweden on the trunks and leaves of *Populus tremula*.

6. *D. teniatus*, Fab., Gyll., Steph., Schönh.

Very much like the small varieties of *D. maculatus*, but distinct; its form is altogether more slender, and it is subject to very little variation in size. It may be distinguished at once from its congeners by having the rostrum faintly carinated, and finely rugose-striate; the elytra with scattered, short, suberect, black hairs towards the apex; the legs comparatively short and slender, and the femora armed with a smaller tooth. Length $1\frac{2}{3}$ -2 lines.

The late M. Schönherr supplied me with a foreign specimen of *D. teniatus*, which agrees with my British specimens.

First discovered as a British insect I believe by Mr. R. N. Greville, who found a number of specimens in winter, under the loose bark of a willow-tree near Northampton, and subsequently many others, under firmer bark of the same tree, in the beginning of August; he searched carefully for it on the leaves of that and other willow-trees in the neighbourhood, but without success; since taken sparingly in the crevices of the sound bark by the Rev. H. Clark.

7. *D. Salicis*, Walt.

Oblong-ovate, rufo-ferruginous, with the head, rostrum, and breast black; sparingly clothed with cinereous pubescence, and maculated on the elytra. Head small, subglobose, thickly punctulated, the frons channeled; eyes oval, moderately prominent, black; rostrum rather thick, as long as the head and thorax, rugulose-striate, pubescent, black, with the apex testaceous. Antennæ rufo-ferruginous, the clava black. Thorax short, as broad as long, dilated and equally rounded at the sides, a little convex

above, closely punctulated on the disk, rugulose-punctate towards the sides, and with a distinct, smooth, dorsal carina. Elytra long-ovate, the shoulders a little elevated, the sides dilated and rounded, punctate-striate, the punctures close and rather large. Legs shortish, entirely testaceous or rufous; femora armed with a small tooth. Length $1\frac{1}{2}$ line.

Very similar and closely allied to *D. maculatus* and *D. taniatus*, principally differing in having the elytra shorter in proportion to the length, with the sides dilated and rounded, and in being a much smaller insect.

Some years ago I took a single specimen off willows in Yorkshire; since which several specimens have been taken from the gray sallow (*Salix cinerea*) on Wimbledon Common, in June, by Mr. S. Stevens.

8. *D. Salicinus*, Gyll., Schönh.

Elongate, narrow, piceous-black, variegated, and sparingly clothed with white pubescence. Head small, rounded, black, closely punctulated; eyes rotundate, black; rostrum longer than the head and thorax, rugose-striate, black, with the apex rufous. Antennæ ferruginous, the clava black. Thorax long, subdepressed on the disk, slightly dilated and equally rounded at the sides, black, with the anterior and posterior margins rufous, thickly punctulated and sparingly pubescent. Elytra long, narrow, not much broader than the thorax, the shoulders somewhat elevated, the sides straight, punctate-striate, nigro-piceous or fusco-ferruginous; maculated with white pubescence; the breast black, densely pubescent. Legs entirely testaceous or obscure ferruginous. Length $1\frac{1}{2}$ – $1\frac{2}{3}$ line.

Extremely variable in colour; the rostrum, thorax and elytra vary from piceous to testaceous, are either entirely of one colour or indefinitely variegated with different shades of both; it may however be distinguished by its narrow elongate form, its oblong thorax, and its small size.

I possess six Swedish specimens from Schönherr.

Found on willows in Scotland by the Rev. Wm. Little. "On willows, Horning Marshes, Norfolk, in July or the beginning of August," Mr. Curtis.

9. *D. majalis*, Payk., Gyll., Steph., Schönh.

There are two foreign specimens of this insect in Mr. Kirby's collection from Gyllenhal, and one in mine from Schönherr: in Sweden it inhabits the flowers of *Salix cinerea*, in May and June.

The smallest species of the genus (length $1\frac{1}{3}$ – $1\frac{1}{2}$ line), and has not hitherto to my knowledge been found in the South of England; I have received many specimens from the Rev. Wm. Little, taken by him in Scotland. "Near Carlisle," T. C. Heysham, Esq.

10. *D. pectoralis*, Panz., Gyll., Steph., Schönh.
 — *melanophthalmus* (var.), Pk., Steph. Man.
 — *fructuum*, Marsh., Kirb. MSS.
 — *rubellus* (var.), Marsh.

One foreign specimen in Mr. Kirby's collection, and two in mine, the latter from Schönherr, identify, and confirm the name of this insect.

Generally distributed. Common on willows (*Salix Capreae*) from June to October.

11. *D. agnathus*, Dahl., Schönh.
 — *majalis*, Steph. sec. ej. Mus.

Oblong, rufo-testaceous, nigro-piceous beneath; clothed with pale cinereous pubescence. Head rotundate, convex, thickly punctulated, rufo-piceous, densely pilose; eyes moderately prominent and black; rostrum longer than the head and thorax, stout, curved, cylindrical, striated and punctulated, rufo-testaceous or piceous, and pubescent. Antennæ slender, rufo-testaceous. Thorax rather broader than long, narrowed anteriorly, depressed within the apex, much dilated and rounded at the sides, a little convex above, thickly punctulated, rufo-ferruginous. Elytra oblong, scarcely twice as broad as the base of the thorax, the shoulders rounded, slightly elevated, the sides inflexed, not dilated, three times the length of the thorax, moderately convex above, finely punctate-striate, the interstices rather convex, very finely coriaceous, rufo-ferruginous; each elytron with a broad piceous stripe down the middle, abbreviated posteriorly; densely clothed with short pale pubescence. Legs moderate, rufo-testaceous, pubescent; femora clavate, each armed with a large tooth. The male. Length 2-2½ lines.

The female has the rostrum longer, shining, obsoletely striated; the elytra concolorous; the femora acutely denticulated.

Closely allied to *D. pectoralis*, from which it differs in being longer, proportionably narrower and less convex; the rostrum longer and more curved.

I possess a foreign male specimen from Schönherr.

I first received specimens of this very distinct new British insect from the Rev. Wm. Little, who found them in Scotland; and subsequently from Mr. S. Stevens, taken by him off willows near Weybridge, in company with *D. pectoralis*. From the paucity of specimens in cabinets it appears to be local and rare.

12. *D. tortrix*, (Mus.) Linn., Gyll., Steph., Schönh.
 — *arcuatus* (var.), Steph. sec. ej. Man.

On willows, Swanscomb Wood near Gravesend, June and July. On Lombardy poplars near Edinburgh, Mr. R. N. Greville.

13. *D. validirostris*, Schönh.— *Waltoni*, Schönh. Supp. vii. p. 171.

Oblong-ovate, black, variegated with pale cinereous hairs. Head subglobose, black, minutely punctured, the frons densely pubescent; eyes rather large, round, and moderately prominent; rostrum very short, thick, nearly straight, closely and finely punctured, black, sparingly pubescent. Antennæ ferruginous, the clava black. Thorax transverse, abruptly narrowed in front, dilated and rounded at the sides, closely punctulated, black, densely clothed towards the sides with pale cinereous hairs. Elytra with the shoulders elevated, the sides straight, a little convex above, finely striated, the striæ closely punctulated, piceous-black, the suture, and a vitta towards each side of each elytron, pallid rufous; thickly pubescent, variegated on the back with unequal fuscous blotches, interspersed with whitish spots; the outer margins, from the shoulders towards the apex, broadly edged with white. Legs short, robust, ferruginous, sometimes pallid rufous; femora clavate, armed with a strong tooth. Length 2-2½ lines.

The form and sculpture of the rostrum, with the beautiful variation in the colour of the pubescence, distinguish this insect.

I have six foreign specimens from Schönherr and Chevrolat.

First discovered as a British insect by Mr. S. Stevens on the south side of the Thames near Hammersmith Bridge, and subsequently under the bark of *Populus nigra*, in winter. I once found it in profusion, after a high wind, on the lower branches of the same kind of trees, and on the grass and shrubs beneath, in the same locality.

B. *Femora simple*.14. *D. pillumus* (Sturm.), Schönh.*Bagoüs pillumus*, Sturm. Ins. Cat. 1826, p. 99.*Rhynch. Chamomillæ*, Kock. in litt.*Bagoüs Beckwithii*, Kirb. MSS.

Oblong-ovate, piceous or rufous-brown, densely clothed with agglutinated cinereous scales, and sparingly with setiform, erect, white scales. Head short, depressed, the vertex convex, abruptly narrowed in front, punctulated, piceous-black; eyes inferior, rather prominent, black; rostrum as long as the head and thorax, subdepressed, curved, stout, constricted at the base, rugulose and setose above, testaceous or sometimes rufous. Antennæ rufous, pubescent. Thorax nearly as broad as long, constricted in front, the anterior margin elevated, lobed behind the eyes, moderately dilated at the sides, bisinuated at the base, a little convex above, piceous, closely and deeply punctured. Elytra

rounded at the base, the shoulders elevated and obtusely narrowed, the sides straight, convex above, rufous-brown, punctate-striate, the interstices alternately elevated; clothed with agglutinated cinereous scales, and with scattered, erect, white setæ. Legs shortish, stout, pale ferruginous and pubescent. Length $1\frac{1}{3}$ –2 lines.

Dr. Germar, to whom I sent a British specimen of this insect under the name of *Bagois tibialis*, first informed me that it was unknown to him, and that it appeared to belong to another genus, '*Styphlus*?'; subsequently however he referred it to *Erirhinus pillumus*, of which he sent me foreign specimens: it is placed by Schönherr in the first section (*Notaris*) of his genus *Erirhinus*; it is here located in his second section (*Dorytomus* of authors) of that genus.

Extremely local: I once found many specimens in the month of June on the wild chamomile (*Matricaria Chamomillæ*) on dry hedge-banks, on the road-sides leading to Low Layton, from Stratford in Essex.

Genus ELLESCHUS, Megerle, Schönh., Steph.—*Hypera*, Germ.

1. *Elleschus Scanicus*, Pk., Gyll., Schönh. Supp. vii. p. 187.

Erirhinus pallidesignatus, Schönh. olim.

Oblong, testaceous, unequally clothed with pale cinereous hairs. Head rotundate, nigro-piceous, thickly punctulated; eyes black, depressed; rostrum as long as the thorax, cylindrical, as thick as the same part in *E. bipunctatus*; testaceous, shining, rather smooth, sometimes piceous at the base. Antennæ entirely pale testaceous. Thorax narrowed anteriorly, a little dilated and rounded at the sides, subdepressed above, testaceous, thickly and minutely punctured. Elytra scarcely twice as broad as the base of the thorax, the shoulders nearly rectangular, the sides straight, four times the length of the thorax, convex above, deeply punctate-striate, the interstices plane, rather smooth; rufo-testaceous with a large pitchy black patch at the base, sometimes however extending beyond the middle of the elytra, and sometimes partially broken up by the rufous ground colour, the outer margins piceous; the suture densely, the base and disk sparingly, clothed with pale cinereous hairs; the breast black, densely covered with white hairs. Legs rather short, stout, totally rufous, pubescent; femora robust, very obsoletely denticulated within. Length 2 lines.

One insect with the name '*Scanicus*' in the collection of Kirby from Gyllenhal, and three others in my possession from Germar, specifically agree with an immature specimen found by Mr. Wollaston in Lincolnshire; in Sweden it is found on the aspen.

2. *E. bipunctatus*, Linn., Gyll., Steph., Schönh.

There are two foreign specimens in the collection of Kirby sent by Gyllenhal.

Plentiful on the gray sallow (*Salix cinerea*), Bishop's Wood, Hampstead, in June.

XXXIII.—On a new genus and several new species of British Crustacea. By C. SPENCE BATE.

[With a Plate.]

Bellia arenaria.

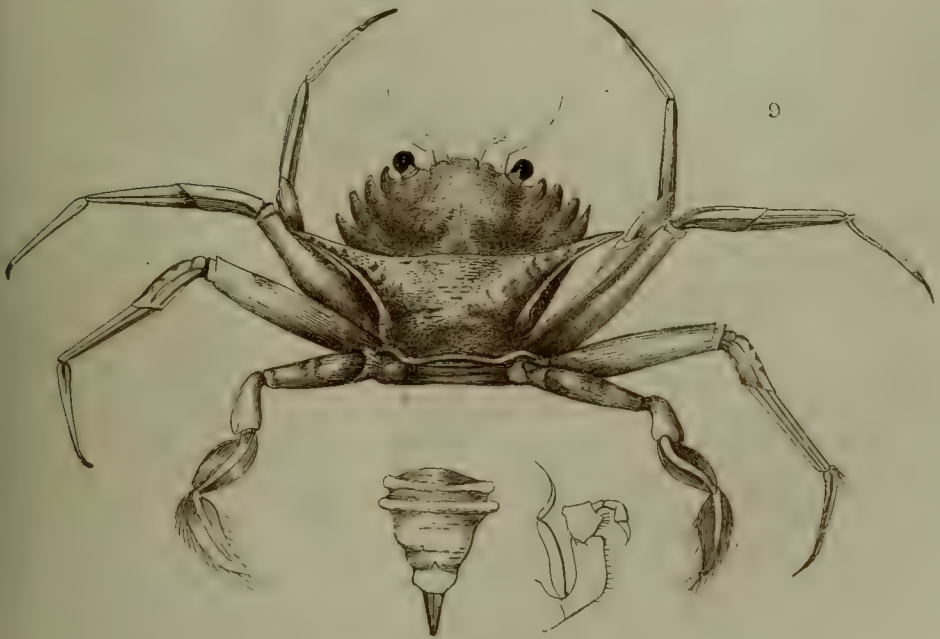
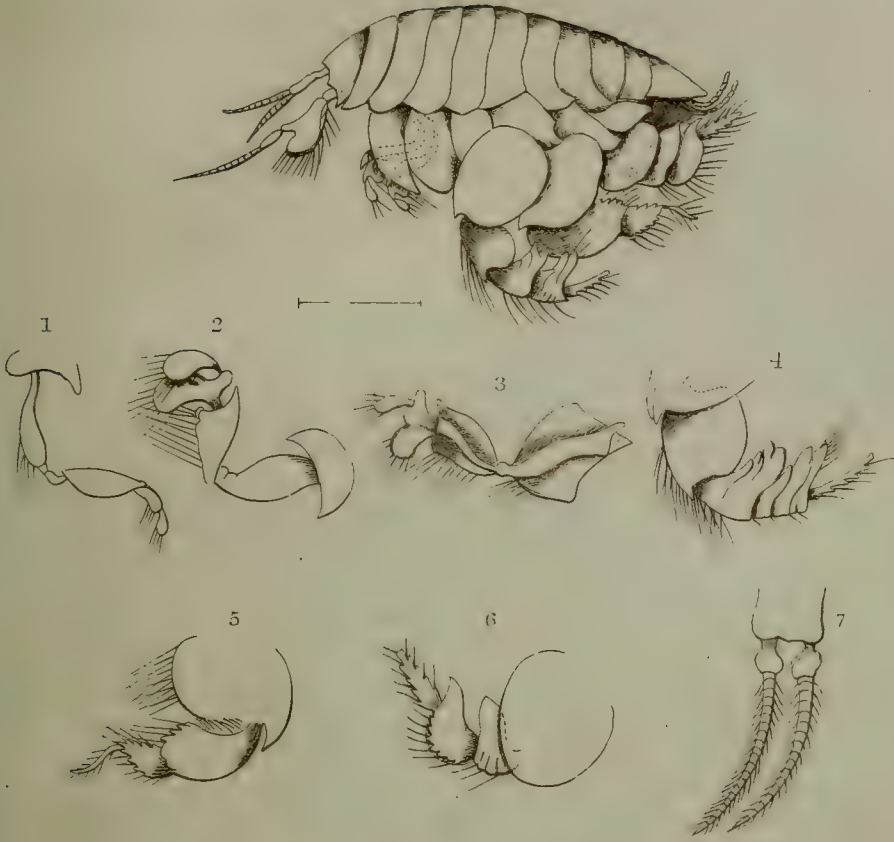
Gen. Char. Back broad, round and smooth. Upper antenna forked. Lower antenna ciliated, having the second joint flattened. First pair of feet simple: second and third pairs didactyle, remainder simple. The three anterior pairs of feet much smaller than the rest; the lateral appendage to each annular segment, together with the joints of the three last pairs of feet, largely developed, so as to appear like scales. Natatory feet arranged in double parallel pairs.

This animal bears a nearer resemblance to the genus *Talitra*, of which it probably may be a subgenus, than to any other among the order of the Amphipoda, although I think it offers too many very distinctive characters to admit of its being considered as a species of that genus. It is stouter in body and shorter in length than *Talitra*. The upper antenna is shorter than the lower and has two filaments; the second joint of the lower antenna is large, flat and thin, a peculiarity which is extended to the first joint of the fourth and fifth pairs of legs, as well as the first, second and third joints of the sixth pair, whilst the third, fourth and fifth joints increase in diameter at their lower extremity. The first pair is small and folded in as if attendant on the mouth; the second and third pairs are shorter and more slight than those posterior to them, and terminate in a didactyle claw of peculiar form; its shape carrying out a character peculiar to this genus, and differing from that most general, wherein the finger of the forceps is sharp and pointed. We find that in this animal the joint from a narrow point increases in diameter towards the terminal extremity, upon being reflected back against the penultimate, where instead of impinging against a sharp process, as is usually the case, even where most rudimentary, it is here met by an obtuse but thin, flattened and ciliated edge.

The peculiar habits of this genus exhibit the modification of its several parts to be adapted to required conditions.

Bellia arenaria.

8

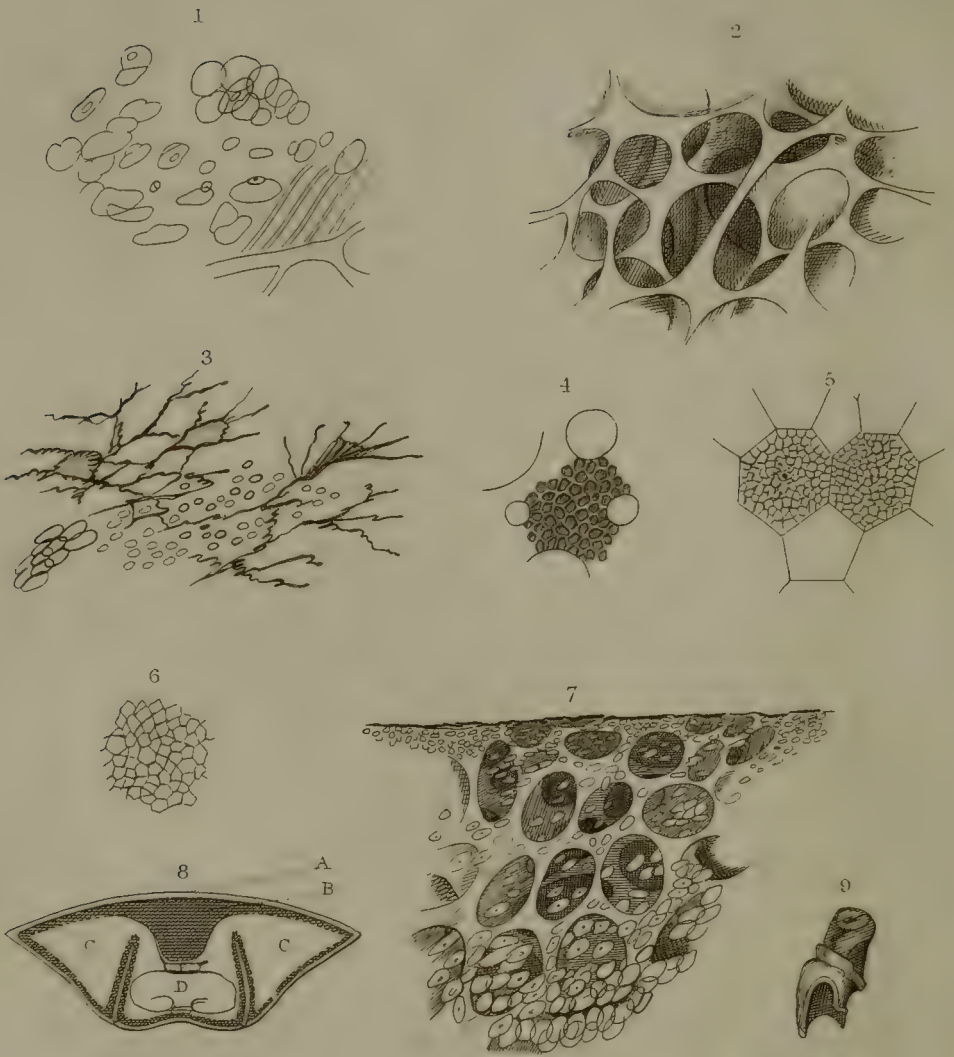


Portunus Dalvellii.

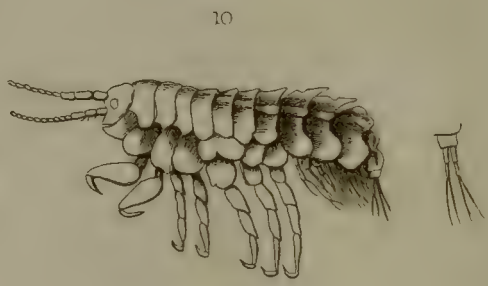
1851







Pagurus Dillwynii



Amphitoe Moggridgii

This crustacean, unlike the *Talitra*, *Gammarus*, and other allied genera, is remarkably sluggish in its habits, and lives almost wholly beneath the sand, into which it burrows, and from which it appears only to come out just after the receding of the tide, when it gropes to a distance of about a foot, and again burrows beneath its surface. The legs, which by their formation are all lessened in their capability as members of perambulation, obtain, through the great expanse of surface which each joint displays, a paddle-like power, by which they are enabled to progress through the sand without resorting to leaps and bounds, the usual mode of passage among the *Talitra*, or by crawling whilst lying upon the side after the manner of *Gammarus* and other Amphipoda.

I believe the manner in which the respiratory process is carried on in this order of Crustacea is supposed to be by a current excited through the agency of the natatory feet, passing continually over the branchiæ situated beneath the thorax; but the peculiar habits of this animal, living as it does chiefly beneath the sand, must materially interfere with the passage of such a current. Then may we not presume, that the great extent of dermal surface, which is prolonged by large hair-like processes, may offer a medium through which the blood may be aerated, and so lessen the dependence of vital action upon the waters circulating freely over the branchial organ? This seems to be supported by the fact, that blood-discs pass into the hair-like processes on the surface of the flabellæ in the *Brachyura*.

The eye is covered by the first ring, and is not distinguishable above except by the assistance of transmitted light.

The colour of the animal is of a pale muddy gray.

It lives in sandy bays between the tides. I have taken them in company with Messrs. Jeffreys and Moggridge, both in Oxwich and Rhosilly bays near Swansea.

I have named the genus *Bellia*, in order as much as possible to identify Prof. Bell with the Crustacea, a class of animals to which he has given particular attention.

EXPLANATION OF PLATE XI.

- Fig. 1. First pair of legs.
— 2. Second ditto.
— 3. Third ditto.
— 4. Fourth ditto.

- Fig. 5. Fifth pair of legs.
— 6. Sixth ditto.
— 7. Natatory feet.
— 8. *Bellia arenaria*.

Amphitoë Moggridgei. Pl. X: fig. 10.

Back carinated, the three last rings of the thorax gradually increasing in length at the centre of the posterior margin into the form of a sharp tooth, which arrives at the greatest development in the two first rings of the abdomen, upon the centre of

each of which exists a notch or depression which is increased in the fourth and fifth abdominal rings, which do not terminate in a tooth-like projection.

There also exists a lateral ridge on both sides, which, commencing at the fifth thoracic ring, terminates with the fourth abdominal ring where it becomes confluent with the carinated edge.

Lower and upper antennæ short, equal in length, the peduncle of each consisting of three articulations.

Taken in Langland Bay, Swansea, at low water mark.

To designate this species, I have adopted the name of M. Moggridge, Esq., of Swansea, whose industry as an observer of nature is indefatigable.

Pagurus Dillwynii. Pl. X. fig. 11.

Carapace smooth and polished. Colour bluish, marked with brown.

First pair of feet unequal, *the left* being much longer than the right; smooth to the naked eye, but under a lens perceived to be minutely granulated. The second and third joints are armed with teeth, which give to the limb an angular character. The *right* is very short and covered with hairs.

The external antenna is about two-thirds the length of the longest of the first pair of feet, and hairy; its base as long as the eye-stalks, which are slender and long. The basal tooth with which the antenna of this species is generally armed, is wanting.

The false feet in the female are *long* and feathery, and divide at the *base*.

The most striking difference between this and other British species of the *Paguridæ* is exhibited in the form of the first pair of feet and the length of the external antennæ.

Having met with only this solitary specimen, it is impossible to say but that the right foot of the first pair, which is usually the longer, may be in the process of being reproduced from loss; although I am inclined, from its well-developed character, to believe that the left is in this species the more important of the two. The false feet, which in the female are generally forked, are so in this specimen, but very much nearer to the base than in the common species.

It burrows very rapidly in the sand. Taken near the Worms Head, Swansea.

Mr. Couch has informed me, since this has been in the hands of the printer, that he has also found the species in Cornwall.

The name applied to this species is one long known to science, and honoured as the stimulator of natural history in this locality in the person of L. W. Dillwyn, Esq., Sketty Hall.

Portunus Dalyellii. Pl. XI. fig. 9.

The most remarkable points which distinguish this crab from any other species of the genus to which it belongs, are to be found in the large development of the posterior marginal teeth of the carapace, the base of each of which continues prominent, so that a line or ridge extends quite across the centre of the back of the crab, which gives to the anterior half the appearance of being depressed forwards. It is this ridge, together with the two prominent teeth, by which the species may be most quickly recognized.

The front of the carapace between the eyes is divided into three scarcely appreciable lobes, of which the centre one is depressed in the middle.

The terminal joints of the fifth pair or swimming feet are scarcely so flat and oar-shaped as in most of the *Portunidae*, therefore this species approaches nearer the transition-type of the genus *Carcinus*, and its long and active-looking legs seem to corroborate the idea of its habits being mostly perambulatory.

The first pair of feet unfortunately are missing from this the only specimen which I possess; it was brought me a few days since by Mr. Matthew Moggridge, who took it in Oxwich Bay near Swansea.

The colour is a brilliant reddish brown with darker blotches of the same. I have taken upon myself to identify the species by the name of Sir James Dalyell, which has become distinguished in natural history by his valuable researches.

Upon forwarding a sketch of the species to Mr. Couch of Penzance, so well known as an observer in this department of science, he in reply informed me, that three years since he had mentioned to Prof. Bell that we had in Mount's Bay a species of *Portunus* not described by authorities, and that in the year following he had sent him an injured specimen taken there, but had not as yet received his opinion on the subject. Mr. Couch adds, "I recollect being convinced it was quite new; and it is the species figured by you. Dalyell's name is worthy of all honour."

Mount's Bay, like the coast upon which the specimen figured was taken, has a sandy bottom and beach.

BIBLIOGRAPHICAL NOTICES.

Observations in Natural History. By the Rev. LEONARD JENYNS, M.A., F.L.S. &c. London, John Van Voorst.

THE cultivators of a science have some points of analogy with the settlers in a new country; of the latter some wander into the interior.
Ann. & Mag. N. Hist. Ser. 2. Vol. vii. 21

rior, and each, isolated, and careless of the rest, clears his little spot in the wilderness; others remain at the port, gather from all sides the produce of their wandering brethren, and return to them the wares of other countries, or the value, in the current coin, of their own crude materials, which, isolated, had become but so much useless lumber. So it is in natural science: there are backwoodsmen in natural history,—men who furnish the raw material of science, as well as merchants, who convert that raw material into handy, available knowledge. And in the case of science as in that of ordinary life, it is of importance that the capitalists and the productive classes should understand that their interests are common, and that each derives his importance from the other.

We must have out-of-door naturalists before we have in-door naturalists, and any supercilious depreciation of one another cannot but remind a dispassionate observer of the old story of the belly and the members.

The author of the present work has furnished us with a book of the backwoodsman class. Some books are said to “smell of the lamp,”—this “babbles o’ green fields.” It is redolent of new hay and the hedge violet. Far away from the study of the anatomist, from the museum of the zoologist, it calls to mind nature in the concrete. We study analogies and affinities, beauties of adaptation and marvellous homologies, until we forget that after all, these creatures we dissect are not mere pieces of mechanism, but live and breathe, and have affections, and impulses, not absolutely dissimilar to our own. Such a book as this carries us from our skeletons and preparations, back to the recollection of the overflowing life of nature, to the trill of the skylark, and the caw of the rook busy overhead, what time we wandered not too scientifically thoughtful, nor yet without observation, along some green lane, while the hare now and then crossed the path, and the partridge rose whirring from the cornfield.

To those who take a scientific interest in nature without caring to penetrate into the hidden mysteries of organization, the Rev. Mr. Jenyns’s work will be most acceptable. It will find a place on their shelves beside ‘The Natural History of Selbourne.’ It is full of curious information upon the habits of the denizens of our fields and woods, and some excellent remarks upon “Habits of observing” are prefixed.

We cannot too heartily applaud the observations upon the importance and dignity of *facts* as such, and apart from any obvious immediate bearing (p. 13). Let those who would take the high *à-priori* road in science bethink them whether it may not be of more importance to establish even such a simple fact as that the field cricket “drops its dung on a little platform at the mouth of its hole,” than to prop up with quite remarkable ingenuity the hypothesis that the said field cricket is a “mucus animal of the third power—ovum³!”

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

April 16, 1850.—Robert Brown, Esq., President, in the Chair.

Read the conclusion of Mr. Miers's memoir "On the family of *Triuriaceæ*."

Mr. Miers commences his paper by a reference to his establishment of the genus *Triuris* in the 19th volume of the Society's 'Transactions,' and to the subsequent publication in the same volume by the late Dr. Gardner of another nearly related genus under the name of *Peltophyllum*; but the name of the latter having been derived from a leaf accompanying the specimen which Mr. Miers shows not to have belonged to it, but to be in all probability that of a seedling *Cissampelos*, he has found it necessary to substitute another generic name, and has redescribed it in the following terms:—

HEXURIS, Miers.—*Peltophyllum*, Gardn.

CHAR. GEN. *Flores* dioici. *Masc.* ignoti. *Fem.* *Perianthium* profundè 6-partitum, hyalinum, persistens; laciniis obovatis, præfloratione valvatis, singulâ infra apicem cornu subulato duplò longiore gyrato incluso, demùm patentibus, marginibus reflexis. *Ovaria* indefinitè numerosa, minima, densissimè in gynæcium aggregata, sessilia, gibboso-ovata, 1-ocularia, 1-ovulata. *Stylus* subulatus, ad faciem internam sublateralis, apice paulùm incrassatus, obliquè truncatus et stigmatosus. *Fructus* ignotus.—*Planta pusilla, Brasiliensis, diaphana, albida*; rhizomate fibroso; caule recto, simplici, v. subramoso; foliis bracteiformibus, paucis, basilaribus, ovatis, acutis, adpressis, hyalinis; floribus solitariis v. subracemosis; pedunculis unifloris, basi bracteatis.

Hexuris Gardneri, Miers.

Peltophyllum luteum, Gardn. in Linn. Trans. xix. p. 157. t. 15.

Hab. in arenosis humidis Prov. Goyaz Brasiliæ, Gardner, no. 3570.

The author next refers to two Ceylonese plants described by Capt. Champion in the Calcutta Journal of Natural History for April 1846, with a note by Dr. Gardner, who was at the time much struck by their resemblance to *Triuris* and his own *Peltophyllum*; but both gentlemen recognizing the manifest affinity of the Ceylonese plant to *Sciaphila* of Blume, and misled by the position in *Urticeæ* assigned to that genus by Dr. Blume, concurred in placing them in one or other of the divisions of that great natural group. Of these two genera Mr. Miers adopts the one, *Hyalisma*, as sufficiently distinct; but the second, *Aphylleia*, he refers without hesitation to *Sciaphila*, together with two undescribed plants from Sir W. J. Hooker's herbarium, found respectively by Cuming in the Philippine Islands, and by Purdie in Venezuela. He also corrects with much detail the descriptions of the embryo of the latter given by Mr. Champion and by Dr. Gardner. The following are his characters of *Sciaphila* and of *Hyalisma*, together with those of the known species:—

SCIAPHILA, Blume.—*Aphylleia*, Champ.

CHAR. GEN. *Flores* monoici, v. polygami. *Perianthium* in utroque sexu 6-partitum; laciniis oblongis, acutis, reflexis, æstivatione valvatis,

persistentibus. *Masc. Stamina* 6, in hermaphroditis abortu 3-1, in androphorum carnosum ferè sessilia; *filamenta* brevissima; *antheræ* transversim oblongæ, 4-loculares, apice rimâ transversali 2-valvatum hiantes. *Fem. Ovaria* plurima, in gynæcium carnosum subglobosum densè aggregata, obovata, sessilia, 1-locularia; ovulo solitario erecto. *Stylus* lateralis ferè basalis, plus minusve papilloso-subciliatus. *Stigma* truncatum, papilloso-plumosum, rarò simplex obtusum. *Carpidia* plurima, densissimè aggregata, obovata, styli basi persistente notata, monosperma. *Pericarpium* utriculare, subtenuè, papilloso-rugosum, suturâ dorsali hians. *Caryopsis* obovata, brevistipitata: *endocarpium* arilliforme, 8-10-costatum, costis basi apiceque confluentibus, transversim cancellatis, interstitiis membranaceis. *Semen* ovatum, basi apiceque endocarpio adhærens: *testa* testacea, striis paucis longitudinalibus aliisque creberrimis transversis signata, apice saturatiùs colorata: *integumentum externum* pelliculare, reticulatum, testæ adnatum; *integumentum internum* tenuissimum, areolis hexagonoideis magnis oblongis reticulatum, nucleum arcè cingens. *Nucleus* (Embryo protoblastus) indivisus, homogèneus, carnosus-cereus, opalinus, cellulosus; cellulis parvis, subglobosis, materie grumosâ succoque oleoso farctis.—*Herbæ pusillæ, utriusque hemisphæræ indigenæ, hyalinæ*; rhizomate fibroso; caule simplici, erecto vel subramoso; foliis paucis, bracteisformibus, alternis, ovatis, acutis, adpressis, venis destitutis, celluloso-rugosis; floribus spicatis, monoicis, superioribus ♂, inferioribus ♀; pedunculis unifloris, basi bracteatis; bracteis foliis conformibus.

1. *Sciaphila tenella*, “tenuissima carnosâ aphylla, scapo simplicissimo erecto, floribus nutantibus, perigonii laciniis reflexis apice villosiusculis, stigmate sessili punctiformi, baccis pluribus glandulis pellucidis tectis, semine subtriquetro, testâ subcoriaceâ.”

Sciaphila tenella, *Blume, Bijdr.* p. 515.

2. *SCIAPHILA MACULATA*, hyalina, caule simplici, foliis bracteisformibus adpressis lineis interruptis rubris maculatis, perianthii laciniis sublanceolatis reflexis apice intùs barbatis alternis margine ciliatis, floribus inferioribus staminibus 3 cassis (?), carpellis densissimè congestis, utriculo hiante.

Hab. in Insulis Philippinis, *Cuming*, no. 2088.

3. *SCIAPHILA PICTA*, hyalina, caule subramoso erecto flexuoso, foliis bracteisformibus maculis longis rubris pictis, perianthii laciniis oblongis acutis patentibus rubro-maculatis apice intùs barbatis alternis sublatisioribus ciliatis; tubo laciniarumque basi lineis punctatis violaceis creberrimis ornatis, floribus (an semper?) hermaphroditis, carpellis plurimis densissimè supra discum carnosum congestis staminibus 2 v. 1 munitis.

Hab. in Venezuela, ad fl. Apure, a cl. *Purdie* lect. Octobr. 1845. (*Herb. Hooker.*, exemplar unicum.)

4. *Sciaphila erubescens*, hyalina tenerrima, foliis bracteisformibus bracteisque acutis rubro-pictis, floribus punctis rubris maculatis, perianthii laciniis æqualibus oblongis acutis glaberrimis reflexis, flor. superioribus ♂ inferioribus ♀ interdum hermaphroditis, staminibus 3 cassis (?), utriculo bivalvi.

Aphyllia erubescens, *Champ. in Calc. Journ. Nat. Hist.* vii. p. 468.

Hab. in Insulâ Ceylon, ad Narawalle, prope Galle, in sylvis umbris.

HYALISMA, Champ.

CHAR. GEN. *Flores* monoici, v. dioici. *Perianthium* in utroque sexu 8-partitum; laciniis lanceolatis, æqualibus, patentibus, celluloso-rugosis basi in urceolam coalitis, æstivatione valvatis, persistentibus. *Masc.*

Stamina 4, in androphorum carnosum prominulum ferè sessilia, laciniis alternis opposita; *filamenta* brevissima; *antheræ* 4-loculares, peltatæ, apice lineâ transversâ bivalvatim hiantes; *pollen* sphaericum simplex. *Pistilli* rudimentum nullum. *Fem. Stamina* nulla. *Ovaria* plurima, (50–60) densissimè in gynæcium carnosum liberum aggregata, obovata, 1-locularia; *ovulo* unico erecto. *Stylus* ferè basilaris, ovario 3–7-plò longior, subulato-filiformis, celluloso-articulatus, apice subobtusio, stigmate inconspicuo. *Carpidia* plurima, utricularia, obovata, breviter stipitata, structurâ omninò *Sciaphilæ*.—Herba *Ceylonica*, *pusilla*, *hyalina*; rhizomate *fibroso*; caule *simplici, erecto*; foliis *bracteiformibus alternis, ovatis, acutis, venis destitutis, celluloso-rugosis*; spicâ *terminali*; floribus *pedicellatis, sæpissimè dioicis, interdum monoicis, et tunc superioribus ♂ inferioribus ♀*; pedicellis *unifloris, basi bracteatis*.

Hyalisma ianthina, *Champ. in Calc. Journ. Nat. Hist.* vii. p. 466 cum icone.

Hab. in Insulâ Ceylon, prope Galle, in sylvis humidis.

To these plants Mr. Miers adds the following, described from specimens recently sent from Parà by Mr. Spruce.

SORIDIUM, Miers.

CHAR. GEN. *Flores* monoici. *Perianthium* in utroque sexu 4-partitum; laciniis ovatis, acutis, patentibus, celluloso-rugosis, æstivatione valvatis, persistentibus. *Masc. Stamina* 2, supra discum minimum inclusum ferè sessilia, laciniis alternis opposita; *filamenta* brevissima; *antheræ* transversim elongatæ, compressæ, 4-loculares, rimâ verticali longitudinaliter 2-valvatim septicidè hiantes; *pollen* globosum, irregulariter subtrivalvatim rumpens. *Ovaria* plurima, in capitulum densè aggregata, obovata, sessilia, 1-locularia; *ovulo* solitario erecto. *Stylus* lateralis, ferè basilaris, pilis longis clavatis plumosus. *Stigma* obconicum, truncatum, piloso-plumosum. *Carpidia* plurima, baccata, radiatim aggregata, obovata, stylo persistenti basilari notata, monosperma. *Pericarpium* siccum, subcoriaceum. *Semen* ovale; *testâ* coloratâ nucleoque omnino *Sciaphilæ*.—Herba *Amazonica, in uliginosis umbrosis indigena, hyalina*; rhizomate substolonifero, *radiculas hinc inde emittente*; caule *simplici erecto*; foliis *paucis, bracteiformibus, alternis, ovatis, acutis, venis destitutis, celluloso-rugosis*; floribus *spicatis, superioribus ♂, inferioribus ♀*; pedunculis *1-floris, basi bracteatis*.

SORIDIUM SPRUCEANUM, Miers.

Hab. prope Parà Brasilæ, ad Caripi, in sylvis umbrosis.

Having concluded the description of these remarkable plants, which he gives in much detail, Mr. Miers proceeds to observe on their affinities. They evidently belong to one common group with *Triuris*, which the author originally suggested would form the type of a distinct order (*Triuriaceæ*), subsequently adopted by Dr. Gardner, under the name of *Triuraceæ*. He first dismisses without hesitation the hypothesis that they have any relationship to *Menispermaceæ* or *Smilacææ*, as suggested by Dr. Gardner with reference to *Hexuris*; or to any section of *Urticeæ*, to which *Sciaphila* was referred by Dr. Blume, and in which he was followed by Endlicher and Gardner. He commences his investigation by calling particular attention to their habit as plants destitute of real leaves; composed of little more than cellular tissue; void of green colour, of fibres and of ducts; and furnished with a seed not merely acotyledonous, but

without distinct embryo. He refers to Mr. Brown's memoirs on *Rafflesia*, and to Mr. Griffith's on the plants referred to *Rhizanthæa*, for instances of inembryonal seeds; and observes that we have no satisfactory evidence of the existence of an embryo, in the ordinary sense of the term, in *Burmanniaceæ*. He notices also the imperfect condition of the embryo in *Cuscuta*, in *Orobanchææ* and in *Monotropa*; and the striking discrepancy between the well-developed cotyledonous embryo of the leaf-bearing *Cactææ* and the solid and undivided embryo of the leafless genera of that family. Admitting then, in *Triuriaceæ*, *Burmanniaceæ*, *Balanophorææ*, &c., the existence of an organ endowed with the function, but wanting the usual structure, of the embryo, he proposes for this organ the name of *protoblastus*, with the view of distinguishing between a *protoblasteous* and a *cotyledonous* embryo. Modifications of the protoblasteous structure may occur; and the author refers to *Ceratophyllum* and to several genera of *Aroideæ* (especially *Cryptocoryne*) as furnishing instances of anomalous forms of embryo, which are best explained by a reference to this view of the subject. He also notices some peculiarities in the structure of the seed of *Pistia*, which he regards as in some points analogous to that of *Sciaphila*, although widely different from it in others.

Setting aside then the Acotyledonous embryo as a character of primary importance, and regarding it only as an imperfect condition of development, common to all the great divisions of the vegetable kingdom, it is evidently among the *Endogens* that *Triuriaceæ* should take their place, and the author concludes that upon the whole the greatest amount of approximative characters leans towards *Fluviales*. He then gives the characters of the order and its subdivisions as follows:—

TRIURIACEÆ, *Miers* (1841). Triuraceæ, *Gardn.* (1843). Triuridacææ, *Lindl.* (1846).

CHAR. ORD. *Herbæ* parvulæ, subhyalinæ; *rhizomate* fibroso, interdum substolonifero; *caule* subsimplici, texturâ cellulosâ, vasis deferentibus in axi centralibus; *foliis* alternis, bracteiformibus, sessilibus, nervis destitutis. *Flores* monoici, v. dioici, rariùs polygami, spicati; *pedicellis* alternis, 1-floris, basi bracteatis. *Perianthium* in utroque sexu 3-4-6-8-partitum, hyalinum, texturâ celluloso-bullatâ, v. papilloso-rugosâ; laciniis ovatis, acutis, basi in tubum brevissimum coalitis, apice interdum processu elongato donatis, æstivatione valvatis. *Stamina* numero varia, pauca, in fundo perianthii ferè sessilia, supra androphorum sæpissimè magnum carnosum inserta; *antheræ* 4-loculares, 2-valves, rariùs in lobos 2 sejunctæ. *Ovaria* plurima, in gynæcium toro adnatum densissimè aggregata, 1-locularia; *ovulo* unico, e basi erecto. *Stylus* excentricus, introrsum lateralis, sæpissimè ferè basilaris, glaber aut plumoso-fimbriatus. *Stigma* obsoletum, v. truncato-clavatum. *Carpidia* plurima, baccata, excentrica, obovata, stylo persistente ferè basilari notata, coriacea et indehiscencia, v. interdum utricularia dorso valvatim dehiscencia; *caryopside* obovatâ, telâ arillæformi donatâ; *testâ* ovatâ, durâ, testaceâ, coloratâ, transversim scalariformi-striatâ. *Nucleus* (embryo protoblasteus) opalinus, integumento areolis elongatis reticulato inclusus, texturâ mollis, cellulosis; cellulis materie oleosâ

grumosâ faretis.—Triuriaceæ in locis humidis umbrosis sylvarum inter-tropicalium Asiæ et Americæ epigeæ.

1. TRIURIEÆ. Perianthii lacinie appendice lineari, æstivatione spiralter tortâ et inclusâ, demùm exsertâ, munitæ. Stylus cum ovario gibboso lateraliter continuus. Antherarum lobi disjuncti, singuli 2-locellati.

Perianthii lacinie 3. Stamina 3 1. *Triuris*.
 Perianthii lacinie 6. Stamina ignota 2. *Hexuris*.

2. SCIAPHILEÆ. Perianthii lacinie ecaudatæ. Stylus ferè basilaris. Antherarum lobi confluentes et inde 4-locellati, rimâ transversali v. verticali bivalvatim hiantes.

Perianthii lacinie 4. Stamina 2 3. *Soridium*.
 Perianthii lacinie 6. Stamina 6 4. *Sciaphila*.
 Perianthii lacinie 8. Stamina 4 5. *Hyalisma*.

May 7.—R. Brown, Esq., President, in the Chair.

Read a letter, dated May 19, 1845, addressed by the President to Admiral Sir Francis Beaufort, for communication to Baron Alexander von Humboldt, "On the Origin and Mode of Propagation of the Gulf-weed." The letter is as follows:—

"My dear Captain Beaufort,

"I am vexed to have kept Baron Humboldt's letter so long, and now in returning it, that it should be accompanied by so little satisfactory information on the only one of its queries with which I could have been supposed to deal, namely that which relates to the origin and mode of propagation of the Gulf-weed.

"On this subject it appears that M. de Humboldt (in his Personal Narrative) first supported the more ancient notion, that the plant, originally fixed, was brought with the stream from the Gulf of Florida, and deposited in what Major Rennell calls the recipient of that stream. More recently, however, Baron Humboldt has adopted the opinion*, also held by several travellers, that the Gulf-weed originates and propagates itself where it is now found. To the adoption of this view it appears that he has been led chiefly by the observations of the late Dr. Meyen, who in the year 1830 passed through a considerable portion of the great band of Gulf-weed, and who ascertained, as he states, from the examination of several thousand specimens, that it was uniformly destitute both of root and fructification; he concludes, therefore, that the plant propagates itself solely by lateral branches: he at the same time denies that it is brought from the Gulf of Florida, as, according to his own observation, it hardly exists in that part of the stream near the great band, though found in extensive masses to the westward. I have here to remark that, as far as relates to the absence of root and fructification, Meyen has only confirmed by actual observation what had been previously stated by several authors, particularly by Mr. Turner (in his 'Historia Fucorum,' vol. i. p. 103, published in 1808), and Agardh (in his 'Species Algarum,' p. 6, published in 1820). But

* Histoire de la Géographie du Nouveau Continent, vol. iii. p. 73, and Meyen, Reise, vol. i. p. 36-9.

Meyen materially weakens his own argument in stating that he considers the Gulf-weed (*Sargassum bacciferum* of Turner and Agardh), and the *Sargassum natans*, or *vulgare*, specifically distinguished from it by these authors, as one and the same species; adding, that he has observed among the Gulf weed all the varieties of *Sargassum vulgare* described by Agardh; and finally, that on the coast of Brazil he has found what he regards as the Gulf-weed in fructification. Now as *Sargassum natans* has been found fixed by a discoid base or root, in the same manner as the other species of the genus, and as according to Meyen the Gulf-weed has been found in fructification, the legitimate conclusion from his statements seems to be, that this plant is merely modified by the peculiar circumstances in which it has so long been placed. I am not, however, disposed to adopt Dr. Meyen's statement that he actually found the true *Sargassum natans*, much less all its supposed varieties, mixed with the Gulf-weed, having reason to believe that at the period of his voyage his practical knowledge of marine submersed Algæ was not sufficient to enable him accurately to distinguish species in that tribe. It is not yet known what other species of *Sargassum* are mixed with the Gulf-weed, what proportion they form of the great band, nor in what state, with respect to root or fructification, they are found; though, in reference to the questions under discussion, accurate information on these points would be of considerable importance.

“ That some mixture of other species probably exists may be inferred even from Dr. Meyen's statement, and indirectly from that of Lieut. Evans, who, in his communication published in Major Rennell's invaluable work on the Currents of the Atlantic, asserts that he found the Gulf-weed in fructification, which he compares with that of Ferns, a statement which would seem to prove merely that he had found along with the Gulf-weed a species of *Sargassum* with dotted leaves, the real fructification of the genus bearing no resemblance to that of Ferns, though to persons slightly acquainted with the subject the arranged dots on the leaves might readily suggest the comparison.

“ With regard to the non-existence of roots in the Gulf-weed as a proof of specific distinction, it is to be observed that the genus *Sargassum*, now consisting of about sixty species, is one of the most natural and most readily distinguished of the family *Fucaceæ*, and that there is no reason to believe that any other species of the genus, even those most nearly related to, and some of which have been confounded with it, are originally destitute of roots; though some of them are not unfrequently found both in the fixed and in considerable masses in the floating state, retaining vitality and probably propagating themselves in the same manner (see Forskal, Fl. Ægypt.-Arab. p. 192, n. 52). It is true indeed that a *Sargassum*, in every other respect resembling Gulf-weed, has, I believe, not yet been found furnished either with roots or fructification, neither Sloane's nor Browne's evidence on this subject being satisfactory*. But the

* See Sloane's Jam. i. p. 59. I have examined Sloane's specimens in his Herbarium; they belong to Gulf-weed in its ordinary form, and are alike

shores of the Gulf of Florida have not yet been sufficiently examined to enable us absolutely to decide that that is not the original source of the plant: and the differences between the Gulf-weed and some other *Sargassa*, especially *S. natans*, are not such as to prove these two species to be permanently distinct. The most remarkable of these differences consists in the leaves of the Gulf-weed being uniformly destitute of those dots or areolæ so common in the genus *Sargassum*, and which are constantly present in *S. natans*. These dots, in their greatest degree of development, bear a striking resemblance to the perforations or apertures of the imbedded fructification in the genus. But as the receptacles of the fructification, as well as the vesicles, are manifestly metamorphosed leaves; and as the production of fructification is not adapted to the circumstances in which the Gulf-weed is placed, it is not wholly improbable, though this must be regarded as mere hypothesis, that the propagation by lateral branches, continued for ages, may be attended with the entire suppression of these dots.

“ That the Gulf-weed of the great band is propagated solely by lateral or axillary ramification, and that in this way it may have extended over the immense space it now occupies, is highly probable, and perhaps may be affirmed absolutely without involving the question of origin, which I consider as still doubtful.

“ My conclusion, therefore, is somewhat different from that of Baron Humboldt, to whom I would beg of you to forward these observations, which will prove that I have not been inattentive to his wishes and to your own, though they will at the same time prove that I have had very little original information to communicate.”

Read also “ Notes on the Dry-rot, as observed in the Church of King’s Wear, Devonshire.” By A. H. Holdsworth, Esq. Communicated by the President.

The church of King’s Wear is immediately opposite to Dartmouth, and stands about 100 feet above the harbour, on the north-west side of a very steep hill, which rises 200 feet above it. The walls of the old church having become unsafe, the whole of it was taken down except the tower at the north-west angle, to which a new church was attached, standing within the site of the old one, and the new building was completed about two years ago. From the north and south doors eastward the ground rises rapidly, and an area is formed round the church to preserve it from damp; from the same doors to the westward the ground falls far below the level of the floor within. The floor and ground beneath the old church were removed and the graves filled up. The new seats, which were open, rested on oak-sleepers, supported by new dwarf walls, the floors of the seats being about sixteen inches above the ground; but the earth on which the paving of the aisles or passages was laid was as high as, and rested destitute of root and fructification; hence they are probably those gathered by him in the Atlantic, and not those which he says grew on the rocks on the shores of Jamaica. Browne’s assertion to the same effect is probably merely adopted from Sloane.

against the sleepers on, the dwarf walls. The other parts of the seats were of Baltic deal. Good limestone masonry was used in the construction of the walls; the pillars and windows were made of stone from France; and the aisles were paved with closely-jointed fine black slate.

Within a few months after the completion of the church a fungus was observed at the seat at the corner immediately behind the south door, and soon after decay appeared in other seats near it. Fresh passages for air were made through the walls running under the seats, but in a few months these were filled with a species of vegetable matter looking like fine mould. This was found to spread under the whole of the seats to the west of the south door, and successively affecting those to the eastward of the same door and those of the centre of the church, but always that part which adjoined the aisle or passage. A suspicion arose, from taking up some of the stones of the aisles, that there was a plant which had its origin near the south door, which crossed under the paving of the aisles, and travelled along the sleepers and framing of the seats, causing all the mischief; and a thorough investigation was determined on. On taking down some of the seats, a fungus was found having some of its branches as large as straws, and others as fine as horse-hair, spreading out under the floors of the seats in the very finest fibres, breaking into forms resembling the finest leather, and wherever it obtained a good supply of air by means of an air-channel, becoming half an inch thick, attached on one side to the dry floor, and having on the other side a spongy surface, fitted for the collection of moisture from the atmosphere; for although the floor was perfectly dry, the fungus by which it was eaten out was as wet and cold as a sponge filled with water. The seat next the south door was removed; its framing was entirely decayed, and beneath it was found a root-like portion of the fungus descending nearly perpendicularly to the depth of sixteen inches. In the north aisle the seats were not affected, and it was presumed that they had not been reached by the fungus; but on taking up the paving-stones of that aisle, it was found to have approached within a foot of the reading-desk, growing from the seats of the opposite side of the aisle in the form of a semicircle increasing gradually on all sides.

Mr. Holdsworth is convinced that one plant, beginning near the south door, was the cause of all the mischief; when, however, the whole of the paving of the aisles was removed, other plants were found spreading in a fine film under it in a circular form, and six or eight inches in diameter; and these, when carefully taken up, were seen to have a stem in the centre running two inches or more into the ground, and usually attached to a bit of decayed wood. Thus the habit of the plant appears to be to travel on through grooves or under pavements, and in other concealed places, where it can find wood on which to feed, and which it renders dry and of a character as if destroyed by fire. Mr. Holdsworth exhibited dried specimens of the fungus in various states, which he has presented to the British Museum.

ZOOLOGICAL SOCIETY.

March 12, 1850.—W. Spence, Esq., F.R.S., in the Chair.

The following papers were read:—

1. ON A NEW SPECIES OF *LYMNÆA* FROM THIBET.
BY LOVELL REEVE, F.L.S., F.Z.S. ETC.

LYMNÆA HOOKERI. *Lynn. testâ ovatâ, tenuiculâ, conspicuè umbilicatâ, anfractibus quatuor ad quinque, convexis, superne depresso-rotundatis, suturis subimpressis, aperturâ orbiculari-ovatâ, marginibus lamina latiusculâ subverticali conjunctis; sordidè olivaceo-fuscâ.*

The above-described freshwater mollusk, collected by Dr. Hooker on the Thibetian or north side of Sikkim Himalaya, at 18,000 feet elevation, belongs to the same type as our well-known *Lymnæa peregra*, and affords an interesting addition to the evidence which has been in part collected touching the wide geographical distribution of corresponding forms of plants and animals over those parts of Europe and Asia where there are no extensive mountain-barriers. The European *Lymnæa stagnalis* has been collected as far east as Affghanistan, and the typical form of *Lymnæa peregra* is very characteristic in this species from Thibet. A depression of the whorls next the sutures, which gives a more orbicular form to the aperture, and a conspicuous umbilicus, which is not in any degree covered by the columellar lamina, prove it to be specifically distinct from *L. peregra*; and these characters do not appear in the various modifications of that species arising out of its more or less ventricose growth, or more or less attenuated convolution. South of the Himalaya range, where Dr. Hooker reckons the snow-line to be 5000 feet lower than on the north side, and 3000 feet lower than the locality inhabited by this species, the *Lymnææ* are of quite a different type, more especially in the plains of Bengal, where the shell, owing to its being formed in so much warmer a temperature, is of stouter growth, and characterized by some design of colouring. The European types of *Lymnæa*, ranging over Russia and Siberia, appear abundantly in the stagnant waters of North America; and some are identical in species. *L. elodes* of Say, inhabiting Pennsylvania, is doubtless the same species as the European *L. palustris*; *L. truncatula* of the same author appears to be identical with *L. desidiosa*; and the *L. peregra*, represented by *L. Hookeri* in Thibet, is represented in Pennsylvania by Say's *L. catascopium*. The *Lymnææ* of Australia are of a remarkable and very distinct type from either of those mentioned above.

I have much pleasure in naming this Thibetian *Lymnæa* after the indefatigable traveller, whose researches into the natural and physical history of that remote country into which few have penetrated, are likely to be attended with such important results. I have placed the specimens in the British Museum.

2. ON THE ANIMAL OF *LIOTIA*; WITH DESCRIPTIONS OF NEW SPECIES OF *DELPHINULA* AND *LIOTIA*, FROM THE CUMINGIAN COLLECTION. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

An examination of the animal of *Liotia Peronii* tends to confirm the generic importance of a small group hitherto confounded with *Cyclostrema* and *Delphinula*, but which had been justly recognised by Mr. Gray under the name of *Liotia*. The shell is known by its thickened peritreme; the operculum is peculiar, and the habits are peculiar in living at considerable depths, while *Delphinula* proper are chiefly littoral. In *Liotia* the head is probosciform, the tentacles subulate, the eyes on conspicuous peduncles at their outer bases; there are no intertentacular lobes, but a conical lobe on each side of the head external to the eye-peduncles; the lateral membrane of the foot is undulated, and furnished posteriorly with three cirrhi.

The operculum is arctispiral, the volutions being very narrow, numerous, and covered with a calcareous deposit, which is articulated at regular intervals, giving the upper surface of the operculum a tessellated appearance; the periphery is ornamented with radiating, horny fibres.

LIOTIA PULCHERRIMA, Adams. *L. testá subdiscoidea; spirá elevatiusculá, anfractibus rotundatis, liris transversis et longitudinalibus elegantissimè cancellatá, liris transversis muricatis; labro expanso, duplicato, radiatim fimbriato; umbilico amplo, crenulato.*

Hab. Cape of Good Hope. (Mus. Cuming.)

LIOTIA AFFINIS, Adams. *L. testá globosá; spirá subprominulá, anfractibus rotundatis, transversim elevato-striatis, costis variciformibus longitudinalibus, distantibus, angulatis, mucronatis; anfractuum parte inferiori serie unice foraminum; labro expanso; umbilico patulo, crenulato.*

Hab. Australia. (Mus. Cuming.)

A species partaking of the characters of *L. scalaroides* and *L. varicosa* of Reeve, but which can be referred to neither.

LIOTIA DUPLICATA, Adams. *L. testá orbiculari; spirá depressá, anfractibus transversim et longitudinaliter costatis; costis transversis duabus, tuberculatis; anfractuum parte inferiori planá; umbilico amplo, perspectivo, crenulato.*

Hab. Cagayan, province of Misamis, Isle of Mindanao, Philippines. (Mus. Cuming.)

LIOTIA NODULOSA, A. Adams. *L. testá orbiculato-depressá; spirá complanatá, transversim striatá, ultimo anfractu costis transversis duabus in medio puncto sulcatis et nodulis magnis subdistantibus instructis, infra serie punctorum circa regionem umbilicalem; aperturá orbiculari, peristomate reflexo puncto fimbriato, umbilico patulo margine crenulato.*

Hab. in insulis Philippinis. (Mus. Cuming.)

DELPHINULA CORONATA, Adams. *D. testá subdiscoidea, albá, nigro lineatá; anfractibus rotundatis, supra, spinis squamæ-*

formibus subramosis nigricantibus sursum curvatis coronatâ; anfractuum parte alterâ spinis brevioribus nigris in seriebus dispositis; spirâ plano-convexâ.

Hab. Cape Upstart, North Australia, in crevices of rocks at low water; *Jukes.* (Mus. Cuming.)

DELPHINULA EURACANTHA, Adams. *D. testâ subdiscoideâ, albidâ fusco rubroque variegatâ, anfractibus supra lævigatis, supernè angulatis, angulo spinis squamæformibus grandibus latis decurvatis ornato; anfractuum parte inferiori serie unicâ spinarum et squamarum in seriebus parallelis dispositis ornata; umbilico amplo, squamis muricatis armato, peromphalo nodoso.*

Hab. Isle of Mindora, Philippine Islands; *H. C.* (Mus. Cum.)

Like *D. aculeata*, Reeve; but the spinose processes are broad and deflexed, and there is a single row of large spines on the under part.

DELPHINULA CALCAR, Adams. *D. testâ orbiculari, discoideâ; spirâ depressâ, albâ, anfractibus angulatis acutis, peripheriâ serie unicâ spinarum radiatim stellatâ, spinis triangularibus compressis prominentibus; anfractuum parte inferiore planâ; umbilico patulo, crenulato.*

Hab. Catanuan, province of Tayabas, island of Luzon, sandy mud, 10 fathoms; *H. C.* (Mus. Cuming.)

A small species, partaking somewhat of the characters of *D. stellaris*, Adams and Reeve, but much more depressed, and the lower part of the whorls simple.

March 26.—W. Yarrell, Esq., V.P., in the Chair.

The following papers were read:—

1. ON THE SPECIES OF MOLLUSCA COLLECTED DURING THE SURVEYING VOYAGES OF THE HERALD AND PANDORA, BY CAPT. KELLETT, R.N., C.B., AND LIEUT. WOOD, R.N. BY PROFESSOR EDWARD FORBES, F.R.S.

1. *On the Land-Shells collected during the Expedition.*

Officers employed on a hydrographical survey have seldom time or opportunity for making an extensive collection of land-shells. In the assemblage of mollusks collected by Capt. Kellett and Lieut. Wood, there are twenty-eight species, of which eight are undescribed forms. These have been collected at various points between the coast of the Equador to the south and Vancouver Island to the north, the Gelepagos Islands, Pitcairn's Island, and the Sandwich Isles. Unfortunately, in consequence of the mixing of unlabeled specimens, the precise locality of several of the species cannot now be determined.

Of the genus *Helix* there are nine species. Of these, *H. Townsendiana*, *Nuttalliana* and *Columbiana* are certainly from the neighbourhood of the Columbia river. *Helix Kelletti* and *Pandora*, both new, are probably from the same country, though the box in which they were contained was marked "Santa Barbara." *Helix areolata* bears no indication of its locality. *Helix labyrinthus*, variety *sipunculata*, is a very curious modification of *H. labyrinthus*, and, like its

known near relations, comes from Panama. *Helix ornatella* (known also as *H. Adamsi*) was collected in Pitcairn's Island, where it had originally been observed. A single specimen of the common European *Helix aspersa* is marked "Santa Barbara," and probably owed its presence, wherever it was found, to transport by Europeans.

Of the genus *Bulimus* fourteen species were collected. Among the most interesting of these are seven species, two of them new, from Chatham Island, one of the Gelepagos group. Five, viz. *nux*, *calvus*, *eschariferus*, *unifasciatus*, and *rugulosus*, are described forms; two, to which I have applied the names *chemnitzioides* and *achattellinus*, are new, and very curious. Of these latter, the first is singularly isolated in many of its features, though bearing a resemblance sufficient to indicate an affinity with certain elongated and turreted *Bulimi*, natives of South America. The other is equally distinct from any known members of this genus; but, moreover, instead of linking, as the majority of the Gelepagos land-shells do, the fauna of those singular islands with the American continent, rather points, as it were, in the opposite direction, and distantly indicates affinity with the fauna of the Sandwich Isles.

Unfortunately less certain as to exact locality, though contained in a box labeled "Panama," is a curious small elongated *Bulimus*, to which I have given the name *fmbrriatus*. A form such as this, suggests, when we bear in mind the varied characters of its congeners, considerable doubts as to the value of the generic sections at present generally received among the Pulmoniferous Mollusca. We speak of *Bulimus*, *Helix*, *Pupa*, *Achatina*, and *Balea*, as if they were so many marked groups, the species in each assimilating to ideal generic types, whereas the difference between certain forms of so-called *Bulimi* and others placed under the same generic name is greater than between many *Bulimi* and *Helices* or *Pupæ*. Without assenting to the views of Férussac, which would have amalgamated the genera into one, on account of the similarity in external characters of the soft parts of the animal, and fully admitting that in certain tribes the shell alone may become a most important source of generic character—in other words, granting that in certain groups the sources of generic distinction may lie in the pneumo-skeleton—I do think that we have not yet attained a natural arrangement of the Pulmoniferous Mollusks, and until we have solved that problem, we shall be seriously impeded in the study of the laws of their distribution as well as of their organization.

Besides the *Bulimi* already named, there are specimens of *Bulimus iostomus*, *B. Hartwegii*, and a beautiful new species lately described and figured by Mr. Reeve under the name of *Bulimus Kellettii*, all probably from the Equador; *Bulimus alternatus*, from Panama; and *Bulimus miltecheilus*, marked from the Sandwich Islands, though this curious and beautiful shell is not known to inhabit that locality; nor have we evidence sufficient that the specimen brought home by Lieut. Wood was gathered there. Hitherto it is only known from "San Christoval, south-eastern island of Solomon's Group, north-east coast of New Holland" (Reeve), from which locality the speci-

mens in Mr. Cuming's collection were obtained, and the single example now referred to may have possibly been brought away from the same place.

Of the curious genus *Achatinella*, two species, *livida* and *alba*, are in the collection, both procured at the Sandwich Islands.

Of *Succinea* there is a new species, marked from Mazatlan; I have named it *Succinea cingulata*.

There are two species of *Cyclostoma*, the fine *C. grande* (no locality is attached to it), and an equally beautiful one which I have named *C. purum*.

The following diagnoses of the new species in the collection have been modeled on those of Dr. L. Pfeiffer, whose admirable 'Monographia Heliceorum Viventium' is one of the most valuable contributions to Malacology that have been published for many years.

HELIX PANDORÆ. *H. testâ obtectè perforatâ, depresso-globosâ, tenui, rugulosâ, concentricè minutissimè striatâ, anfractibus supra peripheriam fuscis, infra et prope peripheriam albidis fusco cingulatâ, basi albidis; aperturâ rotundatâ intus fuscâ albido-fasciatâ, margine interno incrassato albo; peristomate reflexiusculo, ectus albo-labiato, margine columellari dilatato, reflexo, umbilicum occultante.*

Diam. max. 17, min. 16, alt. 14 mill.

Collected near the Straits of Juan del Fuaco; allied to the last species, but very distinct.

HELIX KELLETTII. *H. testâ angustè umbilicatâ, depresso-globosâ, tenui, rugulosâ, granulatâ, fulvâ, spirâ subturbinatâ, sordidè flavo conspersâ, rufo-unifasciatâ, anfractibus 6, convexiusculis, ultimo ad peripheriam fasciâ pallidâ cincto, basi subinflato; aperturâ lunato-rotundatâ, intus pallidè fuscâ, unifasciatâ; peristomate reflexiusculo, margine columellari dilatato, reflexo, umbilicum occultante.*

Diam. max. 22, min. 19, alt. 19 mill.

This species is nearly allied to *Helix Californiensis*, Lea. It differs in the more pyramidal contour of the spire, in the less tumid body-whorl, and consequently differently shaped, more lunate, slightly elongated mouth. The margin of the mouth is more reflected.

HELIX VELLICATA. *H. testâ apertè umbilicatâ, tenui, convexo-depressâ, subnitidâ, sulcato-striatâ, striis minutissimis spiralibus decussatâ, late viridibus; spirâ convexiusculâ, anfractibus 6, ultimo rotundato magno, anticè dilatato, subdescendente; aperturâ perobliquâ, lunato-oblongâ; faux alba, peristomate margine sub-reflexo, supernè deflexo-sinuato.*

Diam. max. 22, min. 18, alt. 8 mill.

From Panama?

Distinguished from its near allies by the peculiar deflexion of the upper portion of the lip-margin.

BULIMUS CHEMNITZIOIDES. *Bul. testâ subperforatâ, turrito-subulatâ, regulariter costatâ, costis numerosis, nitidulis, flavidulâ,*

fasciâ spirali fusco-purpureâ cinctâ; anfractibus 14, ultimo $\frac{1}{2}$ longitudinis subæquante, basi fusco-purpureo; columellâ subrectâ, albâ; peristoma simplex, acutum; margine externo supernè arcuato; apertura ovali-oblongâ.

Long. 19, diam. 4 mill.; apert. 3 mill. longa, 2 lata.

Chatham Island, Gelepagos.

This beautiful species strikingly resembles a marine *Chemnitzia*. It is very distinct from any known *Bulimus*, but has affinities with *B. terebralis*, *B. columellaris*, and *B. clausilioides*.

BULIMUS FIMBRIATUS. *Bul. testâ imperforatâ, subuliformi, tenui, costis longitudinalibus subarcuatis, lineis confertis parallelis in interstitiis costarum sculptâ, rufo-fuscâ, suturâ impressâ; anfractus 7-8, tumidi, ultimus $\frac{1}{3}$ longitudinis vix superans, infra medium obsoletè carinatus; columella subsimplex, ad basim aperture angulum formans; apertura subovalis; peristoma simplex.*

Long. 9, diam. 2 mill.; apert. 2 mill. longa, 1 lata.

In a box of shells labeled "Panama." The nearest ally of this very curious shell is the *Bulimus gracillimus* of Pfeiffer, from Cuba.

BULIMUS ACHATELLINUS. *Bul. testâ perforatâ, umbilico parvo, conicâ, obsoletè striatâ, nitidâ, flavâ, fusco-fasciatâ; suturâ cingulatâ, crenulatâ, albâ; anfractibus 7-8 convexiusculis, ultimo vix $\frac{1}{2}$ longitudinis æquante; apertura semiovalis, peristoma rectum, simplex, acutum; columella obsoletè contorta, margine columellari reflexo, perforationem semitegente.*

Long. 19, diam. 10 mill.; apert. 5 mill. longa, 4 lata.

This shell is from Chatham Island, Gelepagos; it is unlike any other known *Bulimus*, and its characters distinctly indicate affinity with the *Achatinellinæ*.

SUCCINEA CINGULATA. *S. testâ oblongo-ovatâ, vix obliquâ, solidâ, striatâ, nitidâ, fulvo-succineâ, sæpe spiraliter albo-lineatâ; spirâ exsertâ, obtusâ; anfractus 4, convexiusculi, ultimus $\frac{2}{3}$ longitudinis æquans; apertura elongato-ovatâ, supernè acutâ, basi obliquè pone axin recedente; columellâ arcuatâ.*

Long. 12, lat. 6 mill.; apert. 7 mill. longa, medio 3 lata.

This *Succinea* is distinct from any recorded by Pfeiffer. It is said to come from Mazatlan. The very fine white spiral lines are not always clearly marked in colour; they correspond with lines of deeper depression at intervals of the striæ of growth.

CYCLOSTOMA PURUM. *C. testâ orbiculari, depressâ, albâ, nitidâ, spirâ elevatiusculâ, luteolâ; anfractibus sex, rotundatis, spiraliter sulcatis, sulcis numerosis, transversè striatis; apertura subcirculari, obliquâ, peritremate simplici; umbilico maximo; operculo — ?*

Diam. 48, alt. 17 mill.

Very near *C. Cumingii*, a species described by Mr. G. Sowerby from the island of Tumaco.

1. ON THE CHARACTERS OF THE GENERA *PUSIONELLA* AND *CLAVATULA*. BY J. E. GRAY, F.R.S. ETC.

In the List of Genera of Mollusca published in the Proceedings for 1848, I gave the name of *Pusionella* to a genus of shell, referring to the *Nefal* of Adanson and the *Murex pusio* of Born as the type.

This genus is easily characterized by the smooth thin periostraca, and the sharp-edged oblique plait which crosses the lower part of the canal. At the time I formed the genus, which contains several species in my collection, all coming from Africa, I was convinced that it was separate from the other zoophagous mollusca, from the characters assigned to it above, though I am aware that several zoologists were inclined to consider that they were scarcely sufficient for the formation of a generic group.

The examination of the operculum of the shells arranged in this group has shown that it affords a most excellent character, which separates it at once from all the other genera of the family. The operculum is formed of concentric laminae, with the nucleus or first-formed lamina placed on the straight front or inner side of the operculum, which is situated next to the pillar of the shell. With this peculiarity the genus must now be regarded as firmly established. This form of operculum had only before been observed in the genus *Bezoardica*.

The discovery of this character in shells which had been regarded by most authors as *Fusi*, induced me to examine the opercula of some other allied genera, and I was rewarded by the discovery that *Pleurotoma bicarinata*, which is very nearly allied in form to *P. coronata*, the type of the genus *Clavatula* of Lamarck's 'System,' has the operculum of the same shape and formed nearly in the same manner as that of the genus *Pusionella*; while *Pleurotoma Babylonica*, *P. Virgo*, and *P. oxytrophis*, which may be regarded as the typical *Pleurotomæ*, have the ovate lanceolate operculum with the nucleus on the acute apex, like the typical *Fusi*.

This being the case, it appears to me desirable that the genus *Clavatula* should be re-established, and restored to the species which has the operculum of this kind. Should it be considered necessary to separate from *Pleurotoma* the species which have a very short anterior canal, which have hitherto been regarded as *Clavatulae*, they may be called *Drilliaæ*, as that was the name which was first applied to them before they were confounded with the true *Clavatulae*.

These observations show the importance of studying the opercula of the different genera; and I may add, that the attention which I have been able to bestow on the subject has convinced me that they form quite as important a character for the distinction of the genera, and the arrangement of the genera into natural groups, as the structure and form of the shelly valve, or of the external form of the animals themselves; and this may well be believed, when we consider them, as I am inclined to do, as an imperfectly developed valve, and as homologous to the second valve of the bivalve shell.

April 9.—Prof. Owen, V.P., F.R.S., in the Chair.

DESCRIPTION OF A NEW SPECIES OF MONKEY, RECENTLY LIVING IN THE SOCIETY'S MENAGERIE. BY JOHN EDWARD GRAY, ESQ., F.R.S. ETC.

PRESBYTIS ALBIGENA. Grey-cheeked Presbytis.

Black; throat, sides of the neck and front of the chest greyish; face black, nearly bald, with a few short, rigid, black hairs on the lips; a tuft of elongated rigid hairs over each eye; the cheeks are covered with short, adpressed, greyish hairs. The hairs of the body are uniform black to the base, rather elongated and flaccid, forming a fringe along each side, and a compressed crest on the crown and nape. The hands and feet are short; the fore-thumb is small, the hinder one rather large and broad.

Hab. West Africa?

This species is very like *Presbytis obscurus*, but it is blacker, and has no pale spot on the nape, and the hair of the body is much longer, more silky, and forms a compressed crest on the nape, which is quite wanting in *P. obscurus*.

It is more like *P. melalophus*, but differs from it in being black, and can scarcely be a black variety of that species.

May 14.—William Yarrell, Esq., V.P., in the Chair.

The Secretary stated that, through the liberality of Ronald Gunn, Esq., and Dr. Grant, of Launceston, the Menagerie had been enriched by the safe arrival of two living specimens of *Thylacinus cynocephalus*. The author states in the letter which accompanied this most valuable and interesting gift, that—

“An observation of mine, contained in a letter to Sir W. Hooker, and which was not meant for publication, has been misunderstood, and has led to the propagation of error—for which I am very sorry. In it I said the Thylacine's tail was *not compressed*—in reference to an observation of Mr. Swainson's in the ‘Encyclopædia of Geography’ (then recently published), that the tail of the Thylacine was compressed, *which suggested the supposition that it was used in swimming, &c.* It was to the latter part of this observation that my remarks were particularly applied (vide Annals of Nat. Hist. vol. i. p. 101–2), and I meant that the tail was not compressed to such an extent as to have justified the inference that it was useful in swimming; and thus that the animal obtained its food principally from the sea, which the paragraph in the ‘Encyclopædia of Geography’ implied. The tail is obviously slightly compressed, but not, I think, more so than the tails of the Dasyures, to which aquatic habits are not attributed. In writing hurriedly—and not for publication—I did not express myself with the precision I ought to have done. I mainly wished to point out that the tail would not justify the inference of Mr. Swainson (which I thought very far strained), that the animal was aquatic in its habits and piscivorous.”

The following paper was read :—

1. DESCRIPTIONS OF NEW BIRDS. BY J. GOULD, F.R.S. &c. &c.

It is no less interesting than true, that during the past two years we have had accessions in ornithology of no ordinary value; comprising as they do additional species of several anomalous forms, of each of which only one was previously known; for instance, we have a second species of the genera *Apteryx*, *Memura*, and *Ptiloris*. On the present occasion I have the good fortune to offer to the notice of this Meeting new species of two forms, equal in interest to those above referred to, viz. that of *Cephalopterus*, a form known to all as being American, and of which the type is the remarkable species *Cephalopterus ornatus*, commonly called the Umbrella Bird. The discovery of a second species of this form is due to the researches of M. Warzewickz, a gentleman who has just returned from Central America, after traversing parts of that country hitherto untrodden by Europeans: it was in the high Cordillera of Chiriqué in Veragua, at an elevation of 8000 feet, that this bird was found, and of which the individual now exhibited was the only one procured.

CEPHALOPTERUS GLABRICOLLIS.

This new species differs in many particulars from its congener, particularly in its smaller size, in the lesser development of its umbrella-like hood, and in its denuded fore-neck and chest, and in the absence of feathers on the base of the tab or appendage at the basal part of the neck. M. Warzewickz describes the bare part of the neck to be reddish orange, and the bare base of the tab as bright red. This fine bird forms part of the collection of T. B. Wilson, Esq., of Philadelphia.

Independently of the novelty just described, M. Warzewickz brought me six species of Humming Birds entirely new to science; these, with some other new species of the same group, I propose to characterize at a future meeting.

By Lord Gifford, who has recently returned from a journey in Thibet, ornithology has been enriched by the discovery of a new species of *Syrrhaptēs*, a form as extraordinary in its way as that of any of those above noticed; the new species is finer both in size and colouring than the *Syrrhaptēs paradoxus*; it was shot on the banks of the Stumerreri Lake, where two examples were seen, but unfortunately only one was procured; it appears to be an adult male, for which I propose the name of

SYRRHAPTēs TIBETANUS.

Face hoary; front and sides of the neck ochreous yellow; feathers of the head and nape brown at the base, and alternately barred at the tip with black and white; upper part of the back, front and sides of the breast buffy white, crossed by narrow irregular bars of blackish brown; all the upper surface and wings buff, pencilled all over with dark brown, the pencillings being conspicuous on the back, and so minute on the wings as to be almost imperceptible; scapularies largely blotched on their inner webs with black; primaries and

secondaries slaty black, the fourth, fifth, sixth, seventh and eighth primaries with an oblique mark of brownish white at the tip; basal half of the two centre tail-feathers buff, pencilled with brown, their apical half narrow, filamentous and black; lateral tail-feathers sandy red, crossed by three widely placed irregular bands of black, and tipped with buffy white; under surface buffy white, minutely pencilled on the breast with brown; legs of the same hue, but the feathers banded with faint bars of brown; bill and nails black.

Total length, $15\frac{1}{2}$ inches; bill, $\frac{5}{8}$; wing, 10; tail, $7\frac{1}{2}$; tarsi, 1.

Hab. Ladakh in Thibet.

Remark. Distinguished from the *S. paradoxus* by its much larger size, by the primaries not being extended into the filamentous form so remarkable in that species, and by the absence of any black colouring on the breast.

The only example which has come under my notice is in the possession of the Rt. Hon. the Lord Gifford, to whom I am indebted for permission to include a figure of it in my work on the 'Birds of Asia.'

Extraordinary as have been the new species discovered during the last few years, of that remarkable group the *Ramphastidæ*, no one is more singular than the bird which I now submit to the notice of the Meeting; it may be regarded as an evidence that all the members of the group are not yet known to us, and that the productions of the rich forests of the Cordillerian Andes appear to be inexhaustible. It had long been my intention to propose a generic name for the Andean group of Toucans, characterized by the dense villose clothing of the under surface, the colouring of which is of a uniform tint, instead of being crossed by bars of black, red and yellow as in the typical *Pteroglossi*; and at no moment could such a step be more appropriately taken than at the present, when characterizing a new species of this section, for which, indicative of the country in which the members are found, I propose the generic term of *Andigena*, and for the new species, *A. laminirostris*; the other species pertaining to this genus are *A. hypoglaucus*, *A. nigrirostris*, *A. cucullatus*, and *A. Bailloni*. The new species *A. laminirostris*, which is distinguished by the yellow laminæ near the base of the upper mandible, is the property of Dr. T. B. Wilson of Philadelphia, to whom and to his brother, E. Wilson, Esq., I am indebted for permission to describe this fine bird; the native habitat of which is the forests at the base of Pichincha, a high mountain of Ecuador.

GENUS ANDIGENA.

Gen. Char.—Bill stout, swollen, and moderately large when compared with the bill of the true *Pteroglossi*; wings and tail very similar to those of *Aulacorhynchus*. General plumage long, loose, and hair-like.

The species belonging to this genus are—

Andigena hypoglaucus (*Pteroglossus hypoglaucus*, Gould).

— *cucullatus* (*Pteroglossus cucullatus*, Gould).

— *nigrirostris* (*Pteroglossus nigrirostris*, Waterh.).

— *laminirostris*, Gould.

— *Bailloni* (*Pteroglossus Bailloni*, Wagl.).

All are characterized by a uniform wash of colour on the under surface, in lieu of the bars of rich red and black so conspicuous in the true *Pteroglossi*.

ANDIGENA LAMINIROSTRIS.

Crown of the head and back of the neck deep black; upper surface golden brown; primaries black; rump pale sulphur-yellow; upper tail-coverts very dark green; tail dark slaty grey, four central feathers largely tipped with chestnut-red; under surface ashy blue; on either flank a large patch of rich yellow; thighs deep chestnut; under tail-coverts blood-red; orbits apparently orange; culmen and apical half of both mandibles black; a broad band on the base of the upper mandible and the basal half of the lower mandible deep blood-red; on either side of the upper mandible, immediately in front of the blood-red basal band, is a large buff-coloured plate or lamina, continuous with the structure of the bill at its base, but separate and detached in front, thin on its upper edge, but thicker and projecting beyond the edge of the mandible below; feet slaty blue.

Total length, 18 inches; bill, $3\frac{3}{8}$; wing, $6\frac{3}{4}$; tail, $6\frac{3}{4}$; tarsi, $1\frac{1}{2}$.

Hab. Neighbourhood of Quito.

Remark. The only example I have seen belongs to the collection of T. B. Wilson, Esq., of Philadelphia, and which has been kindly lent to me by his brother Edward Wilson, Esq., to enrich my Monograph of the *Ramphastidæ*.

Equally inexhaustible appear to be the Odontophorinæ or Partridges of America, for in the rich Museum of Leyden, I lately found a species which was previously unknown to me; it pertains to the genus *Odontophorus*, and I propose for it the name of *Odontophorus Columbianus*.

ODONTOPHORUS COLUMBIANUS.

Crown of the head brown, minutely freckled with black; back of the neck washed with rufous; over each eye an indistinct mottled stripe; throat white, irregularly spotted, especially on the sides, with black; upper surface brown, washed with grey on the centre of the feathers, each of which is delicately pencilled with black, and has a narrow stripe of buff, bounded on each side by a narrower one of black, down the centre; those of the scapularies and wing-coverts have moreover a large patch of rich dark brown on the inner web near the tip, bounded above by two narrow lines, one of buff, the other of dark brown; primaries brown; secondaries brown, freckled and barred with dark brown, and washed with rufous; tertiaries brown, washed with grey and rufous, freckled with black, having a broad V-shaped mark of black near the tip, and broadly margined and tipped internally with deep buff; under surface reddish brown, each feather with a large irregularly-shaped mark of white margined with black near the tip; under tail-coverts, and vent mottled reddish brown and sandy buff; bill black; feet lead-colour.

Total length, 11 inches; bill, 1; wing, $5\frac{3}{4}$; tail, $2\frac{3}{4}$; tarsi, 2; middle toe and nail, $2\frac{1}{4}$.

Hab. Caraccas.

Remark.—The fine specimen gracing the Museum at Leyden was

transmitted by M. Landsberger, Netherlands Consul at Caraccas. There is also another specimen, from, I believe, the same locality, which differs in having the under surface of a nearly uniform greyish brown, with here and there a few of the white marks so conspicuous in the bird above described; it is also of a somewhat smaller size, but notwithstanding these differences, the two birds appear to be one and the same species.

The *O. Columbianus* has a stouter bill, and is of a larger size than *O. dentatus*, but is smaller than *O. Balliviani*, to which it is most nearly allied.

Leaving America and India, and proceeding to Australia, I return to a country which has so long engaged my attention, to characterize a new genus of small creeping Insessorial Birds, nearly allied to the genera *Hylacola* and *Dasyornis*, under the name of *Pycnoptilus*, of which at present only a single specimen is known, and to which I beg to assign the specific name of *floccosa*; it is from New South Wales and the country towards the river Darling.

Genus PYCNOPTILUS.

Gen. Char.—Bill much shorter than the head; gonys and culmen gradually descending; upper mandible notched at the tip; *nostrils* covered with a distinct operculum; base of the bill beset with very fine feeble hairs; *wings* very short, round and concave, the sixth primary the longest; *tail* short, rounded, feathers very broad and of a soft texture; *tarsi* strong, and somewhat lengthened compared with the size of the bird; hind-toe strong, and armed with a rather long claw; fore toes and nails rather feeble, the outer and inner toes of equal length; plumage dense, lengthened and silky, especially on the flanks.

PYCNOPTILUS FLOCCOSUS.

All the upper surface, wings and tail rich brown; throat and breast sandy buff, the feathers of the latter with a crescent of brown near the tip; remainder of the under surface brown, approaching to white on the centre of the abdomen; under tail-coverts rusty red; bill and feet dark brown.

Total length, $6\frac{3}{4}$ inches; bill, $\frac{5}{8}$; wing, $2\frac{3}{4}$; tail, $2\frac{3}{4}$; tarsi, $1\frac{1}{4}$.

Hab. New South Wales.

Remark.—Received in a collection made on the upper part of the river Morumbidgee.

This form is somewhat allied to *Atrichia*, *Hylacola* and *Dasyornis*, but differs from all those genera in several particulars.

I cannot conclude this paper descriptive of several new and important birds, without congratulating the Society upon the means they possess of making known to the scientific world through their Proceedings and Transactions, spread far and wide as they are, not only over our own country, but I may say over the world, the many interesting objects which from time to time are brought before their Meetings; neither must I omit to bear testimony to the high estimation in which they are held by all the continental naturalists and every true lover of scientific research.

BOTANICAL SOCIETY OF EDINBURGH.

Jan. 9, 1851.—Professor Balfour, President, in the Chair.

The following papers were read:—

1. "Botanical Notes of a visit to Holstein, in August 1850," by Mr. W. Lauder Lindsay. The author, in the first place, gave a general view of the physical features of the country, alluding more particularly to the geological formations. The Duchy of Holstein may be divided into four great belts or zones, the most easterly being the boulder clay, the next the boulder sand, then the sand-heaths and sandy marshes, and the most westerly the marshes composed of the alluvium of the Elbe, the richest soil in Denmark. The *boulder clay* belt is characterized by the growth of the beech, which here forms magnificent forests. The ordinary meadow and pasture, field, forest, and hedge-plants grow here in profusion, and the cultivated grains are wheat, barley, rape, and peas. The *boulder sand* belt is characterized by the luxuriant growth of the oak and fir, but is not so fertile as the last. The *sandy-heath* belt is characterized by *Calluna vulgaris*, *Erica cinerea* and *E. tetralix*, and by the predominance of moor, amphibious, and certain aquatic plants. Rye is the grain generally cultivated in this belt. The marsh-belt is the most prolific. It is characterized by the abundance of Gramineæ, with a great number of aquatic and amphibious plants. The sea-coast and the sand-dunes have also their peculiar marine and littoral vegetation—*Psamma arenaria*, *Elymus arenarius* and *Carex arenaria* being characteristic of the latter. During the author's residence in Holstein, his head-quarters were at Schneefeld, which is situated in the most sterile of the four great belts already spoken of, viz. the sandy heaths; but within a circle of ten miles, he had types of all the chief formations of Holstein. He had made a full list of all the plants, which was laid before the Society, along with numerous dried specimens; he enumerated 1290 phanerogamous plants and ferns, of which 1062 are found in Britain.

2. "On the chemical composition of *Cytisus Laburnum*, *Euphorbia officinarum*, *Lunaria biennis* and *Bryum ligulatum*," by Mr. R. Smith.

3. "Biographical Notice of the Rev. Dr. Rottler," by Dr. Hugh F. C. Cleghorn, H.E.I.C.S. The author had looked in vain for any memoir of the venerable Rottler, Danish Missionary at Tranquebar, who formed one of the little knot of early botanists who searched the plains of Southern India, leaving comparatively little on the eastern coast for subsequent discovery, and he considered it a duty to draw attention to some MSS. which had fallen into his possession, giving fuller particulars than had yet appeared of this amiable and illustrious man. He stated that Dr. Rottler had been engaged by the English Government in 1796 to make a tour in Ceylon, his acquaintance with the native language and his knowledge of botany enabling him to collect much valuable information after the island was captured from the Dutch. This venerable man, after attaining the age of 87 years, which few reach in India, died at Madras in 1836, having devoted upwards of sixty years of his life to the work of a missionary. Dr. Cleg-

horn exhibited a drawing of the *Rottleria tinctoria*, named by Roxburgh in honour of his friend Rottler, and stated that he hoped to obtain sufficient information to draw up a short memoir of one who seems to have passed away with so slight a notice in the annals of botany.

Dr. Balfour exhibited a specimen of peat from Cantyre, received from His Grace the Duke of Argyll, which was composed of leaves of trees and shrubs in a good state of preservation. As the examination of the peat was not completed, Dr. Balfour deferred a notice of the plants composing it until next meeting.

Feb. 13, 1851.—Professor Balfour, President, in the Chair.

Dr. Balfour exhibited a specimen of *Polysiphonia subulifera*, new to Scotland, gathered at Lamlash, Arran, in August 1850, by Mrs. Balfour.

Dr. Balfour likewise exhibited, from the Palm House of the Royal Botanic Garden, a flowering specimen of *Livistona chinensis*, taken from a plant 38 feet high (measuring from the floor to the extreme point of the centre leaf). The lower portion of this palm is 5 feet 8 inches in circumference. Above this point the stem is covered to the extent of 10 feet by the bases of the fallen leaves, above which 54 large palmated fronds are fully expanded, besides numerous others in various stages of development, and so arranged as to give the head, which is 20 feet in diameter, a somewhat globular shape. This palm has three flowering spadices standing upright, the largest being 3 feet 6 inches long. It grows in a box 5 feet square, and 5 feet 3 inches deep, in soil composed of very rough brown loam, leaf mould, and sand.

The following papers were read:—

1. "On the Composition of the Ash of *Armeria maritima*," by Dr. Voelcker, Professor of Chemistry, Cirencester. (See p. 266.)

2. "Remarks on numerous species of *Diatomaceæ* found in Peat from Cantyre," by J. H. Balfour, M.D. The author observed that the peat is remarkable on account of its containing an immense accumulation of leaves which are comparatively unaltered in their structure. The bed in which it occurs is stated by the Duke of Argyll to be in an extensive flat or plain very little raised above the existing level of the sea, full of peat mosses, strata of clay, with vegetable stems, &c. It must be of ancient date, as it is covered by clay and gravel, and there is reason to believe that a peat moss which is now cut away lay over it. This moss, where it remains still uncut, is from 10 to 12 feet in depth. The forms of the leaves are well marked, and the following appear to occur:—

Leaves of *Salix caprea*, *S. viminalis* or *stipularis*, and of *Rumex Acetosella*.

Stem and leaves of a moss.

Stems of grasses, and of a rush.

Leaves of a heath-like plant, either *Empetrum nigrum*, or a species of *Erica*.

Epidermis of birch.

Mr. John Matthews, who had examined the microscopic structure of the leaves, &c., had detected woody and vascular tissue. He had also found scalariform vessels indicating the remains of ferns, and had detected the cellular arrangement of grasses as well as of mosses. His investigations have shown the unaltered condition of the anatomical structure; and prove the advantage of the use of microscopic researches in determining the nature of plants found under peculiar conditions such as those referred to. On a farther examination of the peat, Mr. Matthews and Mr. Cobbold detected numerous species of Diatomaceæ belonging to the following genera:—*Navicula*, *Cocconema*, *Gallionella*, *Campylodiscus*, *Fragillaria*, *Diatoma*, *Euastrum*, *Gomphonema*, &c., along with some spiculæ of sponges. The leaves found in the peat having been examined by Dr. Voelcker, give the following result:—

Ash from leaves dried at 212°—32·46. Ash of a reddish colour, apparently from the presence of oxide of iron; resembles ordinary peat-ashes in many respects.

3. "Notice of a *Lepidodendron* found in Craigleith Quarry, and of a species of *Dadoxylon* discovered in the sandstone of Arthur's Seat," by Mr. A. Bryson.

Mr. Bryson exhibited a very fine section, measuring 6 by 5 inches, of *Lepidodendron obovatum* from Craigleith, which is apparently allied to *L. Harcourtii*, Brongn., and in which the structure is distinctly shown. He also exhibited a section of *Dadoxylon* from sandstone under the trap of Salisbury Crags, showing disc-bearing woody tissue; this plant Mr. Bryson supposes to be allied to *Dadoxylon (Pinites) Withami*, which is found at Craigleith. Mr. Bryson stated his opinion that *Lepidodendron* would be found closely allied to the tree-ferns of the present day.

4. "Notice of several new Indian Plants," by H. Cleghorn, M.D., H.E.I.C.S. Dr. Cleghorn stated that he was indebted to Dr. Wight for publishing some of his drawings of Mysore plants in the 'Icones Plantarum Indiæ Orientalis,' now in progress, and which, while it will form a lasting monument to the industry and labours of the author, supplies to the student of Indian botany a standard work of reference, illustrating the Indian flora, so far as it goes, as perfectly as Sowerby's 'English Botany' depicts the British flora.

Dr. Cleghorn exhibited the original specimens of *Osbeckia hispissima* (Wight) and *Mitreola paniculata* (Wall.), figured in the Part recently received from Madras; *Dunbaria latifolia* (W. and A.), dedicated to Professor Dunbar of Edinburgh; *Alysicarpus styracifolius* (DC.); *Hedysarum glumaceum*, Rox. Fl. Ind. iii. p. 646; the ticket of the original specimen in the Edinburgh University Herbarium in Roxburgh's handwriting is distinctly written *H. plumaceum*. The error has been copied into subsequent works.

Dr. Cleghorn exhibited microscopic preparations, by Mr. John Matthews, of the stellate hairs and glands of *Rottleria tinctoria*, the latter only containing the colouring matter of the dye used by the Mahommedans.

Dr. Balfour mentioned that he had received a letter from Dr. Johnston of Berwick, in which he states that he is now convinced

that the *Anacharis Alsinastrum* found in the Whiteadder is of foreign origin.

A letter was read from Mr. C. E. Parker, Torquay, noticing various instances which had been observed of the effects of lightning on trees; and mentioning the occurrence of *Tilia Europæa* on a promontory in the sea near to Torquay, where he supposes it to be indigenous.

MISCELLANEOUS.

ATHANAS NITESCENS.

To the Editors of the Annals of Natural History.

Weymouth, March 5, 1851.

GENTLEMEN,—On the 2nd instant I obtained from two small rock-pools (one of which was not more than 18 inches diameter), at extreme low-water mark, sixty or seventy specimens of *Athanas nitescens*, and am thus enabled not only to add this as a new locality, but to fill up the blank of colour in Mr. Bell's 'Crustacea.' The general colour varies from a transparent watery-green in the very small specimens through almost all the shades of green, some having a yellowish tinge, whilst others are of a deep liver colour (they vary quite as much in their general colour as *Hippolyte varians*); some few are of a pale buff; there are however two markings constant in every specimen; the first is a broad white stripe, extending from the base of the rostrum along the middle of the back, and ending at the junction of the plates of the tail with the body. This stripe when the animal is dried disappears altogether in the lightest specimens,—is scarcely visible in others, whilst in the liver-coloured specimens it remains visible, but changed to a pinkish brown. The first pair of legs are the colour of the body, but the other four pairs are barred or annulated alternately with reddish brown and white in the manner of *Pagurus Forbesii*. The plates of the tail are unicolorous.

Athanas nitescens lives a long time out of water; it is very active, but not so much as some small *Galatheas* in the same pool with it, though like it they strike backwards and attempt to enter some crevice to escape. In confinement they are timid, striking to all parts of the basin; but they will crawl up to a pen or any substance put quietly into the water and apparently explore it. One of my specimens has the right fore-leg very much larger than the left, but on comparing this individual with another of the same size, I find the large leg is the proper size, and that it is the smaller leg which is deformed, thus proving that the small leg has replaced one broken off. The fingers are generally much paler than the hands.

I am, Gentlemen, yours obediently,

WILLIAM THOMPSON.

Description of a new species of Mole (Talpa leucura, Blyth).

By ED. BLYTH, Esq.

The species of restricted *Talpa* that have hitherto been described amount to four only in number, that I am aware of; viz. *T. europæa*,

L., of Europe generally,—*T. cæca*, Savi, of Italy and Greece,—*T. moogura*, Temminck, of Japan,—and *T. microura*, Hodgson, of Nepal, Sikim, Butan, and the mountains of Asám : but the Society's Museum has long possessed specimens of another from Cherra Punji (N. of Sylhet), which I have recognised as distinct for some years, but now only proceed to describe.

In its external characters, the Cherra Punji Mole differs little from *T. microura*, except that the tail is considerably more developed, though much less so than in *T. europæa*; and the latter is clad and tufted with white hairs, whence I propose for the species the name of *T. leucura*. This animal, also, would seem hardly to attain the size of *T. microura*. An adult female in spirit measures $4\frac{1}{4}$ inches long, with tail $\frac{3}{8}$ inch additional: the latter is of a club shape, much constricted for the basal half. The general colour of the fur, too, is less fulvescent than is usual with *T. microura*. In both of these Asiatic species, as in *T. cæca*, there is no perforation of the integument over the eye, as in *T. europæa*; the skin being there merely attenuated and imperfectly transparent.

But the characteristic distinction of *T. leucura* consists in having only two small præmolars in the upper jaw anterior to the great last præmolar (*carnassier*, or 'scissor-tooth'); both *T. europæa* and *T. microura* having three,—these being comparatively larger and less separated in the latter, and the *carnassier* is also much larger in *T. microura* than in *T. europæa*. The posterior spur of the canine (? or *pseudo-canine**) is remarkably developed in *T. leucura*, in place of the absent small præmolar. In the dentition of the lower jaw, there are also characteristic differences distinguishing these three species. In the Moles, as in most other *Insectivora*, and also in the *Lemuridæ* (the very peculiar genus *Cheiromys*, which has rodential tusks, excepted), the lower canine is minute and takes the form of an incisor, for which it has been very commonly mistaken†; and the first præmolar is developed to assume the form of a canine, but locks *posteriorly* to the upper canine (or pseudo-canine), and like it has a double fang. There is no instance of a genuine lower canine locking behind the upper one, unless the gnawing tusks of the *Rodentia* and of the Lemuridous *Cheiromys* be regarded as the homologues of canines, which seems to be indicated more by the co-presence of undoubted upper incisors in the *Leporidae*, than the reverse is by the difficulty of always tracing the origin of upper rodential tusks

* In all the *Insectivora*, Cuv., which apparently possess upper canines, these teeth have rather the structure of *modified false molars*, and, I believe, have always double fangs, as exemplified by *Talpa*, *Centetes*, and *Gymnura*.

† No placental mammal has more than three pairs of true incisors, or than three pairs of true molars (distinguished by their not being preceded by deciduary teeth in the young animal, as is the case with all other teeth). Although certain instances occur, as especially in the hoofed ruminants, where the lower canine is hardly (if at all) to be distinguished from the incisors, yet this fourth supposed pair of incisors never co-exists with an undoubted canine (*vide* the Camels, Horses, Tapirs, &c.), that is among the *placental mammalia*, inasmuch as they are the veritable homologues of those teeth.

through the intermaxillaries to the true maxillary bones in the rodents generally. But to return to *Talpa leucura*: following the minute lower canine and the canine-like first lower præmolar of this species, there are two small præmolars anterior to the *carnassier* or last of the series, and the first of these is conspicuously much smaller than the second; in *T. microura* the two are of equal or nearly equal size, and occupy more space longitudinally; while in *T. europæa* these and the *carnassier* successively enlarge in a regular gradation, the latter being proportionally smaller than in the two Indian species. Both scissor-teeth are indeed most developed in *T. microura*, and the teeth generally are more robust.

The specimens of *T. microura* from Asám, like those of Nepal, have generally a very minute tail, which can at least be distinctly enough felt under the fur; but those from the vicinity of Darjiling have no external trace of tail, whether sent as skins or in spirit. I have found, however, no perceptible difference in the skulls and dentition, nor in any other character whatever, that should warrant us in considering the tail-less Darjiling Moles as a distinct species, separable from *T. microura*. The Society's Museum contains *T. leucura* stuffed and in spirit, and the skull of the specimen preserved in spirit has been extracted and cleaned; while the dentition of the stuffed specimen is exposed, and is quite similar to that of the other here described. It is not improbable that *T. leucura* may extend its range eastward into China; and in that direction we may look for additional species of *Talpa*, if not also in western Asia. In Africa the genus is unknown, but is represented in the south by *Chrysochlore*; in North America by *Scalops* and *Condylura*; while in South America the *Insectivora*, Cuv., do not occur, their functions being performed by numerous diminutive species of *Didelphys*, as also may be said in Australia by the *Perameles* tribe; and it is far from unlikely that Australia may yet be found to produce a fossorial marsupial form, resembling the Moles as other *Marsupialia* present an analogical but superficial likeness to certain other *Insectivora*.—From the *Journal of the Asiatic Society of Bengal*, No. III., 1850.

On the Analogy between the mode of Reproduction in Plants and the "Alternation of Generations" observed in some Radiata. By JAMES D. DANA.

The very remarkable fact that a Polyp and a Medusa may be in some instances different states of one and the same species, has been well established of late by the researches of Sars, Dalyell, Steenstrup and others; and recent important observations have been made on the subject by Professor Agassiz. The alternations are as follows:—

1. The Medusa produces eggs;—
2. The eggs, after passing through an infusorial state, fix themselves and become polyps, like *Corynæ*, *Tubulariæ*, or *Campanulariæ*;—
3. The polyps produce a kind of bud that finally drops off and becomes a Medusa.

Thus the egg of a Medusa, in such cases, does not produce a Medusa, except after going through the intermediate state of a polyp.

Or if we commence with the polyp, the series is thus:—

1. The polyp produces bulbs that become Medusæ;
2. The Medusæ produce eggs;
3. The eggs produce polyps.

This is what is called by Steenstrup "Alternation of Generations;" and he considers the earlier generation as preparing the way for the latter. It certainly seems to be a most mysterious process:—a parent producing eggs which afford a progeny of wholly different form (even so different, that naturalists have arranged the progeny in another grand division of the Radiata); and this progeny, afterwards, by a species of budding or gemmation repeating the form of the original parent.

Yet although seemingly so mysterious, is not this mode of development common in the vegetable kingdom? Is it not the prevalent process in the plants of our gardens and fields, with which we are all familiar?

It is well known to us, that in most plants, our trees and shrubs for example, growth from the seed brings out a bud of leaves; from this bud after elongation, other leaf-buds are often developed, each consisting like the first of a number of leaves. It is an admitted fact (as may be found in Treatises on Vegetable Physiology) that each of these buds is a proper plant-individual, and that those constituting a tree are as distinct and independent as the several polyps of a compound zoophyte; and that the tree therefore is as much a compound group of individuals as the zoophyte. In some cases the plant forms but a single leaf-bud; in others, where there is successive gemmation for a period, the number is gradually multiplied, and more or less according to the habit of the species. So among polyps, there is the simple and compound *Tubularia*, *Campanularia*, and the like.

After the plant has sufficiently matured by the production and growth of its number of leaf-buds, there is a new development—a flower-bud—consisting of the same elements as the leaf-bud, but wholly unlike it in general appearance—as much so, as the Medusa is unlike the polyp. The flower-individual starts as a bulb from the leaf-individual, or the group of leaf-individuals, and is analogous in every respect to the bulbs from the *Campanulariæ* and allied species; and when it has fully matured, it produces, like the Medusa, ovules or seed—these seed to begin the round again of successive or alternating developments.

Thus among plants the seeds produce leaf-individuals; these yield bulbs or buds becoming flower-individuals; and these produce seeds; precisely as the egg produces polyps, the polyps, bulbs that develop into Medusæ, and the Medusæ, eggs.

When we follow out this subject minutely, we find the analogy completely sustained even in minor points of structure and growth. The leaf-bud consists of leaves developed in a spiral order; and in the polyp, as some species show beyond doubt, the tentacles and corresponding parts are spiral in development. The same spiral character

is found in the flower, but the volutions are so close as not to be distinguished readily from circles. In the Medusæ referred to, the regularly circular form is far more neatly and perfectly developed than among the polyps—as is clearly seen in a comparison of the polyp *Coryna* with the elegant *Sarsia*, a species of which is described and beautifully delineated in Professor Agassiz's recent memoir, published by the American Academy of Arts and Sciences at Boston. The relations in structure between plants and polyps might be further dwelt upon; but for other observations the writer would refer to his volume on Zoophytes.

The only point in which the analogy seems to fail, is that the Medusa-bud falls off before its full development, while this is not so with plants. But it is obvious that this is unimportant in its bearing on this subject. It is a consequence of the grand difference in the mode of nutrition in the two kingdoms of nature; for the plant-bud on separation loses its only means of nutriment.

The law of alternating generations is therefore no limited principle, strange and anomalous, applying only to a few Radiata. It embraces under its scope the vegetable kingdom, and it is but another instance of identity in the laws of growth in the two great departments of life.—*From Silliman's American Journal of Science and Arts*, No. 30, November 1850.

NOTE ON CALLICHTHYS AND ANABLEPS.

BY J. P. G. SMITH, Esq.

The flesh of *Callichthys*, when cooked, is of a fine deep yellow colour, and in substance is somewhat cheesy or buttery on the tongue, it is very rich in flavour: no cleaning of the intestines appears to be necessary before preparation for the table.

In the creeks by which the island of Mexianna is intersected, these fish literally swarm and keep the waters alive and in a state of constant disturbance. I have witnessed them crossing a log of wood, which was lying in the water and intercepted the passage, in such numbers that they quite concealed it from view; and the people, when they wanted a dish, were in the habit of going down to a favourable spot and picking them out with their hands, without going into the water.

Anableps swims in small shoals with the eyes above the surface of the water, generally close to the shore, and so near together that I have shot twenty to thirty at a time by firing a gun among them; their flesh is very sweet, and not unlike a smelt in taste.—*From the Proceedings of the Zoological Society*, March 26, 1850.

BOTANICAL TRAVELLERS.

We learn from Mr. Stevens that Mr. N. Plant, Curator of the Leicester Museum, is about to leave England to investigate the natural productions of several districts in S. America, the Sandwich Islands, &c.

His proposed course is, first to Rio Grande, thence to La Plata and Paraguay; next crossing to Chili, he will turn northward, examining

the western slopes of the Chilian and Peruvian Andes; from Peru he will make for the Sandwich Islands, and carefully examine that group; proceeding thence to Vancouver's Island and several adjoining districts of the N. American continent, he will return homeward by the East Indian Islands.

Mr. Plant will make collections of birds, insects, shells, dried plants and other objects, and anticipates being able to send home many interesting and valuable specimens during the four or five years which his journey will occupy.

METEOROLOGICAL OBSERVATIONS FOR FEB. 1851.

Chiswick.—February 1. Overcast: fine: clear at night. 2. Rain: hazy: slight fog: frosty. 3. Frosty and foggy: cloudy. 4. Clear: cloudy and fine: clear and frosty. 5. Drizzly. 6. Clear and fine. 7. Rain. 8. Fine: heavy clouds: clear. 9. Cloudy and fine. 10. Hazy. 11. Clear. 12. Very fine. 13. Hazy: cloudy: slight fog. 14. Dense fog: hazy. 15. Foggy: exceedingly fine: frosty. 16. Sharp frost: clear and very fine: frosty. 17. Frosty, with fog: clear: cloudy. 18. Cloudy and fine. 19. Densely clouded. 20. Very fine: rain at night. 21. Hazy: fine: slight fog. 22. Dense fog: very fine: clear at night. 23. Clear and fine. 24. Cloudy: foggy. 25. Foggy. 26. Fine: clear: frosty. 27. Slight shower of sleet: dense dark clouds. 28. Cloudy and cold.

Mean temperature of the month	38°·35
Mean temperature of Feb. 1850	42 ·60
Mean temperature of Feb. for the last twenty-five years ..	39 ·56
Average amount of rain in Feb.	1·67 inch.

Boston.—Feb. 1. Fine. 2. Cloudy. 3. Cloudy: rain P.M. 4. Fine. 5. Cloudy: rain P.M. 6. Fine. 7. Cloudy: rain A.M. and P.M. 8—10. Fine. 11—14. Cloudy. 15. Foggy. 16—18. Fine. 19, 20. Cloudy. 21. Fine. 22. Foggy. 23. Fine. 24. Fine: rain P.M. 25. Foggy: rain A.M. 26. Fine. 27. Fine: rain A.M. and P.M. 28. Fine.

Applegarth Manse, Dumfries-shire.—Feb. 1. Frost: snow melting. 2. Frost gentle: louring P.M. 3. Rain in the night: drizzly day. 4. Frost rather hard: fine: clear. 5. Rain heavy: high wind: flood. 6. Rain in the night: fair day. 7. Rain all day: high wind: flood. 8. Fair and fine A.M.: a few drops P.M. 9. Fog: hoar-frost: cleared P.M. 10. Fair A.M.: rain P.M. 11, 12. Dripping day. 13. Fair throughout. 14. Fair early A.M.: slight drizzle. 15, 16. Shower during night: fine day. 17. Rain A.M.: cleared at noon. 18, 19. Storm of wind and rain. 20. Fair and fine: a few drops P.M. 21. Frost: fine: butterfly seen. 22. Frost harder: barometer falling. 23. Frost mild: barometer falling. 24. Frost slight: fine and clear. 25. No frost: fine: cold P.M. 26. Frost gentle: cloudy. 27. No frost: but ungenial. 28. Frost: clear and fine.—During this month the spring flowers were earlier by three or four weeks than usual: snow-drops, crocuses, hepaticas, polyanthuses, daffodils, in full bloom.

Mean temperature of the month	39°·45
Mean temperature of Feb. 1850	41 ·70
Mean temperature of Feb. for the last twenty-nine years ...	36 ·90
Average rain in Feb.	2·14 inches.

Sandwich Manse, Orkney.—Feb. 1. Clear: frost: clear: aurora. 2. Bright: frost: cloudy. 3. Bright: clear. 4. Bright: clear: cloudy. 5. Cloudy: rain. 6. Sleet-showers: showers. 7. Rain: showers. 8. Bright: clear. 9. Cloudy: fine: rain. 10. Showers: clear: showers. 11. Bright: showers. 12. Snow-showers: clear: frost. 13. Clear: frost. 14. Drops: showers. 15. Clear: drizzle. 16. Drizzle: clear. 17. Drops: cloudy. 18. Rain: cloudy: aurora. 19. Showers: cloudy: aurora. 20. Showers: sleet-showers. 21. Bright: showers. 22. Clear: aurora. 23. Clear: hoar-frost: fine: aurora. 24. Clear: frost: clear: aurora. 25. Clear: frost: fine: aurora. 26. Cloudy: fine: cloudy. 27. Hoar-frost: cloudy. 28. Showers: cloudy.

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[SECOND SERIES.]

No. 41. MAY 1851.

XXXIV.—*Contributions to the Natural History of the Shark.* By RICHARD HILL, Corr. Mem. Zool. Soc. Lond., and M. C. Roy. Agr. Soc. Jam.

Spanish-Town, Jamaica, August 1850.

OBSERVING, when I was at Port Henderson in 1842, that whenever the sein was hauled the fishermen caught numerous young Sharks, it became evident to me, that under ordinary circumstances, these ravenous fishes are ground-feeders; and that the structure of their mouth, far beneath the snout, and entering the origin of the trunk, fits them especially for snatching up their prey from the ground, when they quarter over a shoal, like a hound scenting and beating over a field. I could not, however, at the time I made the remark, reconcile the predilection of the same fishes for hunting at the surface of the sea, with their habit of hounding for their prey in deep waters. I think I have now found an explanation for this contradictory instinct. We have a proximate solution for the difference of habit in the viviparous nature of this family of Cartilaginous Fishes.

Cartilaginous Fishes are endowed with a peculiar generative œconomy. They procreate *in coitu*, whereas the Osseous Fishes almost universally (the exceptions are very few) cast their spawn without contact; that is, the female deposits the ova, and the male the seminal fluid independently. Impregnation is effected by diffusion, just as the pollen of plants is disseminated from one flower to another, or is conveyed through the air from the male to the female tree.

Let us devote a moment's attention to the instincts and habits of some three or four of the Osseous Fishes the most important to man. We begin with the Pilchard and the Herring. In carrying on the great purpose of organic life—"increase and multiply"—at certain seasons, within certain ranges of latitude, these two species of fishes approach the coasts in inconceivably

large bodies. What may be called the multitudinous array, is increased as they pass onward to their breeding ground, by numberless smaller masses, which, perpetually joining the main body, add to the number of the muster. In the early months of the year, the Pilchard and the Herring avoid the surface waters. They are known to keep then near the bottom in soundings, by being taken in the stomachs of rapacious fishes. Their union into the bodies called *schulls* is not permanent, but partial, earlier than July; but as they breed only once in the year, the great multitudes that approach the coast do not perform this function until the month of October, and then at no great distance from the shore. The instinctive necessity that gathers the multitude of these and several other species of fish near to coasts, and within the reach of man, when they are in the best condition to form his food, is a beautiful exhibition of providential œconomy; but this is the secondary object; the primary is the perpetuity of the species.

Let us illustrate the manner and circumstances under which impregnation is effected, by the habits of some fish of similar instincts, but more under our observation than the Pilchard or the Herring, or those that inhabit the broad ocean. Let us devote our attention for a little while to the Salmon, a fish plentiful in the rivers of the northern temperate zone, where they spawn, and where, in carrying out their procreative instincts, they exhibit unwearied perseverance and indomitable energy of purpose. During the early part of the season, when the ova begin to develop in the mature fish, the Salmon ascend the rivers in which they design to breed; advancing with the flood, but generally retiring with the ebb, till the upward stream enables them to get beyond the place they had previously reached. The female fish appear before the males, and those of the first year, called the *grilse* in their first spawning, move to the breeding grounds, and ascend the rivers earlier than the Salmon of mature age. By the time the season has advanced, they have reached beyond the influence of the tide, and are losing their condition more and more, as they approach nearer and nearer the time of expelling the ova. Eventually the male Salmon follows, surmounting the obstacles of the stream, with the same perseverance. "They shoot up rivers with the velocity of arrows, and make wonderful efforts to surmount cascades and other impediments by leaping;—frequently clearing an elevation of 8 or 10 feet,—and, gaining the water above, pursue their course. If they fail in their attempt, and fall back into the stream, it is only to remain a short time quiescent, and thus recruit their strength to enable them to make new efforts *."

* Yarrell's *British Fishes*, vol. ii. p. 9.

“The process of spawning has been described by various observers:—‘A pair of fish are seen to make a furrow, by working up the gravel with their noses, rather against the stream, as a Salmon cannot work with his head down stream, for the water then going into his gills the wrong way, drowns him. When the furrow is made, the male and female retire to a little distance, one to the one side, and the other to the other side of the furrow; they then throw themselves on their sides, again come together, and rubbing against each other, both shed their spawn into the furrow at the same time. This process is not completed at once; it requires from eight to twelve days for them to lay all their spawn, and when they have done they betake themselves to the pools to recruit themselves. Three pairs have been seen on the spawning bed at one time, and were closely watched, while making the furrow and laying the spawn *.’”

We return for a moment from the river to the sea, to carry on the instincts from sexual association to parental oversight, and regard for a dependent offspring. We might expect that an arrangement for the perpetuity of the species, which left the eggs after being fertilized and deposited in shallow waters to be perfected by the heats of the ensuing summer (for the young do not appear till the middle of the year following, by which time the parents have returned to the sea and regained the deeps)—we might expect that such an arrangement would hardly exhibit instinct, expanding into care and watchfulness on the part of the male parent. The history of the Lump-sucker (*Cyclopterus lumpus*) however is a remarkable instance of solicitude for the young in the male. The *Cyclopteridæ* are a family of fishes of exceedingly limited locomotive powers. To compensate for the deficiency attending an organization fitted to make but small progress through the water, nature has bestowed upon them a provision by which they attach themselves to other moving objects, so as to transport themselves readily into different and distant feeding-places. They adhere by an apparatus termed the *sucker*, and hold so tenaciously to their place when fixed, that if they die in that position, adhesion continues after death; when the fish however has no motive for maintaining this sullen tenacity, upon a wet finger being applied to the part with which it sucks, it holds on suspended, and on grasping it when free in the water, it instantly attaches itself to the hand. When Fabricius related that the Lump-suckers, in April or May, enter the rocky bays of the Greenland coast for the purpose of spawning; that the female, preceding the male, deposited the roe among the larger *Algæ* in the fissures of the rocks; that, followed by the

* Yarrell quoting Ellis on the Natural History of the Salmon. British Fishes, vol. ii.

male shortly afterwards, she finally left him fructifying the eggs, and adhering to the masses of roe till the eggs were hatched, and that he fought other fishes while watching and guarding the important deposit;—he was doubted by the cautious Lacépède: but his statement has not only been confirmed, but the traits of parental care first made known by him have been considerably extended by the testimony of the fishermen of Berwickshire, in Dr. George Johnston's History of the Fishes of that coast. It appears from their observation, that the male fish not alone covers the spawn and remains covering it until the ova are hatched; but that he receives the young on his back, to which they attach themselves, and that he then sails away loaded with them to deeper and more safe retreats.

I would here mention, as a still more remarkable illustration of the offices performed by male fishes independently, that in the *Syngnathidæ* or Pipe-fish tribe there is a strange and very peculiar organization. The male has a subcaudal pouch closed by two elongated lateral flaps. On separating these flaps in the spawning season, a sac is seen lined with ova, or marked with hemispherical depressions, from which the ova had been removed. This marsupial structure in a fish, though curious, is very intelligible as a peculiarity of the male sex only. Fishes of the Osseous division, we have seen already, are not impregnated by intermittent contact. The female spawns the roe, and the male ejects the milt into the common element, and impregnation results from the effusion of sperm upon the waters. Another œconomy prevails in the Pipe-fish: the female discharges the ova into the caudal pouch of the male, and the eggs there receive impregnation from the proximative sexual organs, where they are retained until the young escape from the capsules in a state of perfect development.

I have exhibited the instinctive actions of oviparous fishes for the purpose of showing the extent to which a provident arrangement of habits necessary for the continuance of the species influences the two sexes under their remarkable œconomy. We shall find the phænomena of viviparous fishes replete with tendencies not less remarkable, though altogether working in another direction. What is wonderful in all these impressions, is the consciousness, which, in our distinction between the rational and the instinctive mind, we should say manifests itself in a belief as to a future, which, not existing as knowledge, or as a fact the result of experience, cannot be an anticipation of consequences. "When we consider, however," as Professor Brown beautifully observes, "who it is that formed us, it would have been wonderful if the belief had not arisen; because in that case, the phænomena of nature, however regularly arranged,

would have been arranged in vain, and that Almighty Being, who, by enabling us to foresee the physical wants that are to arise, has enabled us to provide for them, would have left the creatures for whom He has been so bounteously provident, to perish, *ignorant and irresolute, amid elements that seemed waiting to obey them*, and victims of confusion in the very midst of all the harmonies of the universe*.”

We now proceed to consider the special œconomy of Cartilaginous Fishes.

In the Osseous Fishes the ova escape into the interior of the ovary, and are expelled through an excretory orifice resembling the duct of an ordinary gland. In the Cartilaginous Fishes, and in all other Vertebrata, the germs burst from the exterior of the ovarium, from whence they are generally conveyed as eggs out of the body through intermediate tubes, or hatched internally; the offspring being retained within the body, to be nourished in receptacles provided for the purpose, until they arrive at a considerably advanced state of development.

It is only by degrees that perfect *ovigerous* organs make their appearance in Cartilaginous Fishes. In the Lamprey is found the first appearance of the ovary common to the higher Vertebrata. As there is no excretory duct, naturalists were long at a loss to explain how the ova were expelled; it is now ascertained that as the eggs become mature they break loose from the nidus in which they were generated, and penetrate into the peritoneal cavity, and floating loose in the abdomen escape into the surrounding water in countless numbers, by two orifices placed on each side of the anal opening.

Such is the first step in the provision for ovigerous organs in Cartilaginous Fishes.

In the Sharks and Rays it advances a step further, and the female sexual apparatus receives the important addition of an *oviduct*. In this passage the germ is seized on its escape from the ovarium, and furnished with additional coverings necessary for the security of the foetus.

Some of the Rays and the Sharks are oviparous, and others viviparous. To accommodate the species of each respectively to their different circumstances, a different provision for the foetal life is severally made. The means employed for attaining the oviparous end are simple and beautiful. “About the middle of the oviduct of the female, there is a thick glandular mass, destined to secrete a horny shell in which the yolk and white of the egg become encased.” This coincides with the provision in birds for investing the egg with a calcified covering, in other words, with

* Moral Philosophy, Lecture VI. Physical Inquiry.

an egg-shell ; but the corresponding action in the same organ in the Ray and the Shark goes no further than giving it a covering of horn. "The egg, when thus completed, has somewhat the shape of a pillow-case, with the four corners lengthened out into long tendrils like cords," by which the egg is fastened to seaweeds, or branching corals, in the spots where they are deposited. "A brittle egg-shell would soon be destroyed by the beating of the waves, hence the necessity for the corneous envelope ; and yet, how is the feeble embryo to escape from such a tough and leather-like cradle ?" This obstacle has been overcome by a very efficient expedient : the egg remains permanently open in two places ; or, to carry out our humble simile, as Professor Jones, to whom we are indebted for our details, very instructively observes*, one side of the pillow-case is left unsewn in two places to receive and eject water. The slightest pressure from within separates the valvular lips of the openings, and no sooner has the little Shark extricated itself from its confinement through one of the slits, than the two sides close again so accurately, that the fissure is not at all perceptible. In those Sharks which are viviparous, that is, whose young are hatched in the oviduct prior to their expulsion, this egg-shell is never formed, and the investments of the fœtus remain permanently membranous.

In the Dictionary of Natural History, a work containing the most recent information on the phenomena of organic life, Bosc, the author of the article on *Rays*, represents an intermediate development in which the corneous egg is hatched within the parent, and in which the young fish is expelled at the moment it bursts the covering. There is some little obscurity in his narrative, but it is plain that he not only insists on this intermediate process of utero-gestation, but affirms that it varies in one and the same Ray, and is sometimes a perfect hatching of the egg within the parent, and sometimes a delivery of the fœtus from the uterine cavity, while it is still within the corneous envelope, and to be hatched after extrusion in the surrounding waters. I give his words :—

"On observera sans doute avec surprise que je parle d'œufs, quoique j'aie déjà dit que les Raies étoient vivipares ; mais il est difficile de s'exprimer autrement. Ce ne sont point de véritables œufs, ce sont des matrices oviformes que portent les Raies. Quelque temps après le premier accouplement, il sort de leur ovaire un de ces œufs ou une de ces matrices, qui reste attachée à la mère, et dans laquelle se développe un fœtus jusqu'à l'époque où il est assez fort pour briser les enveloppes qui le tiennent enfermé, nager et se pourvoir de nourriture. Quel-

* Lectures on the Animal Kingdom, by Rymer Jones. Chap. xxvii. sec. 582.

ques auteurs, et Lacépède, suit leur avis, prétendent que ces petits éclosent dans le ventre même de leur mère, comme ceux des Squales; mais il est facile de croire que ces deux manières peuvent avoir lieu dans la même espèce, selon les circonstances. Cet œuf n'est pas plutôt débarrassé de son fœtus, qu'il se sépare de la mère, qu'il s'en présente un autre déjà fécondé avec le premier, ou qu'il se fait un nouvel accouplement qui donne la vie à un nouvel œuf, pourvu d'un blanc ou d'un jaune comme le premier, et ainsi de suite*."

This is talking at something like a hazard respecting the forming of the egg, and the expelling the immature as well as the mature young in the Ray; but Bosc writes with more confidence when treating of the Shark:—"Les diverses espèces de Squales qu'on a observées sont toutes ovovivipares, c'est-à-dire que leurs œufs éclosent dans leur ventre, et successivement; mais il arrive quelquefois, et dans certaines espèces plutôt que dans d'autres, que ces œufs sont expulsés avant le complet accroissement de l'embryon qu'ils contiennent, ce qui n'empêche pas, pour l'ordinaire, les embryons de parvenir à bien†."

In the degree in which the oviparous or viviparous character prevails in Cartilaginous Fishes, the *ground-feeding* habit is constant, or modified by a predilection for the *surface waters*. I shall not detail many instances of this distinction, but confine myself to the similarity of ground-habit of the Small Spotted Dog-fish (*Scyllium canicula*) and the *Scymnus spinosus* of Cuvier, two fishes very wide apart in their place of classification.

The Small Spotted Dog-fish is one of the most common of the Shark tribe on the British shores, particularly along the southern coast. It is constantly stationed near the bottom, where it feeds on small fish and crustacea, taking freely the bait the fishermen use for the capture of shoal feeders, such as soles and plaice. This fish, one of the numerous alliances of the true Shark, commonly known as Dog-fish, and distinguished by the several canine names of Beagle, Hound, Rough Hound, Smooth Hound, and Spotted and Penny Dog, from the habit of following their prey coursing along the bottom, and hunting in companies or packs, brings forth its young enclosed in the horny case we have been describing, terminating at each corner in exceedingly lengthened and convoluted tendrils, for fixing it to the sea-weed

* Bosc speaks with more distinctness respecting this occurrence in ovoviparous Sharks. "On trouve souvent, sur les rivages, de ces œufs rejetés par le flot, et très-entiers. Il est probable que ce sont ceux qui n'ont pas été fécondés, ou qui sont sortis du ventre de leur mère avant le terme prescrit par la nature; car souvent il s'en fait des expulsions irrégulières, comme chez les Raies."—*Diction. d'Hist. natur.*, REQUIN.

† Idem. SQUALE.

when deposited within the reach of the light and heat of the summer sun. Two narrow slits in the capsule, the provision we have referred to already, allow of the admission of aërated water, and of the expulsion of the fluid, when the oxygen has been consumed in sustaining the embryo. For a time the young fish is nourished by the vitellus attached to the body, till it has acquired the power of taking food by the mouth, when the fluid contained in the depending sac being taken within the abdomen, just as the yolk which nourishes the bird within the egg is absorbed at the moment of hatching, the matured Dog-fish escapes by the fissure which opened near where the head of the folded embryo was situated.

There is another interesting provision observed in this class of Cartilaginous Fishes. The ordinary gills are not fitted, at the early stage of life, for the office of respiration. To meet this emergency there are filaments provided at each branchial opening, containing a single minute reflected vessel, in which the blood is submitted to the action of the aërated water. These appendages are only temporary. Some short time after the embryo has been excluded, the filaments are gradually absorbed, and respiration is carried on by the true gills.

In everything connected with the structure of the egg, we see the provision made for hatching it, independent of the parent; the arrangement for supplying it with air from the influent waters, on the one hand; and the appliances for securing it near the surface, within reach of the sun's rays, and within the increased temperature of the shore, on the other. The parent having deposited the egg, already vivified by previous contact, when the male and female hunted together in social packs, it is left to the accident of tides and agitated seas to be matured and hatched in due season.

The *Scymnus spinosus*, or Spinous Shark, is not so well known on the British coast as the Spotted Dog-fish, but it is common enough in the Mediterranean with the *Squalus Nicensis* and the Humantin or *Centrina*. The *Centrina* inhabits muddy bottoms, and the *Nicensis* affects waters of a particular degree of temperature; Risso says of 10 degrees of Reaumur, equal to 53 of Fahrenheit; and that it is caught with particular baits at a thousand metres below the surface. When the *spinosus* is taken on the Cornish coast, it is caught either in trawl-nets or on hooks sunk down for conger-eels, and baited with cuttle-fish. The fishermen describe its action as most powerful in the water. As they are obliged to let him run with a line four times to the bottom before they can hamper him with a sliding noose, let down over the line to his tail, Mr. Yarrell therefore remarks, that as these and the trawl-net *only do their work at the bottom*, we may con-

clude that the *Scymnus spinosus* is a *Ground Shark*; and Dr. Andrew Smith says of the specimens occasionally found at the Cape of Good Hope, that they are described by the fishermen as sluggish and unwieldy in their movements,—seldom observed on the surface, and hooked always when they are fishing in deep water, and when the bait is near the bottom. As the *spinosus* resembles in this respect the *Scyllium* or true *Ground Shark*, Dr. Smith concludes, that if we regard only its internal organization, we should be disposed to consider it as closely allied to that genus*. The *Scyllium* we have already spoken of as oviparous.

Of the Sharks that frequent the surface waters, the *Blue Shark* (*Carcharias glaucus*), the *White Shark* (*C. vulgaris*), and the *Basking Shark* (*Selachus maximus*) are the most conspicuous. They are all three of gigantic size, but two only are voracious, if the word 'voracity' be restricted to a predacious appetency for large animals. Of the *Zygæna* or *Hammer-headed Sharks*, which are said to possess habits very similar to those of the other large *Squalidæ*, sharing with them their characteristic rapacity, and not hesitating to attack man when an opportunity offers, we have not such specific facts respecting their mode of utero-gestation as to say whether their œconomy is so absolutely viviparous as to render a resort to the increased temperature of the surface waters necessary for maturing the fœtus; they are not very frequently seen in the broad ocean. That which the atmosphere does for the eggs of the *Ground Sharks*, anchored as we have described, by their tangled tendrils in shoal waters, the *viviparous Sharks* must effect by constantly haunting such depths only as are heated by the daily sun.

Now, as we know that the lower the animal is in the scale of organization, the nearer it approaches to the plant in comparative feebleness of function in generating heat; and as we know that the heat of worms, insects, crustacea and mollusca, and of fishes and amphibia, is commonly only two or three degrees above that of the medium in which they are immersed, and that, absolutely colder in their circulatory fluids than the higher animals, they are incapable of resisting any considerable changes in the surrounding medium, whether it be from heat to cold or from cold to heat; we necessarily know also that their blood must be absolutely gelid in the polar regions, and cold in the temperate zone in the cold months of the year, and they must be heated to a degree of warmth equal to that of the medium in which they move in the hot season, whether that medium be air or water.

* Dr. Andrew Smith, on the Zoology of South Africa, No. 1.

In all animals whose respiratory organs are so constructed, that the consumption of oxygen, and the consequent evolution of carbonic acid gas is minute in quantity, the production of heat is proportionally small. In the invertebrate classes the respiratory apparatus is feeble in its action, and these animals accordingly generate heat in a minimum degree. In the class of fishes, though the respiratory apparatus is large, and though all the blood of the body circulates through it, yet as only the air contained in the water is brought into contact with the respiratory organ, the temperature of the blood is, as a consequence, regulated by that of the fluid in which the fish swims. In the reptile, though there is a true and proper lung, and though air is respired, yet as only one half of the blood of the body circulates through the comparatively small, imperfectly divided, and simply constructed air-bag, which constitutes its respiratory organ, its temperature does not exceed that of the atmosphere. Hence the contrast exhibited between the temperature of cold-blooded and warm-blooded creatures—between the mammiferous quadruped, whose lung, comparatively large, and composed of innumerable minute and closely-set air-vesicles, presents to the atmosphere an immense extent of surface, and the intermediate air-breathing reptile, whose organs, made up of numerous divisions broken into vesicles and cells, bring the circulatory fluid but imperfectly into contact with the air. In the fish, the lowest order of Vertebrata, the respiratory organs, formed as fringed folds disposed in leaves, and called gills, communicate to the blood increased warmth only by adding the direct action of the sun's rays to the augmented heat of the air in contact with the superficial waters.

As a resort to the warmth of the surface waters is necessary to mature the fœtus in the viviparous Shark, the period of gestation must be increased or diminished just in proportion as facilities are afforded for the access to heat. "*Les femelles,*" says Bosc "*mettent bas leurs petits successivement et à des époques plus ou moins éloignées, selon les espèces, et sans doute selon la chaleur de l'eau au milieu de laquelle elles vivent.*" It is necessary to detail the generative organs of these viviparous fishes to understand the exigencies of this œconomy.

I shall avoid a minute account of the general internal organs of Sharks. It is enough to mention that immediately beneath the heart and liver, which are situated near the mouth of the fish, and between the arches that support the respiratory apparatus, the testes of the male, attached to the region of the spine, communicate with long and tortuous vasa deferentia, which occupy the whole length of the body to the cloaca. Corresponding to the testes of the male are the ovaria of the female, which

occupy the same situation, and are not very different from them in appearance; they have a common oviduct, and end in uterine cavities.

Some of the viviparous Cartilaginous Fishes are fertile only on one side, generally the right. The testes are made up of two portions, but one only has an excretory duct, and one only of the ovaria is fully developed. The tortuous passage of the vas deferens in the male terminates in an orifice common to it and the ureters, which open on a kind of papillary eminence, the intermittent instrument for internal impregnation. The glandular passage from the ovarium is much less developed in viviparous than in oviparous Cartilaginous Fishes. The oviduct is greater in diameter, and the wide dilated uterine cavity, lined with plicæ, is the receptacle in which the young in the viviparous Sharks are retained after the eggs are hatched, until they are fit for exclusion in a state of active maturity.

We have already spoken of the glands in the oviduct of the oviparous Rays and Sharks, as a provision for forming a horny shell in which to encase the egg—an œconomy which coincides with the provision in birds for investing the white and yolk with a calcareous covering. In some species of viviparous Sharks, much more than in others, as in the *Mustelus* of Cuvier, the walls of the uterine portion of the oviduct are so closely attached to the contained ovum, as to remind the anatomist very forcibly of the placental connection that exists in the Mammalia. In these instances, according to Müller, the egg in the oviduct is covered only with a kind of membranous investment or chorion, which is as thin and delicate as the amnion of Mammalia, and without apparent organization. This sacculate membrane is seven or eight times as long as the vitellus, and the regularly plicated walls are embraced by corresponding folds of the lining membrane of the oviduct, so that there is a very intimate adhesion between the two. With this detail we finish our anatomical references to the female, but we have not done with the male.

In the vicinity of the cloacal aperture are two very important members, that distinguish in a remarkable manner the male from the female Shark. They are anal appendages called claspers or holders, and are prominent accessory organs in the Ray and the *Chimæra*, as well as in the Shark. They are an extension of the ventral fins. A cartilage unites them with the genitals, and the pieces that articulate with this cartilage have received names which imply their structural analogy to the hind limbs of quadrupeds. These are the femur, the tibia, the metatarsus, and the os calcis, terminating in a sort of digit. There is a tendon of the great adductor muscle, with cartilaginous pieces, that represent phalanges, moved by some strong muscles on either

side, respectively named the depressor, the elevator, the adductor, and the expansor of the fin. Though the claspers are without muscular apparatus calculated to approximate them, when out-stretched (for they recover their place after expansion only by their own elasticity), they are notwithstanding supposed by some naturalists to perform all the offices of prehension, by the action and pressure of the ventral fins, with which they are conjoined.

Dr. John Davy has examined and compared these members with great minuteness. Though he describes them carefully, he is doubtful of their functional purpose. We shall quote his remarks at length:—

“Before entering on the inferences to be drawn from the relative functions of the different parts constituting the male organs, which are contained within the abdominal cavity, I would wish to offer a few remarks on the external accessory organs, which have commonly been considered auxiliary to the more important internal ones. They are the anal appendages, which are characteristic of the male Cartilaginous Fishes, organs of complicated and curious structure, the use of which at present is far from being understood.

“The Torpedo, the common Ray, and the Thornback, are the only species of Ray which I have yet carefully examined in relation to the organization of these parts. In each species they are very similar, consisting of articulated bones, muscles, mucous ducts, &c., and containing a large and remarkable gland, associated with an elaborate and complicated structure.

“On account of the large size of the Ray, and its large anal appendages and their full development, the gland and its accompaniments are seen in this fish to great advantage. In two specimens of *Raia batis* which I have examined, each about three feet long, the gland was nearly the size of a chestnut of a very elongated oval form, divided on one side, as it were, into two columns by a superficial furrow or depression, in which were two rows of delicate projecting tubuli, the extremities of its excretory ducts.

“The substance of the gland was enveloped in a muscular coat, and this was covered with a vascular tissue. The gland itself was contained in a sac, composed of three coats, an inner fibrous, a middle muscular, and an outer cellular one, and was surrounded with strong muscles, the principal flexor and extensor muscle of the organ.

“Moreover, at the inferior extremity of the sac, just below its outlet, was a distinct cavity formed of muscular walls, and intersected by delicate tendinous fibres. In one instance, when under examination, the fish was still irritable, its muscles acting when stimulated; and then this part pulsed regularly and vigorously.

It contained blood, and I believe it to be an auxiliary heart designed for circulating the blood in the appended organ. A similar structure exists in the same situation in the Thornback and Torpedo.

“In the sac of the gland a cream-like secretion was found, and the same flowed out pretty copiously through the excretory ducts when pressure was applied to the gland. * * * The blood in the pulsatory cavity, from which it is probable that the secretion just mentioned is formed, coagulated like ordinary blood on exposure to the air, but it was more dilute.” * * *

“How the anal appendages are constituted in Sharks, I cannot speak from my own observations, having yet examined these organs only in one instance, that of *Scyllium Edwardii*. From the descriptions of naturalists, it may be inferred that they vary more or less in organization in different genera; that in some, as probably in the genus *Carcharias*, there is a distinct gland, secreting an opaque fluid, similar to that of the Rays I have mentioned; that in others, as in the genus *Scyllium*, the gland is wanting, and its place is supplied by a sac (one for each organ) situated under the common integument of the lower part of the abdomen, communicating by a narrow elongated passage with the appendage, and containing a fluid slightly viscid, probably secreted by follicles situated between the fibrous inner coat and its outer muscular one*.”

Dr. Davy ends these notices with a probable solution of the controversies that have prevailed from the days of Aristotle on the functions of these accessory organs. Aristotle had observed that they were characteristic of males and peculiar to Cartilaginous Fishes. Bloch, the most authoritative name among modern naturalists, held the conclusion that the organs were designed for prehension; but Dr. Davy considers their purposes explained in an ancient remark that they were used as retaining members. The report in the days of Aristotle was that the male and female Shark coupled like dogs: “Sunt qui se vidisse confirmant nonnulla ex cartilagineis aversa modo canum terrestrium co-hærere.” (De Hist. Anima. lib. v. cap. v.)

I venture on making only one observation on the facts detailed by Dr. Davy. The structure of the anal appendages, with the gland here said to perform the function of an auxiliary heart, is found existing in the *Carcharias*, a viviparous, while it is wanting in the *Scyllium*, an oviparous Shark. Though largely developed in the Torpedo, a fish eminently viviparous, the fœtus being without any investing membrane whatever, a character it partakes with the *Squatina*, usually denominated the Shark-ray from its intermediate structure, both rhomboidal and elongated,

* Davy's Researches: Phys. and Anat. vol. ii. chap. xix.

it is remarkable how, in the *Squalidæ*, the general exhibition of the membrane, from its appearance in the early stages of gestation to its disappearance at an advanced period of foetal life, is the gradual exhibition of the advance from the viviparous to the oviparous character. It progresses onward from the *Acanthias*, through the *Galeus* to the *Scyllium*, whose horn-encased eggs are hatched out of the body. Whether the gland of the ventral appendages has the same progressive development, has not been ascertained; but in the season when the male Shark seeks the company of the female, the parietes of its cavity are turgescient with red blood in those species, particularly the *Carcharias*, in which it exists.

Having given a description of the male and female Shark, we shall next proceed to give an account of their habits in deep water, and under the influence of air, light, and heat.

We see that the male, when it has advanced to the condition of a full-grown fish, is subject to a peculiar stimulus of the genital organs. In the more temperate seas, the sexes are excited, as soon as the spring sets in, to seek each other's company. The couplings are frequent, and the female excludes the young at distant intervals of time which coincide with the order in which the ova are successively fecundated. It is said that the same male impregnates twenty females; that there is no constancy in its attachment to a companion; and that chance alone decides its choice of a mate. This remark no doubt is the result of observations made on the Dog-fish, the commonest of the Shark-tribe in the temperate zone; for no such familiarity with *Carcharias* can occur in tropical seas, to enable a person to speak of the habits of numbers. Lacépède, writing of the Requin, the common Shark of the Atlantic, says, that about thirty young ones are produced in a season. On our own shores immature Sharks are prodigiously numerous, though larger fish are comparatively scarce. The canoes seldom bring in less than five in each haul of the sein. There are usually several hauled every morning in each fishing village. On such a coast as Old Harbour or Passage Fort, this would give ten or fifteen thousand in the year. For Kingston Harbour alone, taking every place in its circuit, it would make a destruction of from one hundred to one hundred and fifty thousand annually. They are thinned off by a number of voracious fishes. The Cetacean Dolphin pursues them constantly, and as scarce one in a thousand can reach maturity, the annual produce from a single female is much more likely to be a hundred than only thirty*.

* This calculation seems to give an incredible number, but this is trifling compared with the Bone-dog Shark (*Acanthias vulgaris*), known on most fishing stations in Europe and America. Mr. Couch says, "It is the most

In the Shark the most perfect of the senses appear to be those of smelling and hearing. The power of touch however also exists. It is readily detained by the enticement of tainted meat. When it comes across a vessel in the open ocean, it will follow it for successive days, attracted by the refuse victuals thrown overboard; but let it be a slaver, or some such ship freighted with death and disease, it scents the infectious atmosphere, and dogs the vessel from one coast of the Atlantic to the other. For an acquaintance with the sense of touch in the Shark, we are indebted to the investigations of Jacobson. In the head, and great pectoral fins, he found an organ composed of ten tubes, united in a spheroidal cavity filled with a viscous humour, in which he traced a provision for this sense. The organ, in its offices, is analogous to the mustachio in the cat and other quadrupeds, and its existence explains the custom of the fish to approach and gently try its prey before it makes that retreating movement in which it turns over to seize and devour, mouth upward, that which it may be said to have touched before it tasted*.

Lacépède dilates with graphic eloquence on the character of the Shark. He says, "It is a formidable animal, but size alone is not its attribute; ferocity is combined with an appetite always ready to devour. Impetuous in motion, greedy of blood, and insatiable of prey, it may truly be described as the tiger of the sea. Seeking what it wants without fear of an enemy, and pursuing with more obstinacy, attacking with more rage, and fighting with more fury than any other inhabitant of the deep, it is more dangerous than other tribes which surpass it in power." Frederick Cuvier too speaks of it in the same tone of measured horror. "The French," he says, "name this terrible animal Requin or Requiem, the rest or stillness of death—in allusion to the deadly character of its habits; and when we consider its enormous size and powers, the strength and number of its teeth, the rapidity of its movements, its frequent appearance during all the turmoil and terrors of a tempest, with death and destruction apparent in every blast and every wave, to add to the horror of the scene by the phosphoric light emitted from its huge body near the surface of the troubled waters, with its open mouth and throat ready to swallow entire the despairing sailor, we must admit the abundant of the Sharks, and is sometimes found in incalculable numbers, to the no small annoyance of the fishermen, whose hooks they cut from the lines in rapid succession. I have heard of twenty thousand taken in a sein at one time." These were all young ones.—Yarrell's Brit. Fishes, vol. ii.

Mr. Haughton James, in Old Harbour, procured three large seines, to be joined together, and set for a whole night. The result was a take of two hundred and fifty Sharks, but he caught no other fish.

* Bulletin des Sciences par la Société Philomathique, Année 1813.

propriety of a name expressive of the natural association of ideas, which connects this cruel monster of the deep with death*.”

A reason for all this uncontrollable rapacity is to be found in the description we have given of the nature of the monster in procreation. Afloat, in the broad and fathomless ocean, where almost the only fishes that make the traverse of the deep are the flying *Exocætus*, the Bonito, and the Dorado Dolphin, the Shark, obliged to supply the aliment necessary for the progressive growth of the fœtus, where so little is afforded to gratify the craving appetite, is always voracious, and in its voracity always fierce and daring. Its steady and persevering pursuit in the wake of a vessel—its exhibition of unwearied power and energy, manifested in such fastness of swimming, that it plays round the swiftest ship—its self-command while watching for prey—its rapid pursuit of an object—its falling behind to snatch whatever may be thrown to it—its apparent indifference whether it proceed onward or delay its course, are all only so many exhibitions of appetite, regulated by the necessity of keeping to the surface and in sunny waters, to carry onward the process of gestation, till the period when it must regain the shores to deposit the young ones ready to be extruded.

It is usually asserted that such is the frightful rapacity of this animal, that everything which comes within its reach, possessing life, is snatched up and devoured. Those who have had constant opportunities of observing the Shark in harbours of deep and shoal waters, and where the living tenants of the sea are numerous and diversified, know that at the times when the force of instinct makes him a surface-feeder, objects endowed with life, and with an organization similar to his own, that is with the fish-nature, are perfectly safe, and confiding in their association with him. For other creatures, and especially for man, he is however supposed to have a peculiar enmity, and when once human flesh has been tasted, to haunt unceasingly the place where he expects the recurrence of similar prey. The fact is, that at the surface the Shark is so constructed that he cannot pursue and seize at once a creature whose command of the element equals his own. The swimming fish is safe at these times: but let it be hooked, or reluctantly dragged, and the Shark immediately seizes and swallows it†. At the bottom of

* Griffith's Cuvier.

† The injury the Blue Shark, when it appears in the British Channel, inflicts on the fishermen, is great. It hovers about the boats, and pursues the fish as they are drawn up. "To the Pilchard drift-net," says Mr. Couch, "this Shark is a still more dangerous enemy, and it is common for him to pass in succession along the whole length of the net, cutting out, as with shears, the fish and the net that holds them, and swallowing both together."—Yarrell's *Brit. Fishes*, vol. ii.

the sea, where he quarters over the shoal, the circumstances are different, and there he chases and pursues his prey, and takes it with ease, for he can press it to the earth, stop its progress, and snap it up. A man floundering in the water is a very different thing from a fish swimming. The very attention he draws to himself by being something strange, proves fatal to him. It is like the fish struggling on the hook. The condition of both is unusual, and both, in attracting notice, attract the rapacity, and excite the appetite of the Shark.

I would just briefly advert to the similar predilection for the sunny surface of the ocean, without the predaceous instinct, which occurs in the "Basking Shark," or "Sun Fish,"—the *Selachus maximus*. It is the very largest of the fish tribe,—usually thirty feet in length, and only exceeded in size by some of the Cetacea; but it is at the same time as gentle as it is gigantic. It has no ferocity of disposition; it allows itself to be approached and handled. It moves about in small squads of seven or eight, and seldom otherwise than in pairs. Its mouth is situated at the apex of the snout, and the teeth are small. Its food is *Medusæ*, and other molluscous products. It usually swims deliberately, and so near to the surface, that the upper fin is above the water; but it sometimes gambols among the waves, and leaps into the air, so intensely does it pursue its purpose of enjoying the light and heat. It continues in the British seas till the latter end of July, when it disappears. The Greenland Shark, the *Squalus borealis* of Scoresby, has similar habits, with a similar gentleness of disposition. Our Devil-fish (*Raia Banksiana*) is another instance of the same requirement of air and sunshine, on account of viviparous maternity. The immense disk of this fish, fifteen and twenty feet in diameter, floating almost motionless on the water in the breeding season, is a sufficiently familiar object. In Lieutenant Lamont's spirited account of the capture of one of these monster Rays in Kingston Harbour, in the year 1824*, we have a reason for the fish being descried floating as usual near the surface, and moving slowly about. The animal was a female, and the young one taken from it, some twenty pounds in weight, had acquired its perfect foetal growth, and was probably the last of the monster progeny of the season.

I conclude these suggestions for an intelligible history of the Shark, by observing, in conclusion, that whatever may be the intensity of summer heat in temperate zones, the *Carcharias*, or the species most distinctively known as the Shark, limits its

* Edinburgh Philos. Journal, vol. xi.—"Notice of the Colossal Ray, &c., at Port-Royal, Jamaica."

oceanic movements to regions under the influence of direct, and not of diffused, solar heat; that is, to climates where the sky is clear and the sun always shines, or where it is only transiently obscured by clouds. The White Shark sometimes pays a summer visit to the shores of Europe, confining however its course to where the Gulf-stream extends a warming influence into Northern seas; but its appropriate place is in and about the tropics, and within the torrid zone; and there its sexual and viviparous instincts, and its presence *at all times*, and *in all places*, swimming in the uppermost waters, make it pre-eminently *the terror of the deep*. Though some venomous Sea Serpents imbued with special dangers the shores of Oriental seas*, and though fishes are of all animals the most voracious and insatiable, yet as far as man is concerned, if there were no Sharks, there would be no living creature in the Ocean to excite his dread or apprehension. Save and except this tribe, all other tenants of the deep, whatever their magnitude or however hostile to one another, are helpless and indefensible against the power of man.

XXXV.—*Zoological Notes and Observations made on board H.M.S. Rattlesnake during the years 1846–50.* By THOMAS H. HUXLEY, Assistant Surgeon R.N.

[With a Plate.]

II. *On the Anatomy of the genus Tethya.*

THE animal which forms the subject of the present communication was found attached to rocks and stones, close to low water mark, upon the shores (skirting one of the smaller bays of Sydney harbour) of the beautiful grounds of my friend Mr. W. S. MacLeay†.

MM. Milne-Edwards and Audouin (Ann. d. Sc. Nat. 1828, tom. xv.) and Dr. Johnston (British Sponges and Lithophytes)

* In the Transactions of the Zoological Society for 1838 are published Dr. Cantor's observations on Marine Serpents, a group of Ophidians to which but little attention has been hitherto given from the danger of examining them, and from their distribution being entirely tropical. He establishes the circumstance of *all the species being highly venomous*, and relates the death of an officer in Her Majesty's service, which occurred near about the time of his writing, within an hour or two after the bite of a Serpent caught at sea. Dr. Cantor relates also numerous experiments of his own, in which fowls, fish, and other animals, invariably died within a few minutes after the bite had been inflicted.

† It is not necessary for me to speak of Mr. MacLeay's singular acquirements and acumen; but I cannot refrain from taking this opportunity of expressing my deep sense of the benefit I have derived from his advice and assistance—always most readily offered.





are, so far as I am aware, the only authors who give any detailed account of the genus *Tethya*.

Of the two species described by the latter, *T. Lyncurium* approaches nearest to the present species; the only difference being, that while the former is yellowish white, the latter is deep red, and that the stellate bodies, scanty in the former, are very numerous in the latter.

However, pale specimens were frequent among the deep red ones—without any other apparent difference—and the presence of more or fewer stellate bodies is a mere question of degree.

MM. Edwards and Audouin describe currents traversing the “oscles” of the *Tethya* similar to those of a sponge. I did not observe any currents, but I do not doubt their existence.

Dr. Johnston says (*op. cit.* p. 82), “The propagation of *Tethea* is by means of sporules or gemmules generated within the sarcoid matter. The latter resemble the parent sponge in miniature, but they have no distinct rind or nucleus, being composed of simple spicula woven together by albuminous matter.”

I did not observe such “sporules or gemmules” in any of the specimens I examined, but it can hardly be doubted that these bodies are merely further developments of the “ova” which I observed; and as I found spermatozoa, it will follow, that the *Tethyæ* are reproduced by a process of true sexual generation.

It would be most interesting to ascertain whether the “gemmules” of sponge take their origin in a similar way, and whether true spermatozoa are developed here also.

The specimens of *Tethyæ* observed presented several prominent tubercles upon their surface, perforated by irregular apertures, from which a liquid exuded when the animal was taken out of the water.

When there was only one or two of these tubercles, the external resemblance to some forms of *Cynthia* was very great.

On cutting across one of these bodies, it was seen to be solid, and composed of three distinct substances; viz. a central whitish spherical mass, a deep red cortical substance, and between these two, forming the largest part of the body, a yellowish red intermediate substance, sharply separated from both the central and cortical substances.

The two latter were united by radii of a silvery whitish colour, which ran through the intermediate yellow mass, and became lost in the cortical portion.

Small canals took their rise at the apertures already mentioned, and penetrating the cortical substance, ramified irregularly through the intermediate substance, reaching as far as, but not penetrating, the central substance. They appeared to be lined by a very delicate smooth membrane.

The general structure of the central, cortical, and intermediate portions agreed pretty closely with the description already given by Johnston.

1. *The central portion.*—This consists of a granular mass interpenetrated in every direction by short, cylindrical, transparent rods which form a sort of network. At the margins of the central portion, however, the rods become gathered into bundles, and they are longer and lie parallel to one another. In this form they enter the intermediate substance and form the radii before mentioned. When they reach the cortical substance, the majority of the rods diverge and become spread out; a few however remain as a bundle, and reach the edge, or even project a little beyond it.

Besides the bundles, a great number of long, solitary rods traverse the intermediate substance radially.

The rods are cylindrical, and about $\frac{1}{2500}$ th of an inch in diameter. They are all perforated by a very narrow central canal, so as to appear like minute thermometer-tubes.

2. *The cortical substance* consists of two zones, an inner and an outer, which pass insensibly into one another at the line of contact.

The inner is composed of a mass of thick bundles of a fibrous tissue, so interwoven that a slice presents every possible section of them. The rods penetrate this zone, and a very few of the stellate bodies are found scattered through it.

The outer zone is dense, granular, and otherwise apparently structureless. Scattered through it are great numbers of crystalline spheres beset with short conical spikes.

3. *The intermediate substance.*—This consists of a granular substance in which ova and stellate crystalline bodies are imbedded.

The ova are of various sizes. The largest are oval and about $\frac{1}{330}$ th of an inch in long diameter. They have a very distinct vitellary membrane, which contains an opaque coarsely granular yolk. A clear circular space about $\frac{1}{1600}$ th of an inch in diameter, marking the position of the germinal vesicle, is seen in the centre of each ovum, and within this a vesicular germinal spot $\frac{1}{5000}$ th of an inch in diameter is sometimes visible, although with some difficulty, in consequence of the opacity of the yolk.

The stellate bodies are about $\frac{1}{1200}$ th of an inch in diameter: they appear to be of a similar nature to those described in the cortical substance, but they are smaller; and while the radii are proportionally long, there is hardly any centre beyond that formed by their meeting.

The granular uniting substance is composed entirely of small circular cells about $\frac{1}{3500}$ th of an inch in diameter, and of sper-

matozoa in every stage of development from those cells. The cell throws out a long filament which becomes the tail of the spermatozoon, and becoming longer and pointed forms, itself, the head.

The perfect spermatozoa have long, pointed, somewhat triangular heads about $\frac{1}{3000}$ th of an inch in diameter, with truncated bases, from which a very long filiform tail proceeds.

It is remarkable that the ova are in no way separated from the spermatozoa, but lie imbedded in the spermatie mass like eggs packed in sand.

EXPLANATION OF PLATE XIV.

- Fig. 4. Section of *Tethya*; natural size: *a*, cortical substance; *b*, intermediate substance; *c*, central substance; *d*, canals.
- Fig. 5. Portion of central substance (*a*) with two of the radii (*b*).
- Fig. 6. Segment of the cortical and intermediate substances: *a*, cortical substance; *b*, intermediate substance; *c*, canals cut across; *d*, radii.
- Fig. 7. A portion of the cortical substance: *a*, inner fibrous portion; *b*, radial bundle of rods; *c*, stellate bodies; *d*, marginal homogeneous portion.
- Fig. 8. A portion of the intermediate substance: *a*, ova; *b*, granular substance consisting of spermatozoa and cells; *c*, stellate bodies.
- Fig. 9. Spermatozoa in various stages of development.
- Fig. 10. Longitudinal and transverse view of rods, showing the central canal, *a*.

Note—"Upon the Auditory Organ in Crustacea."

MM. Frey and Leuckart* (for access to whose work I am indebted to Prof. E. Forbes since writing on this subject) express a doubt as to the correctness of any of the determinations of the auditory organ in Crustacea hitherto given. They describe a very singular organ existing in the caudal appendages of *Mysis flexuosa*, consisting of an oval flattened sac or cavity $\frac{1}{3}$ rd of a line in diameter, and containing an otolithe $\frac{1}{4}$ — $\frac{1}{6}$ th of a line in diameter. The otolithe is discoidal, flat on the one side, umbilicated on the other, and marked with concentric lines. About two-thirds of the circumference of the otolithe are occupied by the bases of a series of glassy, stiff hairs which are inserted into the otolithe and project from it.

The otolithe is apparently composed of chitine and carbonate of lime.

No nerve was traced to this sac, but the caudal ganglion is of large size.

No similar organ exists in *Palæmon*, *Crangon*, or *Squilla*, but the authors compare it to the organ noticed by Souleyet in *Lu-*

* Beiträge zur Kenntniss Wirbelloser Thiere.

cifer; and notwithstanding the extraordinary position of the organ, it must be allowed that its structure goes far to support this view. It must be remembered that in some of the lower Annelida the auditory organs are situated, not in the head, but one or two rings behind it, and in *Polyophthalmus* every ring has its pair of eyes.—See Quatrefages, Ann. d. Sc. Nat. 1850.

XXXVI.—On a supposed new species of *Rubus*.

By FENTON J. A. HORT, B.A.*

AT a time when descriptions of Brambles, published by botanists whose qualifications have been fully tested and acknowledged in other fields, are received with incredulity and even derision, those who possess no such advantages have little right to expect a gentler and more charitable treatment. If therefore it were allowable to be guided wholly by personal considerations, I should not venture to add another species to our already crowded list: but cowardice and mock-modesty are as unjustifiable in science as in anything else. It is at all times unfair to assail the worth of a supposed new species and escape the labour of honest investigation by recklessly imputing vanity to the describer: but in the case of Brambles such imputations are not less absurd; for the possible attention of the isolated few who now study this genus can surely have but poor attractions for a vain mind, when accompanied by the certain suspicion of the great mass of botanists, good as well as bad: and on the other hand, there is an obvious restraint in that fear of future opprobrium from the chance of erroneous conclusions and consequent ultimate rejection, which must always haunt the study of difficult groups of plants. Until then a time arrive, when the worshippers of observation and sober induction shall cease to assume *à priori* the worthlessness of the careful observations of others, conducted with a view to trace the manifold laws of variation through the living forms of Nature under the influence of the most different circumstances, we must be content to go our own way quietly, asking no more than bare toleration from those who affect to try our conclusions by a few dry fragments of an isolated form or two out of each species. To students of Brambles therefore, and to them alone, the following description is offered:—

Rubus imbricatus; caule decurvato ramosissimo angulato sulcato glabro, aculeis parvis validis declinatis, foliis quinatis subtus pallidioribus convexis, foliolis imbricatis subconvexis subundulatis cuspidatis, infimis breviter pedicellatis terminali subrotundo cordato

* Read before the Botanical Society of Edinburgh, April 10, 1851.

longius pedicellato, paniculæ angustæ inferne foliosæ ramis longis racemosis ascendentibus, sepalis abrupte cuspidatis a fructu globoso prorsus reflexis, stylis sulphureo-virescentibus, toro subgloboso subsessili.

Stem soon decurved horizontally or more rarely arching, almost invariably throwing out numerous slender flagelliform shoots, rooting, angular, slightly furrowed, purplish red, glabrous or nearly so, the axillary shoots with a few hairs. Prickles purplish red, glabrous, enlarged and compressed at the base, slender but very strong, declining and rather small, on the axillary shoots slightly deflexed and longer, mostly confined to the angles of the stem. Leaves quinate, convex, slightly wavy over the whole surface, rather opaque and nearly glabrous above, paler and sparingly pilose beneath: leaflets convex; their margins doubly but not deeply dentate-serrate-apiculate; lower pair oblong, cuspidate, shortly stalked, overlapping the obovate cuspidate intermediate pair, which themselves overlap the roundish or roundish-obovate cordate leaflet, which has rather a long stalk: midribs and petioles with strong decurved prickles; general petioles flat above, partial channelled; all hairy. Stipules linear, slightly hairy.

Flowering shoot very variable in length, surrounded at its base by brown scales clothed with white hairs, purplish red, with a few patent hairs. Prickles small, strong, slightly deflexed, glabrous or slightly hairy. Upper leaves simple; intermediate usually quinate, subglabrous above, paler and slightly pilose beneath; leaflets cordate-ovate or -obovate: petioles and midribs with very slender slightly deflexed prickles. Stipules linear. Panicle rather narrow, compound, slightly hairy below, very hairy, but not tomentose above; hairs white: prickles few, short, slender, deflexed: branches long, racemose, the four or five lowest axillary, distant; all ascending or nearly erect. Bracts trifid with narrow segments or simple and broad. Flowers small. Sepals ovate, abruptly cuspidate with an usually rather short linear or almost filiform point, clothed with ashy tomentum within and without, completely reflexed from the fruit. Petals elliptical, concave, clawed, converging, white. Styles greenish yellow below. Primordial fruit rather small, subglobose, glossy black: torus subsessile, ellipsoidal or nearly globose.

In many places, mostly on sloping banks, for three or four miles on both sides of the Wye below Monmouth, in both Monmouthshire and Gloucestershire. June and July.

The position of this plant is easily determined. It belongs to the group possessing subglabrous eglandular rooting barren stems and stout leathery leaves. It is closely allied to *R. affinis*, *R. cordifolius*, and *R. incurvatus*. On a hasty inspection it might probably be referred to *R. corylifolius*, but there is in reality a

wide gap between them, the latter species being rightly, I think, referred by Mr. Bloxam to his group of "*Rubi Cæsii*," possessing subterete barren stems, with often a glaucous bloom and sometimes a few small true setæ, somewhat subulate prickles, and many of the drupes in each fruit abortive. Again, it is often difficult to distinguish dried specimens of *R. imbricatus* and the three species above mentioned, although no one accustomed to look at Brambles could confound them when growing. The present plant may be known from the larger and more typical forms of the protean *R. affinis* by the structure of the branches of the panicle, which are racemose and not cymose, and their much slighter degree of divarication from the rachis, and by the sepals being abruptly cuspidate and not gradually acuminate; (to the less developed forms, which apparently constitute Mr. Lees's *R. lentiginosus*, having suberect stems and nearly simple panicles, and growing chiefly in heathy places, it bears no resemblance :) from *R. cordifolius** by the laxer and less pyramidal panicle, the absence of tomentum on the under side of the leaves, and the agreeable flavour, globular shape and glossy lustre of the fruit, which in the latter species are very peculiar, when able to ripen freely, being remarkably large, oblong, with somewhat flattened drupes, dull and burnished rather than glossy, and very insipid; (it should be observed that all these three species grow in the same neighbourhood): from *R. incurvatus* by the leaves being hairy, but not clothed with a firm velvet beneath, and by the yellowish green not flesh-coloured styles. The numerous secondary shoots of the barren stem, the imbricated and convex leaves and leaflets, and the absence of tomentum on the upper part of the panicle, sufficiently separate it from all three species.

The extraordinary tendency of *R. carpiniifolius* and *R. macrophyllus* to assume the most unlike forms renders it possible that they may be confused with *R. imbricatus* as with several other species. In this case single dried specimens are almost useless, but an intelligent examination of numerous bushes in the same district will commonly detect the aberrancy of type: both are sure to throw out occasionally superfluous small prickles (or even true aciculi) and a few setæ or sessile purple glands from their barren stems, and a tendency to puffiness and flac-

* Perhaps I may be allowed to take this opportunity of expressing my surprise at Dr. Bell Salter's union of *R. nitidus* of English authors with this species. I carefully watched the two plants last summer growing freely internixed in the same hedge, and in their sportive variations deceiving the eye for a moment, but for a moment only. When autumn came, the fruits of *R. cordifolius* were invariably perfected those of *R. nitidus* for the most part abortive, throughout my neighbourhood. Facts like these appear to me valuable collateral proofs of the distinctness of species. Thus I found last year *Luzula Forsteri* always fruitful, *L. pilosa* usually the reverse.

idity is perceptible in even the thicker leaves: *R. carpinifolius* is moreover apt to have its terminal leaflets wholly or partially subdivided, so as to produce septenate leaves. These characteristics are absent from the group "Nitidi," to which *R. imbricatus* belongs.

I may add that it flowers early, almost contemporaneously with *R. nemorosus*, and nearly a month before its true allies.

Trinity College, Cambridge, March 25, 1851.

XXXVII.—*Characters of Tomichia**, a new palustrine testaceous Mollusk from Southern Africa, heretofore referred to the genus *Truncatella*. By W. H. BENSON, Esq.

IN the December number of the 'Zeitschrift für Malakozologie' of 1846 there appeared an interesting Monographic Essay on the genus *Truncatella* of Risso by Dr. Louis Pfeiffer. In that article the author complained, with reason, of the difficulty of reconciling the contradictory statements of observers regarding the animal inhabiting the shells referred to the genus, with reference to the situation of the eyes, to its mode of life, and residence; without certainty on which points no positive place in the system could be assigned to the group.

On a perusal of the various statements there collected, it does not appear to be an unnatural conclusion if we suppose that some of the animals brought together on account of a general resemblance in their testaceous covering, belong, in reality, to different genera; and that, while each of the observers may have been in the right, the system has been in fault which insisted on clubbing together dissimilar beings. In regard to their habits, an amphibious mode of life, similar to that of *Assiminia*, Leach, will explain most of the statements put forth, with the exception of a single case in which two or three living examples of *Truncatella* were stated to have been found in moss on the slopes of hills near Triest. The presence or absence of salt in the water which they occasionally frequent appears to be immaterial to several amphibious mollusks, such as *Assiminia* and *Nematula*, nobis. I have observed the same indifference in some of the *Neritinae* of Indian estuaries.

In the paper in question fifteen species of *Truncatella* are recorded, and the diagnoses of fourteen are given at length. Subsequently, in the July number of the 'Zeitschrift' for 1847, *Truncatella* is referred, with a mark of doubt, to the *Cyclostomacea*, and the following characters are assigned to it by Dr. Pfeiffer.

* From *τομικὸς*, truncate.

? *Truncatella*, Risso.

“Operculum membranaceum, obsolete spiratum. Testa (juniorum turrilo-subulata) adulta cylindrica, truncata. Apertura oblongo-ovalis. Peristoma simplex vel duplicatum, marginibus distantibus, callo junctis.”

T. ventricosa, the 14th species, is there included with a (?) prefixed. This form, the shell of which, examined apart from the animal, exhibited to Dr. Pfeiffer sufficient ground for ascribing it with hesitation to Risso's genus, I now propose to separate from that group on account of the peculiar characters observed in the living animal. Having, immediately on my first discovery of live examples, in October 1846, separated the genus, in my journal, under the designation here adopted, with regard solely to the characters of the inhabiting mollusk, it is satisfactory to be able thus to confirm the suspicions suggested to a learned conchologist, and skilful describer, by the mere inspection of the testaceous covering.

Tomichia, nobis, nov. gen.

Testa perforata, spira elongata; anfractibus subsenis; apice plerumque truncato. Apertura oblique elliptico-ovali, verticali; peristomate duplicato vel triplicato, continuo, margine sinistro expanso, reflexiusculo, leviter emarginato; epidermide olivacea.

Animal.

Proboscis elongata, transverse corrugata, ad apicem emarginata. Tentacula duo mediocria, filiformia, ad apicem obtusa; oculis postice, prope basin superiorem tentaculorum, insuper tubercula, positus. Pes brevis, ovatus, antice ad latera utrinque lobatus, postice lobo dorsali, operculum gerente, præditus. Operculum * corneum, subspirale, anfractibus velocissime crescentibus, nucleo sub-basali, ad latus sinistrum posito.

* The operculum is very similar in structure to that of the Gangetic *Assiminia* (*Turbo*) *Francesiæ*, Gray. Several of the continental conchologists appear to be unaware of the peculiar characters of *Assiminia*, as given, in 1834, by the Rev. Mr. Berkeley in page 429, from the English; and by myself in page 463 of the 5th vol. 'Zoological Journal,' from the Indian species. Dr. Philippi (Abbild. t. 1. f. 15) refers *A. Francesiæ*, Gray, to *Paludina*, remarking (tab. 2. f. 6) that the Brazilian *P. atomaria* may possibly be an *Assiminia*; but that he did not know any distinguishing character between the genera. Now the presence of a subspirale, in contradistinction to a concentrically laminar operculum, independently of the position of the eyes at the summits of the two tentacula, alone suffices to prevent the fusion of the two genera; characters for separation are not, however, wanting in the shell, if regard be had to the invariably discontinuous peristome, to the more regularly conical spire with flattened whorls, and to the acutely pointed apex, which, even in the absence of the operculum and animal, permit of the recognition of a specimen of *Assiminia*.

Dr. Pfeiffer's description of the species is as follows:—

- “*T. ventricosa*, Sow. Testa rimata, adulta truncata, cylindraceo-turrita, solida, lævigata, cornea; anfr. $4\frac{1}{2}$ convexiusculi, sensim accrescentes, ultimus ventricosus, antice plurivaricosus; apertura verticalis, elliptico-ovalis; perist. subduplicatum, margine externo recto, interno vix prominente, continuo, ad columellam reflexiusculo. Operc. tenue, fusco-nigricans.
- “Long. 7, diam. anfr. penult. 5 mill. Apertura $2\frac{2}{3}$ mill. longa, medio $1\frac{3}{4}$ lata.
- “Jun. *T. turrita*, apice acuminata ($6\frac{1}{2}$ anfr.) 5 mill. long.
- “*Truncatella ventricosa*, Sow. MSS.; Reeve, Conch. Syst. ii. t. 182. f. 2.
- “*Truncatella capensis*, Krauss in litt.
- “Habitat in Promontorio Bonæ Spei, Zwellendam (Krauss).”

To the above may be added, *Anfractus penultimus sæpe mal-leatus, ultimus fere rubens*; apertura intus nitida, fuscata. I have full-grown specimens possessing six whorls. On referring to Dr. Krauss's ‘Sudafrikanischen Mollusken,’ it appears that he gathered his specimens in marshes on the Cape Flats, as well as in Zoetendal Valley, but it does not appear that he examined and took any note of the animal. I also captured specimens, chiefly in the Cape Flats, in a marsh near Baszaarms Kraal, to the right of the main road from Wynberg to Muysenberg, and beyond the 12th milestone from Cape Town. There the water is ordinarily fresh; although I understood that in severe southerly gales, when the “vlei,” or mere, near Muysenberg is invaded by the sea from the head of False Bay, the water has been known to flow over the road; thus, for a time, rendering the marsh in question brackish. However this may be, I captured a single live specimen at Michelville (or Holloway's Halfway House), in a freshwater ditch communicating with the little wayward stream called Kuel, which discharges itself, probably through the Erste Rivier, into False Bay, after a course of at least sixteen miles. In this ditch it was accompanied by living examples of a new species of *Physa*. At Baszaarm's Kraal the adult specimens, for the most part, crept about on the moist earth by the edge of the water; but the younger individuals were immersed, in company with a small soleniform *Cypris*. I observed that, aided by the lightness of their shells, the young *Tomichia* were enabled to swim resupinate at the surface; a habit common to the fluviatile Pulmonifera both operculated and inoperculate, and which is equally shared by the *Succinea** of which I narrated the voluntary resort to this act, in page 255 of the 6th volume of

* Dr. Pfeiffer, to whom I forwarded a specimen of this *Succinea*, considers it a new and distinct species, to which he has assigned the name of *S. Delalandii*, Pfr.

the 'Annals.' Placed in a glass of fresh water, I found the adult *Tomichia* creep indifferently above or under the liquid.

The new form differs from *Truncatella*, as described and figured by Lowe in the 'Zool. Journal,' in the tentacula, eyes, and snout; from *Melania* and *Assiminia* in the position of the eyes, and of the operculum. In the true *Melania* the aperture has not a continuous peristome; although the little Melaniadous genus *Tricula*, from the mountain lakes of the Himalaya, which I described in M'Clelland's 'Calcutta Journal of Natural History,' has an entire aperture like that of *Tomichia*.

Aix la Chapelle, March 1851.

XXXVIII.—On the *Chemnitzia*. By WILLIAM CLARK, Esq.

To the Editors of the *Annals of Natural History*.

GENTLEMEN,

Norfolk Crescent, Bath, April 5, 1851.

I REQUEST the insertion of some observations in continuation of those on the *Chemnitzia opalina* and *C. diaphana* which appeared in the April 'Annals' for 1851. In the December 'Annals' for 1850 I submitted to the attention of malacologists many unpublished descriptions of the animals of the *Chemnitzia*, but from the length of the memoir, I purposely omitted for another opportunity, various important considerations, which, with the rectifications and additions now presented, the result of a recent investigation, will I think be acceptable to your malacological and conchological readers, as both are frequently at a loss how to determine the species of this, by far the most difficult of the British gasteropodan genera, in consequence of the great number of spurious objects that have been deposited therein, and from the obscurity in which it is still in some measure involved; notwithstanding the illuminations it has received at the hands of the learned authors of the 'British Mollusca,' which have far exceeded every thing that has been made known by their predecessors. If apocryphal matters have been pressed on their attention by ardent communicators, these gentlemen have always received them with caution, and a courteous intimation that further information is required.

The errors of the Malacology are slight, and inseparable from the subject, in consequence of the rapid progress of science bringing continually new facts to our knowledge; we must therefore be thankful for the present great amount of new and valuable information. The expurgation from our list of the spurious species is a feature of the highest moment, for if the path had not been cleared, nothing but doubt and confusion

would have accompanied our march. The descriptions and figures of the animals and shells are often perfection, and leave nothing to be desired; I use no others, and find my doubts on these points always resolved; they have superseded every other reference, and are in themselves a British conchological library. The notes on each species have been thought too long; I dissent from this opinion, and think that in these difficult and often diminutive objects, identity, particularly to the younger students, cannot be communicated unless the delicate and minute differential features are pointed out. I should regret to see a greater conciseness introduced.

Whilst I am on this subject, I will venture to allude to a recent publication which I have just read—I mean the ‘Introduction to Conchology,’ by George Johnston, M.D., who has not only given his own extended experiences, but referred us to the best of every thing that has been written on the subject of his book, affording a mass of information and malacological lore that has never been surpassed, and I doubt much, if in the same space it has ever been equalled; the notes are truly valuable. I should fail in my duty to this branch of science if I did not confidently recommend to my brethren, my friends, the young student as well as the experienced naturalist, not to delay the perusal of this excellent work. I may truly say to the votaries of this lovely science, the elegant resource of leisure at home, and of the sea-side visit, that if they neglect the aids of such books as I have alluded to, they will be left far behind by their competitors who have the wisdom not to set out without these *vade-mecums*.

I propose to endeavour to dispel the clouds which envelope this beautiful and interesting group, by a variety, I hope, of useful preliminary observations, by many additions to my former memoir on this subject, by giving a catalogue of every British *Chemnitzia*, sweeping away the phantoms of the genus, and thus establishing the means of identifying every genuine species, whereby the collector will be enabled to complete his list without fretting himself by endeavouring to obtain many recorded objects, which may as well be looked for as the philosopher’s stone or the perpetual motion. Without further preface, I will make one or two general remarks, and then enter on some particular Chemnitzian incidents, concluding with a series of short explanatory notes on every British species, whether genuine or apocryphal, that has found its way into our various annals. This review of the tribe, which I call *Chemnitzia*, and others of the moderns term partly *Chemnitzia* and partly *Odostomia*, will I think interest and be singularly useful both to the malacologist and conchologist. In my *exposé* I shall show that this group, from its comparative difficulty and obscurity, has long been the arena

and one of the great laboratories of the species-manufacturers, who have turned them out with a liberal hand. This has in some measure been occasioned by the singular variations exhibited by the individuals of almost every species of the genus.

Before I proceed, it may perhaps be desirable, for easy reference, at once to mention the principal essential generic characters of *Chemnitzia*, which, in my first memoir, I left to be collected from the numerous descriptions.

Animal spiral, with a generally short but variably shaped foot, labiated anteriorly, always furnished with a suboval corneous or substestaceous operculum, of a character between that of the *Holostomata* and *Muricidæ*, that is, one of transition. The tentacula are short, triangular, sometimes with their edges folded on the principal stamens, conjunctive at their bases, forming in many species a small awning or veil, under which a long proboscidal muzzle? is emitted, which may be termed an involute and evolute *contractile* proboscis? The eyes are immersed at the centre of the tentacular bases or at the internal angles, but have never an external position, though occasionally raised on minute circular eminences.

Mr. Alder tells us the head of *Chemnitzia* is very short, without a muzzle, and that the mouth has no jaws, but is furnished with a long retractile proboscis, as in the zoophagous gastropods. We will now see what M. Philippi says on this head, in the 'Enum. Moll. Siciliæ,' 2nd part, p. 136, sub fide D'Orbigny: "Animal illi Eulimarum simillimum sed *probosciferum*; sic describitur: buccæ labiales coalitæ, infra tentacula exsertæ, proboscidem *abbreviatam*, depressam, profunde emarginatam, seu bilobam referentes." For comparison, I give an extract of what M. Philippi says of *Eulima*:—"Caput? vix in proboscidem productum," 2nd vol. p. 134. Moll. Siciliæ.

Let us now examine M. Lovén's characters of his genus *Turbonilla*, our *Chemnitzia*:—"Proboscis sub basi vibraculorum recondenda, involvenda; evoluta cervicem latitudine vix cedens." Whether these characters support those of M. Philippi, depends on how the above terms are to be construed; they are peculiar, and accompanied by incidents not alluded to in any other of M. Lovén's true proboscidal animals, with respect to which, he simply, *in every instance*, uses the words "proboscis recondenda," which undoubtedly signifies a strict *retractile* proboscis; but in reference to the genus *Turbonilla* he qualifies that term and says, it is rolled on itself and *concealed under the bases of the tentacula, and when unrolled it scarcely yields to the neck in width*. The last observation is very important, because if the proboscis is a retractile one, it would be physically impossible to satisfy M. Lovén's phrase. If this is the true construction of his characters,

it supports those of M. D'Orbigny; and it would show that the Chemnitzian animal has not a long retractile proboscis, as Mr. Alder states, and in which point, if it be so, *Chemnitzia* would appear to differ from *Eulima*, which has a retractile proboscis. The matter at present is involved in some doubt; my own impression accords with M. Philippi, and I believe with M. Lovén, but I fully expect this summer to clear up errors, and throw much light on these points.

When I stated in the last paper in the April 'Annals,' 1851, that all the *Chemnitzia* had a tantamount process to those assigned by Mr. Alder as one of the distinguishing characters of his genus *Jeffreysia*, I thought my discovery a new one; but I find by Dr. Johnston's excellent 'Introduction to Conchology,' from a paper inserted therein, written in 1835 by John Edward Gray, Esq., that that gentleman is, I believe, the original discoverer of the flap or process in the opercula of the *Pyramidellidæ*. I now present a most important quotation from that portion of the paper relating to the opercula (p. 449); Mr. Gray says,—“The opercula of some shells which have plaits on their pillar are very thin, and are furnished with a moveable flap on the left side of their anterior margin, which passes over the plaits. I first observed this in the common *Tornatella*, and afterwards in *Turbo pallidus* of Montagu, the genus *Odostomia* of Dr. Fleming, and have since verified it in *Pyramidella*. The subannular operculum of *Turbinella cornigera* has a notch in the middle of the anterior margin and a plait running from the nucleus, but in this case the flap is not moveable.”

This latter part of Mr. Gray's remarks with reference to the subannular operculum, the plait running from the nucleus, and the flap not being moveable, precisely embraces my views of *Chem. opalina* and *Chem. diaphana*, in which the flap, as Mr. Gray calls it, is not moveable; and I found that to be the case in most of the fourteen species of *Chemnitzia* I have examined; but in some, for instance the young shells of *Chem. pallida*, and in *Chem. rufa*, the flap or apophysis is moveable, or in other words, it is cartilaginous and flexible. These extracts and remarks are strongly corroborative of my determination in the last 'Annals,' April 1851, that Mr. Alder's genus *Jeffreysia* is superfluous, and its species with the subannular striæ on the opercula belong to the Pyramidellar genus *Chemnitzia*, and are much nearer to the *Muricidæ* than to the *Littorinidæ*, whatever may be the character of the proboscis, which I suspect will turn out to be one of transition or subretractile.

The definition of the Chemnitzian animal, and explanation of the incidents attached to it are so decided, peculiar and impressive, that when once it has been seen it will never be forgotten,

and will enable the malacologist instantly to detect an individual of this genus from every other; these characters, allowing for specialty variations, are essentially the same, whether the animal inhabits a shell of two or twenty volutions, whether they be tumid, rounded, flat, smooth or plicated, or coiled on a discoidal plane. In this genus, with two exceptions, we throw overboard form and markings, with respect to generic attributes, regarding all such points as only useful specialties. The first exception is the constant peculiarity in the form of the apex: this is never absent, though it is attended by numerous modifications of inversion, which however slight they may be, always prognosticate that a shell with this character is inhabited by a true *Chemnitzia*. The second exception is the tooth or fold on the columella, which, when present, however variable in figure and position, I have always found to be an unerring character that the animal is of Chemnitzian type; but as it is often absent, even in the same species, we have only its occasional assistance. With these views, we cannot see the utility of a divisional arrangement of the group; we can only acknowledge the genus *Chemnitzia* in its comprehensive integrity for the animal we have defined.

With respect to the apices, it is necessary to impress on the student, that in all the *Chemnitzia* there are numerous phases of inflexion, from the most decided to the more obtusely-pointed or button-shaped subreflexions. The variations arise either from original configuration, or the forms become travestied from the effects of attrition, which will reduce the most conspicuous inverted points, of even good fresh specimens, to a button-shaped, sunken, or subreflected apex. Malacologists may not be aware that live shells, especially the littoral ones, are more liable to suffer from the attrition caused by the tides and waves than those of the deeper zones, and the true characters of their apices are with greater difficulty appreciated from being enveloped in calcareous and other extraneous deposits, the removal of which often destroys the true figure of the apex, and conchologists are thus misled. In many of the apices both of live and dead shells the coil is rubbed through, leaving a part which becomes worn, simulating a button-shaped point, which may be, and is often, mistaken for that of a *Rissoa* by the incautious observer, leaving a greater or less portion of the other part of the coil soldered to the second volution: and microscopic aid is often required to detect these divisions of the terminal inflexions; but to the really observant and experienced malacologist, there is a certain aspect and peculiar twist at the antepenultimate bend of the inversion, which detects the true conchological Chemnitzian character. The only species we know of, in which any difficulty can arise by the subreflexion or bend on the second volution exhibiting a more

subdued character of the apex, by being sunken or deposited in a groove or depression, with a more graduated arcuation, are the *Chemnitzia pallida*, *C. spiralis*, *C. nivosa*, Mont., and the *R. diaphana* of Mr. Alder, our *Chem. diaphana*—not the *C. diaphana* of some authors, which is the young of *C. obliqua*, and perhaps there may be one or two more; all the remaining *Chemnitzia* have their terminations unmistakably inverted. We have examined and described in the memoir above referred to all the animals, except that of *C. nivosa*, of the less inflexed species, and they are all decided *Chemnitzia*.

With regard to the continuity and interruption of the peristome in *Chemnitzia*, I can say that neither character is to be depended on. I have in my cabinet elongated shells of this genus, and others of all its species with intensely continuous apertural margins, not mere testaceous deposits, which only simulate the continuity of the peristome; but as a general rule, the periphery of the aperture is more usually discontinuous; nevertheless the exceptions are numerous.

As to the characters of the umbilici, they are most fallacious; for instance, in the *Chemnitzia pallida*, and in fact in every species, there are individuals with every variation of the umbilicus, from the open and patulous to the mere fissure, and from it to the entirely imperforate one. To use the umbilicus at all is most deceptive; it can only be mentioned in the description of a particular individual. The fold or tooth, except its presence or non-presence as a character, as we have stated above, is equally fallacious; for in the *same* species it is often strong, slender, small, prominent and retired. Such characters cannot fail to mislead and confuse the young student.

The first and best characters of a *Chemnitzia* are undoubtedly the malacological ones we have given above, when they can be had; the next are of conchological value, the inflected apices, which however will almost always shadow out what the animal of a shell will prove; and the tooth, however minute and rudimental, is an excellent aid; and we may add, the flap or process of the operculum. All others from their instability lead to error and confusion; but if they are brought forward as specialties, it should be *sub modo*, with explanatory guards and limits, and indications of their variableness.

I now approach the *catalogue raisonné*, and will amalgamate with it the additions and new matter under the titles to which they belong. Perhaps it may be conceded that a sedulous examination of these interesting objects for more than forty years, has in some measure placed me in a position to offer a reformed list of the British *Chemnitzia*, which will include all the animals,

with our defined characters, whatever may be the form and sculpture of their testaceous habitations. To accomplish what I have proposed, my own cabinet affords large facilities, and my friend Mr. Barlee has kindly taken the great trouble to consign to me for inspection, from Falmouth, his rich tablets of accredited examples of those species I do not possess, many of them stamped with the fiats of authenticity of their authors. These aids and appliances have increased my confidence, that perhaps I may succeed in offering such a relieved and moderated list of the objects of this important genus, as will place within just limits the genuine indigenous *Chemnitzia* of our Isles. We do not pretend to perform this task without error. Who, on such a subject, can avoid occasional misconceptions? We can only try conscientiously to perform our duty; but alas! even in the midst of these delightful studies and recreations, the *bit of bitter* will spring up. How admirably has the inimitable Lucretius illustrated this inevitable ingredient in all human affairs, and told us that the attempt to evade the thorns of this destroyer of our peace is vain and fruitless!—

“Nequidquam: quoniam medio de fonte leporum
Surgit amari aliquid quod in ipsis floribus angat.”

In this case the “amari aliquid” arises from my fear of imperilling old friendships, recollections and associations, which often afford the most delightful solaces, and soften down the rougher portions of our pilgrimage. I envy not the man who would not relax the sterner calls of duty to avoid disturbing these tranquillizing fountains of consolation. These reflections press heavily on me. I will simply obey the calls of duty. I am bound to do so, and will use the plainest phrases consistent with the integrity of truth and honour, to bring me through the ordeal of my invidious task, which I would have gladly left to others.

It must be admitted that this interesting genus can no longer remain in its present unsatisfactory position; a reform must be carried out; the progress of malacological science demands that the rotten species be rooted out, to preserve the honest constituencies; the pruning knife must be applied, to extirpate the gangrene that preys on the vitals of the genus:—

“Ense recidendum ne pars sincera trahatur.”

Chemnitzia rufa, Philippi et auct.

The animal of this species is described in our first memoir on this genus, and is the southern variety mentioned by the learned authors of the ‘British Mollusca,’ vol. iii. p. 245, which is certainly the true *C. rufa* of Philippi and authors. Professor Forbes and Mr. Hanley in their account of the “*rufa*” have stated, that

it is with some hesitation they have followed the suggestions of their friends; and well they might pause, as they have described an entirely distinct species, a northern one, the *Chemnitzia fulvocincta* of Thompson and Alder, for the true *rufa*, which we found thirty years ago at Exmouth, and took five in 1850, which supplied the notes of our memoir. The description of the animal in the 'British Mollusca' refers to the *C. fulvocincta*, and appears to differ from ours of the true "*rufa*," in those slight specialties which might be expected in such congeneric creatures: it is really extraordinary how two species so totally different, as to the hard parts, should have been confounded. I will now state the characters of each.

The *C. fulvocincta* is well figured in the 'British Mollusca' under the title of *C. rufa*; it is more conical and tapers more rapidly than the true *C. rufa*; it has rarely more than eleven or twelve volutions, and sixteen to eighteen ribs, somewhat raised and sinuated; each volution slopes from its base to the ascending suture, which is merely a fine line; it is very glossy, with a most conspicuous yellow or orange band spirally coasting the five or six last turns; the basal portion of the aperture is subrotund.

The genuine *C. rufa* is generally larger, though it has some very slender varieties, one of which is figured in the 'British Mollusca' under the appellation of *C. formosa*, that most accurately represents our true Exmouth shells of the '*rufa*,' in which, in perfect specimens, there are often fourteen volutions and twenty ribs on the body; they are plain, straight, and not raised; the suture, instead of a fine line, is decidedly grooved; the interstitial striæ are adequately developed; the basal periphery of the aperture is usually less rounded and more subquadrangular, and the base of the body-whorl exhibits greater tumidity than in the *C. fulvocincta*. Our beautiful and perfect specimens are not glabrous; on the contrary they show a palish dull rufous colour, with not a trace of the conspicuous tawny orange spiral fascia of its congener: in fact the true "*rufa*" differs in every point from the "*fulvocincta*." This comparison obliges me, with every deference, to submit, that for the *Chemnitzia rufa* of the 'British Mollusca,' the *C. fulvocincta* be substituted, and the southern shell they have alluded to be named *C. rufa*, as it and the Exmouth examples truly represent that species, adopting their *C. formosa* as a slender variety and synonym; indeed its figure excellently represents the "*rufa*."

The *C. rufescens* is decidedly distinct from either the "*rufa*" or "*fulvocincta*," as well as from the *C. scalaris*, which I obtained at Exmouth twenty-five years ago, and have met with several specimens at the same place in 1850, but not alive.

Chemnitzia fulvocincta, Thompson and Alder.

See the notes immediately above for what is known of this species, which is decidedly distinct from the *C. rufa*.

Chemnitzia Sandvicensis, nobis.

Turbo Sandvicensis, Walker, Test. Min. Rar.

Testa subovalis, inflata, subpellucida, pruinosa. Anfractus quatuor, duobus ultimis tumidis, superne turriculatis, lineis flexuosis, spiraliter cinctis, striis incrementi prominulis, densis, obliquis, decussatis; anfractu basali, plusquam dimidiam testæ superante. Apex in gyrum sequentem reflexus. Apertura subovalis, ad basin rotundata, effusa, supra in brevem rectangulum desinens. Labium columnare reflexum, incrassatum, umbilicum angustum obtegens, superne plicam conspicuam gerens. Margo externa simplex. Axis circa $\frac{1}{12}$, diameter $\frac{1}{13}$ uncia.

Exmouth, August 1850.

I have just obtained fine specimens of this rare species, first discovered by Mr. Walker at Sandwich, and rediscovered by myself at Exmouth near thirty years ago. From an examination of my present acquisitions at this place, I am bound, in justice to that naturalist's diagnosis, to confirm the statement that his shell has a *quasi*-reticulated aspect, resulting from the close-set raised lines of increment, crossing the spiral striæ, though irregularly. Mr. Walker's phrase of elegantly reticulated is not borne out, nor is the shell pellucid, but subopaque and frosted; its texture and colour somewhat resemble the *Bullæ pruinosa*. Some of the recent specimens were taken alive; but unfortunately, before they were detected, the animals had become asphyxied, beyond resuscitation, by immersion in their natural element. Notwithstanding these discrepancies in Mr. Walker's and my specific characters, I have scarcely a doubt of this being the species he meant to designate, making due allowances for the lax and less precise descriptions of his day; for instance, he says, the shell has three volutions;—a cursory view would assign it that number; but the conchologists of that period, with the exception of the accurate Montagu, were not aware that the apical turns in a certain tribe of the minuter species were reflexed on the subsequent one. Mr. Walker's specific characters are perhaps insufficient for positive identification. At the time of the re-discovery of the species I neglected to enlarge them; I have repaired the omission, by presenting above, more correct diagnoses. Believing our shell to be the true *Turbo Sandvicensis*, I of course adopt, as a matter of right and justice, Mr. Walker's

specific appellation. I think no other shell will ever be found to represent Mr. Walker's object.

Chemnitzia eulimoides, Hanley.

Turbo pallidus, Montagu et Auct.

This species is, I think, undoubtedly Montagu's shell. I draw my conclusions from his figure and notes, in the 'Testacea Britannica,'—not from the fragment of what is said to be his type, that still exists, and is enveloped in dubiety, whether it be genuine, spurious, or a substitution by accident. When I stated in the December 'Annals' for 1850, in the memoir on the *Pyramidellidæ*, under the article *Chemnitzia eulimoides*, that that species, the very common *C. pallida* of authors, was not the "*pallida*" of Montagu, I did so, as I had been led to believe that an undoubted type of his species existed to prove that fact; the 'British Mollusca' has since informed me that is not the case; I therefore gladly revert to the commonly received opinion, which I have always entertained, that the well-known *Chem. pallida* of almost all authors, or one of its innumerable varieties, is the true Montaguan "*pallida*." Montagu says his shell is very rare, but that arises from the very different appliances of his day and ours for obtaining shells. When he wrote, the minuter species were procured by ocular labour from the littoral sands, and as they were rarely washed up from the deeper and more distant zones, they were of course very scarce, but which, if the modern dredge or trawl-boat had been in general use, would have afforded abundance.

We have numerous suites of the *C. pallida*, our type, of all adult sizes; of all juvenile ones; of all forms, slender, tumid, short, elongated; of every description of markings, smooth, rough, spirally ridged, or more finely striated, with the fold sometimes conspicuous, often scarcely visible, and an umbilicus of most variable character: all these phases of the same species may be seen in our cabinet, in which scarcely a specimen of the *Chem. pallida* can be matched, because all differ. What has been the result? Authors have produced their interminable lists of varieties; and when a somewhat more differential form was met with, it was promoted to a species. We have not the slightest doubt that the *Chemnitzia rissoides* is a dwarf littoral variety of the "*pallida*." A comparison of our notes on the two animals bears us out in this view; these two alone agree, whilst every other exhibits some difference. Besides, our examination of the opercula of this genus (see the observations in the April 'Annals,' 1851) strongly supports their identity; they are amongst the few species that have the pillar-lip flap moveable, resulting from car-

tiliginous flexibility. This rissoidean variety of *Chem. pallida* is the parent of the *C. albella* and *C. dubia* of authors. We possess them both, besides having had authentic specimens sent to us by Mr. Barlee, for inspection; the *C. alba* and *C. nitida*, from their figures in the 'British Mollusca,' and in other works, are, beyond doubt, of the same parentage. I engage to match any of the four species I have named. I conclude, from the 'British Mollusca,' the *C. notata*, nonnull., is a variety of the typical "*pallida*." Montagu's shell, from his figure, is also probably a semistriated "*pallida*;" one of the varieties with a retired inconspicuous fold, and a produced smooth spine, or polished by attrition. We have here a goodly progeny of, as I believe, six pseudo-species from a single parent: I must be allowed to insist on this position with respect to *C. pallida* and its spurious offspring. I think it cannot be subverted.

Nothing is more common than a littoral and coralline zone variety of the same species; for instance, *Rissoa striata*, *R. semistriata*, *Chem. spiralis*, *Scalaria clathratula*, &c. &c. Sometimes the littoral shell is the larger, and sometimes the coralline zone variety. The *C. truncatula* recently rediscovered by Mr. Barlee, at Plymouth, is large and elongated in the deeper zones; but the littoral variety, as with *C. pallida*, is dwarfish, more slender, and is called by recent authors *C. cylindrica*. They are undoubted varieties of each other, and both are the *Turbo nivosus* of Montagu; with me, *Chemnitzia nivosus*. As proof, the learned authors of the 'British Mollusca' have, on the highest authority, pronounced the *C. cylindrica* to be the *nivosus* of Montagu; it follows that the *C. truncatula*, which, without question, is the adult of *C. cylindrica*, is also the "*nivosus*" of Montagu: a careful comparison of the opercula of the two has since fully confirmed this view.

The *C. decorata*, the *C. diaphana*, of the *obliqua* type, and the *C. obliqua* of Mr. Alder, have been kindly put into my hands by Mr. Barlee, for inspection; I possess them also; and after the most attentive examination, both lenticular and microscopic, I can arrive at no other conclusion than that of their identity, exhibiting slight specialties. The *C. diaphana* is certainly the young of *C. obliqua*, as the 'British Mollusca' have determined; the only doubt is the *C. obliqua* of Mr. Alder, though I think it a large tumid variety of the *C. decorata* of authors. The *C. Warrenii* I have not seen; I have, from its figure, in the 'Annals,' vol. xv., considered it referable to the *C. insculpta*; but if it is synonymous with the *C. decorata*, we shall have four identical species: I propose for them Mr. Alder's appellation of *C. obliqua*.

Mr. Alder's *C. conspicua*, we have it; it is, as the learned authors of the 'British Mollusca' suspect, a large, strong, clon-

gated variety of *C. acuta*, which has sometimes irregular striæ in the throat, but not near so closely set as in *C. conoidea*: and that gentleman's *C. striolata* is perhaps a variety of *C. insculpta*; or it may be a *C. acuta*, with the spiral striæ more conspicuous than usual, some of which, as we will show below, have lately been christened *C. turrita*.

The *Chem. fenestrata* is very distinct, as is the elegant *C. scalaris*, which latter we have frequently, during the last thirty years, taken at Exmouth, varying in the number of ribs, but never in a living state.

The *C. indistincta* and *C. clathrata* are mere varieties of the type *C. interstincta*, the animal of which is recorded in our first memoir. This species, of which we have very large series, presents infinite variations, in size, in the ribs, flatness and rotundity of the volutions, as well as in the presence and absence of the columellar tooth: these slight discrepancies have induced conchologists to constitute some unnecessary species. We have examined the animal of the *C. clathrata*, which is a large, elongated, toothless variety, and is so precisely similar to the one described by us, that it was not thought necessary to add notes on it. This species illustrates the inconvenience of a separation of *Chemnitzia* and *Odostomia*, by having the variety *C. indistincta* deposited in the former, and the edentular variation of the type in *Odostomia*; and the other variety, the so-called "*clathrata*," is, as with us, a *Chemnitzia*. Surely this division of the tribe will not be sustained, and all its species will merge in *Chemnitzia*.

The beautiful but common *Chem. elegantissima* is the staple commodity amongst the shells at Exmouth, where all its varieties occur, but never alive—probably because they inhabit the rocky portion of the laminarian zone, far beyond the lowest tides, where the dredge cannot work; they must be alive, in the immediate vicinity; their numbers, and often fresh and excellent condition, are sufficient proof; and we have offered what may be the solution of the difficulty of obtaining them alive.

The elegant *C. decussata*, the "*arenaria*" of Montagu, abounds at the same place, in the coralline zone, and with the well-known *C. scillæ* and *C. acicula* require no remark, as they are undisputed species.

The *C. clavula* and *C. affinis*, the accredited types of which have been placed in our hands by the favour of Mr. Barlee, and have received our most attentive consideration, under every modification of position, light, and optical aids, have fully convinced us that they do not even offer varietal distinctions from the type, the *Chemnitzia acicula*, and we confidently predict that no animal of those varieties will ever be discovered that will exhibit decided specialities.

In the notes of our first memoir we have sufficiently men-

tioned the *C. unica* and *C. nitidissima*, which I think are undoubted *Chemnitzia*, as far as conchological indices enable me to judge; and we shall not be surprised if the *Aclis ascaris* proves a *Chemnitzia*.

The beautiful *Chemnitzia Gulsonæ* is our own discovery more than thirty years ago: I have not a character to add or detract from my late description, except that after the phrase of the specific character, "peripheria integra," *interdum interrupta* may be added, as my specimens differ. The apex is subreflexed—indeed every character denotes the Chemnitzian animal; there is not a single point of the *Rissoa* in it.

With respect to the so-called *O. turrita* of authors, much discussion and difference of opinion have lately existed to determine if it is a distinct species, or a variety of an established one. It is inferred from the specimens being more or less spirally striated throughout, that it is a good species. My own opinion has changed more than once: at one time I thought it might be an aberrant variety of *Chem. insculpta*; in this I am mistaken: again, I had made up my mind that it could not belong to *Chem. acuta*; in this point I am also mistaken, as it turns out to be scarcely a variety of that common species; it is one of the individuals with the more inflated volutions. I have forty specimens, which I took the trouble separately to submit to the microscope, and in those which were not worn, I was agreeably surprised to receive the solution of this problem, by finding that every recent shell was finely spirally striated throughout; in some the striæ were more apparent, and easily seen by a Coddington lens; in others the microscope was required, and with ordinary powers, even in the most apparently glabrous shells, the spiral lines became conspicuous. In the shells that have not been much rubbed, the striæ have acquired a crassitude by exposure to the air, as is always the case, which renders them more visible; I have such; but in the perfect recent ones they are excessively fine, and cannot be detected without considerable optical assistance. This is the simple history of the so-called *C. turrita*, which certainly is nothing more than the *Chem. acuta*, with the striæ somewhat more apparent than usual; such are in our cabinet, and malacologists will find that they have not a perfect recent specimen of the *C. acuta* which is not more or less spirally striated throughout. This question may be considered finally settled; it admits of no further discussion. I have had the advantage of viewing Mr. Barlee's typical tablets of this variety of the *Chem. acuta*.

The "*dolioliformis*," nonnull., has, I think, sufficiently been shown to be the *Chemnitzia Sandvicensis* of Mr. Walker. We need only say of the *C. insculpta*, *C. plicata* and *C. unidentata*, that they are old Montaguan species; the two latter animals are described by us. The *C. conoidea* is a well-marked coralline zone

species, taken rarely, but alive, at Exmouth. The *C. excavata* is a good species, which I found at the last place.

The new *Chemnitzia Barleei*, as yet only known as a northern production, is the discovery of that excellent and indefatigable malacologist whose name it bears, and from specimens from himself has first been ushered into notice by ourselves as an undoubted member of this singularly difficult genus; and it affords, in the misconceptions that have attached to it, a plain proof of the correctness of this observation.

The *C. glabrata?* of Mühlfeldt, said to be a production of one of the isles of the Ultima Thule, is quite unknown to us. The animals of the *C. acuta*, *C. conoidea* and *C. spiralis* are fully mentioned in our former paper. Their shells are admitted as genuine indigena by every one. The *Chem. acuta* was discovered by us many years since at Exmouth, but at the time we neglected to publish notes on the hard parts; it is curious that after a lapse of thirty years we should be the first to discover and describe the animal. And lastly, the *Chemnitzia diaphana*, which is the *R. diaphana* of Mr. Alder's Northumberland catalogue, is fully described in the first notes on this genus, and the animal shown to be of the true Chemnitzian type, scarcely differing from the *C. conoidea*: it has enjoyed a position to which I think it is not entitled, as I regard it a simple *Chemnitzia*, as well as its congener the *Chem. opalina* described in the April 'Annals,' 1851. It must not be confounded with that "*diaphana*" which has been brought forward as a distinct species, and which has been considered to be a synonym of *C. obliqua*:

After the reforms we have submitted, the British list will exhibit some attenuation; but a still numerous and a sounder family will testify the importance of this truly British group, which far outnumbers the discoveries of any other country in respect of this peculiar and very interesting genus. We think that the expurgation that has been made will bring the acquirement and identity of our indigenous species within the reach of the naturalists of this particular line of science.

The list will now stand thus:—

<i>True species.</i>		
<i>Chemnitzia pallida.</i>	<i>Chemnitzia scillaæ.</i>	<i>Chemnitzia decussata.</i>
— <i>conoidea.</i>	— <i>excavata.</i>	— <i>rufa.</i>
— <i>acuta.</i>	— <i>diaphana.</i>	— <i>scalaris.</i>
— <i>insculpta.</i>	— ? <i>glabrata.</i>	— <i>elegantissima.</i>
— <i>interstincta.</i>	— <i>nivosa.</i>	— <i>nitidissima.</i>
— <i>Sandvicensis.</i>	— <i>unidentata.</i>	— <i>acicula.</i>
— <i>fulvocincta.</i>	— <i>plicata.</i>	— <i>Barleei.</i>
— <i>rufescens.</i>	— <i>obliqua.</i>	— <i>Gulsonæ.</i>
— <i>fenestrata.</i>	— <i>spiralis.</i>	— <i>opalina.</i>
— <i>unicas</i>		

Spirious species:

Chem. formosa, synonym of Chemnitzia rufa.		
C. indistincta,	—	C. interstincta.
C. clathrata,	—	C. —.
C. conspicua,	—	C. acuta.
C. striolata,	—	C. insculpta or acuta.
C. dubia,	—	C. pallida.
C. alba,	—	C. —.
C. nitida,	—	C. —.
C. albella,	—	C. —.
C. rissoides,	—	C. —.
C. eulimoides,	—	C. —.
C. cylindrica,	—	C. nivosa, dwarf and littoral.
C. truncatula,	—	C. —, elongated var. of coralline zone.
C. Warrenii,	—	C. insculpta or obliqua.
C. decorata,	—	C. obliqua.
C. diaphana,	—	C. obliqua, juv.
C. dolioliformis,	—	C. Sandvicensis.
C. notata,	—	C. pallida.
C. turrita,	—	C. acuta.
C. affinis,	—	C. acicula.
C. clavula,	—	C. —.

I have now only to offer sincere acknowledgements for the very liberal space I have been favoured with.

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

XXXIX.—*On some new Protozoic Annulata.* By FREDERICK M'COY, Professor of Geology and Mineralogy in Queen's College, Belfast.

Myrianites tenuis (M' Coy).

Sp. Char. Usually coiled in numerous, small, very irregular undulations; diameter of body about one-third of a line.

This beautiful little worm is easily distinguished from the *M. Macleayi* (Murch.) by its very slender proportions, agreeing more nearly in this respect with the *M. Murchisoni* of Prof. Emons's "Taconic Slate." I think it was about a foot long, from following, as well as I could, the convolutions of three individuals. I have only in one part seen traces of the cirrhi, which have the same general proportions as in the *M. Macleayi* (Murch.).

Not uncommon in a particular layer of the fine olive slate of Greiston, on the Tweed, near Inverleithen.

(Col. University of Cambridge.)

Genus *Crossopodia* (M'Coy), n. g.Etym. Κροσσός , *fimbria*; πῶς , *pes*.

Gen. Char. Body long, moderately slender, of excessively short, numerous, wide segments, from which arise very long, delicate, crowded cirrhi, forming a broad dense fringe on each side, completely concealing the feet (at least five or six times longer than a segment of the body, or interval between one cirrus and another).

These beautiful worms are easily distinguished from their protozoic companions, the *Nereites* and *Myrianites*, by the excessive shortness of the joints of the body, as indicated by the very crowded cirrhi (only one of which comes from the dorsal aspect on each side of any given segment) and by the broad, close, fringe-like development of these latter, concealing the lobes of the feet, so conspicuous in the two genera named.

Crossopodia lata (M'Coy).

Sp. Char. Length unknown (upwards of 1 yard); width 9 lines, width of body 3 lines, length of cirrhi 3 lines; articulation of body and number of cirrhi indistinct, but apparently three in a space of 1 line.

Prof. Sedgwick informs me, that the portion of this remarkable worm which he saw in the rock, and of which the specimen described is a part, measured a yard in length, without signs of tapering or alteration of character, thus agreeing in proportion with its living allies. Its great width easily distinguishes it from the older *C. Scotica* (M'Coy), and it has no resemblance to any other fossils I know of. The piece described is about 4 inches long, and is gently flexuous.

Tilestone (Upper Ludlow) of Storm Hill, Llandeilo.
(Col. University of Cambridge.)

Crossopodia Scotica (M'Coy).

Sp. Char. Length unknown (upwards of 2 feet), width nearly 2 lines, width of body (and trail on the surface of the beds) one-third of a line; cirrhi very fine, close, delicate, about five in the space of 1 line.

This interesting worm is closely allied to the so-called *Nereites Loomisii* of Prof. Emmons's 'Memoir on the Taconic System,' t. 3. f. 3, from the taconic slates of Waterville, Maine. The American species certainly belongs to our new genus *Crossopodia*, but, if correctly drawn, has much thicker and fewer feet. The narrow deep *trail* of the middle part of the body on the upper surface of the planes of deposition of the slate, and the narrow

cord-like ridge formed by the casts in them on the under surface of the laminæ, might possibly be mistaken for a different worm resembling a *Gordius*, without due caution or the absolute demonstration of their nature, afforded by many of the specimens.

Very abundant in the greenish slate of Thorney Lee quarry, on the Tweed, near Inverleithen.

(Col. University of Cambridge.)

Trachyderma? lævis (M'Coy).

Sp. Char. Tube slightly curved, thin, coriaceous, slightly tapering, subcompressed; slightly more than 1 line in diameter at the broad end, and slightly less than 1 line at the imperfect smaller end of a specimen 1 inch 7 lines long; surface nearly smooth.

The specimen is a brown, tough, flexible tube, irregularly and gently compressed (parallel to the plane of stratification of the rock), assuming an oval section; and being filled with the bright-coloured matrix shows clearly the thinness of the tube, which, from the same cause, has a few irregular indentations of the surface, which otherwise seems smooth.

Rare in the fine beds of Caradoc sandstone of Acton Scott, Church Stretton.
(Col. University of Cambridge.)

XL.—*A Catalogue of British Spiders, including remarks on their Structure, Functions, Economy, and Systematic Arrangement.*
By JOHN BLACKWALL, F.L.S.

[Continued from p. 262.]

13. *Lycosa cambrica*.

Lycosa cambrica, Blackw. Linn. Trans. vol. xviii. p. 614.

Adult males and females of this handsome spider were taken on swampy ground in woods at Oakland, near Llanrwst, in May 1839. The decidedly curved form of the maxillæ, an approximation to which may be observed in *Lycosa campestris*, *Lycosa allodroma*, and some other species, has not been considered of sufficient importance to require its separation from the genus *Lycosa*, with the semiaquatic species of which genus it is very closely allied by its general organization, habits and colours.

I have observed a deficiency of the right intermediate eye of the anterior row in an adult male of this spider.

M. Walekenaer is certainly mistaken in supposing that *Lycosa cambrica* is identical with *Lycosa allodroma* (Hist. Nat. des In-

sect. Apt. t. iv. p. 395), for it is not only much smaller than that species, but its colours, which are dissimilar, constitute by their arrangement a different design both on the cephalo-thorax and abdomen; there is some diversity also in the structure of its palpal organs, and in the relative size of the four minute eyes forming the transverse frontal row.

14. *Lycosa latitans*.

Lycosa latitans, Blackw. Linn. Trans. vol. xviii. p. 612.

— (*Potamia*) *palustris*, Koch, Die Arachn. B. xv. p. 4. tab. 505. fig. 1415, 1416.

Females of this species, which appears to connect the terrestrial with the semiaquatic *Lycosæ*, may be found in the months of May and June, under stones in moist situations in the woods of Denbighshire, with their cocoons attached to their spinners. The cocoon is globular, measuring $\frac{1}{8}$ th of an inch in diameter, and is composed of compact white silk encircled by a narrow zone of a slighter texture; it comprises 40 or 50 spherical eggs of a yellow colour, having no adhesion among themselves.

Lycosa latitans is placed by M. Walckenaer among the synonyma of *Lycosa funigata* (Hist. Nat. des Insect. Apt. t. iv. p. 395); but on insufficient grounds, as it is very much smaller than that species, and differs from it in the design formed by the distribution of its colours, which likewise present some diversity.

15. *Lycosa piratica*.

Lycosa piratica, Walck. Hist. Nat. des Insect. Apt. t. i. p. 339; Hahn, Die Arachn. B. i. p. 107. tab. 27. fig. 80; Sund. Vet. Acad. Handl. 1832, p. 193; Blackw. Linn. Trans. vol. xix. p. 120.

— (*Potamia*) *piratica*, Koch, Die Arachn. B. xv. p. 1. tab. 505. fig. 1413, 1414.

— *palustris*, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 22.

Lycosa piratica frequents marshes and the margins of pools in England and Wales; it runs rapidly on the surface of water, even when encumbered with its cocoon, and frequently takes refuge from danger beneath the surface of that liquid, concealing itself among the leaves of aquatic plants, the air confined by the circumambient water among the hairs with which it is clothed enabling it to remain immersed for a considerable period of time. In June the female deposits from 80 to 100 spherical eggs of a deep yellow colour, not agglutinated together, in a globular cocoon of compact white silk, encircled by a narrow zone of a slighter texture; it measures about $\frac{1}{2}$ th of an inch in diameter, and the young, when extricated from it, attach themselves to the body of their parent.

Genus *Dolomedes*, Latr.16. *Dolomedes mirabilis*.

Dolomedes mirabilis, Walck. Hist. Nat. des Insect. Apt. t. i. p. 356 ;
Latr. Gen. Crust. et Insect. tom. i. p. 117 ; Hahn, Die Arachn.
B. ii. p. 35. tab. 51. fig. 120.

Ocyale mirabilis, Sund. Vet. Acad. Handl. 1832, p. 198 ; Koch,
Uebers. des Arachn. Syst. erstes Heft, p. 23 ; Die Arachn. B. xiv.
p. 107. tab. 482. fig. 1346.

— *rufofasciata*, Koch, Die Arachn. B. xiv. p. 110. tab. 482. fig.
1347.

— *murina*, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 23 ;
Die Arachn. B. xiv. p. 111. tab. 483. fig. 1348.

Titulus 28, Lister, Hist. Animal. Angl. De Aran. p. 82. tab. 1.
fig. 28.

Well-wooded districts in England and Wales are the favourite haunts of this handsome spider, which, even in the adult state, varies greatly in colour. The *Ocyale murina* of M. Koch, described by that arachnologist as a distinct species, is merely the female of *Dolomedes mirabilis* after she has exercised her parental functions. In June the female constructs a globular cocoon of dull yellow-coloured silk of a compact texture and rough exterior surface, measuring $\frac{3}{10}$ ths of an inch in diameter, in which she deposits between 220 and 240 eggs of a spherical form and dull yellow colour, not agglutinated together. This cocoon, for which she manifests a strong feeling of attachment, is carried underneath the sternum, and retained in that situation by means of the falcēs* and palpi, additional support being usually supplied by silken lines connecting it with the spinners ; this latter circumstance, it will be perceived, furnishes a new link in the chain of analogies which connect the genus *Dolomedes* with that of *Lycosa*. When the young are about to quit the cocoon, the female spins a large dome-shaped web among grass or low bushes, under which she retires with her treasure, and her progeny, on being extricated from their silken envelope, cluster together on lines spun by themselves beneath the dome, where they remain till they are capable of providing for their own sustenance.

17. *Dolomedes fimbriatus*:

Dolomedes fimbriatus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 345 ;
Latr. Gen. Crust. et Insect. tom. i. p. 118 ; Hahn, Die Arachn.
B. i. p. 14. tab. 4. fig. 10 ; Sund. Vet. Acad. Handl. 1832,
p. 194 ; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 23 ;

* The organs of spiders, improperly denominated mandibles, as they are situated above the labrum, and, consequently, form no part of the oral apparatus, I have proposed to name *falcēs*.

Blackw. Linn. Trans. vol. xix. p. 120; Koch, Die Arachn. B. xiv. p. 116. tab. 485. fig. 1352, 1353.

Dolomedes limbatus, Hahn, Die Arachn. B. i. p. 15. tab. 4. fig. 11.
— *marginatus*, Hahn, Die Arachn. B. i. p. 15. tab. 4. fig. 12.

In the fens of Cambridgeshire, this fine spider, which presents remarkable differences of colour in its several stages of growth, is of frequent occurrence. Like *Lycosa piratica*, it descends spontaneously beneath the surface of water, the period of time during which it can respire when immersed depending upon the supply of air enveloping its body. In May the female deposits several hundred eggs in a globular cocoon of brown silk of a compact texture, measuring $\frac{5}{8}$ ths of an inch in diameter, which she carries under the sternum, supporting it there by the instrumentality of the falces and palpi.

The *Dolomedes limbatus* and *Dolomedes marginatus* of M. Hahn are immature individuals of this species. See the synonyma.

Genus HECAËRGE, Blackw.

18. *Hecaërge spinimana*.

Hecaërge maculata, Blackw. Lond. and Edinb. Phil. Mag. Third Series, vol. iii. p. 193; Researches in Zoology, p. 413. pl. 3.

fig. 8.

Lycæna spinimana, Sund. Vet. Acad. Handl. 1832, p. 266.

Lycodia spinimana, Sund. Conspectus Arachnidum, p. 22.

Dolomedes lycæna, Walck. Hist. Nat. des Insect. Apt. t. i. p. 348.

Zora spinimana, Koch, Die Arachn. B. xiv. p. 102. tab. 481. fig. 1343, 1344.

Hecaërge spinimana occurs in woods in various parts of Great Britain; it is active in its movements, and being provided with a small scopula or climbing apparatus at the extremity of each tarsus, can run with facility on dry objects having polished perpendicular surfaces. In June the female constructs a lenticular cocoon of white silk of a slight texture, measuring about $\frac{3}{10}$ ths of an inch in diameter, which she usually attaches to the under side of a stone, depositing in it between 20 and 30 spherical eggs of a yellowish white colour, not agglutinated together.

In its general organization this species approximates most nearly to the spiders belonging to the genus *Dolomedes*, among which it is still retained by M. Walckenaer (see the synonyma); the propriety of constituting a new genus for its reception is rendered sufficiently manifest, however, by differences in the disposition of its eyes, in the structure of its mouth and legs, and also in its habits and œconomy. These differences present distinct characters admitted to be generic by Professor Sundevall and M. Koch; indeed the generic name *Lycæna*, proposed by the former

eminent arachnologist, would have taken precedence of all others had it not been previously employed by Fabricius.

Family *Salticidæ*.

Genus *ERESUS*, Walck.

19. *Eresus cinnabarinus*:

Eresus cinnabarinus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 395 ; Latr. Gen. Crust. et Insect. tom. i. p. 121 ; Koch, Die Arachn. B. iv. p. 106. tab. 138. fig. 318.

— *quadriguttatus*, Hahn, Die Arachn. B. i. p. 45. tab. 12. fig. 35 ; Koch, Die Arachn. B. iv. p. 104. tab. 138. fig. 316 ; Uebers. des Arachn. Syst. erstes Heft, p. 35.

— *annulatus*, Hahn, Die Arachn. B. i. p. 47. tab. 12. fig. 36 ; Koch, Die Arachn. B. xiii. p. 14. tab. 435. fig. 1087.

— *illustris*, Koch, Die Arachn. B. iv. p. 105. tab. 138. fig. 317.

I give this species, the only one of the genus hitherto found in Great Britain, on the authority of Dr. Leach. See the Supplement to the 4th, 5th and 6th editions of the 'Encyclopædia Britannica,' article Annulosa.

Genus *SALTICUS*, Latr.

20. *Salticus scenicus*.

Salticus scenicus, Latr. Gen. Crust. et Insect. tom. i. p. 123 ; Hahn, Die Arachn. B. i. p. 57. tab. 15. fig. 43, 44.

Attus scenicus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 406 ; Sund. Vet. Acad. Handl. 1832, p. 202.

Calliethera scenica, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 31 ; Die Arachn. B. xiii. p. 37. tab. 439. fig. 1106, 1107.

— *histrionica*, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 31 ; Die Arachn. B. xiii. p. 42. tab. 439. fig. 1110, 1111.

Titulus 31, Lister, Hist. Animal. Angl. De Aran. p. 87. tab. 1. fig. 31.

When searching on walls or the trunks of trees for those insects which constitute its food, this common spider employs much art, moving with great circumspection, and occasionally elevating the cephalo-thorax, by straightening the anterior legs, for the purpose of extending its sphere of vision. It runs without difficulty on the perpendicular surfaces of dry polished bodies, having, like the other species of the genus, a small climbing apparatus situated below the tarsal claws, which, by the emission of an adhesive secretion, gives it a secure hold upon objects. It takes its victims by surprise, leaping suddenly upon them, and by that act draws from the spinners a line attached by its extremity to the station whence it took its spring, a necessary pre-

caution to prevent the possibility of falling, whether successful in seizing its prey or not.

In June the female constructs one or two cocoons of white silk of a slight texture and lenticular form; the larger ones measure about $\frac{1}{5}$ th of an inch in diameter, and usually contain 15 or 16 spherical eggs of a pale yellow colour, not agglutinated together. These cocoons are comprised in a cell of compact white silk fabricated in crevices of rocks, walls, and the bark of old trees, in which the female also generally occupies a place.

By subdividing the extensive genus *Salticus*, M. Koch has obtained several minor groups which he has dignified with generic appellations; but as even the species regarded as types of his new genera are, for the most part, connected by close ties of affinity, it is not probable that his views will be adopted by arachnologists generally. The genera *Calliethera*, *Heliophanus*, *Euophrys* and *Marpissa*, including species indigenous to Great Britain, present differences in structure of importance as affording specific characters, but much too slight and circumscribed to be rendered available in promoting the systematic changes proposed to be made by M. Koch.

21. *Salticus sparsus*.

Salticus sparsus, Blackw. Research. in Zool. p. 417.

Titulus 32, Lister, Hist. Animal. Angl. De Aran. p. 89. tab. 1. fig. 32.

Specimens of this spider were captured on the outer walls of Crumpsall Hall, near Manchester, in the summer of 1828. It pairs in the month of May.

22. *Salticus coronatus*.

Salticus coronatus, Blackw. Linn. Trans. vol. xix. p. 121.

— *abietis*, Hahn, Die Arachn. B. i. p. 61. tab. 16. fig. 46.

— *Blancardi*, Hahn, Die Arachn. B. i. p. 64. tab. 16. fig. 48.

Attus coronatus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 412.

— *falcatus*, Sund. Vet. Acad. Handl. 1832, p. 213.

Euophrys falcata, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 33;

Die Arachn. B. xiv. p. 24. tab. 472. fig. 1290–1295.

Titulus 34, Lister, Hist. Animal. Angl. De Aran. p. 91.

The sexes of *Salticus coronatus*, which is common in the woods of Denbighshire and Caernarvonshire, differ greatly in colour, and have been described as distinct species. They pair early in June.

23. *Salticus xanthogramma*.

Attus xanthogramma, Walck. Hist. Nat. des Insect. Apt. t. i. p. 415.

Titulus 33, Lister, Hist. Animal. Angl. De Aran. p. 90.

The attempt to identify the "*Araneus subflavus, oculis smaragdinis, item cui secundum chunes tres virgulæ crocæ*" of Lister (De Ann. & Mag. N. Hist. Ser. 2. Vol. vii. 26

Aran. tit. 33. p. 90), either with the *Attus xanthogramma* or the *Attus tripunctatus* of M. Walckenaer, who has referred it to both (Hist. Nat. des Insect. Apt. t. i. pp. 415, 418), is attended with difficulty in consequence of the brevity of the descriptions and the want of specimens to enable me to compare it with those species. It differs from both in some particulars, but, on the whole, appears to resemble the former more than the latter.

24. *Salticus frontalis*.

Salticus rufifrons, Blackw. Research. in Zool. p. 420.

— *maculatus*, Wider, Museum Senckenbergianum, B. i. p. 278.

taf. 18. fig. 10.

Attus frontalis, Walck. Hist. Nat. des Insect. Apt. t. i. p. 415;

Koch, Die Arachn. B. xiv. p. 44. tab. 474. fig. 1304, 1305.

I have procured specimens of this spider, which is partial to well-wooded districts, in Denbighshire, Caernarvonshire, Yorkshire, and Lancashire. In June the female constructs an oval cell of white silk of a slight texture, usually attached to the inferior surface of stones or withered leaves, in which she deposits about 16 spherical eggs of a pale yellow colour, connected by fine lines of silk.

25. *Salticus obscurus*.

Salticus obscurus, Blackw. Annals and Magazine of Natural History, Second Series, vol. vi. p. 336.

An adult male of this minute *Salticus* is in the extensive collection of British *Araneidea* belonging to Francis Walker, Esq., of Arno's Grove, Southgate, Middlesex, in which locality it was taken in May 1848. In the spring of 1850 an opportunity of inspecting this fine collection was afforded me by the Rev. Hamlet Clark, and Mr. Walker very liberally permitted me to publish descriptions of any species comprised in it which I suspected to be unknown to arachnologists.

XLI.—*On the Progress of Natural History in Ceylon: in a Letter from EDGAR L. LAYARD, Esq., to R. TEMPLETON, Esq.*

Port Pedro, Jaffnapatam, North Ceylon,
October 18, 1850.

You ask me in your last to give you some idea of the progress of natural history here, and of the doings of the few who take an interest therein. You also ask me for a list of such animals, birds, &c. as have fallen under my notice. The first is easily done; the second is rather a labour—one of love, I grant, but still an unsatisfactory one, from a cause which you and I have often deplored, viz. the absence of books of reference. This I felt badly enough in Colombo, with the limited stock in the U.S. library: what then do I feel now, in this *Ultima Thule*, where my own scanty shelves contain

more volu mes than all the other houses in the place together, including my court and the custom-house? However, to the point:— Brodie is at Anarajahpoora, acting assistant agent; he tells me he has just employed a native whom he has instructed to procure specimens from the jungle with which he is surrounded. He is in a very favourable locality, and one untrodden in our paths save by poor Dr. Gardner here and there, and now a little by our enlightened active Government-agent Mr. Dyke, who was inoculated by Dr. Gardner with some of his botanical ardour. Mr. Dyke however, I fancy, collects principally for the improvement and embellishment of his district, by the introduction to notice of new and useful trees and plants from the distant jungles to the cultivated peninsula. Brodie has been busy of late with *native* [illigible], and this together with his official duties has left him little time for other pursuits, and I now seldom hear from him. He lately transmitted to our friend Blyth in Calcutta a live pair of the *Paradoxurus zeylanicus*, which are destined for Lord Derby I believe; so you may see them if they survive.

Dr. Kelaart is at Newera Ellia—a *terra incognita* to the zoologist; he has consequently made several discoveries both among animals and birds. I fear however that he thinks too many of his species *new*, and will meet with disappointment from having his nomenclature rejected. Many of his novelties have already proved to be well known on the continent. You are aware how singularly similar is the zoology of his district to that of the Neilgherries; one marked difference however exists—all our Ceylonese specimens are darker than their Indian representatives. This is an observation Blyth and myself have made, since we exchanged largely, in almost every instance.

Mr. Thwaites is at his post, the Botanical Gardens at Peradenia; what he is doing I hardly know, but he has asked me to supply him with seeds of all useful plants cultivated here, to enable him to introduce them into the Kandian Province. We do not correspond much; we run in different tracks, and have not met. My hands also are full of my official business—so full, that I have but scanty time for more necessary writing;—and, lastly, there is myself, of whom I can give you a fuller account, if egotism won't bore you. I have been appointed here for a year and four months, and during that time have devoted what spare time I have, to my old pursuits of entomology and ornithology, to which I have added that of conchology, and have paid some little attention to the habits of the marine Crustacea, *Holothuræ*, &c. Mrs. Layard has also, as her very impaired health permitted, painted the fish I catch on the coast, or which the little fisher boys bring me for a few pice. I intend sending them to the British Museum some of these days, when my pickling barrel is full. Lord Torrington kindly supplied me with good spirit from the store for this express purpose. I don't think you visited this part of the island; still you know that we are as flat as a table, with a hot dry soil which is artificially irrigated. How I do wish that imaginary river spoken of by Mr. Pridham in his *wondrous* book on Ceylon as existing up here had any being! Who could have been humbugging the poor man so much! Our cultivation is principally Palmirah-trees, with paddy in the wet season; tobacco and fine grains are also grown.

Our birds and animals consequently much resemble those of the Indian coast opposite, to which we so much assimilate: nor are these abundant, for the Palmirah offers neither food nor shelter. The Margoza, Illippy, and Tamarind however supply some, but in only a small proportion. I have however added several species which I never saw in the south of the island, and the large salt lakes and plains which fall under my jurisdiction have supplied me with vast numbers of *Anatidæ*, *Laridæ*, *Sternidæ*, and all the Waders. I should say I have added some thirty species to my list of indigenous birds.

Among land and freshwater shells I have made but few captures; I have added a few *Helices*, *Naninæ*, *Auriculæ*, and a *Succinea*, a *Valvata*, a *Bithinia*, a minute *Planorbis*, and some few other genera not found in the south. *Pupa bicolor*, which you say Benson found at Galle, I have found in some abundance on one bastion of the old Jaffna Fort, and there alone. The reason why you did not see *Helix Waltoni* in my last list, was because my cousin Fred. Layard assured me he had it on good authority that it was only a variety of *H. hæmastoma*: as at that time I was a beginner, I of course knocked under to him. As to marine Mollusca, I have been working away hard at them. I manufactured a "Ball's dredge," and on Saturday, which I generally take as a half-holiday to let my clerk work up my official business, I go out and dredge a bank about two miles along the coast. If I had a nice boat and intelligent men, I might do well; but my native-built cobble won't sail, and the natives take no interest in anything, so the work falls heavy on my shoulders: had I not a young European friend here who helps me, I could do nothing. However, under all these disadvantages, in the last ten months I have collected about 600 species, nearly all with my own hands. The following anecdote well illustrates some of my work and the native ideas upon it. One morning at sunrise I was engaged at the edge of the tide, on the coral reef which runs along the coast, in turning over the masses of stone, &c., assisted by my syce with a crow-bar; on the shore sat a Tamul clergyman (a friend of mine) dressed in European clothes; two of my people came along and halted near his seat, when the following conversation ensued between them, affording my friend infinite amusement. "Eh! who is that on the reef?" "That? that is the Justice." "The Justice? (with great emphasis)—and what ever is he doing?" "Oh! looking after shells and sea-slugs." "What does he do with them? eat them?" "No, you fool!" was the reply, "he has great boxes full of them, and he sends them to the Queen, who puts them into a large house she has got in England!!!" Here followed the usual exclamations of native surprise, and the pair walked on.

I have lately been finding rather a large quantity of the Pearl Oyster. I should like very much to hit upon a good bed, that we might have a fishing to help our coffers. If you know of any person in your part of the world willing to exchange shells, I would willingly enter into some arrangement to do so; or I would gladly send shells, &c. to any one who contributes to any of the scientific societies, if he would send me in return an occasional copy of his papers. I know nothing of what is going on in the zoological world; I can't afford to buy

books with my *small* income and *small* family, and so I jog on almost in the dark, noticing habits and peculiarities which may come into use some day, if ever I get back to England and publish a 'Fauna Ceylonensis.' I wrote to my brother at Nineveh lately, to ask him to procure some animals I named; he tells me he has got a "*wild ass*." How much I wish I were able to join him, to examine the fauna of that region! My collections are increasing rapidly—I am exchanging with so many people in different parts of the world; some therefore of my brother's collecting, in his classical country, would have a twofold value in my eyes. However, I must leave off this gossiping and give you the list:—

List of Mammalia and Birds observed in Ceylon.

MAMMALS		
Macæcus sinicus, <i>Desm.</i>	Mus Bandicota, <i>Besch.</i>	
Presbytis Thersites, <i>Elliot & Blyth.</i>	M. indica, <i>Geoff.</i>	
P. Priamus, <i>Elliot & Blyth.</i>	M. setifer, <i>Horsf.</i>	
P. cephalopterus, <i>Zimm.</i>	M. decumanus, <i>Linn.</i>	
Stenops gracilis, <i>Geoff.</i>	M. Rattus.	
Pteropus edulis, <i>Geoff.</i>	Gerbillus indicus, <i>Waterhouse.</i>	
Cynopterus marginatus, <i>Hamilton.</i>	Sciurus Tennentii, <i>Layard.</i>	
Nycticejus Heathii, <i>Horsf.</i>	S. Macrourus, <i>Forst.</i>	
N. Temminckii, <i>Horsf.</i>	S. tristriatus, <i>Waterhouse.</i>	
Kerivoula picta, <i>Gray.</i>	S. Brodiei, <i>Layard & Blyth.</i>	
Pipistrellus irroritus, <i>Cantor.</i>	S. Layardii, <i>Blyth.</i>	
Hipposideros Speoris, <i>Sch.</i>	S. Kelaartii, <i>Layard.</i>	
H. murinus, <i>Elliot.</i>	Pteromys oral, <i>Tickell.</i>	
Megaderma lyra, <i>Geoff.</i>	Hystrix leucurus, <i>Sykes.</i>	
Canis aureus, <i>Linn.</i> (probably 2 varieties).	Lepus nigricollis, <i>Cuv.</i>	
Felis pardus.	Elephas indicus, <i>L.</i>	
F. Viverrinus, <i>Bennett.</i>	Sus serofa?, a decided variety.	
F. Chaus.	Halicore Dugong, <i>Cuv.</i>	
Paradoxurus zeylanicus, <i>Sch.</i>	Cervus Hippelaphus, <i>Cuv.</i>	
Viverra Zibethii, <i>Linn.</i>	C. Axis, <i>L.</i>	
Genetta indica, <i>Geoff.</i>	C. Muntjac, <i>Zimm.</i>	
Mangusta vitticollis.	Meminna indica, <i>Gray.</i>	
M. griseus, <i>Sykes.</i>	Bos Bubalus.	
Lutra nair, <i>Cuvier.</i>	Manis Brachyura, <i>Eral.</i>	
Ursus (P.) labiatus, <i>Blainv.</i>	I have seen another, which I think is the Long-tailed Manis, <i>Auct.*</i>	
Sorex murinus, <i>Linn.</i>		
BIRDS.		
Palæornis Alexandri.	Falco peregrinus.	C. melanoleucos.
P. torquatus.	Tinnunculus alaudarius.	Micronis badius.
P. bitorquatus, vel P. Layardii, <i>Blyth.</i>	Baza Lophotes.	Astur trivirgatus.
P. Calthropæ, <i>Layard.</i>	Hæmatornis Cheela.	Spizaëtus limnaëtus, and var. cristatellus.
P. cyanocephalus.	H. Bido.	Hieraëtus pennatus.
Loriculus philippensis.	Circus Swainsonii.	Blagrus leucogaster.
	C. cinerascens.	

* Mr. Grace has lately added to this list two other species: (1.) *Herpestes Smithii*, Gray, and (2.) a new species of *Herpestes* described in the 'Proceedings of the Zoological Society.'—J. E. GRAY.

- Haliastur Indus.*
Milvus ater.
Scops lempiji.
Ketupa ceylonensis.
Ninox scutulatus.
Athene castanotus.
Syrnium Indrani.
Strix flammea, L.
Buceros pica.
B. gingalensis.
Upupa senegalensis.
Halcyon gural.
H. smyrnensis.
Ceryle rudis.
Alcedo bengalensis.
A. meninting.
Coracias indica.
Eurystomus orientalis.
Merops viridis.
M. philippinus.
M. erythrocephalus.
Brachypternus ceylonus.
B. aurantius.
Gecinys chlorophanes.
Micropternus phaeiceps, var.
Picus mahrattensis.
P. gymnophthalmos.
Megalania caniceps.
M. flavifrons.
M. philippensis.
M. rubricapilla.
Cuculus varius.
C. canorus.
C. tenuirostris.
Surniculus dicruroides.
Chrysococcyx xanthorhynchos.
Eudynamis orientalis.
Oxylophus melanoleucos.
O. coromandus.
Phaenocopus pyrrhcephalus.
Zanclostomus viridirostris.
Centropus philippensis.
C. chlororhynchos.
Harpactes malabaricus.
Podargus moniliger, Layard.
Caprimulgus indicus.
C. mahrattensis.
C. asiaticus.
Acanthylis caudacuta.
- Cypselus melba.*
C. affinis.
C. balasiensis.
Collocalia nidifica.
Macropteryx coronatus.
Corvus culminatus.
C. splendens.
Cissa puella.
Picus cinereus.
Gracula religiosa.
G. philogenys.
Acridotheres tristis.
Sturnia —, n. s.
S. pagodarum.
Ploceus philippinus.
P. manyar.
P. bengalensis.
Munia rubronigra.
M. malacca.
M. undulata.
M. striata.
M. malabarica.
Passer indicus.
Alauda Gulgula.
Mirafra affinis.
Pyrrhulauda grisea.
Anthus Richardi.
A. rufulus.
Nemoricola indica.
Mctacilla boarula.
M. viridis.
Dumetia albogularis.
Malacocercus bengalensis.
M. rufescens.
Drymoica robusta.
D. inornata.
Orthotomus longicauda.
Cisticola omalura.
C. cursitans.
Pomatorhinus melanurus.
Aleippe nigrifrons.
Chrysomma sinense.
Lanius tephronotus.
L. superciliosus.
Tephrodoris pondiceriana.
T. affinis.
Hemipus picata.
Pitta triostegus.
Oreoemela spiloptera.
Thamnobia fulvicata.
Kittacincla macrourus.
Copsichus saularis.
- Cyornis rubeculoides.*
Stoparola melanops.
Muscicapa latirostris.
Drymocapus fuscocapillus.
Acrocephalus dumetorum.
Phylloscopus nitidus.
P. montanus.
Sylvia affinis.
Dendrophila frontalis.
Graucalus Macei.
Campephaga Sykesi.
Pericrocotus flammeus.
P. peregrinus.
Hirundo rustica.
H. domicola.
H. hyperythra, Layard.
Artamus fuscus.
Dicrurus edoliformis.
D. macrocerus.
D. longicaudatus.
D. leucopygialis.
Tehitrea Paradisi.
Myiagra caerulea.
Cryptolopha cinereocapilla.
Leucocerea albofronata, var.
Hypsipetes nilgiriensis.
Hemixos icterica.
Pycnonotus haemorrhous.
P. flavirictus.
P. atricapillus.
Phyllornis malabaricus.
P. Jerdoni.
Iora zeylanica.
Oriolus melanocephalus.
Zosterops palpebrosus.
Nectarinia lotenia.
N. asiatica.
N. zeylanica.
Dicaeum minimum.
Treron chlorigaster.
T. bicolor.
T. malabarica.
Columba puniceus?
Palumbus Elphinstonii.
Turtur risorius.
T. humilis.
T. suratensis.
Chalcophaps indicus.
Pavo cristatus.

Gallopéridix zeylonensis.	Scolopax rusticicola.	Gallix cristatus.
Gallus Stanleyi.	Gallinago stenura.	Porzana phoenicea.
Perdix pondiceriana.	G. gallinula.	P. pygmaea.
Perdica argoondah.	Rhynchæa bengalensis.	P. fusca.
Coturnix chinensis.	Hydrophasianus chirgurus.	P. zeylanica.
Turnix taigoor.	Falcinellus igneus.	Rallus striatus.
Cursorius coromandelianus.	Threskiornis melanoccephalus.	R. indicus.
Esacus recurvirostris.	Tantalus leucocephalus.	Gallinula chloropus.
Cedionemus crepitans.	Platalea leucorodia.	Larus brunnicephalus.
Sarciophorus bilobus.	Anastomus oscitanus.	Sylochelidon caspius.
Lobivanellus goensis.	Dromas ardeola.	Gelochelidon anglicus.
Charadrius virginicus.	Ciconia leucocephala.	Hydrochelidon indicus.
Hiaticula Leschenaultii.	Ardea cinerea.	H. niger.
H. cantiana.	A. purpurea.	Thalasseus cristatus.
H. philippina.	Herodias alba.	T. bengalensis.
Limantopus candidus.	H. intermedia.	Sterna hirundo.
Totanus glottis.	H. garzetta.	S. javanica.
T. fuscus.	H. bubuleus.	S. minuta.
T. calidris.	H. asha.	Pelicanus javanicus.
Actitis glareola.	Butorides javanica.	Graculus carbo.
A. ochropus.	Ardeola leucoptera.	G. pygmaeus.
A. hypoleucos.	Nycticorax griseus.	Plotus melanogaster.
Limosa ægocephala.	Tigrisomaculanoëphia.	Phoenicopterus roseus.
Numenius arquata.	Ardetta flavicollis.	Dendrocygna arcuata.
N. phæopus.	A. cinnamomea.	Anas pœcilorhyncha.
Tringa subarcuata.	A. sinensis.	Dasila acuta.
T. platyrhynchos.	Porphyrio poliocephalus.	Querquedula crecca.
T. minuta.		Podiceps philippensis*.
Strepsilas interpres.		

* All these, with the exception of *Palumbus Elphinstonii*, I have observed myself. Dr. Kelaart has just added several more. I copy Mr. Blyth's letter in which he gives Dr. Kelaart credit for the discovery:—"Dr. Kelaart's collection has reached me, and is a most interesting one. It consists of skins of mammalia and birds only; among the latter the novelties are—a new *Garrulax* affined to the Nilgiri *Delesserti*, and the female of a new *Brachypteryx*; other birds new to Ceylon are, *Merula Wardii*, *Scops sunia* (so called), and a *Caprimulgus* like *indicus*, but smaller, and with the colours more strongly contrasted, of which I had previously a Nilgiri specimen, which I always suspected would prove to be of a distinct race. I had nearly forgotten to mention the finest of all—a noble specimen of *Spizaetus nipalensis* (Hodgs.), which I have never previously seen from anywhere southward of the Himalaya. The mammalia comprise many novelties:—of Monkeys a large fellow like *cephalopterus*, but larger, and bearing the relationship to that species which your large *Sciurus Tennentii* does to *S. macrourus*. Of Bats, a small *Pteropus*, which I suspect is new, and is certainly neither *Leschenaultii* nor *Dussumieri*; three new *Rhinolophi*, as they appear to me? *Taphozaus longimanus* (Hardwicke), and a new *Nycticejus*, which I have long had from Chiebassa in Central India, and termed *isabellinus*, but I have published no description. Of *Carnivora*, what he has sent as two varieties of Jackal, appear to me to be merely slight individual variations of *C. aureus*. His *Paradoxurus montanus*, a very handsome animal, I think can only be regarded as a very dark-coloured and full-furred variety of *P. zeylanicus*, especially as he sends an intermediate specimen. His two *Sorices* are both decidedly new. Of Squirrels, he sends *Pteromys*

This is the second parcel of skins Dr. Kelaart has sent; his first was nearly as interesting, and comprised the following novelties and additions to our fauna:—*Merula Kandiana*, n. s., Blyth; *Pratincola atrata*, Blyth, n. s.; *Pycnonotus melanops*, Blyth, n. s.; *Hirundo domicola*; *Palumbus Elphinstonii*, a marked variety; *Corydalla striolata*?; *Munia acutirostris*, Blyth, n. s. I should mention that my arrangement and nomenclature is entirely derived from Blyth's published Catalogue of the Birds in the Museum of the Bengal Asiatic Society.

The following is a list of land and freshwater shells in my collection; it is however small, and limited nearly to the southern and northern coasts. I should much like to collect in the hilly region; that humid climate, I doubt not, contains a vast variety yet unnoticed. When I have not got the specific name, I give only the generic; the figures following denote the number of species:—

Psammobia, 1.	Unio marginalis.	Megalomastoma, 1.
Modiola, 1.	Vitrina gigas.	Pterocyclos rupestris.
Helix guttata, Mill.,	3 varieties.	Planorbis indica. Planorbis, 1.
H. vitellina, Pfeiffer.		Lymnea, 2.
H. bistrialis, Beck.		Melania pyramus.
H. carabinata, H. Waltoni.		M. elegans, Benson? Melania, 5.
H. hæmastoma, Linn.,	7 var.	Pirene subulata, Lam. Valvata, 1.
H. Juliana, Gray,	2 var.	Paludomus sulcatus. P. nigricans.
H. fallaciosa, Ferr.,	2 var.	P. punctulatus. P. Tennentii.
Helix, 3 species, n. s.		P. Gardnerii. P. loricated.
Pupa bicolor. Pupa, 3.		Paludina melanostoma, Hutton?
Bulimus pallens, Gray.		P. (Bithinia), 1.
B. punctatus, Auct.		Ampullaria glauca?
B. trifasciatus, Chemn. Bulimus, 1.		Navicella bicanaliculata, Recluz.
Achatina ceylanica, Pfeif.,	2 var.	N. lineata, Lam. Navicella, 1.
A. gracilis. Achatina, 1.		Neritina Matonii.
Succinea, 1. Auricula, 1.		N. coromandeliana, S.
Scarabus pantherinus, Adams.		N. fabia, Sowerby.
S. plicatus, Fer.		N. dubia, Lam. Neritina, 2.
Conovulus, 1. Partula, 1.		Lithrina lævis.
Cyclostoma cornu venatorium, 2 var.		Cerithium Telescopium.
C. ceylanicus, Swains.		C. palustra. Potamis, 2.
C. Involvulus. Cyclostoma, 1.		

oral, Tickell, and what appears to me to be but a large and faded specimen of the same with old and worn pelagi—only it is remarkable that the tail is brown instead of black. Of *Sciuroptera*, a splendid new species, which however may perhaps be merely a fine adult of what I described the young of, by the name *Sc. fuscocapilla*, from South India. Of ordinary Squirrels, *S. Tennentii*, *S. macrourus*, *S. tristriatus*, and *S. trilineatus* (vel *Delesserti*). Some of the Rats are puzzlers, and I have asked him to send me specimens in spirits of these and the new *Rhinolophi*. There is no doubt about *M. Bundicota*, *decumanus*, and *Gerbillus indicus*. Of his *M. coffæus* you formerly sent me a specimen. His *Golunda newera* is very like *M. hirsutus*, Elliot, but has a much shorter tail. His *M. albiventer* I think is new, a species with very soft fur, and there are two other species of white-bellied Rats which are new to me. Also a large species with very long tail, and merely a little paler on the under parts, which I suspect is identical with a Tree Rat here, *M. arboreus*, Buchanan Hamilton MSS., of which I am trying to get some fresh specimens for comparison."

If I include these last among the fluviatile genera, I should add in, *Venus brunnea* and *Cytherea vulgaris*, as they inhabit fresh and salt water alike; however, as to that, I have found *Ampullaria glauca*? doing the same.

Of the marine Mollusca and the Crustacea, &c., I can give you no information by name, neither can I in like manner catalogue the Reptilia I have; on these last I have no work whatsoever to supply me even with generic divisions, much less specific. I don't give you the names of any Lepidoptera—those you know as well as I do—*better, you ought*—as you have the advantage of books and cabinets to refer to.

Well, my dear friend, my task is ended; you are doubtless glad of it. If I make any fresh discoveries or glean any zoological news, you shall hear again.

Meanwhile I remain as ever, yours very truly,

EDGAR L. LAYARD.

BIBLIOGRAPHICAL NOTICES.

The Geological Observer. By Sir H. T. DE LA BECHE, C.B., F.R.S. &c., Director-General of the Geological Survey of the United Kingdom. London: Longmans.

THIS work, although differing in its general characters from the ordinary introductions to geological science, is essentially intended to aid the student in his practical observations in the field, and few men have brought so much experience to the task as Sir Henry De la Beche, devoting, as he has done for a long series of years, an earnest and laborious investigation to the physical changes which have taken place on the earth's surface.

The ample opportunities which Sir H. De la Beche has enjoyed of comparing the geological constitution of this country with that of many other parts of the globe, noting the peculiarities, differences or resemblances of the various mineral masses, and not overlooking the importance of the causes at present in operation, have materially fitted him to produce such a volume as "The Geological Observer."

The previous works of the author are well known, and the title of the present one must not lead the reader to expect merely an elementary treatise or a disquisition on the succession of rock formations and their contained organic remains, but is more usefully occupied in pointing out the importance of a knowledge of those general principles connected with the present terrestrial phenomena—the changes now taking place on the surface of the globe by igneous and aqueous action—their influence on the distribution of animal and vegetable life—the formation of strata—the imbedding of the remains of terrestrial and marine beings, and showing their intimate bearing upon the interpretation of geological discovery; in fact, it may be considered as a treatise on applied cosmical phenomena to the ancient changes of the earth, so as to assist the observer in his inquiries respecting the physical geography of the great geologic periods, of

which interesting illustrations of certain portions are given in the volume before us.

In no science more than geology is correct observation necessary; for it has been well remarked by Humboldt, to behold is not to observe, that is, to compare and combine; and the author states that the present work was undertaken in the hope that the experience of many years might assist and abridge the labours of those entering upon the study of this science, especially in the field, so as to afford a general view of the chief points, such as existing observations would lead us to infer were established; showing how the correctness of such observations may be tested, and sketching the directions in which they may be extended. To effect this, the work is divided into a series of sections, of which the greater portion are devoted to the consideration of the effects of igneous and aqueous agencies in present and past time; thus, amongst the former may be classed—volcanos and their products, and salses or mud volcanos—temperature of the earth—igneous products of earlier date than those of modern volcanos—earthquakes—rise and subsidence of land—bending, contortion and fracture of bedded rocks, &c. Resulting from aqueous agency may be noticed—removal of the parts of rocks by water—action of the sea on coasts—distribution and deposit of sediment in tidal and tideless seas—chemical deposits in seas—transportal of mineral matter by ice—preservation of remains of existing life in mineral matter: under this head the valuable researches of Prof. E. Forbes on the distribution and modification of marine life and their bearing on geological inquiry are concisely treated; as is also the subject of coral reefs and islands, the theory of formation of the different classes, and the varied effects of their submergence and elevation in reference to the changing arrangements of the surface distribution of land and water.

The subject of ossiferous deposits is also fully treated by the author; and as the extinction of the great mammalia in connection with the glacial period, and the occurrence of their remains in deposits both anterior and posterior to the “drift” is at present engaging the attention of geologists, the following remarks are quoted:—“It is only as regards the probable connection with the inferred interval of increased cold at a particular time in the northern hemisphere that ossiferous deposits are here noticed. Under the hypothesis of this increase of cold being accompanied by the submergence of a large portion of Europe, such submergence being gradual and followed by a rise of the same area, and with very considerable modifications of its surface, there are apparently conditions for much movement amid the terrestrial animals of this portion of the northern hemisphere. They would be sometimes isolated and destroyed, as by continued depression the sea passed over their feeding-grounds; at others they would retreat to regions where they could, for a time, establish themselves and increase, some species being better able to preserve themselves than others. Upon a rise of the sea bottom, and the consequent formation of new lands, migrations would be effected. according to the relative levels of these lands, as regards the sea, and as passages for

the movement of certain animals would sometimes present themselves more favourably in one direction than in another.

“Evidences of the accumulation of the osseous portions of elephants, rhinoceroses, and other animals of several of the same species, the remains of which occur in accumulations beneath those formed at the cold or ‘glacial’ time, are considered to have been detected also above them, together with the remains of some animals not previously inhabiting the area of the British Islands and adjacent portions of the continent of Europe. This subject offers a fertile field for the labours of an observer. Though much may have been accomplished, much remains to be done, and it will require his especial care to see, that amid the new lakes and river-channels formed, when the ground took that general configuration which we now find, a re-arrangement of bones, washed out of the older deposits, containing remains of the *Elephas primigenius*, *Rhinoceros tichorhinus*, and their contemporary mammals, and carried into the newer lacustrine and fluviatile beds, may not occasionally be such as to mingle the osseous remains of the species of one time with those of another.”

Among the more interesting portions of the work to which we would direct the attention of the student, is the section devoted to the consideration of the mode of accumulation of detrital and fossiliferous rocks, in which points of the highest geological interest are fully discussed. As a general fact, we must dismiss from our minds the notion, that the present distribution of dry land and water in the world bears any relation to that of past time, for it is now generally conceded that the earth has passed through a series of physical changes, and has been successively tenanted by forms of animal and vegetable life, adapted to each varying condition as it arose,—indications of periods of repose or of the continuance of certain given conditions over the whole area of the globe itself.

The difficulty, therefore, with which the geologist has to contend in his investigation of the physical geography of different geological times, is the obliteration of the ancient landmarks, either by denudation and the washing away of previous formed materials, or the subsequent accumulation of detrital matter over the ancient surface. We are glad to find the interest manifested of late in seeking out the boundaries of any ancient land and the actual margins of the seas of the time, which points, to some extent, have been successfully followed out by the labours of the Geological Survey, for it has been ascertained, from the researches of Prof. Ramsay, “that during the deposit of the Silurian rocks of Wales and Shropshire, there was a time when the older accumulations now forming the district of the Longmynd, rose above the sea, and were bounded by beaches; while a part of the Silurian series, named the Caradoc sandstones, was being deposited adjacent to them. Again, in the Malvern district, Prof. J. Phillips has shown that about the same geological date a portion of the syenites of the Malvern hills must have been above the sea; a beach deposit, in which there are angular fragments of the pre-existing rocks, occurring on their western flank. In both cases organic remains are mingled with the shore accumulations, and Prof. E. Forbes

considers that those which he examined in the Longmynd district are of a coast character." Littoral accumulations have also been detected in the older fossiliferous rocks of Ireland and Devonshire; and a very instructive instance, during the secondary period, is given by the author, and well illustrated by a map (p. 552), showing the mode of occurrence of beaches (of the age of the dolomitic conglomerates), surrounding the older rocks of the Mendip hills, and the changes effected in the dry land, shores, and sea bottom of a small area (proved by the peculiar manner in which the organic remains are imbedded) during the subsequent deposition of the lias and inferior oolite.

With these brief remarks we conclude our notice of this valuable contribution to Geological literature; and no geologist, and certainly no student of the science, can fail to derive from the perusal of the work, correct and philosophic views, which may render his investigations into the past history of the earth more interesting and practically useful.

Works in the Press.

We learn from Mr. Ralfs that it is his intention to publish a series of specimens of British Algæ.

In order not to interfere with Mrs. Wyatt's 'Algæ Daumonienses,' in which she had included most of our marine species, it will be chiefly confined to the freshwater species and the Diatomaceæ, thus forming a sort of supplement to her work. The 1st fasciculus will contain forty species, at ten or twelve shillings. The number of copies will be limited. The following Algæ are comprised in the forthcoming number:—*Chylocladia reflexa*, *Chantransia investiens*, *Chætophora fastigata*, *Desmonema Dillwynii*, *Leptothrix tinctoria*, *Desmidium quadrangulatum*, *Didymoprium Borreri*, *Exilaria pulchellum*, &c.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

April 23, 1850.—R. H. Solly, Esq., F.R.S., in the Chair.

The following papers were read:—

1. ON THE GARRULINE BIRDS, OR JAYS; WITH DESCRIPTIONS OF NEW SPECIES. BY CHARLES LUCIEN, PRINCE BONAPARTE.

Having elevated the *Garruline Crows* to the rank of a full family, the fifty-third of my Natural Classification of Birds, I now consider the family *Garrulidæ*, (including, besides the *Crypsirhininæ*, *Baritinæ*, and the *Jays*, also the *Hopping Magpies*, notwithstanding their stronger bill and closer relation to the *Corvidæ*), as formed of five different groups (subfamilies or great genera as you may call them, according to your notions, and you admit or not subgenera). And I say five, although I do not separate the Magpies from the Jays, but consider them as *Garruline*, because to the three old subfamilies, *Baritinæ*, *Crypsirhininæ* and *Garrulinæ*, I now add a fourth (*Garrulavinæ*), for the reception of a good many birds hitherto scattered in different families, whose affinity to the Jays, taken for mere analogy,

is now clear and manifest to my eye. *Garrulax*, *Actinodura*, *Oriolia*, *Turnagra*, or rather *Otagon*, distinct from the much more Garruline *Keropia*, with those *Kittæ* which are not *Coraciinæ*, are all members of this my new group, to which (however enlarged) cannot be well united a fifth, *Ptilorhynchinæ*, including the genera *Chlamydera* and *Ptilorhynchus*, which in *Sturnidæ* were out of their place. But the object of the present paper is merely the enumeration of the genera and species of my Garruline subfamily.

The first that we meet, ending the *Garrulaxinæ* with *Keropia*, which may as well be the first of Garrulinæ, is the genus *Platylophus*, Sw., judiciously changed by G. R. Gray, 1840, into *Lophocitta*, hitherto composed of but one species from Java, to which I now add a second from Sumatra, introducing to you the bird called *Garrulus histrionicus* by Solomon Müller, struck in the native woods where he discovered it by its mimic gestures, whilst the skins he sent to the Leyden Museum suggested the name of *Garrulus rufulus*, Temminck, than which there can be no better for closet-naturalists. I introduce it thus in the *Systema Naturæ*.

LOPHOCITTA HISTRIONICA, Bp. *Minor: fusco-ferruginea; collari nigro; maculâ utrinque colli magnâ, supraoculari parvâ, albd.*

Synonyms.

Garrulus histrionicus, Müll.

Garrula rufula, Temm. Fig. nulla.

Hab. Sumatra; Borneo.

The old species will stand as follows:

LOPHOCITTA GALERICULATA, Gr. *Major: nigra; collari nullo; maculâ utrinque colli magnâ, supraoculari parvâ, albd.*

Synonyms.

Corvus galericulatus, Cuv.

Lanius scapulatus, Licht.

Lanius coronatus? Raffles.

Levaill. *Hist. Nat. Parad.* t. 42.

Hab. Java.

The second genus of the family will be my *Perisoreus* or the *Dysornithia* of Swainson, a northern group composed also of two species only, both well known, the European and Asiatic *Perisoreus infaustus* and the American *Per. canadensis*; for *brachyrhynchus*, Sw., is the young of the latter; and as to *Garrulus ferrugineus*, Bechstein, we cannot think of admitting it as distinct, although sustained by Wagler; plate 48 of Levaillant, on which alone it is based, being much more like *Perisoreus infaustus* than the very plate 47 constantly quoted under that name.

Third comes the true *Garrulus*, peculiar to the Old World, composed of our common Jay with its five closely-allied (or mere races), and two other more distinct, though hardly less typical, species. One of these, chief object of the present paper, is certainly by far the handsomest, if not at the same time the largest, resembling most, especially by the small, lanceolate, white-shafted feathers of its throat, with barbs

still more disjuncted, *Garrulus lanceolatus* of Central Asia, so well figured by Gould in his 'Century of Himalayan Birds.' This bird may be appreciated also in its adult state under the name of *Garrulus gularis*, and in immature plumage under that of *Garrulus Vigorsii* among the 'Illustrations of Indian Zoology.' Our new species, notwithstanding its stouter and longer feet, its higher and much more compressed bill, and elongated square tail, can by no means be called aberrant.

GARRULUS LIDTHI, Bp. *Rufo-vinaceus; capite colloque ex totis, alis, caudæque, saturatè azureis; fronte lorisque nigricantibus; plumis gulæ lanceolatis, barbulis disjunctis, rachidibus albis: tectricibus alarum nigro-fasciolatis: remigibus, rectricibusque apicem versus nigricantibus, apice ipso albo.*

Long. 13 poll.; rostr. $1\frac{1}{2}$ poll.; alæ 7 poll.; caudæ $5\frac{1}{2}$; tars. $1'' 8'''$.

Typicus; quamvis ad **ACTINODURAM** accedens simul et ad **CYANOPICAS!**

Rostrum albidum, altum, valde compressum: cauda elongata, æqualis.

Color azureus capitis et colli sensim in rufo-vinaceum dorsi et abdominis transiens.

Hab. The precise country of this Jay is not known; but Asiatic as it shows, and all circumstances induce us to believe, it must live in some very remote and unexplored occidental spot of China or Indo-China. The specimen described formed part of Baron van der Capellen's collection, purchased after the death of that Dutch governor of Malasia by Prof. van Lidth de Jeude of Utrecht. I detected it last week during a visit I paid to that most splendid perhaps of private collections with my learned friend Schlegel*.

The tail alone, strongly rounded, would be sufficient to distinguish from our new species, and indeed from all others,

GARRULUS LANCEOLATUS, Vig. *Cano-vinaceus: pileo genisque nigris: gula juguloque nigricantibus plumis lanceolatis, rachidibus albis: tectricibus alarum minorum exterioribus candidis, corpori proximioribus nigerrimis absque fasciis: remigibus rec-*

* We had a double object in view in visiting Utrecht and the munificent Professor, to whom it is more justice than compliment to dedicate his new Jay: 1. Of admiring the only adult bird in collections of the Japanese Sea-Eagle (*Haliaëtus pelagicus, leucopterus* aut *imperator*), whose monstrously powerful bill must really be *thunderstriking!* 2. Of ascertaining the supposed new species of *Microglossus*, of which you may have read in the 'Comptes Rendus' of the French Academy, and which I am delighted to say proves to be a specimen of the oldest known, more likely to get the second abolished than a third established. Schlegel (whose observations I shall always be happy to collect and profit by) declared that the two species of *Microglossi* will henceforth stand in precisely the same relation as the two *Coracopsis* (which he of course called *Vasa*) to each other. But even not considering that result of our investigation, our chief object would have become the least important, from the great variety of valuable and new animals we saw on all sides in the newly-built galleries and well-kept museum, especially among reptiles! And what can I say of the unique collection of fetuses? Even Englishmen could not help being amazed at seeing in the midst of other wonders, the **ELEPHANT** and **HIPPOTAMUS** bottled up in spirits!

tricipusque cæruleis nigro fasciolatis: cauda valde rotundata, apice alba.

Synonyms.

Garrulus gularis, J. Gr. adult.

Garrulus Vigorsi, J. Gr. juv.

Ill. Ind. Zool. i. t. 10 & t. 9.

Hab. in Asia centrali, Himalaja.

N.B. The small coverts which in all other Jays are blue banded, in this are plain black and white (bipartite); which latter colour on the contrary is wanting on the quills, beautifully striated blue and black as are the small coverts of the others.

The comparison with this last species was the only one necessary to establish; but, considering that no little difficulty is met with in discriminating the different European and Asiatic Jays, and what a confusion prevails among the synonyms of the remaining, which may be considered as six races of the same great species, I shall try to take advantage of my long experience, peculiar fancy for the group, and especially of the rich collection I now have at my command, in order to point out their discrepancies.

1. *GARRULUS GLANDARIUS, Vieill. Cinereo-vinaceus, dorso orbitisque concoloribus: pileo albo-cinereo, plumis elongatis medio nigris: genis rufescentibus: gula juguloque albis: remigibus primariis extus basi albis; secundariis obsolete cæruleo-fasciolatis: rectricibus nigris subfasciolatis. Major: rostrum validum.*

Synonym.

Corvus glandarius, L. &c.

Pl. Enl. 481; Levaill. Parad. t. 40, 41; Gould, Eur. t. 214.

Hab. Europ. s. occ. et m. ab Hispaniâ ad Græciam.

2. *GARRULUS JAPONICUS, Schlegel. Fusco-vinaceus, dorso concolore: pileo albo-cinereo, plumis elongatis maculis nigris expansis: orbitis, loris, remigibusque primariis basi externe nigris: secundariis cæruleo nigroque distincte fasciatis: rectricibus subunicoloribus.*

Synonym.

Garrulus glandarius, var. an nov. sp.? Patriæ ignotæ, De Filippi, Cat. Mus. Mediolanens. 1847, sp. 18; Faun. Japonic. Av. t. 43.

Hab. in Japan.

3. *GARRULUS KRYNICKII, Kaleniczenko. Cinereo-vinaceus, dorso orbitisque concoloribus: pileo nigro, plumis elongatis: cervice rufa: gula, genis, juguloque rufo-cinereis: remigibus secundariis unicoloribus: rectricibus mediis tantum fasciatis cærulescentibus ad basim. Major: rostrum robustum.*

Synonyms.

Corvus glandarius, var. pileo nigro, Hohenacker, Enumeratio Anim. Schirwan, in Bullet. Soc. Nat. Mosc. 1837, p. 141.

Garrulus Krynicky, Kalenicz. Bull. Soc. Nat. Mosc. 1839, p. 319. t. 14.

Garrulus iliceti, Mus. Lugdun.

Garrulus glandarius melanocephalus, Schleg. Rev. Critiq. Ois. Eur. et Faun. Japon., et *G. melanocephalus*, Auct. quoad Av. Europ.! nec Bonelli; Susemihl, Eur. Vog. 11. t. 6.

Hab. in Europa magis orientali et Asia occid. in Regionibus Caucasica et transcaucasica, Persia boreali, Crimea, Ukraina, Daouria.

4. *GARRULUS MELANOCEPHALUS*, Bonelli. *Cano-vinaceus*, dorso orbitisque concoloribus; pileo nigro, plumis vix elongatis: ceruice rufo-castanea: gula, genisque albis: subtu albido-cinereus: cæruleo alarum dilutiore, minus extenso: remigibus secundariis unicoloribus: rectricibus mediis omnino cæruleo-fasciatis. Minor: rostrum gracilius.

Synonyms.

Garrulus atricapillus, Geoffr. 1832.

Garrulus iliceti, Mus. Berolin.

Pica stridens, Ehrenb.; Géné, Mem. Acad. Taur. xxxvii. t. 1; Levaill. jun. Exp. Alger. Av. t. 6.

Hab. in Africa s. Syria, Arabia.

5. *GARRULUS BRANDTI*, Eversm. *Vinaceo-rufus*, dorso cano; orbitis nigris: abdomine cinnamomeo canescente: pileo rufo-cinnamomeo, plumis elongatis, vix maculato: remigibus secundariis externe candidis: rectricibus ad basin tantum obsolete fasciatis.

Synonym.

Garrulus Brandti, Hartl. Rev. Zool. 1845; Schleg. in Faun. Japon. p. 83; Brandt, Enum. Anim. Vert. Sib. Occ. p. 25. sp. 104.

Hab. in Sibiria occid. et centr. Mont. Altai.

6. *GARRULUS BISPECULARIS*, Vig. *Cinereo-cinnamomeus*, dorso orbitisque concoloribus: pileo immaculato, plumis vix elongatis: remigibus secundariis (uti tectrices minores) nigro cæruleoque fasciatis.

Synonyms.

Garrulus ornatus, J. Gr. Ill. Ind. Zool. t. 10.

Garrulus bispecularis, Gould, Cent. Himal. B. t. 38.

Hab. in Asia Centrali, Nepal. Mont. Himalay.

N.B.—I do not know *Garrulus albifrons*, figured by J. Gray on plate 12 of the second volume of Hardwicke, Ind. Zool. Ill., but notwithstanding the authority of Hartlaub, judging as he does from the figure, I have no hesitation in declaring it is not a Jay.

The fourth genus of my *Garruline* subfamily is *Cyanogarrulus*, Bp., a North American group, dismembered from *Cyanocorax*, Boie, for the distinction of the Blue true Jays with shorter bills, short-tailed and crested, much more allied to the European *Garruli* than to the South American *Cyanocoraces*. Three species are known: *cristatus*, L., *Stelleri*, Pall., and *coronatus*, Sw.

Not professing Mr. Strickland's principles as to the appropriation of names, we borrow from him the classical one *Cyanocitta* for a fifth

group, still composed of a dozen species of both Americas, such as *flavidanus*, *ultramarinus*, &c., of which genus we shall say no more on this occasion, in hopes that such elegant birds tinged with blue will shortly make their appearance in a peculiar monograph published in the same style and with the same joint authorship as the monograph of those birds tinged with red, the *Loxiinæ*, just ready to appear by the exertions of Dr. Schlegel and myself.

A sixth genus will necessarily be the one to which I restrict Boie's name of *Cyanocorax*, because even by their size and less brilliant colours they are really *Blue Crows*, such as *C. azureus* and *violaceus*, which latter, even by its nuchal ornament (beautiful ornamental spot), shows a passage on one side to *C. ornatus*, (which with the other smaller elegant species, such as *armillatus*, have again a tendency to the Jays;) and on the other, by *C. cayanus*, to the white-tailed species, much more crow-like, and which five, as they are, might constitute the group *Uroleuca*.

Then comes seventh, with its yellow tail, my new genus *Xanthura*, composed of three South American birds formed and coloured as *Corvus peruvianus*, one of which exhibits also the elegant nuchal spot which so much contributes to show the South American birds connected. The last of *Cyanocorax* must be the *Sanblasiana*, so abnormal as to deserve perhaps the generic appellation of *Cissilopha*. More than ever convinced of the propriety of using old names for modified groups, I persist of course in retaining that of *Cyanurus*, Swainsonian synonym of *Cyanocorax*, but recalling attention to the tail, for the *Long-tailed Blue Jays with black bills*: of these, two undescribed species appear to live in the far east of Asia, quite as beautiful as the two celebrated ones of occidental America, upon which so many names have been lavished:

1. **CYANURUS BULLOCKI**, Bp. *Cyaneus, subtus albus: gula, genis, pectoreque nigris: crista frontali parva: rectricibus duabus mediis mirifice elongatis, lateralibus apice latissime albis.*

Synonyms.

Pica Bullocki, Wagl. 1827.

Pica miles, Licht.

Pica formosa, Sw.

Garrula gubernatrix, Temm. Pl. Col. 436.

Psilorhinus gubernatrix, Gr.

Hab. in Mexico.

2. **CYANURUS COLLIEI**, Bp. *Cyaneus, subtus cum genis albus; torque jugulari nigro: crista sincipitali magna: rectricibus mediis modice elongatis; lateralibus apice latissimis albis.*

Synonyms.

Garrulus bullocki, Aud. nec Wagl.

Psilorhinus bullocki, Gr.

Pica Colliei, Vig. Zool. Beechey's Voy. f. 7.

Garrulus Burneti (err. berneti, berneti and bennetti), J. Gr.

Garrulus ultramarinus, Aud. nec Bp. Am. B. t. 96.

Hab. in California.

3. **CYANURUS DAIRI**, Bp. *Cyaneus, subtus omnino albus : crista occipitali longa ; reatricibus mediis valde elongatis ; omnibus apice nigris.*

Hab. in Asia magis orientali, Corea.

4. **CYANURUS CUBO**, Bp. *Cyaneus, subtus antice niger : crista nulla : reatricibus mediis valde elongatis ; omnibus apice albis.*

Synonym.

San-zjak, *Japonens.* (which name applies also to the red-billed *Calocitta sinensis*).

Hab. in Asia magis orientali, Corea.

Naturalists acquainted with the two American species will see, independently of these phrases, how much more strongly the characters contrast between my two new Asiatic species than between the old American ones, although in some aspects they may be considered to bear to each other the same relations. At all events that I should be excused, if not justified, my Chinese *Black-billed Cyanuri* must on every account be followed and supported by Schlegel's own genus *Biophorus* and by its only species *Biophorus paradisiacus* of the Fauna Japonica, Av. Suppl. tab. B. Of this splendid bird also the portrait only has yet reached Europe, taken by a Japanese artist from the living bird under the eye of the celebrated Siebold, who is warrant of its correctness.

The next genus will be that of the *red-billed, long-tailed, Blue Magpies*, to which I give the name of *Calocitta*, not being able to apply to the group any older than that given to it by my friend Gray in 1840, though since withdrawn when he had the untoward idea of making the most unnatural amalgamation of *Garrulinæ* under his arrangement of *Psilorhinus*! Those who call it *Cissa* are evidently wrong. I know three Indian species, nor do I believe in many more, at least among the described. *Psilorhinus morio, fuliginosus* or *mexicanus*, therefore, would have to stand alone, as Rüppel probably intended it when he instituted the genus (excellent if not adulterated), if we had not from Chili a smaller new species as typical as the old one (*Psilorhinus chilensis*, Bp.).

Still less than the other intruders can *Gymnorhinus cyanocephalus*, Wied, be forced into it, as the name alone ought to have taught. That name, however, was preoccupied, when, in 1840, the Prince of Neuwied proposed it for his new genus: and it was very reluctantly, and after requesting in vain the author to change it himself, that I was compelled in 1842 to make it *Cyanocephalus*, calling the bird *Cyanocephalus Wiedi*, as a small compensation and a testimony of personal regard to the author, with whom I have long corresponded and prosecuted all kinds of satisfactory scientific affairs. Now, in 1850, he requests me to take his new name of *Gymnokitta*, and I most willingly adopt it, hoping that all ornithologists will make an exception to the rule of priority in this very peculiar case, in which, after all, the Prince of Wied claims his own genus with a better name.

Intermediate between *Garrulus* and *Pica*, we come now to my *Cyanopica*, a genus of *Blue Magpies* about which some English

journalists have *chattered* like *pie'd* (or rather *paid*) Magpies! I sub-join here the phrases of its three species, that of Vaillant, Pallas, and Capt. Cook, now Widdrington (so closely allied as to be taken for three races of but one species), to show they are really distinct, although the characters hitherto assigned to them by the most clever and accurate naturalists may have proved inconstant and fallacious.

1. *CYANOPICA MELANOCEPHALA*, Bp. *Capite subcristato, ex toto cum gula nigro: dorso cærulescenti: reatricibus omnibus albo terminatis.*

Synonyms.

Corvus cyaneus, Lath., Vieill.

Pica melanocephalos, Wagl.

Cyanopica Vaillant, Bp. in litt.; Levaillant, Ois. Afr. t. 58.

Hab. in China.

2. *CYANOPICA CYANEA*, Bp. *Capite lævi, supra tantum nigro-chalybæo: dorso cinereo-vinaceo, nucha vix canescente: reatricibus lateralibus apice tantum albis, mediis valde elongatis late albo terminatis.*

Synonyms.

Corvus cyaneus, Pall.

Pica cyanea, Wagl., Schleg.

Cyanopica Pallasi, Bp. in litt.; Faun. Japon. t. 42.

Hab. in Asia orientali, Daouria, Japan:

3. *CYANOPICA COOKI*, Bp. *Capite lævi, supra tantum nigro-chalybæo: dorso cano-rubello, nucha albicante: reatricibus lateralibus late albo terminatis, mediis modice elongatis vix apice albis.*

Synonyms.

Pica cyanea, Cook.

Pie bleue d'Europe, Schlegel (*Cyanopica europæa*).

Cyanopoli Cooki, Bp. Brit. Assoc. Birmingham. 1849; Gould, Eur. t. 217; Susemihl, Eur. Vog.

Hab. in Eur. mer. Hispania.

We are thus arrived to the genus *Pica*, Br., or true Magpie (*the pied long-tailed*), which, as we observed from the beginning, must close the *Garruline* series, which it connects with the *Corvidæ*, showing as much affinity to those larger Crows as the first of the Jays do to the smaller Shrikes or *Laniidæ*. Of such Magpies we know eight species perfectly typical and quite close to each other, whilst two birds still allowed to remain in it are abnormal, each deserving of a genus by itself: to both these birds, however different in form and colour, the name of *Corvus caledonicus* has been applied, one of which is the slender-billed, more jay-like *Pica albicollis*, Vieill., *Garrula torquata* of the 'Pl. Col.' of Temminck, to which the generic name of *Streptocitta* might be applied; whilst I propose that the name of *Gazola* (so congenial in this our family), applied to the legitimate *Corvus caledonicus*, should honour the person and perpetuate the martyrdom of a highly refined and scientific ecclesiastical friend of humanity, the lost victim of clerical machinations!

MONOGRAPH OF SPHÆNIA, A GENUS OF LAMELLIBRANCHIATE
MOLLUSCA. BY ARTHUR ADAMS, R.N., F.L.S. ETC.

In the unrivalled Collection of Mr. Cuming is a group of Bivalve shells, which appear to be neither *Mya* nor *Corbula*, but partaking of the characters of each. The animal, which is also preserved in spirits, resembles that of *Corbula* in having short united siphons, a small compressed foot, and in the mantle being closed, with the exception of an anterior elliptic opening; the shells, however, have the hinge of *Mya*, but do not gape at both extremities. The only genus, therefore, into which they resolve themselves is *Sphænia* of Turton, which, with the hinge of *Mya*, gapes only at one end, and which moreover is deprived of a long coriaceous siphon. Mr. Hanley has published one species in the 'Zoological Proceedings,' under the name of *Mya semistriata*, and M. Deshayes another, under that of *Corbula decussata*, in the 'Magazin de Zoologie,' 1844, and I had described a third, under the name of *Sphænia Mindorensis*, in the 'Zoology of the Voyage of H.M.S. Samarang;' and to these I now add several other large exotic species collected by Mr. Cuming.

SPHÆNIA, Turton.

Animal ovatum; pallium anticè clausum, præter aperturam pro pede parvo digitiformi sulco byssali instructo; siphones connati usque ad extremitates, orificia cirrata; siphon analis valvulâ tubulari membranacè extra orificium productâ.

Testa oblonga, inæquivalva, inæquilateralis, magis minusve posticè hians; lævis, vel rugosa, epidermide tecta; umbones incurvati; cardo dente laminari dilatato erecto in valvulâ sinistrâ, alveo convenienti in valvulâ dextrâ; ligamentum internum; impressiones pallii sinu parvo.

SPHÆNIA BINGHAMI, Turton. *S. testâ inæquivalvâ, inæquilaterali, ovato-trigonalâ, transversim concentricè sulcatâ, epidermide olivaceo tectâ; latere antico breviorè, rotundato, postico longiorè, hiantè, subtruncato; impressione pallii sinu subprofundo, rotundato; dente cardinis valvulæ sinistræ posticè subsinuato.*

Hab. British islands.

SPHÆNIA DECUSSATA, Deshayes, sp. *S. testâ ovato-oblongâ, subæquilateralâ, posticè truncatâ, subrostratâ, rostro basique obliquè carinatâ, albâ, striis longitudinalibus, transversisque tenuissimè decussatâ; umbonibus magnis, oppositis; dente cardinali magno, obliquo, compresso in valvâ sinistrâ, in valvâ dextrâ foveolâ profundâ, marginatâ.*

Hab. Seas of Sumatra.

SPHÆNIA SEMISTRATA, Hanley, sp. *S. testâ albâ, transversâ, ovali, inæquilateralâ, concentricè striatâ; latere antico breviorè, valdè convexo, lævi; postico longiorè, angustiorè, truncato, radiatim striato; margine ventrali in medio sinuoso, posticè angulato, anticè rotundato.*

Hab. — ?

This species have sculpture similar to *Sp. princeps*, but the valves are more gibbous, especially at the anterior part; the shell is much thinner, and the general outline different.

Mya semistriata, Hanley, *Zool. Proc.* 1843.

SPHÆNIA PRINCEPS, Adams. *S. testá magná, albá, transversá, ovali, inæquilaterali, concentricè striatá; latere antico, longiore, rotundato, lævi; postico breviorè, angustato, subtruncato, radiatim sulcatá; margine ventrali arcuato, integro; impressione palliali vix sinuatá; dente cardinis emarginato.*

Hab. Philippine Islands; *H. C.* (Mus. Cuming.)

SPHÆNIA ELLIPTICA, Adams. *S. testá transversá, ovali, subæquilaterali, albá, fragili, utrinque rotundatá, epidermide tenui partim obtectá, concentricè striatá; latere antico lævi, postico radiatim striato; impressione pallii vix sinuatá; dente cardinis sæpe valdè anticè fisso.*

Hab. Sydney, 4 fathoms, mud; *Mr. F. Strange.* (Mus. Cuming.)
Mus. Hanley.

SPHÆNIA DECURTATA, Adams. *S. testá transversá, ovali, subæquilaterali, albá, concentricè transversim sulcatá; longitudinalliter tenuissimè radiatim striatá; anticè latiorè, rotundatá, posticè angustatá, angulatá, abruptè truncatá; margine ventrali arcuato, integro; impressione pallii sinu parvo; dente cardinis anticè valdè fisso.*

Hab. Catanuan, province of Tayabas, island of Luzon, in sand at low water; *H. C.* (Mus. Cuming.)

SPHÆNIA PHILIPPINARUM, Adams. *S. testá ovali, transversá, subinæquivalvâ, albá, tenui, ventricosá, inæquilaterali; latere antico longiorè, rotundato, lævi; postico breviorè, radiatim striato, vix truncato; epidermide fusco tenui tectá; margine ventrali interdum subsinuato; impressione palliali sinu parvo; dente cardinis valvulæ sinistræ trilobato.*

Hab. Sibunga, island of Zebu, fine sand, 30 fathoms; *H. C.* Bay of Manila, clayey sand, 6 fathoms; *H. C.* (Mus. Cuming.)

SPHÆNIA RÜPPELLII, Adams. *S. testá transverso-elongatá, transversè striatá, epidermide fusco tectá; latere antico breviorè, rotundato, gibboso, obsoletè radiatim striato; postico longiorè, angustiorè, subrostrato, truncato; dente cardinis valvulæ sinistræ subsinuato.*

Hab. Red Sea; *Dr. Rüppell.*

SPHÆNIA MINDORENSIS, Adams and Reeve.

Voy. Zool. Samarang, t. . f. .

May 14.—William Yarrell, Esq., V.P., in the Chair.

DESCRIPTIONS OF TWO SPECIES OF CRUSTACEA IN THE
BRITISH MUSEUM. BY ADAM WHITE, ASSISTANT ZOOLOGICAL
DEPARTMENT, BRITISH MUSEUM.

POTAMOBIVS SERRATUS.

Cancer serratus, *Shaw, Zoology of New Holland, t. 8.*

Beak shorter than the peduncle of the outer antennæ, with three

teeth on the outside, above hollowed and slightly grooved down the middle, edges over the eyes considerably thickened. Hands, outside with a double row of serratures extending to near the end of the fixed claw; inside edge serrated with four teeth and one tooth at the end; moveable claw with six or seven teeth placed irregularly but chiefly on the ridge; claws elongated, inner edge with a few bluntish teeth, the end somewhat hooked. Wrist with each of the lateral edges furnished with two strong teeth or spines. Carapace smooth along the back; the sides of the front portion with a few spines, which on the lower part are almost reduced to tubercles; hinder part of the carapace separated from the front portion by a very deep groove, each of the sides in front with two spines; the sides of this portion are thickly covered with tubercles, which increase in size as they approach the back. Abdomen smooth on the dorsal line, the sides spined; the first segment with a large prominent spine on each side of the first segment; second segment with twelve or thirteen spines, four or five on each edge of the dilated part, the other two larger and situated on the sides; the spines are more or less conical and sharp, the one on each side nearest the back blunt; the third, fourth and fifth segments with eight spines each, placed transversely, the two inner bluntest; the sixth segment with ten or eleven small spines or tubercles; the seventh or terminal segment with seventeen or eighteen small sharp spines arranged in a crescent-like figure, the convexity being outwards. The two posterior pairs of legs with the penultimate joint on the outside furnished with two rows of serratures.

Carapace and legs in the dead specimen of a dirty yellowish brown hue, tinged on the carapace with red. In Dr. Shaw's figure this crayfish is coloured of a bright red, the sides of the claws, carapace and abdomen, are tinged with blue; the specimens, however, were preserved in spirits. Dr. Shaw does not mention from what part of New Holland the specimens described by him were received; I cannot find any trace of them, neither does any author that I am aware of refer to his figure or description.

The species comes closest to the *Potamobius (Astacus) Franklini*, described with three other Australian species of the same genus by Mr. Gray, in the Appendix to Eyre's Discoveries in Central Australia, vol. i. p. 409, t. 3. f. 1.

The specimen in the British Museum was found by Mr. Strange in freshwater creeks, Brisbane Water. Mr. Leicester informs me that the species is not uncommon also in the Richmond River.

GONODACTYLUS CULTRIFER, n. sp.

In a Chinese collection, part of which was acquired by the British Museum, there occurs a *Gonodactylus* quite distinct from any of the species of this genus which have been described. This species enters into the second section of Prof. Milne-Edwards, in which the rostral plate is rounded, or scarcely pointed, in front. From the elevated compressed process on the seventh abdominal ring, this species may be called *G. cultrifer*.

The sides of the carapace are very thin and membranaceous. The

rostral plate is wider than long, but not so wide as in the *G. scyllarus*, neither is the tip so much deflexed as in that species. The raptorial legs are rather slender, and are considerably compressed, the base of the terminal joint is very slightly thickened, the terminal part elongated and knife-shaped, the inner edge with two teeth; tarsi of the three last pair of legs styliform; abdomen with the lateral margins of the first five segments thin and membranaceous, the fifth with a notch at the hind angle; the sixth segment with six slight crests terminating in short spines, the two middle approximating; the seventh segment with a sharp crest which rises nearly as high above its dorsal surface, as the space between its base and the edge of the segment; the end of this crest is pointed; the marginal teeth of the seventh segment are long and sharp, and have a slight ridge behind; the penultimate joint of the outer branch of the appendages to the sixth ring long, and furnished on the outer edge with a series of nine spines, which are depressed, and cover each other at the base. In the *G. scyllarus* there are twelve of these spines.

This species is about four inches long; in its dry state the greater part of the upper surface is tinged with a reddish hue, and along the middle of the back there is a pale line.

The species of the genus GONODACTYLUS are,—1. *G. chiragra*; 2. *G. scyllarus*; 3. *G. Edwardsii*, Berthold, Act. Göttingen. 1845, t. 3. f. 6; 4. *G. cultrifer*; 5. *G. styliferus*; 6. *G. graphurus*; 7. *G. trispinosus*. The *G. Edwardsii* is the species met with in nearly every box of insects and fish imported from China.

LINNÆAN SOCIETY.

June 4, 1850.—Robert Brown, Esq., President, in the Chair.

Read a "Notice of a peculiar Structure of the Cells on the surface of *Callitriche verna*." By E. Lankester, M.D., F.R.S., F.L.S.

The peculiar cells described by Dr. Lankester were found by him in the summer of 1849 on the stems of a specimen of *Callitriche verna* preserved in a glass vessel with other water plants. They project from the surface of the plants, are of a stellate form, and consist of a central cell surrounded by six or eight others. They are easily detached from the epidermal tissue, and may thus readily be procured for microscopic examination. They vary in size as well as frequency, and are not confined to the stem, but occur also on the leaves; and Dr. Lankester is inclined to believe that they are most abundant in the younger states of the plant. In the first stages of their growth they are to be distinguished from the surrounding cells only by their peculiar arrangement; but as the development proceeds, the epidermal (including these stellate) cells contain a smaller proportion of chlorophyll than those under and above them on either side of the leaf, and become gradually freer from cell-contents, until at last they appear perfectly clear. In other water plants, such as *Lemnæ*, *Potamogeta*, &c., Dr. Lankester had not succeeded in detecting any similar bodies. As regards their function, he states, that it at first occurred to him that they might per-

form the office of stomata ; but he was unable to discover any orifice among the cells, or any communication with intercellular spaces below them. In their structure and general arrangement they bear a closer resemblance to certain modifications of hairs than to any other epidermal organs ; and the author considers it not improbable that they are the result of the same tendency of the epidermal tissue under water as that which produces hairs when this tissue is exposed to the influence of the atmosphere.

June 18.—Robert Brown, Esq., President, in the Chair.

The President exhibited portions of trunks of Winter's Bark Trees from the Straits of Magellan, cut down in 1826 by Captain P. P. King, R.N., offering inscriptions made through the bark by a midshipman who accompanied the Spanish expedition under Captain Cordoba in 1786, and by one of the companions of Captain Bougainville in 1767 ; the annual rings in the former case distinctly corresponding with the interval between 1786 and 1826. He also made some observations on the structure of the woody vessels of the genus.

Mr. Adam White, F.L.S., exhibited several elaborate drawings by Mr. P. H. Gosse, A.L.S., representing various species of *Rotifera* found in the neighbourhood of London, and stated that Mr. Gosse had confirmed the opinion which Cuvier entertained in regard to the true position of the *Rotifera*, and that they have no connexion with the *Radiata*, by his observations on their internal structure, and especially by the presence of mandibles, maxillæ and maxillary palpi. The drawings exhibited the development of *Stephanoceros Eichhorni* from the egg to the adult state, as also that of the males of *Asplanchna Brightwellii* and a species of *Brachionus*. Mr. White added, that in 1843 at least, Professor Milne-Edwards was also aware, from the researches of Ehrenberg, of the true division of the animal kingdom to which the *Rotifera* belong. He further stated his own belief that the so-called *Acarus folliculorum*, Simon (*Demodex*, Owen ; Entozoon, *Wilson*), and probably also *Tardigradus*, are parasitic *Rotifera*, with legs or leg-like appendages adapted to their peculiar habits ; and that their retractile antenna-like subtelescopic appendages may have eyes passing through them as in the snails, and may also be the equivalents of the *rotæ*, but from the limited, or rather the absolutely restricted, power of motion of these animals, having neither the ciliary processes nor the movements and economical uses of the appendages so characteristic of most of the *Rotatoria*.

BOTANICAL SOCIETY OF EDINBURGH.

March 13, 1851.—Professor Balfour, President, in the Chair.

The following papers were read :—

1. "On *Lastrea uliginosa*, Newm.," by Thomas Moore, F.L.S. (See p. 301.)

Sir Walter Trevelyan noticed the occurrence of *L. spinulosa* in woods near Dingwall.

2. "Notice of British *Hieracia*," by James Backhouse, jun., Esq.

In this communication the author gave an account of several *Hieracia* found by him in the Highlands of Scotland as well as in Teesdale. He stated that the plant which he had formerly noticed as *H. Oreades* proved, on minute comparison with Swedish specimens, to be *H. saxifragum* (Fries). It grows in the ravine of the White-water at the head of Glen Dole, Clova, on the eastern slope of Cairntoul, and also in Teesdale. During a highland excursion last summer the author found abundance of *H. atratum* (Fries), and a few specimens of the true *H. nigrescens* (Fries), of which plant Fries states he has never seen authentic British specimens. From careful comparison of Teesdale and Scotch specimens of *H. iricum* (Fries) and *H. cerinthoides*, Mr. Backhouse is inclined to consider the former (as Dr. Arnott suggests) to be a luxuriant form of the latter, slightly changed in character from growing on mica-slate, or basalt. The amplexicaul or semi-amplexicaul character of the cauline leaves is inconstant (sometimes they are nearly sessile), and the acuteness or bluntness of the involucreal scales is variable. Last autumn he gathered, in Teesdale, a plant which agrees well with *H. crocatum* var. *angustatum* (Fries). It flowers much later than *H. crocatum latifolium* (the ordinary form) with which it grows, but is out of flower many weeks sooner. The form of the leaves is very remarkable. Mr. Backhouse is cultivating both, in the hope of ascertaining if there is any true distinctive character. The following species have been gathered in Teesdale:—*H. gothicum*, Fries, *H. crocatum* and its var., *dilatatum*, Fries, *H. corymbosum*, Fries, *H. saxifragum*, Fr., *H. tridentatum*, Fr. The author is continuing his researches, on the subject of the British *Hieracia*, and he will be glad to receive specimens even of the common species, addressed to him at York.

3. "On the Berwickshire station for *Anacharis Alsinastrum*," by Dr. Johnston.

Dr. Johnston writes, "As regards the *Anacharis*, my tale is this: For thirty years and more I have herborized in that part of the Whiteadder where the plant is now common. For some years I was accompanied in my searches by Dr. Philip Maclagan, and the specimens of *Potamogeton* in my herbarium were principally collected in a place now choked up with *Anacharis*. Mr. Henderson, surgeon in Chirnside, has also often and again and again, and season after season, botanized in this river, and never saw the plant until I drew his attention to it. Now, I maintain that it was impossible the plant could have escaped our notice had it been there. It is no pigmy—in fact it is a plant that attracts notice.

"When first I found the *Anacharis* in the Whiteadder, I could discover only two or three tufts of it. I was fishing and following the water: I could see no more of the plant anywhere near. Now, however, the place is actually full of it; last year they had to get iron rakes to clear it away, and cart-loads were drawn out. So at Whitehall I found it first in only one creek, but there abundantly. When I wrote to Mr. Henderson he was incredulous, for the very spot was one he knew as the locality of other plants. He not only got the *Anacharis* there the following summer, but he found it in several places adjacent. Now, from Whitehall to Gainslaw Bridge

the *Anacharis* is by far the commonest plant in the Whiteadder ; and its minute flowers whiten the surface of the water. It is to me quite plain that it is of recent introduction.

“ My explanation is this : The plant has been introduced into the lake at Dunse Castle, with alien aquatics, for in the lake there are several foreigners. Then it had multiplied itself there until it took thick possession of some parts of the lake. Now, while they were paddling amongst this herbage, some small bits may have adhered to the plumage of the wild ducks and other aquatic birds, and by their means they have been carried to the Whiteadder. This, as the crow flies, is about two miles from Dunse Castle, but Whitehall is six miles distant.”

Mr. G. Lawson stated that the *Anacharis* had appeared in a somewhat similar manner in the neighbourhood of Derby. Mr. Joseph Whittaker of Breadsall, from whom Mr. Lawson had received a communication on the subject, had been for some years engaged in the examination of the *Potamogetons* of the neighbourhood ; but had never met with the *Anacharis* until recently, although it is now in great abundance.

4. “ Report on the state of vegetation in the Edinburgh Botanic Garden, from Feb. 14 to March 13, 1851,” by Mr. M'Nab.

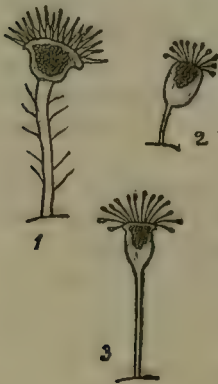
MISCELLANEOUS.

An Account of three new species of Animalcules.

By JOSHUA ALDER, Esq.

WHILE examining a specimen of *Sertularia pumila*, taken from the rocks at Whitburn, under the microscope, I was struck with the appearance of what seemed to be a very minute parasitic zoophyte, several specimens of which were attached to different parts of the *Sertularia*.

The body was of a vase or cup-form, expanded at the top (fig. 1), and set round with numerous pointed tentacles, abruptly thickened towards the base, and forming more than one row : they had very little motion, but were occasionally bent forwards, and the whole were sometimes slowly retracted. The body was attached to the *Sertularia* by a tolerably stout stem.



Other specimens of the *Sertularia* were examined and found to have the same parasite, which was itself infested by still more minute parasitical bodies of the family *Bacillaria*. In addition to the first species of supposed zoophyte, another, rather smaller, was also detected (fig. 2). Its body was of an ovate form, with a very slender and shortish stem : the tentacles were capitate, or knobbed at the end, not so numerous

as in the first species, and placed in a single row round a narrow disk. Under the impression that these animals belonged to the class of

Zoophytes, I sent drawings of them to my friend Dr. Johnston, who informed me that they represented something with which he was not acquainted, and that possibly I had got a new form of Campanularian Zoophyte. A more careful examination, however, of these delicate little creatures, which were so minute as to be only just visible to the naked eye, convinced me that their organization was much more simple than is to be found in the true polypes, and that they must be considered to belong to the class *Infusoria*. I afterwards found both these species on *Sertulariæ* at Cullercoats. I have since met with another species of these polype-like animalcules inhabiting fresh water (fig. 3). It occurred in Crag Lake, on the stem of the new species of *Paludicella* found there, and somewhat resembles the smaller marine species already described, but is perfectly distinct from it, as its habitat would lead us to expect. The body of this lacustrine species is pear-shaped, or, perhaps, rather bell-shaped, with a distinct rim round the top and a single circle of delicate capitate feelers, which as in the former instances were retractile. The stem was long and slender.

The British Animalcules are very imperfectly understood, with the exception of the beautiful tribe of *Vorticellæ*, whose relationship is very remote: there are not any published native species bearing the least resemblance to those here described. The genus *Acineta* of Ehrenberg comes nearest to them. *Acineta mystacina*, found near Berlin, somewhat resembles our lacustrine species, but its form appears to be much more simple, and the tentacles rise irregularly from different parts of the body. It is probable, therefore, that these animalcules are undescribed, and their discovery is not void of interest, on account of their forming a more perfect link between the Infusoria and the Campanularian zoophytes than any hitherto known.

The great class Infusoria, in its present form, includes a heterogeneous assemblage, which at some not very distant period must be broken up; and it will then probably be found that the infusory animalcules contain the first rudimentary forms of nearly all the invertebrate types.—*Trans. of Tyneside Naturalists' Field Club*, vol. i. p. 365.

Note on the bird-devouring habit of a species of Spider.

By Capt. W. S. SHERWILL:

During one of my rambles in company with four other officers in the army, amongst the Kerrakpur hills, in the immediate neighbourhood of Monghyr, on the Ganges, I fell in with several gigantic webs of a large black and red spider, which stretching across our path in many spots, offered from their great strength a sensible resistance when forcing our way through them. The webs are of a bright yellow colour, and we found them stretching from ten to twenty feet, that is, including the gray ropes, which are generally fastened to some neighbouring tree or a clump of bamboos, the reticulated portion being about five feet in diameter, in the centre of which the spider sits waiting for its prey; he is of a dark black hue with red about him, but at this distance of time, now three years, I cannot remember his exact ap-

pearance. I brought one down with me from the summit of the mountain Maruk, which is eleven hundred feet above the Ganges, and he measured six inches across the legs when set up. It was in the web of this very spider that I found the bird entangled, and the young spiders (about eight in number and entirely of a brick-red colour) feeding upon the carcass. The bird was much decomposed and enveloped in web, but the beak and feet being visible I sketched them, a copy of which sketch I enclose for your satisfaction*. The bird hung with his head downwards, his wings were closely pinioned to his sides by the entwined web, and was nearly in the centre of the web. The old spider which I secured was above the bird about a foot removed.

Had we not been a half-starved party, we should have bottled the bird, spider and young ones; but we were at the end of a five-days' roam amongst these steep hills, covered with wet grass, without beds or covering, in the height of the rainy season—so you may imagine our commissariat was at too low an ebb to afford brandy for such a purpose!

Note by Mr. Blyth.—This communication from Capt. Sherwill is the more interesting, since the total demolition of Madam Merian's account of a bird-eating spider in Surinam, by Mr. W. S. McLeay, in the 'Proceedings of the Zoological Society,' 1834. This species would appear to be an *Epeira*, most probably undescribed, and remarkable for the "bright yellow colour" of its web.—*From the Journal of the Asiatic Society of Bengal*, p. 474.

On the Conjugation of Diplozoon paradoxum. By Prof. TH. VON SIEBOLD†.

Prof. Siebold was struck by the constant presence of another parasite in company with the *Diplozoon* upon the gills of the Minnow. This parasite was the *Diporpa* of Dujardin, which differs from *Diplozoon* only in being single, and much smaller—in having only two instead of eight posterior organs of adhesion—and in being destitute of generative organs.

Further, *Diporpa* has on the ventral surface, a little behind the middle of the body, a sucking disk.

Now, besides the solitary *Diporpæ*, some were found mutually adherent by their sucking disks, and others still more closely united, in which all traces of the disks had disappeared and a local fusion of the two *Diporpæ* had taken place.

They had taken on completely the appearance of a *Diplozoon*—four, six, and in some cases eight "organs of adhesion" having become developed at their posterior extremities—so that it was very clear that *two simple asexual Diporpæ become fused together to form a single Diplozoon.*

It follows then that a process of conjugation takes place here, such

* A *Nectarinia* apparently, and probably *N. asiatica*—E. BLYTH.

† From Siebold and Kölliker's *Zeitschrift der Wissensch. Zool.* for March, 1851.

as has hitherto been known only among the lower plants. And as in them the conjugation has, as its end, the development of propagation-cells, so the conjugated *Diporpæ* as a *Diplozoon*, develope generative organs and produce ova, which as simple *Diporpæ* they were not in the condition to do.

It only remains to trace the development of the ova of *Diplozoon* into *Diporpæ*; but the researches which Prof. v. Siebold instituted upon this point were unfortunately interrupted.

In the same paper is contained a very interesting observation of Dr. Fred. Cohn on the conjugation of *Actinophrys*, Sol., which was first observed by Kölliker.

Two *Actinophrys* approximate by means of their long rays, and develope vesicular processes which become fused together.

Between two such united animals a peculiar vesicle is frequently seen, which contains a nucleus-like mass.

Furthermore, a cellæform body of this kind was observed, surrounded by a globular mass, which was plainly the body of an *Actinophrys*, but had no rays.

Prof. Siebold remarks, in conclusion, "I am persuaded that we shall obtain surprising results from observations upon the copulative process of the Protozoa, and we shall discover that different forms will have to be regarded as generations belonging to the same species—following one another in a fixed order."

Here is a field wide enough for any one; and it is much to be wished that a tithe of the energy and perseverance displayed by English microscopists in hunting after new species, could be turned to such observation upon the vital processes of forms already described. We should have fewer names and more knowledge.—T. H.

On a Leech new to the British Fauna. By J. E. GRAY, Esq., F.R.S.

Mr. Hoffmann lately sent to the Zoological Gardens a living specimen of a very large leech which he had found near his house in the Regent's Park. It has been preserved in fluid, and now forms part of the Collection of British Animals in the British Museum.

It proved to be an adult specimen of *Trochetia subviridis*, Dutrochet (*Lamk. Hist. A. s. V. v. 523*), well-figured in the 2nd edition of Moquin-Tandon's 'Monograph of Hirudines,' t. 4. It is a very interesting addition to the fauna. It is the giant of the family, this specimen being more than 7 inches long.—*From the Proceedings of the Zoological Society.*

Government Manufacture and Publication of School-books and Elementary Works of Science.

We would direct the attention of our readers to the correspondence between Lord John Russell and Messrs. Longman & Co. and Mr. Murray, as recently published by them, copies of which we append to our present Number.

The attempt to establish, under the patronage of Government, a

monopoly of School-books, to be produced at the public expense, is reprehensible, not merely as regards the just principles of trade, but as being entirely hostile to the interests of science, whether we consider the means of its advancement and diffusion, or the benefit of those who are engaged in their promotion.

The production of elementary works of the best kind, adapted to the continually progressive state of the sciences, must ever be an object of great importance, and should freely be left in the hands of those men of science who are best able to supply them, and of whose competence the scientific public are the best judges.

The measure complained of tends directly to the establishment of a monopoly, fostered by the irresponsible favoritism of some Board or Commission (probably, as in many instances of late, under the influence of forward quacks and pretenders who easily impose themselves on members of the Government), and such favoritism and adventitious aid must evidently tend to the discouragement and eventual prohibition of works, however superior, which cannot contend against such unfair advantages.

Nor must it be overlooked that the public money thus to be expended is in part levied upon those who come unaided into the field of competition, with a heavy duty on paper and other imposts to contend with.

As might be expected, some of the participators of this government patronage have had no scruple in appropriating the labours of others; and Government has actually had to pay £600 of public money to compromise a case of piracy perpetrated under its sanction.—R. T.

CENTROLOPHUS POMPILUS OR BLACK-FISH.

A specimen of this rare fish was caught last autumn at Cullercoats, and happening to be there at the time, I fortunately secured it for our (Newcastle) Museum. The only British locality hitherto recorded for this fish is the coast of Cornwall, on which a few individuals have been obtained at rare intervals, amounting, I believe, to no more than five since its first discovery in the time of Borlase, nearly a century ago. Its occurrence on this coast (Northumberland), so far beyond its supposed geographical range, is therefore interesting.—*From the Address of the President (Mr. Alder) to the Tyneside Naturalists' Field Club in 1850.*

Description of a new Crustacean. By W. BAIRD, M.D., F.L.S. &c.

CYPRIDINA ZEALANDICA.

The valves of the carapace are of an oval form, somewhat flattened, but convex in the centre, and concentrically striated. The striæ are numerous, close-set, and of a waved appearance. The surface of the valves is covered with minute punctations, which probably give origin in the fresh state to short hairs, though they are not visible in the dried specimens. The anterior extremity is slightly narrower than the posterior. The whole carapace is of a uniform white colour.

The natural size is about one-fourth of an inch in length and one-fifth of an inch in breadth.

Two specimens were sent to the British Museum by the Rev. R. Taylor of Waimati, New Zealand, along with a collection of marine and freshwater shells, but without any history attached to them.—
From the Proceedings of the Zoological Society for May 28, 1850.

METEOROLOGICAL OBSERVATIONS FOR MARCH 1851.

Chiswick.—March 1. Clear : cloudy. 2. Clear : dark clouds : clear and frosty. 3. Overcast : sharp frost at night. 4. Cloudy and fine. 5. Densely overcast : rain. 6. Clear : cloudy and cold. 7. Overcast. 8. Foggy : overcast. 9. Fine : drizzly. 10. Cold rain. 11. Clear : cloudy : clear and frosty. 12. Rain. 13. Fine. 14. Frosty, with slight fog : fine : hazy. 15. Constant rain. 16. Clear and fine. 17. Foggy : rain. 18. Hazy and damp : rain. 19. Overcast : rain. 20, 21. Fine. 22. Heavy rain. 23. Densely clouded : rain. 24. Cloudy. 25. Overcast : rain. 26. Rain. 27. Slight showers. 28. Fine. 29. Boisterous, with heavy showers. 30. Fine. 31. Cloudy and fine.

Mean temperature of the month	41°·72
Mean temperature of March 1850	37·71
Mean temperature of March for the last twenty-five years...	42·55
Average amount of rain in March	1·36 inch.

Boston.—March 1. Fine : snow and sleet early A.M. 2, 3. Cloudy. 4. Fine : rain A.M. and P.M. 5. Rain, 6, 7. Cloudy. 8. Cloudy : rain P.M. 9. Cloudy : rain A.M. and P.M. 10. Rain. 11. Fine. 12, 13. Cloudy : rain P.M. 14. Fine : rain P.M. 15. Foggy : rain A.M. and P.M. 16. Foggy. 17—20. Cloudy : rain P.M. 21. Fine : rain P.M. 22. Cloudy : rain A.M. and P.M. 23. Rain : rain A.M. and P.M. 24. Fine. 25. Cloudy : rain P.M. 26. Rain : rain A.M. 27. Cloudy : rain P.M. 28. Fine. 29, 30. Cloudy : rain P.M. 31. Fine : rain P.M.

Applegarth Manse, Dumfries-shire.—March 1. Gray morning : cleared P.M. 2. Gray morning : dull and cloudy P.M. 3. Gray morning : chill. 4. Gray morning A.M. : slight drizzle P.M. 5. Fine : rain preceding night. 6. Clear and cold : bright sun : frosty P.M. 7. Frost hard : threatening change P.M. 8. No frost : rain : moist all day. 9. Rain all day. 10. Keen and cold : snow on hills. 11. Frost hard : clear : cloudy P.M. 12. Rain A.M. : cleared : rain and hail P.M. 13. Fair A.M. : shower at noon and P.M. 14. Fair A.M. : shower : wind rising. 15. Showers heavy during night. 16. Frosty : fine day : mild P.M. 17. Frosty and keen : fair all day. 18. Cloudy A.M. : rain. 19. Fair till six P.M. : rain and wind. 20. Fair till seven P.M. : rain and wind. 21. Variable : showers frequent and heavy. 22. Fair A.M. : slight drizzle P.M. 23. Rainy morning : cleared and fine. 24. Fine : clear : drying. 25. Gray and cold : shower P.M. 26. Very heavy rain : flood. 27. Dry A.M. : shower P.M. : snow on hills. 28. Heavy rain : hail. 29. Fine : a few drops rain P.M. 30. Clear and fair : a few drops P.M. 31. Rain P.M.

Mean temperature of the month	40°·9
Mean temperature of March 1850	40·3
Mean temperature of March for twenty-nine years	39·6
Average rain in March for twenty-four years	2·22 inches.

Sandwick Manse, Orkney.—March 1. Cloudy : aurora. 2. Cloudy. 3. Cloudy : fine. 4. Rain : fine. 5. Snow-showers. 6. Snow-showers : cloudy. 7. Cloudy : clear. 8. Fine : clear : drops. 9. Cloudy : drops. 10. Clear : showers. 11. Clear : drops. 12. Rain : clear. 13. Bright : cloudy. 14. Fine. 15, 16. Fine : hoar frost : fine. 17. Fine : hoar frost. 18. Fine : hoar frost : sleet-showers. 19. Bright : fine. 20. Cloudy : clear. 21. Rain. 22. Damp : clear : aurora. 23. Rain. 24. Damp : cloudy. 25, 26. Cloudy. 27. Drizzle : showers. 28. Showers. 29. Showers : rain : aurora. 30. Bright : showers. 31. Showers : clear.

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[SECOND SERIES.]

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XLII.—*A Stratigraphical Account of the Section of Hordwell, Beacon, and Barton Cliffs, on the coast of Hampshire.* By THOMAS WRIGHT, M.D. &c.

DURING a short residence in the Isle of Wight last summer I made a minute examination of the section from Round Tower Point to Alum Bay, with a view to ascertain the conditions under which the upper and lower freshwater and upper and lower marine formations of the Hampshire basin* were deposited. The result of these investigations was given in a paper published in the present volume of the 'Annals.' For the purpose of instituting a comparison between the eocene beds of the Isle of Wight and their equivalents on the Hampshire coast, a palæontological analysis and measurement of the strata constituting the sections of Hordwell, Beacon, and Barton Cliffs, on the opposite shore of the Solent, was undertaken, and which form the subject of the present communication.

The following notes were made upon the spot, and corrected and enlarged after frequent inspection. Their chief value consists in showing the order of deposition of the different beds; the changing conditions under which they were deposited; the points at which the most important of them rise on the shore and pass out of the cliff; with a catalogue of the fossil contents of each.

I beg to acknowledge the valuable information derived from the Marchioness of Hastings, relative to the fine collection of fishes, reptiles, and mammals obtained from Hordle Cliff, and now in her ladyship's museum.

To Alex. Pytts Falconer, Esq., of Beacon Hordle, I am like-

* Mr. Joseph Cotton, of Freshwater, supplies on very moderate terms a complete series of the fossil shells from the tertiary strata of the Isle of Wight.

wise indebted for much valuable information relative to the osiferous beds of this locality*.

The quantity of debris that has fallen and obscured the origin and course of many of the beds will account for the discrepancy which may be found between my notes and those of other observers, who have either previously, or who may hereafter, visit this beautiful section under more advantageous circumstances. I have given as complete a list of the fossils contained in each bed, as the limited time devoted to the subject would admit of, and feel well satisfied that additions may be made to these lists, especially if a microscopic investigation of the sands and marls was undertaken. The places where the most important beds rise on the shore, and where they make their final outcrop on the cliff, have been noted. This mode appears to be the most natural for studying coast sections which are gently inclined at a low angle like the strata of these cliffs; it has the advantage likewise of assisting future observers to identify the beds and to make further investigations into their contents.

It is now nearly a century since Brander directed the attention of naturalists to Hordle and Barton Cliffs, in his work entitled '*Fossilia Hantoniensia*,' dated 1766. The author's intention was merely to figure and, with the assistance of Dr. Solander, to describe the shells found in the Barton clay. The beauty and accuracy of his plates have not been surpassed, but his description of the strata is very meagre. "They (the shells) are found," he observes, "in their natural state, excepting their loss of colour, and exceedingly well preserved, below a stratum of sand about 14 or 15 feet thick, in a bluish kind of clay or marl quite down to the level of the sea—how much deeper is not known; the height of these cliffs is in many places above 100 feet."

In 1821 Mr. Webster† gave an account of Hordwell Cliff, and described for the first time its freshwater beds, with a view to show that they were a continuation of the same strata which he had so truthfully figured and described in 1816, in Sir Henry Englefield's splendid work on the Isle of Wight.

In 1826 Sir Charles Lyell read a paper‡ on the Freshwater Strata of Hordwell, Beacon, and Barton Cliffs, and gave an account of the beds and the fossils they contained.

* In the measurement of the beds and in investigating their fossil contents I had the assistance of Henry Keeping of Milford, who has had much experience in exploring the Hampshire section for the purpose of collecting fossils for the Marchioness of Hastings. From Mr. Keeping may be obtained at a moderate price the fossil shells catalogued in this paper.

† *Trans. of the Geol. Soc.* vol. i. p. 90, second series.

‡ *Trans. of the Geol. Soc.* vol. ii. p. 287.

In 1846 Mr. Searles Wood* gave an excellent account of the upper marine formation of Hordle Cliff, and a list of the shells found by Mr. Fred. Edwards and himself in that stratum, the existence of which had been overlooked by previous observers. He likewise described the mammals, reptiles, and fishes found by him, and gave a description of these, and a full list of the shells found in the freshwater beds of this locality.

In 1847 Prof. Owen† described the remains of *Palæotherium* and *Dichodon*, two new genera of the family *Palæotheridæ*, discovered by Alex. Pytts Falconer, Esq., near Hordle, and which that gentleman has since presented to the Hunterian Museum. These are the only communications which especially relate to the subject of the present paper, the object of which is to give a stratigraphical account of the different beds and the palæontological contents of the same.

The strata on this coast have been much denuded; the beds composing the upper freshwater formation are nearly removed, as they have been so likewise to a great extent between Hampstead and Headon Hill in the Isle of Wight. The cliffs are covered with a bed of drift, composed chiefly of rolled flints and other debris derived from the chalk. The drift is disposed in horizontal layers upon the inclined edges of the beds; its thickness in different places varies from 5 to 30 feet. The boulders are loosely cemented together with a matrix of sand and marl. The constant wasting of the cliffs causes the foundering of the drift-bed, and supplies the shore with a superabundance of pebbles. It is probable that from this source Hurst Beach, in ages past and down to the present time, has derived its constantly increasing beds of shingle, which are washed up along this line of coast by the strong tidal currents and heavy seas that set in from the south-west.

The strata are described in a descending order, commencing at the east end of Hordle Cliff at a place called Mine-way; and proceeding towards Beacon and Barton each bed is noted, where it rises on the shore and crops out of the cliff, to which is added a list of its fossil contents.

The beds rise very uniformly at angles varying from 2° to 5° to the horizon, and incline to the east. Their course is interrupted by a considerable denudation at Mead End, and by two small ravines, called "Bunnys," = to the term "Chines" in the Isle of Wight, which means a fissure in the cliff produced by streamlets which form the natural drainage of the land. Beacon Bunny separates Hordle from Barton Cliff and Chuton Bunny—the latter from High Cliff.

* London Geological Journal, pp. 1 and 118.

† Quarterly Journal of the Geol. Soc. vol. iv. p. 17.

Division of the Strata.

The strata which compose this coast section admit of a division into five groups:—

1. *The upper freshwater.*
2. *The upper marine.*
3. *The lower freshwater and intercalated brackish-water beds.*
4. *The estuary series.*
5. *The Barton or true lower marine strata.*

The Upper Freshwater Formation

consists of alternations of sands, clays, and marls which attain a thickness of about 20 feet.

No. 1. White sand striped with pale yellow bands; rises about a mile to the east of Hordle House, and runs out near Mead End: it is well seen *in situ* near a foot-path up the cliff known as “Paddy’s Gap.” We found no fossils in this bed: it measures from 6 to 9 feet.

No. 2. Dark greenish marl striped with fawn-colour; contains layers of shells and several bands of lignite from 1 to 2 inches in thickness. The upper shell-seams contain *Paludina lenta*, *Lymnæa longiscata*, and *Melania*. The lower shell-seam contains immense numbers of *Unio Solandri*, with a great quantity of small dark seeds, *Carpolithes ovulum*, Brong., *C. thalictroides*, Brong.: about 3 feet 6 inches.

No. 3. Green marly clay, very tenacious, having in places a bluish tint. The upper part of this bed contains shelly seams.

Paludina lenta.

Melanopsis carinata.

Planorbis lens.

Lymnæa longiscata.

— *fusiformis.*

Cyclas exigua.

The *os calcis* of a mammal of an unknown genus was found here, which is now in the cabinet of the Marchioness of Hastings; the green clay measures about 10 feet.

The Upper Marine Bed.

No. 4. Brownish-yellow sand. This bed was much covered up at its origin, and throughout nearly its entire course, at the time of my visit, and was only exposed at one place, to the extent of about 10 yards. By digging, my collector ascertained that it rises nearly opposite to Milford, and runs out of the cliff a little to the westward of Hordle House. According to Mr. Searles Wood, it rises a few paces westward of a ravine situated half a mile from Milford, and occurs at an elevation of 10 or 12 feet above high-water mark, with a thickness of only 9 or 10 inches, and only traceable for 40 yards. Mr. Frederick Edwards, of Hampstead, so well known for his unrivalled cabinet of Hamp-

shire fossils, was the first, in 1840, to notice this deposit, three years previous to Mr. Wood's visit. At that time Mr. Edwards could trace the bed for 300 yards*. These facts attest the rapid waste going on in this coast. The following list of Testacea is the result of the joint researches of Messrs. Edwards and Wood:—

Actæon.	Melania muricata.
Ancillaria subulata, <i>Lam.</i>	Melanopsis ancillaroides, <i>Desh.</i>
Arca elegans.	— carinata, <i>Sow.</i>
Balanus unguiformis, <i>Sow.</i>	— fusiformis, <i>Sow.</i>
Bulla (two species).	— minuta, <i>Sow.</i>
Cæcum.	Murex sexdentatus; <i>Sow.</i>
Cancellaria muricata.	Mya angustata, <i>Sow.</i>
— elongata.	Mytilus? affinis, <i>Sow.</i>
Cerithium cinctum, <i>Sow.</i>	Natica depressa, <i>Sow.</i>
— margaritaceum, <i>Sow.</i>	— epiglottina, <i>Lam.</i>
— terebrale.	— labellata, <i>Lam.</i>
— ventricosum, <i>Sow.</i>	Nematura, n. sp.
Chemnitzia (two species).	Nerita aperta, <i>Sow.</i>
Corbula cuspidata, <i>Sow.</i>	Neritina concava, <i>Sow.</i>
Cyrena cycladiformis, <i>Desh.</i>	Nucula deltoidea, <i>Lam.</i>
— obovata, <i>Sow.</i>	—, new species.
— pulchra, <i>Sow.</i>	Odostomia subulata.
Cytherea incrassata, <i>Desh.</i>	Ostrea.
— obliqua, <i>Desh.</i>	Planorbis (two species).
Fusus labiatus, <i>Sow.</i>	Pleurotoma (two species).
Hydrobius.	Psammobia compressa, <i>Sow.</i>
Kellia (two species).	Scalaria.
Limnæus.	Serpula corrugata, <i>Sow.</i>
Lucina divaricata, <i>Lam.</i>	— tenuis, <i>Sow.</i>
— pulvinata, <i>Wood.</i>	—, new species.
Melania angulata, <i>Wood.</i>	Turbo?
— fasciata, <i>Sow.</i>	Voluta spinosa, <i>Lam.</i>

From that portion of the bed which was exposed, we collected a considerable number of the species of the above list. The shells are not so well preserved as those of the upper marine bed at Colwell Bay, many of them being largely impregnated with the peroxide of iron. The thickness of the bed exceeds that given by Mr. Wood; but, in other respects, I agree with that excellent observer in regarding it as a true marine stratum intercalated between the stages of the upper and lower freshwater formations.

The Lower Freshwater Formation.

No. 5. Dark stiff clay above, passing into an iron-gray coloured sand below,—the latter richly fossiliferous. The dark clay forms a good tracing line of the bed in the cliff, which inclines at an angle of 2°, and can be seen, *in situ*, with a telescope, from Colwell. It rises on the shore to the east of Hordle-lane End, and crops out about a quarter of a mile east of Mead End. The

* London Geological Journal, p. 2.

upper clay band is about 2 feet in thickness, and the lower sandy stratum about 8 inches.

The clay contains fine specimens of *Unio Solandri*: laminated masses of this band can be traced through the entire bed.

I have before me a mass of the iron-sand resting on the clay; it contains immense numbers of *Melania*, new sp., *Paludina lenta*, *Cyclas exigua*, and a number of bright green-coloured seed-vessels of *Chara (Gyrogonites)*. These seeds are met with throughout the sand and clay.

No. 6. Green marls and clay; form a conspicuous bed as they rise on the shore eastward of Hordle-lane, and run out of the cliff beyond No. 5. The clay is stiff and tenacious, and is in some parts mottled with red and brown. Contains few shells. *Paludina angulosa* is the only species Mr. Keeping ever recollected obtaining from it. Thin layers of lignite, from 2 to 3 inches in thickness, occur in the upper part. It measures about 12 feet. A bright green marl forms the base of the bed, which is as remarkable for the number of shells it contains, as the upper part of the bed is for its paucity.

No. 7. Bright green marls, which form the base of the preceding, but are distinguished from it by their fossiliferous character, containing immense numbers of *Potamomya gregaria*, which lie in seams. The shells are well preserved, but the valves are mostly separate: the marls measure about 18 inches.

No. 8. Lymnæan limestone, similar to the beds I have described under this name in the Isle of Wight. It rises on the shore, about 200 yards east of Hordle-lane, and forms a well-marked band in the cliff. It is a cream-coloured, pinky, calcareous marl, slightly indurated where it has been exposed for some time to the air, and contains an immense quantity of lacustrine shells, not, in general, well preserved. Many blocks however enclose very good specimens of the following, with the shell entire:—

Lymnæa longiscata, <i>Brong.</i>	Planorbis euomphalus, <i>Sow.</i>
— fusiformis, <i>Sow.</i>	— rotundatus, <i>Brong.</i>
— columellaris, <i>Sow.</i>	— lens, <i>Sow.</i>
— pyramidalis, <i>Sow.</i>	

Several of the above species lie clustered together in a block before me, about 3 inches square. In some parts of its course it contains great numbers of (*Gyrogonites*) *Chara medicaginula*.

Inferiorly this bed reposes on a black carbonaceous clay containing lignite. It is remarkable, that both in these cliffs and in the Isle of Wight, the beds are often separated by lignite bands. The cream-coloured shelly marl measures from 4 to 9 inches in thickness, and the lignite band and clay from 2 to 4 inches.

No. 9. Greenish marly clay, which in that part of the bed exposed to the air hardens into calcareous nodules, which are

stained with the ferruginous salts they contain. In some places these nodules project from the cliff, or are strewn along the shore. This nodular bed has few fossils, and reposes on a green arenaceous marl containing—

Potamomya plana.	Paludina lenta.
Melania.	Melanopsis brevis.
Cyclas.	Neritina, n. sp.

Scales of *Lepidosteus* and *Gyrogonites* (*Chara medicaginula*) are found therein: it measures from 4 to 6 feet.

No. 10. The "Crocodile Bed;" rises to the west of Hordle House, and runs out at Long Mead End. It consists of a fine white sand, very uniform in character, and reduced to the state of an impalpable powder. It is extremely compact in the rock, and is picked with much difficulty.

This is one of the richest beds in the section, and from the circumstance of its containing many skulls and other parts of the skeletons of crocodiles, I have called it the Crocodile Bed; it measures about 5 feet, and contains bones of the following Vertebrata:—

Mammalia.

Palæotherium (<i>Cuvier</i>), nearly a perfect skull and other parts of three species: <i>P. splenum</i> , <i>P. parvum</i> , and <i>P. annectens</i> .	Dichobone, <i>Cuvier</i> .
Palaplotherium, <i>Owen</i> .	Microchærus, <i>Wood</i> .
	Spalacodon, <i>Charlesworth</i> .
	Seal.
	Hyænodon (<i>Laizer et Pairvieu</i>).

Birds.

Bones of this class have been found, but the group to which they belong has not been accurately ascertained.

Reptiles.

Crocodylus Hastingsia. The Marchioness of Hastings first discovered and described the magnificent fossil skull of this eocene Saurian, which has been recently beautifully figured and faithfully described by Prof. Owen*.

Alligator Hantoniensis. Mr. Searles Wood† has figured the upper jaw and dental series of this reptile, with the femur and vertebræ of the same. The following Chelonia have been obtained from this bed:—

Trionyx <i>Henrici</i> , <i>Owen</i> , <i>Palæontographical Memoir</i> , tab. xvi.	
— <i>Barbaræ</i> , <i>Owen</i> ,	<i>Ibid.</i> tab. xvi A.
— <i>marginatus</i> , <i>Owen</i> ,	<i>Ibid.</i> tab. xix.
— <i>rivosus</i> , <i>Owen</i> ,	<i>Ibid.</i> tab. xviii.
— <i>planus</i> , <i>Owen</i> ,	<i>Ibid.</i> tab. xix C.
— <i>circumsulcatus</i> , <i>Owen</i> ,	<i>Ibid.</i> tab. xix B.
<i>Emys crassus</i> , <i>Owen</i> ,	<i>Ibid.</i> tab. xxvii.

* Pal. Mem. Eocene Reptiles.

† London Geol. Journ.

To the above list of reptiles must be added bones belonging to an unknown Lizard, and vertebræ of an Ophidian.

The above specimens of *Trionyx* and *Emys* are in the cabinet of the Marchioness of Hastings, and I cannot cite these valuable relics which I had the privilege of attentively studying without at the same time acknowledging her ladyship's courtesy, and bearing my humble testimony to the judgement and skill displayed in restoring the numerous fragments of these Chelonians to their proper places in the skeleton, a task which the Marchioness has achieved with matchless patience, neatness, and tact.

Fishes.

Very perfect specimens of *Lepidosteus* have been found. The dermal scales are very abundant, many of which, with portions of the jaws and teeth, are strewn throughout the bed.

In the cabinet of Lady Hastings are many beautiful specimens of this eocene ganoid fish.

Mollusks.

Potamomya plana, *Potamides margaritaceus*, and *Melania conica* are found sparingly.

The reptilian bones lie chiefly in the lowest 12 inches of the sand, but separate vertebræ and a great number of dermal plates are strewn throughout the entire bed.

No. 11. Light green marl striped with gray, ochre and red tints, containing a few *Potamomya angulata*; fossils not numerous: 5 feet 6 inches.

No. 12. *Gray Sand* passing into dove-coloured white when dry. Contains many seams of shells. The most abundant fossil is *Potamomya plana*. The blocks of this bed that lie along the base of the cliff, split at the shelly layers into slabs of from half an inch to an inch in thickness. The surface of these is covered with single valves of *Potamomya*. It is rare to obtain specimens with the valves united. In this bed are likewise found many fragments of the bones of *Palæotheria* and *Trionyces*. It is remarkable that the osseous *reliquiæ* of this bed are nearly all rounded and much bouldered. It measures about 4 feet.

No. 13. The "Leaf-bed" consists of a slate-coloured clay, which contains the impressions of leaves of Dicotyledonous plants in considerable number and variety of species; it contains likewise fossil fruits and the stems of plants; but we could not discover any shells. This well-marked bed rises nearly opposite Hordle House, and runs out at Long Mead End. Thickness about 18 inches.

No. 14. Bluish sandy clay forms the lowest bed of the fresh-water series, and runs out at Beacon Bunny. This stratum is very uniform in its lithological character throughout. In one part of its course it makes a sudden dip from 3° to 10°. It is tra-

versed by seams of carbonaceous clay, and has numerous zones of lacustrine shells and remains of plants. It admits of a subdivision into minor beds; but in consequence of the debris which covered it, no satisfactory analysis of these could be made. It measures about 20 feet.

Alex. Pytts Falconer, Esq., obtained from this bed the fine specimens of mammalian remains described by Prof. Owen, consisting of the skull, jaws, and many different bones of the skeleton of *Palæotherium*, a new genus of the *Palæotheridæ*, with

Palæotherium (two species).	Melanopsis brevis.
Dichodon, <i>Owen</i> .	Lymnæa longiscata.
Crocodylus <i>Hastingsiæ</i> .	— pyramidalis.
Trionyx (two species).	Melania, n. sp.
Emys.	Potamomya plana.
Lepidosteus, considerable parts of the skeleton.	Small, black, capsular seeds with a corrugated integument.
Paludina lenta.	Carpolithes ovulum, <i>Brong.</i>
Planorbis.	C. thalictroides, <i>Brong.</i>
Ancylus elegans.	Seeds of Chara medicaginula.

No. 15. The "Lignite-bed" rises about half a mile east of Beacon Bunny, and runs out of the cliff about a quarter of a mile west of that gorge, inclining at an angle of 2° . It forms a good line of demarcation in the section. The course of this bed can be traced with a telescope from Colwell, on the opposite shore of the Solent, a distance in a straight line of six miles. It consists of a dark-coloured carbonaceous and very tenacious clay, full of shells, with an intercalated band of lignite about 18 inches in thickness, which has been extracted in some places and burned as coal. The shells lie chiefly at the bottom of the bed. *Potamomya angulata*, *Potamides margaritaceus*, *Melanopsis brevis*, *Neritina concava*, *Cyrena obovata*, *C. Cycladiformis*, *Mytilus Brardii*, a small-ribbed *Modiola*, and *Serpula tenuis* were collected therefrom.

The shells are much crushed, and are preserved with difficulty. Most of my specimens are broken; the contents of the bed were noted on the spot as the fossils were obtained from the rock. The entire bed, which seems to have been formed in brackish water, measures 3 feet 6 inches.

The Estuary Formation.

No. 16. Grayish white sand rises about 300 yards west of Mead End, and runs out at Beacon Bunny, inclined at an angle of 2° . The siliceous particles of this bed are scarcely coherent, and its numerous fossils are consequently not well preserved. It contains an immense quantity of small shells, which are extremely brittle, and very difficult to preserve; specimens of the following genera are now before me:—

Oliva.	Natica.	Venericardia.
Ancilla.	Potamides.	Cytherea.
Pleurotoma.	Cyrena.	Sanguinolaria.
Bulla.	Lucina divaricata.	Potamomya.
Melania.	Corbula.	

A very perfect specimen of a Turtle was discovered in this bed with the carapace and plastron well preserved, but it fell to pieces on being removed from the sand. We collected fragments of the bones of *Cheloniæ*, and teeth of *Lamna* and *Myliobatis*. The gray sand measures about 5 feet, and passes gradually into No. 17, of which it may be considered to form the upper fossiliferous portion.

No. 17. Fine white sand ; non-fossiliferous : rises on the shore about half a mile east of Beacon Bunny, and disappears beyond Barton Gang. As it passes through Barton Cliff it becomes of a light sulphur-colour, streaked with darker shades, and forms a conspicuous portion of the section, which, when lit up by the sun's rays, presents a beautiful picturesque effect from the water : it measures from 15 to 20 ft.

Nos. 16 and 17 were unquestionably an estuary deposit, as proved by the list of fossils contained therein ; from their stratigraphical position in the series they are the equivalent in the Hampshire section of the Headon Hill sands of Alum and White Cliff Bays in the Isle of Wight. We attach therefore much importance to the analysis of the organic remains they contain, as it throws considerable light on the conditions under which the Headon Hill sands were deposited.

The shelly fragments contained in the latter beds are in such a broken and rounded condition that it is impossible to decide to what genera they belong. In my paper on the Isle of Wight it was observed in reference to these beds, that "the white and yellow sands at Alum Bay, immediately overlying the Barton group, were probably of estuary origin. The absence of organic remains leaves a doubt upon the subject. The equivalent bed however at Beacon Cliff on the Hampshire coast, which shall be more particularly described in a future communication, contains a large quantity of estuary shells mixed with true marine genera, together with the bones of turtles and the teeth of sharks." Guided by these facts, we infer "that the white and yellow sands of Headon Hill were the great estuary deposit which introduced the lacustrine conditions under which the lower freshwater group, with the other intercalated estuary beds, were deposited."

The Lower Marine Formation.

No. 18. Tea-green coloured clay ; rises on the shore near Mead End, about a quarter of a mile east of Beacon Bunny, and

runs out of the cliff near Barton Gang, where it thins out in a singular manner. It is seen "*in situ*," forming the walls of the ravine called Beacon Bunny, where it is capped with the gray sand No. 17. It measures about 25 feet. The fossils are distributed throughout the entire bed. The nacreous laminæ of the bivalves, and the enamel of the *Olivæ* are finely preserved. It differs lithologically from all the other beds in the section, and forms the uppermost true marine stratum of the Barton group. We collected from this clay the following shells:—

<i>Avicula</i> , n. sp.	<i>Tellina lævis</i> , <i>Edw.</i>
<i>Cardium turgidum</i> , <i>Sow.</i> Very large specimens.	<i>Ancillaria subulata</i> , <i>Lam.</i>
<i>Cytherea transversa</i> , <i>Sow.</i>	<i>Buccinum lavatum</i> , <i>Sow.</i>
<i>Corbula</i> .	— <i>desertum</i> .
<i>Mactra</i> .	<i>Natica striata</i> , <i>Sow.</i>
<i>Nucula trigona</i> , <i>Sow.</i>	— <i>patula</i> , <i>Lam.</i>
<i>Venericardia globosa</i> , <i>Sow.</i>	<i>Oliva Branderi</i> , <i>Sow.</i>

Bones of fishes and fragments of the skeleton of a large Turtle have been found in this bed, along with pine-cones, and other vegetable debris.

No. 19. Gray sand rises to the west of Beacon Bunny, and runs out of the cliff beyond Barton Station. No fossils have hitherto been found therein. It measures about 20 feet.

No. 20. The Barton gray sand, or "*Chama bed*," rises on the shore, about half a mile to the eastward of Beacon Bunny, and runs out of the cliff half a mile west of Barton Station. It is much concealed by the shingle of the beach, which requires to be removed before the bed can be worked. From this rich stratum many fine shells are collected. It contains an immense profusion of *Chama squamosa*, from which circumstance I have named it the "*Chama bed*." Much difficulty was experienced in measuring this bed, which varies from 10 to 15 feet in thickness. Where the sand rises on the beach it is concealed by shingle, and in its course through the cliff it is covered up by the debris of other beds. The most beautiful specimens of the Barton shells are obtained from this rich fossiliferous stratum. We collected the following species from the gray sand, and have little doubt that future investigations will add many more to the list. The majority of the species are special to it.

CONCHIFERA.

<i>Arca Branderi</i> , <i>Sow.</i>	<i>Chama squamosa</i> , <i>Brand.</i>
<i>Avicula Bartonensis</i> *, <i>Wright MSS.</i>	<i>Corbula cuspidata</i> , <i>Sow.</i>
<i>Balanus</i> .	— <i>longirostrata</i> , <i>Desh.</i>

* The new species named in this paper will be described in a future Number of the 'Annals of Nat. History.'

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|--|---|
| Corbula exarata, <i>Desh.</i> | Nucula trigona, <i>Sow.</i> |
| Crassatella plicata, <i>Sow.</i> | Ostrea flabellula, <i>Lam.</i> |
| Clavagella coronata, <i>Sow.</i> | Panopæa rugosa, <i>Edwards.</i> |
| Cytherea transversa, <i>Sow.</i> | Pecten carinatus, <i>Sow.</i> |
| — obliqua, <i>Desh.</i> | Pectunculus costatus, <i>Sow.</i> |
| — rotundata, <i>Brand.</i> | — Plumsteadiensis, <i>Sow.</i> |
| —, new species. | Solen gracilis, <i>Sow.</i> |
| Hemicardium Bartoniense, <i>Wright</i> | Tellina Hantoniensis, <i>Edw.</i> |
| MSS. | — lamellulata, <i>Edw.</i> |
| Modiola tenuistria, <i>Mill.</i> | — squamula, <i>Edw.</i> |
| Lucina mitis, <i>Sow.</i> | — lævis, <i>Edw.</i> |
| Mactra depressa (var.), <i>Desh.</i> | — ambigua, <i>Sow.</i> |
| Nucula similis, <i>Sow.</i> | — scalaroides (var.), <i>Lam.</i> |
| — minima, <i>Sow.</i> | Venericardia, near imbricata?, <i>Desh.</i> |

GASTEROPODA.

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|------------------------------------|-------------------------------------|
| Actæon simulatus, <i>Brand.</i> | Pleurotoma prisea, <i>Brand.</i> |
| Ancillaria turritella, <i>Sow.</i> | — colon, <i>Sow.</i> |
| Buccinum junceum, <i>Sow.</i> | Rostellaria rimosa, <i>Brand.</i> |
| — canaliculatum, <i>Sow.</i> | Seraphs convolutus, <i>Montf.</i> |
| Bulla attenuata, <i>Sow.</i> | Strombus Bartoniensis, <i>Sow.</i> |
| Cerithium hexagonum, <i>Lam.</i> | Solarium canaliculatum, <i>Sow.</i> |
| Conus dormitor, <i>Brand.</i> | Triton argutus, <i>Brand.</i> |
| Cypræa Bartoniensis, <i>Wright</i> | Trochus monilifer, <i>Lam.</i> |
| MSS. | Voluta costata, <i>Sow.</i> |
| Fusus bulbiformis, <i>Lam.</i> | — lima, <i>Sow.</i> |
| Mitra scabra, <i>Sow.</i> | — Magorum, <i>Sow.</i> |
| — parva, <i>Sow.</i> | — spinosa, <i>Lam.</i> |
| Murex frondosus, <i>Sow.</i> | — undulata, <i>Wright</i> |
| Natica ambulacrum, <i>Sow.</i> | MSS. |

ZOOPHYTA.

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| Turbinolia Bowerbankii, <i>Milne-Ed-</i> | Turbinolia humilis, <i>Milne-Edwards.</i> |
| wards. | — firma, <i>Milne-Edwards.</i> |
| — Fredericiana, <i>Milne-Edwards.</i> | Lunulites radiata, <i>Lamarck.</i> |

No. 21. The Barton clay; rises on the shore about half a mile west of Beacon Bunny near Barton Gang, and runs out of the cliff about a quarter of a mile westward of Chuton Bunny, nearly half a mile to the eastward of High Cliff Castle. It attains a thickness of about 40 or 50 feet. An accurate measurement of this bed could not be obtained in consequence of the debris which covers it. It contains the greater number of the fossils known as "Barton shells," with teeth of *Squalus*, *Lamna*, and *Myliobatis*.

CONCHIFERA.

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|-----------------------------------|------------------------------------|
| Arca appendiculata, <i>Lam.</i> | Crassatella sulcata, <i>Brand.</i> |
| Cardium porulosum, <i>Brand.</i> | Cytherea elegans, <i>Lam.</i> |
| Clavagella coronata, <i>Desh.</i> | — suberycinoides, <i>Desh.</i> |
| Corbula globosa, <i>Sow.</i> | — tellinaria, <i>Lam.</i> |
| — pisum, <i>Sow.</i> | Ostrea oblonga, <i>Brand.</i> |
| — revoluta, <i>Sow.</i> | Pinna margaritacea, <i>Lam.</i> |
| — striata, <i>Lam.</i> | Venericardia globosa, <i>Sow.</i> |

GASTEROPODA.

- | | |
|-----------------------------|-------------------------------|
| Actæon crenatus, Sow. | Murex defossus, Sow. |
| — elongatus, Sow. | — minax, Brand. |
| Bulla constricta, Sow. | Natica Hantoniensis, Pilk. |
| — elliptica, Desh. | Nummulites elegans, Sow. |
| — filosa, Sow. | — variolaria, Lam. |
| Cancellaria evulsa, Sow. | Pecten reconditus, Sow. |
| — quadrata, Sow. | Pleurotoma brevisrostra, Sow. |
| Conus lineatus, Sow. | — colon, Sow. |
| — scabriculus, Sow. | — comma, Sow. |
| Dentalium acuminatum, Sow. | — conoides, Brand. |
| — nitens, Desh. | — exorta, Brand. |
| — striatum, Sow. | Pyrula Greenwoodi, Sow. |
| Fusus acuminatus, Sow. | — nexilis, Lam. |
| — asper, Sow. | Rostellaria macroptera, Lam. |
| — bulbiformis, var. | — rimosa, Sow. |
| — carinella, Sow. | Scalaria acuta, Sow. |
| — errans, Sow. | — interrupta, Sow. |
| — ficulneus, Lam. | — reticulata, Sow. |
| — interruptus, Sow. | — semicostata, Sow. |
| — longævus, Lam. | Serpula crassa, Sow. |
| — porrectus, Brand. | Solarium plicatum, Lam. |
| — regularis, Sow. | Terebellum fusiforme, Lam. |
| Gastrochæna contorta, Lam. | Trochus agglutinans, Desh. |
| Hipponyx squamiformis, Lam. | Typhis fistulosus, Broc. |
| Infundibulum obliquum, Sow. | — pungens, Brand. |
| — trochiforme, Sow. | Voluta ambigua, Sow. |
| Littorina sulcata, Pilk. | — athleta, Sow. |
| Murex asper, Brand. | — costata, Sow. |
| — bispinosus, Sow. | — luctatrix, Sow.* |

No. 22. Greenish tenacious clay; rises on the shore near Barton Station, and runs out of the cliff near High Cliff Castle. It contains a few shells, and the teeth and bones of fishes, and measures about 20 feet.

No. 23. The High Cliff sands and clays rise on the shore a quarter of a mile to the eastward of Chuton Bunny, and run out of the cliff about a quarter of a mile to the westward of High Cliff Castle. This bed is composed of alternations of sand and clay, of brown, green, and ferruginous colours. It is very rich in beautiful shells, as *Cassidaria coronata*, *C. carinata*, with many other species, and contains numerous nodular masses made up entirely of fossils, but my materials do not at present enable me to give a correct list of these. This bed attains a thickness of from 20 to 30 feet.

No. 24. Green clay; rises on the shore at Chuton Bunny, and runs out of the cliff nearly half a mile westward of High Cliff

* The British Natural History Society, of which Mr. Charlesworth of York is Secretary, has distributed amongst its members a very complete suite of the fossils of the above lists. A series of these shells, including 100 species, is supplied for a small subscription.

Castle. It contains the bones and jaws of fishes, with many broken shells. It attains a thickness of about 30 feet. The fossils are nearly all in a fragmentary state. This green clay forms the lowest bed of Barton Cliff.

Exeter Place, Cheltenham, March 1851.

XLIII.—*A Catalogue of British Spiders, including remarks on their Structure, Functions, Economy and Systematic Arrangement.* By JOHN BLACKWALL, F.L.S.

[Continued from p. 402.]

26. *Salticus distinctus.*

Salticus distinctus, Blackw. Linn. Trans. vol. xviii. p. 616.

Euophrys tigrina, Koch, Die Arachn. B. xiv. p. 6. tab. 469. fig. 1275–1277.

Salticus distinctus, like many other species belonging to the same genus, has the palpi abundantly supplied with hairs, and employs them as brushes to cleanse the corneous coat of the anterior eyes. It occurs in Denbighshire, Caernarvonshire, and the north of Lancashire on stone walls, in the interstices of which the female fabricates a cell of compact white silk attached to the surface of the stone. In July she constructs in this cell a lenticular cocoon measuring $\frac{1}{6}$ th of an inch in diameter, and deposits in it about 16 spherical eggs of a pale yellow colour, not agglutinated together. The young, even before they quit the cocoon, exhibit some of the marks most characteristic of the species.

This spider is regarded by M. Walckenaer as identical with *Attus erraticus* (Hist. Nat. des Insect. Apt. t. iv. p. 409), from which it differs both in structure and colour. The maxillæ of *Salticus distinctus* are shorter, stronger, much more enlarged at the extremity, and straighter than those of *Attus erraticus*; its lip too, instead of being oval and obtuse like that of the latter, is triangular and pointed, and its falces, sternum, and superior pair of spinners have a much darker hue; the figures also on the cephalo-thorax and abdomen of both species, designed by the disposition of their respective colours, are dissimilar.

The *Euophrys tigrina* of M. Koch is the same as *Salticus distinctus*; but the *Salticus tigrinus* and the *Salticus litoralis* of M. Hahn (Die Arachn. B. i. p. 62. tab. 16. fig. 47; and p. 70. tab. 18. fig. 53) should be expunged from the synonyma of *Euophrys tigrina*, among which M. Koch has placed them, as they are distinct species, and have not yet been observed in Great Britain.

27. *Salticus gracilis*.

- Salticus gracilis*, Hahn, Die Arachn. B. i. p. 73. tab. 18. fig. 55 ;
 Blackw. Linn. Trans. vol. xix. p. 122.
Attus gracilis, Walck. Hist. Nat. des Insect. Apt. t. i. p. 423.
Euophrys gracilis, Koch, Uebers. des Arachn. Syst. erstes Heft,
 p. 33.

I have taken specimens of *Salticus gracilis* among heath growing in woods on the Caernarvonshire and Denbighshire sides of the valley of the Conway.

Though M. Hahn has described the female only of this species, yet the figure he has given is that of an immature male.

28. *Salticus cupreus*.

- Salticus cupreus*, Hahn, Die Arachn. B. ii. p. 42. tab. 55. fig. 128 ;
 Blackw. Linn. Trans. vol. xix. p. 121.
 — *æneus*, Hahn, Die Arachn. B. i. p. 65. tab. 17. fig. 49.
 — *flavipes*, Hahn, Die Arachn. B. i. p. 66. tab. 17. fig. 50.
Attus cupreus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 409.
 — *atrovirens*, Sund. Vet. Acad. Handl. 1832, p. 210.
Heliophanus cupreus, Koch, Uebers. des Arachn. Syst. erstes Heft,
 p. 30 ; Die Arachn. B. xiv. p. 56. tab. 476. fig. 1313-1315.
 — *flavipes*, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 30 ;
 Die Arachn. B. xiv. p. 64. tab. 477. fig. 1320-1322.
 — *dubius*, Koch, Die Arachn. B. xiv. p. 61. tab. 476. fig. 1317,
 1318.

There are several varieties of this spider, some of which have been described by arachnologists as distinct species. Crevices among accumulated fragments of rock occurring in woods in the mountainous parts of Denbighshire and Caernarvonshire are frequently selected for its abode, and afford it great facilities of escaping from danger. In June the female incloses herself in a cell of white silk of a compact texture, on the exterior surface of which particles of soil, withered moss, and other materials are sometimes sparingly distributed ; she usually attaches it to the under side of stones or dead leaves, depositing in it from 20 to 30 spherical eggs of a pale yellow colour connected by fine silken lines.

29. *Salticus tardigradus*.

- Salticus Rumphii*, Latr. Gen. Crust. et Insect. tom. i. p. 124.
 — *Rumpfi*, Hahn, Die Arachn. B. i. p. 56. tab. 15. fig. 42.
Attus tardigradus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 461.
Dendryphantus muscosus, Koch, Uebers. des Arachn. Syst. erstes
 Heft, p. 31.
Marpissa muscosa, Koch, Die Arachn. B. xiii. p. 63. tab. 443. fig.
 1129, 1130.

In the summer of 1845, Miss Ellen Clayton, of Lancaster,

transmitted to me living specimens of *Salticus tardigradus*, captured by her at Balham, in Surrey. A female, which I had placed in a phial, spun a sac of fine white silk in June, and attached to its inner surface a lenticular cocoon of delicate white silk of a loose texture measuring $\frac{1}{3}$ rd of an inch in diameter, in which she deposited 35 spherical eggs of a pale yellow colour, not agglutinated together.

M. Koch's figure, number 1130, is stated to represent a female in the text, but a male is delineated in the plate.

30. *Salticus formicarius*.

Salticus formicarius, Latr. Gen. Crust. et Insect. tom. i. p. 124; Sund. Vet. Acad. Handl. 1832, p. 200; Koch, Die Arachn. B. xiii. p. 33. tab. 438. fig. 1101, 1102.

Attus formicarius, Walck. Hist. Nat. des Insect. Apt. t. i. p. 470.

Dr. Leach has remarked, in the Supplement to the 4th, 5th and 6th editions of the 'Encyclopædia Britannica,' article *Annullosa*, that *Attus (Salticus) formicarius* is found, though rarely, in Scotland; consequently I have included it in this catalogue, but I have not succeeded in procuring a British specimen.

Family *Thomisidæ*.

Genus THOMISUS, Walck.

31. *Thomisus brevipes*.

Thomisus brevipes, Hahn, Die Arachn. B. i. p. 30. tab. 8. fig. 25; Walck. Hist. Nat. des Insect. Apt. t. i. p. 503; Blackw. Linn. Trans. vol. xix. p. 122.

Xysticus brevipes, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 25.

I have occasionally met with adult females of this species under stones in fields adjacent to woods at Oakland, near Llanrwst. The only male I ever captured resembled the female in colour; but, though the digital joints of its palpi were very tumid, the palpal organs were not developed, indicating that it had to undergo its final change of integument before it arrived at maturity.

As there does not appear to be the least necessity for adopting the genus *Xysticus*, proposed by M. Koch, to which he has transferred this and some other species of British *Thomisi*, I have deemed it expedient to adhere to the generally received method of arrangement in this instance.

32. *Thomisus cristatus*.

Thomisus cristatus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 521; Latr. Gen. Crust. et Insect. tom. i. p. 111; Sund. Vet. Acad. Handl. 1832, p. 217.

— *pini*, Hahn, Die Arachn. B. i. p. 26. tab. 8. fig. 23.

- Thomisus viaticus*, Hahn, Die Arachn. B. i. p. 35. tab. 10. fig. 29.
 — *ulmi*, Hahn, Die Arachn. B. i. p. 38. tab. 10. fig. 30.
 — *lateralis*, Hahn, Die Arachn. B. i. p. 40. tab. 10. fig. 31.
Xysticus mordax, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 25.
 — *viaticus*, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 25 ; Die Arachn. B. xii. p. 70. tab. 412. fig. 1003, 1004.
 — *ulmi*, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 25.

The varieties of *Thomisus cristatus* are very numerous, and many of them have been mistaken for distinct species. This common spider occurs on the ground and among the herbage of old pastures ; in form and gait it bears some similitude to a small crab, moving in a lateral direction almost with as great facility as it does forwards ; it is remarkable also for its propensity to take aerial excursions, particularly when immature. In July the female constructs a lenticular cocoon of white silk of a compact texture, measuring about $\frac{1}{3}$ rd of an inch in diameter, which is frequently attached to the inferior surface of a stone or fragment of rock ; it contains between 80 and 90 spherical eggs of a pale yellowish white colour, not agglutinated together.

A young female of this species, captured in July 1835, had the two lateral pairs of eyes only ; the four small intermediate eyes were altogether wanting, not the slightest rudiment of them being perceptible even with the aid of a powerful magnifier.

33. *Thomisus erraticus*.

Thomisus erraticus, Blackw. Research. in Zool. p. 408.

This spider may be seen in summer running on foot-paths in North Wales and Lancashire, but it is not a common species. In June the female constructs a lenticular cocoon of compact white silk measuring $\frac{1}{4}$ th of an inch in diameter ; it is commonly attached to the under side of withered leaves, and contains about 43 spherical eggs of a pale yellow colour, not agglutinated together.

34. *Thomisus atomarius*.

- Thomisus atomarius*, Walck. Hist. Nat. des Insect. Apt. t. i. p. 523.
 — *lynceus*, Latr. Gen. Crust. et Insect. tom. i. p. 112.
 — *similis*, Wider, Museum Senckenberg, B. i. p. 275. taf. 18. fig. 8.

As the *Thomisus lynceus* of Latreille, which M. Walckenaer regards as identical with *Thomisus atomarius*, is stated by Dr. Leach to inhabit Scotland (Supplement to the 4th, 5th and 6th editions of the 'Encyclopædia Britannica,' article Annulosa), it is entitled to a place among British spiders.

35. *Thomisus formosus*.

Thomisus formosus, Blackw. Annals and Mag. of Nat. Hist. Second Series, vol. vi. p. 337.

An adult male and female of this handsome species, captured at Southgate in 1848, the former in May and the latter in June, are in Mr. Walker's cabinet.

36. *Thomisus luctuosus*.

Thomisus luctuosus, Blackw. Lond. and Edinb. Phil. Mag. Third Series, vol. viii. p. 489.

Thomisus luctuosus is found among coarse herbage growing in woods and pastures about Oakland. In July the female constructs a lenticular cocoon of white silk of a compact texture measuring $\frac{1}{4}$ th of an inch in diameter, and deposits in it between 80 and 90 spherical eggs of a pale yellowish white colour, not agglutinated together. The cocoon, to which the female manifests her attachment by remaining constantly with it, is often placed between two leaves connected by a slight tissue of silk, forming a kind of sac.

This spider appears to be nearly allied to the *Thomisus fucatus* of M. Walckenaer (Hist. Nat. des Insect. Apt. t. i. p. 505).

37. *Thomisus bifasciatus*.

Thomisus bifasciatus, Blackw. Linn. Trans. vol. xix. p. 122.

Xysticus bifasciatus, Koch, Die Arachn. B. iv. p. 59. tab. 125. fig. 286-288; Uebers. des Arachn. Syst. erstes Heft, p. 26.

In spring this species may be observed running on the ground in pastures near Llanrwst. The female constructs a lenticular cocoon of white silk of a compact texture, measuring $\frac{2}{5}$ ths of an inch in diameter, on the inferior surface of the leaves of plants, the edges of which are folded upon it and retained in that position by silken lines; it comprises about 185 spherical eggs of a yellowish white colour, not agglutinated together, which are hatched in July.

An adult female, taken in May 1846, had the right eye of the posterior row very much smaller than the left eye of the same row.

38. *Thomisus pallidus*.

Thomisus pallidus, Blackw. Ann. and Mag. Nat. Hist. vol. xviii. p. 299.

I discovered this spider among grass in a pasture at Oakland in September 1845, and in April 1849 I received from James Hardy, Esq., of Penmanshiel, Berwickshire, an adult female, found under a stone in Penmanshiel wood. Like *Thomisus cristatus*, *Thomisus bifasciatus*, and some other species belonging to

the genus *Thomisus*, it has the power of changing the colour of the anterior intermediate pair of eyes from dark red-brown to pale golden yellow by a very perceptible internal motion. No such motion appears to occur in the other eyes, which are always black.

39. *Thomisus trux*.

Thomisus trux, Blackw. Ann. and Mag. Nat. Hist. vol. xviii. p. 300.

An adult male of this species was taken among grass in a pasture at Oakland in June 1846, and I have since met with several individuals of the same sex running on the ground in fields near Llanrwst.

40. *Thomisus incertus*.

Thomisus incertus, Blackw. Ann. and Mag. Nat. Hist. vol. xviii. p. 297.

My son, John Blackwall, discovered a specimen of this spider in an outbuilding at Oakland in June 1845; it was a male with the palpal organs fully developed, and in the spring of 1850 I received an adult female from Miss Ellen Clayton, who captured it in Dorsetshire. *Thomisus incertus* appears to be nearly allied to the *Xysticus praticola* of M. Koch (Die Arachn. B. iv. p. 77. tab. 130. fig. 300, 301).

41. *Thomisus citreus*.

Thomisus citreus, Walck. Hist. Nat. des Insect. Apt. t. i. p. 526; Latr. Gen. Crust. et Insect. tom. i. p. 111; Hahn, Die Arachn. B. i. p. 42. tab. 11. fig. 32; Sund. Vet. Acad. Handl. 1832, p. 219; Blackw. Linn. Trans. vol. xix. p. 122.

— *dauci*, Hahn, Die Arachn. B. i. p. 33. tab. 9. fig. 27.

— *calycinus*, Koch, Die Arachn. B. iv. p. 53. tab. 124. fig. 283, 284; Uebers. des Arachn. Syst. erstes Heft, p. 24.

Flowers growing in fields and gardens are the favourite resorts of *Thomisus citreus*, which occurs in various parts of England and Wales. There is great dissimilarity in size and colour between the sexes; so much, indeed, that they have been described as different species.

Genus PHILODROMUS, Walck.

42. *Philodromus dispar*.

Philodromus dispar, Walck. Hist. Nat. des Insect. Apt. t. i. p. 553; Blackw. Linn. Trans. vol. xix. p. 123.

— *fallax*, Sund. Vet. Acad. Handl. 1832, p. 226.

— *limbatus*, Koch, Die Arachn. B. xii. p. 85. tab. 416. fig. 1017, 1018.

This active spider frequents wooded districts in England and

Wales, and being provided, like other species of the genus, with a small climbing apparatus situated below the tarsal claws, it runs with great rapidity on the dry perpendicular surfaces of highly polished bodies. Though the sexes resemble each other in colour before they arrive at maturity, yet in the adult state they differ remarkably in that particular. In June the female constructs a lenticular cocoon of white silk of a fine but compact texture, measuring $\frac{1}{4}$ th of an inch in diameter, in which she deposits about 72 spherical eggs of a yellowish white colour, not agglutinated together. This cocoon is inclosed in a cell of dull white silk of a loose texture, usually attached to a dead leaf, the edges of which are drawn towards each other by silken lines connecting them with the cell.

43. *Philodromus cespiticolis*.

Philodromus cespiticolis, Walck. Hist. Nat. des Insect. Apt. t. i. p. 555.

— *cespitolens*, Blackw. Linn. Trans. vol. xix. p. 123.

— *fusco-marginatus*, Sund. Vet. Acad. Handl. 1832, p. 224.

Philodromus cespiticolis is found among heath, gorse and juniper bushes in the vicinity of woods in Lancashire, Berwickshire, and the west of Denbighshire. In July the female spins a cell of compact white silk among leaves growing near the extremities of the stems of shrubs, curving them about it and retaining them in that position by means of silken lines. This cell she occupies, and usually constructs in it two lenticular cocoons of white silk of a delicate texture, depositing in each from 40 to 100 spherical eggs of a pale yellow colour. The cocoons frequently differ considerably in size, the larger one measuring about $\frac{1}{4}$ th of an inch in diameter.

XLIV.—*Contributions to the Botany of South America.*

By JOHN MIERS, Esq., F.R.S., F.L.S.

CATHEDRA.

THIS is a very singular genus, which I proposed a few years ago, for an arborescent shrub that I found near Rio de Janeiro, having much the appearance of a *Myrsine*, with which genus its flower agrees, in having a small cupshaped calyx, as many stamens as petals placed opposite to them, a short style and a clavate stigma, a depressed ovary, which is unilocular, with seeds fixed to a central placenta. It differs however from that genus, in its almost entire calyx, in its petals and stamens being six in number, inserted upon the margin of a fleshy hemispherical or

cupuliform disk, which is quite free both from the calyx and the ovarium, and in its remarkably thick fleshy petals with a tuft of long stiff hairs in the centre, and which are quite valvate in æstivation, whereas in *Myrsine* they are thin in texture, and in æstivation are always more or less imbricated. M. A. DeCandolle, in his 'Prodromus,' viii. p. 93, states, however, that they are valvate in *M. variabilis* and *M. Paulensis*, contrary to the usual structure of the genus; but I find in the latter species, as also in *M. Rapanea*, and I believe in all the Brazilian genera, that the constantly thin margins of the petals always slightly overlap each other, especially towards the apex: I was at one time, in like manner, mistaken on this point, but on examining the buds with more attention, I satisfied myself in regard to the fact in question.

The somewhat bilobed tetragonous anthers in *Cathedra* consist of four cells quadrately placed around a central connective, and formed of thick crystalline walls, composed of numerous long transverse cellules or hollow cylinders, closed at both ends, forming a honeycombed texture, and which are all arranged in a radiating series around each of the four pollen-cells, so that the external surface of the anther is thus reticulated or rather bullated with the small hexagonoid convexities of the ends of the cellules. Hence, at first sight, there does not appear any provision for the escape of the pollen, but there may be perceived at length in the summit, four small circular depressions or spots, corresponding with the apex of the pollen-cells, which are not open pores, but appear cancellated, as if the ends of the cellules, forming their covering, had there become dissolved, leaving a sieve-like screen over the cells, through the meshes of which, it may be inferred, that the fertilizing particles escape by a kind of endosmose, and are conveyed by the villous tuft of long hairs belonging to the petals, and that overhang the anthers, to the stigma, which they embrace. I have examined at least 200 or 300 anthers, invariably with the same result, even after they have fallen away with the petals, and that they were not sterile is proved by the anther-cells being filled with perfect pollen-grains. I have remarked that the cellules of the anther-casing, when broken under water, exude an oily substance, and it is probable that this may find its way into the pollen-cells and assist in the escape of the fertilizing particles in the manner I have just described. After each anther has discharged its pollen, the walls collapse upon the vacant spaces, and it then assumes the appearance of being 2-lobed, and as if each lobe had burst by a longitudinal line of dehiscence; but if the whole anther in this state be cut across and moistened, it will resume its original shape and display the four separate empty cells in a very distinct manner. Much analogy will be found to exist in this structure to that of the anthers of

Choretrum; these are stated by Mr. Brown (Prodr. p. 354) to be 4-locular and 4-valved, but although correct to a certain extent, this requires some explanation: their form, which is somewhat peculiar, is tolerably well represented in Endlicher's 'Iconographia,' tab. 45; the four rounded lobes there shown consist of four distinct pollen-cells, quadrately placed at right angles to the filament, round a short central connective, and inclosed by thick crystalline walls, as in *Cathedra*: but here, the apices of the cells, which point towards the style, at first open by a minute pore, close to the apical summit of the connective, when by the gradual contraction of the walls, the margins, beginning at these pores, recede and separate from it, showing a somewhat cruciform opening in the summit, and leaving the connective in the central space like a short columnar receptacle, around which the pollen-grains of the four cells remain agglutinated: there exist in reality no sutural slits, so that the anther can hardly be said to be 4-valved.

I have endeavoured to detect some similar mode of dehiscence in the anthers of *Cathedra*, which possess precisely the same structure, but in vain, although we might expect to find them discharge their pollen, as those of *Choretrum* are found to do. It may be well here to adduce the very analogous instance of similar structure in *Myzodendron*, which will be touched upon at greater length on some future occasion, and which has been very beautifully demonstrated by Dr. Hooker in his admirable analytical details of that genus in plates 104 and 105 of the 'Flora Antarctica'; in a subsequent memoir I shall compare the curious analogies observable in these instances, as they will be found to offer a strong bearing upon the affinities of *Cathedra*.

The anthers of *Viscum* will also serve to throw some light upon this subject; these have been described by all preceding botanists as being formed of numerous, aggregated and distinct cells, each filled with pollen-grains, and which discharge these fertilizing particles by as many distinct pores, in a manner that has been described and clearly delineated by Richard in the 'Ann. Mus.' xii. p. 296. tab. 27. fig. 3. M. DeCaisne, in a learned memoir on the development of the pollen in *Viscum album* (Mém. Acad. Bruxelles, vol. xiii.), details the mode of growth of its anthers, and exhibits highly magnified transverse sections of the same in their different stages, but does not give a single vertical section, nor any description or drawing of the anther in its mature state: we may therefore conclude that he coincided with the description of Richard, in regard to its being composed of an indefinite number of distinct aggregated pollen-cells; he seems indeed to confirm this structure, for in his memoir just quoted, tab. 1. fig. 3, he shows a transverse sec-

tion of an anther advancing to maturity, where nine such cells radiate upon its inner face, and in fig. 4 he gives a section of one of these distinct cells filled with pollen-grains. Endlicher repeats the same view of the structure of the anthers in *Viscum*, as being "multicellulosæ, poris plurimis dehiscentes." Prof. Lindley confirms the same statement (Veg. Kingd. p. 790), where he says, "in the genus *Viscum* the anther forms its pollen in a number of distinct cells, as in *Ægiceras*, this being beautifully illustrated by DeCaisne" (Mém. Acad. Brux. *loc. cit.*). Not having any opportunity of examining the structure of the anthers in *Viscum album*, I will not attempt to deny the facts vouched for upon such authority, but I can speak with confidence to what I have unquestionably observed in regard to their structure in dried specimens in all the Brazilian species of *Viscum* that I have examined. Here they are constantly free and sessile upon the base of the lobes of the perigonium, and on the margin of an adnate cupuliform disk; they are bilocular, the cells being parallel and of the whole length of the anther; these cells are filled with numerous pollen-grains, and are formed of very thick crystalline walls, consisting of large cellules, radiating around each central pollen-cell, as in *Cathedra*; and these cellules are closed at both ends by the external and internal facings of the walls, which are thin and marked with close-set parallel interrupted lines, as are also the lateral divisions between these cellules. On a future occasion I shall be able to show that other differences exist in the structure of the seed, in the tropical species of *Viscum*, which are not less striking than the fact here recorded respecting the conformation of the stamens. In my examination, I have not been able to perceive in any instance, an indication of the bursting of these two cells for the escape of the pollen, but at the apex the spaces over the cells become depressed, and may be mistaken for two open pores, which are also covered by a network screen, as before described, in the anthers of *Cathedra*. I have met with several other cases of somewhat similar structure in many genera of the *Santalaceæ*, and in some instances also in *Olacaceæ*, where however a form of anther prevails, which, though somewhat analogous, must not be confounded with the structure above described. Here the anthers are distinctly 4-lobed, 4-celled and 4-valved, often more or less crustaceous in texture, the cells opening alternately right and left by the evolution of the valves, which separate from the connective longitudinally by one of their margins, so that when these are rolled back the pollen is discharged, and they appear as if the anthers had been 2-celled and 4-valved, according to the usual mode of construction. The same development often occurs in *Loranthaceæ* proper, in *Rhamnaceæ*, *Celastraceæ*, and

other families, although they are generally considered to have bilocular anthers; in these instances the valves are much thinner and reticulated in texture; they are the same in *Psittacanthus*; but in *Struthanthus*, though the walls are crystalline, and as thick as in *Cathedra*, they yet open in the manner just described.

The comparison of the characters of *Cathedra* with other genera has led me into a general examination of the *Olacaceæ*, *Santalaceæ*, and other allied families, in the course of which I have met with numerous interesting and novel facts, and from the materials thus collected, I propose to give at an early period, a review of each genus belonging to these orders in succession, together with illustrated details of their characters. In the following memoir on *Liriosma*, I will offer some of the views I have in consequence been led to adopt regarding the affinities of the families above alluded to.

The singular development of the very remarkable free cupuliform disk in *Cathedra*, that supports on its margin the petals and stamens, is an important feature, as it serves clearly to demonstrate the true nature of the same organ, which, with few exceptions, in all true *Olacaceæ*, is always more or less adnate with the ovarium and quite free from the calyx, but which in the genus *Liriosma* is connate with the calyx and wholly free from the ovarium; while in those genera of the *Santalaceæ*, where the calyx and corolla are confluent in one common perigonium, the disk is almost wholly coadnate with the latter: to this feature therefore, as it is developed in *Cathedra*, frequent recurrence will be made when we come to consider the different genera in the manner I have proposed. The ovarium in the plant under consideration is turbinate and flattened, the lower moiety being smooth and concealed within the free surrounding cup just mentioned, the upper moiety being covered with a thick fleshy gland, in shape like a very depressed cone, marked with twelve raised radiating striæ; it is 2-celled at base, unilocular at its summit, with a single ovule in each incomplete cell, suspended from the apex of the free axile placenta. This structure is quite analogous to that found in many genera of the *Olacaceæ*, and different from what exists in *Myrsinaceæ*. I regret very much that I did not meet with the ovarium further advanced towards maturity, but this deficiency is in some degree supplied by another very similar plant, evidently congeneric with the above, and to which our attention was called nearly eight years ago by Mr. Bentham (Lond. Journ. Bot. ii. 375), who says, "No. 5380 bis, of Gardner, from a single straggling shrub, found in a forest at Tejuca, fourteen miles from Rio de Janeiro, is a very singular plant, apparently allied to *Olacaceæ*, but unfortunately past flower in the specimens found. It has the habit, foliage, and inflores-

cence of a *Heisteria*. My specimens bear ovaries in different states of development after the fall of the corolla. They are fleshy and pulvinate, 1-celled inside, with one ovule pendulous from a lateral placenta. The calyx is persistent, very small, and bluntly 6-lobed, or rather with three emarginate lobes; between the calyx and ovary are three cup-shaped truncated disks one within the other. The outer one, considerably larger than the calyx, appears to increase gradually as the ovary swells; within it, the second disk, larger than the first, grows more rapidly; close around the ovary the third or innermost disk is quite short and concealed within the second, and does not increase at all. The ovary is very obtuse and crowned with the remains of a filiform style, from the base of which may be traced six diverging lines." I have examined a specimen of this plant in Sir Wm. Hooker's herbarium, and can confirm the accuracy of Mr. Bentham's observations, but with this difference, that the ovary is probably still more advanced, being of an oval form, and it is partly surrounded by four very distinct cup-shaped disks, that is to say, one more than was observed in Mr. Bentham's specimen. I will annex a drawing and section of the ovary and concentric disks thus observed, to the plate which I intend offering of the analysis of *Cathedra rubricaulis*, and will give below a specific character of Gardner's plant. The smaller and innermost cup around the base of the ovary is evidently the same disk that supports the petals and stamens in my plant: this in the other species is inclosed in, and concealed by the second cup, which is double its length, and half the length of the ovary thus far grown, and is no doubt the true calyx; the other two outer cups, as well as the calyx, are each supported by a short stipes, and are successively smaller, the outermost being extremely short and irregular on the margin. I can only account for the existence of these two outer cups, by supposing them to be merely external involucreting cupuliform bracts, now made manifest by the lengthening of the pedicel, and that have become enlarged in the same manner as the calyx, and which have formed part of the original gemma, out of which the clustered fascicle of almost sessile flowers springs; for in my flowering specimens, although these bracts are very short and almost obsolete, they are yet distinctly cupuliform. I have formed the generic name from *καθέδρα*, *sella*, on account of the petals and stamens being supported on the margin of an elevated cupuliform disk.

CATHEDRA (gen. nov.).—*Calyx* cupuliformis, carnosus, margine membranaceo-ciliatus, obsolete 6-dentatus, liber, persistens. *Petala* 6, oblonga, acuta, intus ad apicem subtrigona, carnosae, et glandulis brevibus sub-piliformibus creberrimis tecta, ad

medium fasciculo setarum barbata, et ad imum subcompressa, truncata et simul cum staminibus puncto ad marginem disci singulatim inserta, erecta, æstivatione valvata. *Stamina* 6, petalis opposita, et iis dimidio breviora; *filamenta* brevissima, lata, crassiuscula; *antheræ* apicifixæ, subconicæ, subtetragoneæ, subgibbæ, imo cordatæ, apice mucrone obtuso signatæ, 4-loculares (summo poris 4 tegmine subdeliquescente hinc clathrato pro emissionem pollinis vix apertæ?), areolato-crystallinæ, e cellulis elongatis circa loculos transversim radiantibus formata, facie externa hinc reticulato-bullatæ. *Pollen* ovatum, cancellato-reticulatum. *Discus* hypogynus, cupuliformis, carnosus, integer, calycis longitudine, utrinque omnino liber. *Ovarium* liberum, substipitatum, dimidio inferiori obconico glabro, dimidio superiori glandula carnosâ depresso-conica radiis 12 notata pilosula coronato; imo 2-loculare, summo 1-loculare, 2-ovulatum, *ovulo* anatropo in loculum singulum incompletum apice placentæ axillaris utrinque pendulo. *Stylus* brevis, erectus. *Stigma* oblongum, obcordato-conicum. *Fructus* ignotus.—Arbusculus *Brasiliensis*, ramulis *subflexuosis*, cortice *rimoso, rubente*; folia *alterna, elliptica, coriacea, breviter petiolata, exstipulata*; flores *plurimi, parvi, e gemma axillari imbricati, aggregati, fere sessiles, glanduloso-tomentosi*.

1. *Cathedra rubricaulis*;—ramis nodosis, subflexuosis, rugosis, ramulis cortice rubro nitido rimoso deciduo vestitis; foliis lanceolato-oblongis, acuminatis, coriaceis, divaricatis, utrinque glaberrimis, subtus pallidioribus, margine revoluto, petiolo subbrevis, crassiusculo, canaliculato; fasciculo axillari, 10–12-flori, floribus creberrime aggregatis.—Rio de Janeiro ad montem Corcovado, v. v.

This is a small tree, about 12 feet high, with copious foliage, which I found growing near the aqueduct, at a spot called Agoas Novas, on the ascent of the Corcovado, in July 1837, and of which I made an analysis from living specimens. The bark of the younger branches is of a dark red colour, soon cracks and peels off, leaving the surface somewhat rugous and tubercled. Its leaves are alternate, with internodes half an inch apart; they are $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long, $1\frac{1}{8}$ to $1\frac{1}{2}$ inch broad, upon a thick channeled petiole, 3 or 4 lines in length; they are polished above, dull, and of an apple-green colour beneath. The small cluster of flowers, densely aggregated in each axil, is scarcely half the length of the petiole; they spring successively out of a closely imbricated bud; the bracts, calyx, and corolla are covered with minute glandular subresinous clavate spicula, harsher and shorter than hairs, the two former of a reddish colour, the latter externally grayish. Each flower is about $\frac{1}{10}$ th of an inch in length;

the calyx is cup-shaped, fleshy at base, the margin being submembranaceous, ciliated, and obsoletely 6-toothed; the petals are very fleshy, oblong, truncated, and compressed at base, acute at summit, where they are much thickened internally, so as to be almost trigonous, and where the surface is covered with close short glandular reddish resinous clavate hairs; about the middle arises a tuft of long white hairs, which overshadow the summit of the anthers and embrace the stigma; when open, they are erect and scarcely thrown back. The stamens are one-third the length of the petals, the filaments being one-sixth the length of the anthers and equal to them in breadth; they are affixed by a small point at their base to the foot of the petals, and both attached by this common point to the outer margin of the cupuliform disk: the anthers from their gibbous form lean forward, and are connivent around the style; the structure of the anthers has been sufficiently described. The cupuliform disk is quite smooth, and is supported on a very short stipes within the more external cup-shaped calyx, to which it is equal in depth; its margin is thin, somewhat undulating about the points of insertion of the stamens, and fleshy towards the base; the ovarium is in the form of a very depressed cone, somewhat attenuated at the base, where it terminates in a short stipitate support; below it is quite smooth, but it is surmounted by a broad thick fleshy gland, slightly conical, marked with twelve raised striæ, radiating from the base of the style to the margin of the overlapping crenated border, which is encircled by the more elevated margin of the cupuliform disk; the rays and style are covered with grayish resinous globules or papillæ, like those seen on the external face of the petals. The internal structure of the ovarium has been already described*.

2. *Cathedra Gardneriana*, n. sp.; ramis nodosis, subflexuosis; foliis oblongis, glaberrimis, supra subnitidis, subtus pallidioribus, petiolo tenuiori; floribus in axillis paucioribus.—Tejuca, prope Rio de Janeiro. Gardner, no. 5380 bis.—v. s. in herb. Hooker.

This plant, referred to in the preceding page as described by Mr. Bentham, is distinct from the foregoing species, but the specimen in Sir Wm. Hooker's herbarium is not in good condition, being almost bare of leaves, only two or three of which are remaining; these are smaller than in my plant, are not spreading and deflected, are not coriaceous, and they grow black in drying; they are $2\frac{3}{4}$ inches long, and 1 inch broad, upon a petiole 3 lines in length †.

* This species, with ample generic details, will be shown in the 'Contributions to Botany,' &c., plate 2.

† A drawing of the ovarium and section, with its surrounding cupshaped bracts, will be given in the same plate.

XLV.—On the distinctive Characters of *Jeffreysia* and *Chemnitzia*. By JOSHUA ALDER, Esq.

To Richard Taylor, Esq.

DEAR SIR,

IN my last letter on the subject of *Jeffreysia*, I endeavoured to draw up as clearly as possible the true characters of that genus and of *Chemnitzia*, in order to show the impossibility of their being considered the same. Mr. Clark has replied to this statement; at first rather doubtfully, so far as *Jeffreysia opalina** is concerned, but gaining confidence as he proceeds, he at last becomes 'irrevocably' satisfied with the correctness of his own opinions. In a subsequent paper that gentleman takes the opportunity of re-asserting those opinions, and makes some observations on Professor Lovén's account of *Chemnitzia* (*Turbonilla*), into the correctness of which it will be necessary to examine. The objections brought forward against my statement are:—first, that the operculum affords a very inconstant character, varying from annular to spiral in the same genus, and even in different individuals of the same species; and that, secondly, the operculum of *Chemnitzia* has an apophysis. With respect to the animal itself, I have endeavoured to glean the 'host of facts' that are stated to be brought forward, but all I can find is that there is a similarity of position in the eyes of the two genera, and that this position of the eyes is not to be found in any of the *Littorinidæ*. For the characters of the head we are referred to Philippi.

As to the variable nature of the operculum in the same genus or species, I can only say that such is contrary to my experience. It is not asserted that any variation takes place in the operculum of *Jeffreysia*, excepting the occurrence of a double apophysis in some specimens of *J. opalina*, a circumstance that I have observed, but which appears to be a splitting of the process into two lairs, or at most it can only be considered a *lusus*. The typical character still remains the same. In *Chemnitzia* however the operculum is stated to vary more, but we do not find it said that it departs from its subspiral character, unless it be in *C. rufa*, where we are informed that "a part of the area is coarsely annular, with striæ on the other part radiating from the elliptic curves." That is, the operculum is half annular and half spiral. I do not possess the species alluded to, at least the one so called by Mr. Clark in his last paper, but I may be allowed to express a doubt that the supposed annular portion has been correctly

* Living specimens of this interesting mollusk have been kindly forwarded to me by my friend, Mr. Barlee, from which I am able to confirm the general accuracy of Mr. Clark's description, though I entirely dissent from his conclusions.

observed. The species that I have been able to examine are *C. rufescens*, *O. acuta*, *O. Rissoides*, *O. Eulimoides* and *O. cylindrica*; in all of which the opercula are similar to what I have represented in my figure, varying a little in the indentation of the margin opposite the longitudinally impressed line*, and the consequent greater prominence of the lower portion of that side, which may possibly be the part Mr. Clark calls the apophysis; at least it appears to be the portion alluded to by Mr. Gray under the name of the flap; but it is in the same plane, and continuous in striæ with the rest of the operculum. There is a little difference in the fineness of the striæ in some of the species, or in the degree of development of the apical turn, but all have the striæ in the same direction, and preserve unchanged the typical subspiral character. The instance produced by Mr. Clark in proof of the operculum's varying in the *same species* is from the genus *Trochus*. "I have some *Trochi*," he says, "with the apparently fine annular striæ, and others with radiating lines and as grossly spiral as in *Littorina vulgaris*." It is difficult to understand the extent of variation this is intended to convey. The operculum of *Trochus* is multispiral, and the whorls are frequently so close as to appear like annulæ to a casual observer. Now, does Mr. Clark mean to say that he has got a *Trochus* with the operculum *really* annular (*apparently* is a vague term when facts are in dispute), and that this is of the same species with others having the operculum decidedly spiral? A more definite assurance of this is desirable, not merely for the sake of localizing a species, but because it militates against the constancy of nature, upon which physiologists are accustomed to rest their faith as the only ground on which generalizations can be made. Our friend Mr. Gray, too, tells us that the spiral and the annular opercula are formed by a different process, the one requiring a gradual movement on the centre as new matter is deposited, while the other remains fixed.

With regard to the existence of an apophysis in *Chemnitzia*, I have broken up several specimens in the endeavour to find it out, but without success. I find in some examples a thickening internally of the apical nucleus, with a tendency to become prominent. Can this be what Mr. Clark means? Or is it the produced central area, sometimes slightly reflected upon the pillar, which is alluded to above as the flap of Mr. Gray? We are not informed exactly of its character or where it is situated. All I can say is that I can find nothing at all resembling the conspicuous erect process of *Jeffreysia*: nor does Professor Lovén, on whose accuracy I place great faith, describe any such process

* The very slight indentation observed in *O. Rissoides* has been omitted in the woodcut accompanying my last letter by mistake of the engraver.

in the operculum, or represent it in his figure. But granting that a process of some kind exists; it cannot convert a spiral operculum into an annular one, nor prove that those two forms are identical. Apophyses, though rare, and differing from each other in character, are found in the opercula of more than one genus and more than one family; taken alone, therefore, without regard to peculiarity of form, they cannot prove even the family to which a species belongs. Mr. Clark is wrong in saying that no apophysis exists in any genus of the *Littorinidæ*, for the *Rissoina* of D'Orbigny has such a process, connected with a spiral operculum. The soft parts of the animal, however, afford the most important characters. The position of the eyes in *Jeffreysia* "far back in the neck, at the bases of the tentacula, in a line with them," is brought forward in support of the union of this genus with *Chemnitzia*, and I am challenged to produce any other of the *Littorinidæ* in which they are so placed. I know of none. The position of the eyes of *Jeffreysia* on bulgings or prominences far back in the neck, is, as far as I know, unique. Mr. Clark however adds another character and places them at the "bases of the tentacula," a statement that may answer the purpose of accommodating them to the Chemnitzian characters, but which is surely incorrect. The eyes are at a considerable distance from the tentacles. Besides they are on prominent bulgings, while in *Chemnitzia* they are deeply immersed under the skin. The resemblance is too remote therefore to be of much value.

A more important character now demands our attention. Mr. Clark, after observing generally that my statements are incorrect in most points, instances the proboscidal apparatus in *Chemnitzia*, the account of which he pronounces to be wrong, "at least," he says, "if any reliance is to be placed in M. Philippi's authorities." But Mr. Clark might have known that Philippi's authorities have been disproved long ago; yet apparently in ignorance of this, he is attempting to perpetuate, by stamping with his authority, what other naturalists have considered an exploded error. The description of this animal given by Philippi is, in fact, only a literal quotation from Mr. Lowe's generic character in the 6th vol. of the 'Annals of Natural History,' M. Philippi probably never having examined the animal himself. Since that time Professor Lovén has very completely investigated this genus, and has given a short monograph of the Scandinavian species, with figures of several of the animals, in the Proceedings of the Royal Swedish Academy, the greater part of which he has republished in his 'Index Molluscorum Scandinaviæ.' This latter Mr. Clark alludes to in his last paper, and endeavours to construe the meaning of the words so as to make the description agree with his own and that quoted by Philippi from Lowe; that is, to make the proboscis of Lovén correspond to the organ called by

Mr. Clark the "proboscidal muzzle," which, in his generic character of *Chemnitzia*, we are informed "may be termed an involute and evolute contractile proboscis." Not very appropriately, one would think; for this organ, the *mentum* of Lovén, is permanently exerted, and attached to the foot for the greater part of its length. How therefore it is to be called "involute and evolute," or can be said to be "emitted," or from whence, I cannot tell. Such an attempt to adapt M. Lovén's words to an organ they were not intended to describe, renders this generic character quite unintelligible.

But to proceed to the quotation given from Lovén's characters: "Proboscis sub basi vibraculorum recondenda, involvenda; evoluta cervicem latitudine vix cedens." This to most people would imply a retractile and extensile proboscis. Mr. Clark thinks otherwise. He admits that "'proboscis recondenda' undoubtedly means a retractile proboscis," but he wishes to make it appear that the words 'involvenda' and 'sub basi vibraculorum' being added in this genus and not in others, must make them mean something else. The whole mystery of the matter however is this: that the genus having been misunderstood required a fuller description than others, and the latter words are evidently added to show the true position of the oral aperture immediately below the tentacles; former authors, and more recently Mr. Clark himself, having placed it below the *mentum*. But then it is also said that "when unrolled it scarcely yields to the neck in width." "The last observation is very important," Mr. Clark informs us, "because if the proboscis is a retractile one, it would be physically impossible to satisfy M. Lovén's phrase." [Why so? The proboscis is not broader than the neck, and the great contractility of these parts is well known.] "If this," it is added, "is the true construction of his characters, it supports those of D'Orbigny" (Lowe?), "and it would show that the Chemnitzian animal has not a long retractile proboscis as Mr. Alder states, and if not so, *Chemnitzia* would appear to differ from *Eulima*, which has a retractile proboscis." Such is the conclusion arrived at. But why, when the length of this organ is in dispute, is not the whole of M. Lovén's description given? Why is it abruptly broken off at a point where the very next words would give us the information we wish? They are these:—"longitudine pedem æquans l. superans." Surely this piece of information is as important as the width on which so much stress is laid. We now find that the extended proboscis equals or exceeds the foot of the animal in length; so that it is evident this organ cannot be the supposed muzzle, or *mentum*, which the former part of the description has been made to represent. Besides the *mentum* is described separately. The entire description of the two parts is as follows:—"Proboscis

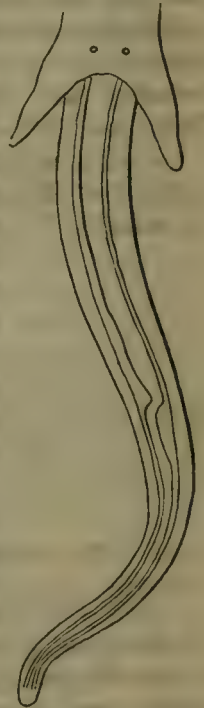
sub basi vibraculorum recondenda, involvenda; evoluta cervicem latitudine vix cedens, longitudine pedem æquans l. superans, teres, versus apicem sensim attenuata, ore apicali minuto (edentulo?). *Mentum* elevatum, a solea discretum, facie superne latiore, suffulcro angustiore soleæ adnatum, antrorsum declive, soleæ marginem anticum vix attingens, antice latius, rotundatum l. bilobum, læte vibrans."

To remove, however, any further doubts upon the subject, we shall let Professor Lovén explain his own meaning, by giving a translated extract from his paper in the Royal Swedish Academy's Proceedings:—

"The animal" (of *Odostomia*) "likewise shows, as Lowe has already remarked, the same characters" (as *Chemnitzia*), "which however have not up to the present time been properly understood. Lowe's description runs thus: 'Buccæ labiales coalitæ, infra tentacula exsertæ, proboscidem abbreviatam, depressam, profunde emarginatam s. bilobam referentes,' and it has generally been supposed that this part answers to the muzzle of *Turbo*: but that is not the case. This perfectly formed part is what I would call the mentum, the muscular mass which is so extremely developed in *Natica*, covering posteriorly a great part of the tentacles and mouth. . . . The proboscis, on the other hand, is again found in *Odostomia* and *Turbonilla* (*Chemnitzia*) in its place, that is, under the veil which is formed by the union of the bases of the tentacles, and is a very long organ for catching prey, which can only seldom, and by persevering observation, be detected. This maybe the reason why it has been overlooked here as well as in *Eulima*, where it is also very long, but is seldom extended in captivity." The more completely to illustrate these remarks, a woodcut from a tracing of M. Lovén's figure has been added.

My own observations on the living animals, as far as they go (for I have not seen the proboscis exerted), agree entirely with those of the distinguished Swedish Professor.

I have considered it necessary to go thus minutely into the characters of *Chemnitzia*, because upon them undoubtedly turns the question whether we shall admit *Jeffreysia* into the genus or not; and Mr. Clark, who has had most favourable opportunities of observation, and has written much, and very decidedly, on the subject, seems yet in the dark as to what the characters of the genus really are. Your readers will, I think, agree with me in the conclusion, that this long retractile proboscis, which a com-







Olostomia plicata.



Olostomia pallida,
or eulimoides.



Rissoa parva,
var. interrupta.



Rissoa eximia,
or Barleci.



Jeffreysia diaphana.



Jeffr? Gulstone.



Jeffr. opalina.

petent scientific observer like Professor Lovén has seen, described, and figured, must have a real existence; and consequently that *Jeffreysia*, which is acknowledged to have a simple longitudinally cleft mouth, like the *Rissoæ*, cannot by any stretch of imagination be brought into the same genus. The one belongs to the family of the *Pyramidellidæ*, the other to the *Littorinidæ*, where the authors of 'British Mollusca' have correctly placed them. Having in my former letter taken a review of the differences that exist in nearly all the organs of the two genera, it is unnecessary here to recapitulate them: it may be permitted me, however, to mention one peculiar character in *Chemnitzia* (or *Odostomia*), also distinguishing it from *Jeffreysia*, which does not appear to have been noticed by British authors, though it has not escaped the observation of M. Lovén. It is this:—that there exists near the apex of each ear-shaped tentacle, just within the inner margin, a circular area or lobe, set with strong vibratile cilia, which are in constant motion during the life of the animal, giving that part the appearance of a revolving wheel, while no cilia are to be found on the other parts of the tentacle, except a few rigid, immoveable setæ at the apex. In one species, *O. Eulimoides*, I have observed the vibratile cilia to extend in a line from the disc down the centre of the tentacle, but confined to a very limited space. These ciliated discs are very curious, and no doubt indicate the seat of a particular function; probably they are a modification of the organs of smelling. They have not been observed in other genera.

I shall now take my leave of this subject, confidently anticipating that future investigations will confirm the correctness of my remarks.

I remain, dear Sir,
Yours very truly,

JOSHUA ALDER.

XLVI.—On *Chemnitzia* and other Mollusca, in answer to Mr. Clark. By J. GWYN JEFFREYS.

[With a Plate.]

To the Editors of the *Annals of Natural History*.

GENTLEMEN,

Norton, near Swansea, May 15, 1851.

My attention has been called to the recent letters of Mr. Clark in your Magazine on the British *Chemnitzia*, and as I have bestowed some attention on this group of Mollusca, I trust I may be excused in making a few remarks. But previously to doing this, I can assure my esteemed friend, the writer of those letters,

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that although he has so sedulously and with such scrupulous delicacy avoided any mention of my name, I have not the least fear of imperilling our old friendship (now of more than twenty years' standing) by the discussion; and that no quotation from Lucretius or any other author, ancient or modern, was necessary to remove any "bitterness" of feeling which he might have anticipated on my part. As however I have neither time nor taste for a lengthened controversy in your valuable Magazine, I do not mean to say more at present on the subject.

With respect to the separation of these shells into more genera than one, I defer to the authors of the 'British Mollusca,' who, from their more extensive opportunities and superior knowledge of the subject generally, must be better qualified to give an opinion than Mr. Clark or myself, who after all cannot be regarded in any other light than as local amateurs.

But in the distinction of species a difficulty of course suggests itself in the first instance, as to what is a species, in this or any other defined or recognised group of Mollusca. It seems to me that one of the chief tests of such distinction which is applicable to the case of higher or more organized animals (the fecundity of mule or hybrid individuals) must be wanting in the marine Mollusca, owing to the extreme difficulty, if not impossibility, of observing the succession of their races. Besides, the animal inhabitants of molluscous shells offer very insufficient criteria for the distinction of species, unless the hard parts or shells are also taken into consideration; and if the character of the soft parts (which is seldom appreciable if perceptible) were to form the only test of distinction, most of the species of any group or genus would be reduced to limits narrow enough to satisfy even my Procrustean friend Mr. Clark. It would be as just to take the soft parts of the Crustacea or Echinoderms and attempt to classify them without regard to their covering. This would be doing equal violence to nature as to truth. In a conchological point of view, the value of specific characters differs in almost every genus; and the knowledge of the laws which govern this variation can only be acquired by extensive and not local study, however perfect of its kind the latter may be.

It is evident that Mr. Clark in his remarks on the species does not place any reliance on his own faculty for distinguishing one from another; as he admits having changed his opinion no less than three times about the *Odostomia turrita* of Hanley. The admission was made with his usual candour; but it might cause some of his readers to think that he may be doing more harm than good to the cause of science in unsettling the minds of "students" by such doubts. With this impression on my own mind, I cannot subscribe to his dogma, that the question

(raised by himself) as to this being a distinct species is to be considered finally settled by him, and that (to use his own words) "it admits of no further discussion." I doubt much if Mr. Clark ever saw typical specimens of *O. turrita*. Mr. Barlee's shells (which I have seen) unquestionably belong to another species (*O. plicata*), and the species in question (to which I refer the *striolata* of Alder) is quite different. It certainly (in my opinion) cannot be what Mr. Clark supposes, *O. acuta*. Several of the true *Odostomia* will under a microscope, as I stated in a former paper, be found to be finely striated in a spiral direction.

Mr. Alder's remarks on the genus established by him, and adopted by the authors of the 'British Mollusca' for the reception of some animals and shells of a different nature from that of *Odostomia* or *Chemnitzia*, and which has been (more I fear out of compliment than from a sense of justice or merit) named after myself, appear to be unanswered by Mr. Clark; and I believe every other naturalist supports the former in his views—

— "non nostrum est tantas componere lites."

But with respect to the statement made by Mr. Clark, that these Mollusks must be *Chemnitzia*, because the apical whorls of their shells are reversed or folded back on the succeeding one, I will endeavour to convince him by the accompanying Plate (Pl. XV.), that this is not the case in any of the *Jeffreysia*, and that he must have either mistaken the shells or laboured under some optical delusion. The objects represented in this Plate (and for which I am indebted to a most able and observant naturalist, my friend Mr. Spence Bate) are *Jeffreysia diaphana*, *opalina* and (?) *Gulstonæ*, *Rissoa parva* (var. *interrupta*), *R.?* *eximia* or *Barleei*, and *Odostomia plicata* and *Eulimoides* or *pallida*. I can vouch for the accuracy of the drawings, and that they were taken from fresh and not worn specimens. If Mr. Clark collected shells himself, instead of trusting to a fisherman, he would I think have become better acquainted with their habits and habitats than to hazard the *ex cathedra* assertion, that "live shells, especially the littoral ones, are more liable to suffer from the attrition caused by the tides and waves than those of the deeper zones," and thereby conclude, that the apices of these shells may be rubbed off so as to simulate the button-shaped apices of the *Rissoæ*. The shells in question, when found on the shore, inhabit the under surfaces and crevices of stones, where no such attrition could very easily take place.

Mr. Clark seems to have made up his mind that every recorded species *must* be found at Exmouth,—a fault which is said to be common to other local collectors and naturalists. I can only in this way account for his assertion, that several which he is not

likely to have met with or seen are varieties of other species, *e. g.* *conspicua*, which he refers to *acuta*, *nitida*, *dubia* and *alba* to *pallida* or *Eulimoides*, *clathrata* to *interstincta*, *turrita* to *acuta* or whichever other species he has by this time determined, *formosa* to *rufa*, *diaphana* to *obliqua*, *affinis* and *clavata* to *acicula*, and *truncatula* to *cylindrica*. I am only surprised at his not being equally assured that *glabrata* is identical with some other of the Exmouth species.

While I fully acknowledge the services which Mr. Clark has rendered to science in this department of natural history, I cannot forbear sharing in and expressing the regret which is entertained by so many naturalists, that he is endeavouring unnecessarily to renew the confusion which once existed in this confessedly difficult group of *Mollusca*; as well as that his opinions are so positively and almost dogmatically enounced; because after all the distinction of species must be to a great extent matter of opinion and dependent on the peculiar views of the writer. His honesty of purpose is undeniable; but he is, as well as others, liable to mistake.

I quite coincide with him in the just tribute of acknowledgement which he has paid to my friend Mr. Barlee for his indefatigable labours and researches.

I will now add a few notes of additional localities which have lately occurred to me, as well as with respect to some of the species:—

O. pallida (*Eulimoides*, Bell). The typical specimen in the British Museum marked "*Turbo pallidus*, Mont." appears to be a worn shell of *Rissoa parva*, var. *interrupta*.

O. notata. This is certainly not a variety of the last, but specifically identical with the shells found by Mr. Barlee in Zetland, and doubtfully referred by the authors of the 'British Mollusca' to the *Rissoa glabrata* of Mühlfeldt. In Mr. Barlee's specimens however (several of which are now before me) the spiral striæ have become obliterated by attrition. It is allied to *Rissoides*.

O. Rissoides. Oban (Dugald M'Kenzie).

O. nitida. The Exmouth shells which Mr. Clark referred to this species, and which I have had an opportunity of carefully examining and comparing, are only a variety of *Rissoides*.

O. acuta. Sark, Mr. Barlee. If Mr. Clark knew this species so many years ago, as he states, it is strange that specimens of it should have been placed by him on the same tablet and mixed with *unidentata* in his collection, which I purchased of him. Those were his only specimens.

O. turrita (mih) is the *striolata* of Alder, to whom a specimen was lately sent for his inspection and confirmation.

O. plicata. Guernsey (Mr. Barlee). It appears to be an universally distributed species.

O. conspicua. Loch Fyne (Angus M'Nab). I observed a fine specimen last spring in the collection of Sig. Nardo at Venice, from the Adriatic. The authors of the 'British Mollusca' say it is allied to, if distinct from, *conoidea*; but Mr. Clark, quoting them, refers it to *acuta*!

O. diaphana is more cylindrical than *obliqua*, and the whorls in young shells of each preserve the same relative proportions.

O. obliqua. All the localities given in my first paper, except Burrow Island, belong to this species, which I at that time regarded as identical with *Warrenii* or *decorata*.

O. Warrenii. Falmouth and Zetland (Mr. Barlee).

O. (Eulimella) affinis. Zetland, the same.

I am, Gentlemen, your very faithful servant,

J. GWYN JEFFREYS.

XLVII.—*On the Classification of the British Marine Testaceous Mollusca.* By WILLIAM CLARK, Esq.

To the Editors of the Annals of Natural History.

GENTLEMEN,

Norfolk Crescent, Bath, May 1850.

IT will be convenient, with reference to my papers on the British Marine Testaceous Mollusca which have appeared in the 'Annals,' that a synopsis of the classification of the whole tribe should be submitted, accompanied by a short analysis, that the incidents and position of any particular family may at once be examined. Most naturalists have their own plan of distribution with respect to natural order; perhaps then, I shall not incur the imputation of an unmeasured presumption, if I venture to offer a sketch of mine, founded on forty years' sedulous investigation of our indigena. I have not the vanity to suppose my scheme is superior to the methods of my brethren; but it is novel, and exhibits, as I think, a progressive advancement of animal organization and harmony of arrangement from the beginning of the class to its termination, by which groups of similar affinities are insensibly united as far as is possible, and succeed each other, on the bases of external and internal anatomical considerations.

These memoirs are the result of numerous visits to the South Devon coast at Exmouth, where I have passed my leisure in the

dissection and examination of the marine testaceous mollusca. Nearly every animal that is, or may be mentioned in the 'Annals,' or appear in a distinct work, has undergone in a living state my personal examination, and in many species often repeated. I have had my own dredger, and I may say with some confidence, that there are few individuals who have had better opportunities of observing the organs, their functions, and the habitudes of these varied and interesting animals, than myself. I trust that my dissections and investigations will give such a general, and in some measure particular account of their external configuration and internal anatomy as will suffice to give the younger students of this branch of zoology an adequate knowledge of their organization, to afford them sufficient aid to discriminate the organs of the animals, so as to let none pass without careful observation; for how many curious creatures, which perhaps only occur once in a lifetime, have been overlooked for want of such assistance, and are for an indefinite time lost to science! I speak with deep regret on this point; as in my earlier career I have neglected opportunities that have never occurred since, and which I have felt the loss of.

The detailed anatomies of *Pholas dactylus*, *Teredo megotara*, *Dentalium tarentinum*, *Bulla hydatis*, and other desultory anatomical observations by myself, with references to M. Cuvier, the "principium et fons" of faithful comparative anatomy, will sufficiently explain the structure of the Acephala and Gasteropoda that have been treated of in these memoirs; which are by no means to be considered as strictly local ones. Though the species have been obtained from one vicinity, they will be found to give, with others which will speedily follow in a more collected form, I hope, a faithful portraiture of most of the animals of the entire class of the British marine testaceous Mollusca. There are however gaps which it has never been in the power of malacologists to fill up; but the hope of acquiring the rare desiderata ought not to be considered as forlorn. I have lately fallen in with very unexpected acquisitions which afford a practical illustration of the quotation—

"Turne, quod optanti Divum promittere nemo
Auderet, volvenda dies, en! attulit ultro."

I may mention that these remarks were scarcely dry, when I received from Exmouth a pine log full of magnificent *Teredo megotara* alive, which species I had not seen for thirty years, and enabled me to supply the anatomy of the Tereidines.

SYNOPSIS of the families and genera of the British testaceous Acephala palliobranchiata and lamellibranchiata, Gasteropoda and Cephalopoda, distributed in six divisions on the bases of sexual organization.

FIRST DIVISION.

Acephala palliobranchiata.

Hermaphrodite, sine concubitu.

Terebratulidæ ... Hypothyris.
Terebratula.
Megathyris.

Craniadæ Crania.

SECOND DIVISION.

Acephala lamellibranchiata.

Hermaphrodite, sine concubitu.

** Mantle open, no tubes.*

Anomiadæ Anomia.

Pectinidæ Pecten.

Lima.

Ostreadæ Ostrea.

*** Mantle open, no siphonal tubes or sessile.*

Mytilidæ Mytilus.

Modiola.

Crenella.

Pinna.

Avicula.

**** Mantle open, tubes sessile or short.*

Arcadæ Arca.

Pectunculus.

Nucula.

Leda.

Galeomma.

Unionidæ Unio.

Anodon.

Cyprinidæ Cyprina.

Circe?

Astarte.

Isocardia.

Lucinidæ Lucina.

Turtonia.

Kelliadæ Kellia.

Lepton.

Montacuta.

Cycladidæ Cyclas.

Pisidium.

***** Mantle open, tubes short.*

Cardiadæ Cardium.

Veneridæ Venus.

Veneridæ Artemis?

Pullastra.
Lucinopsis.

Mactridæ Mactra.

Donaciadæ Donax.

Ervilia.

****** Mantle open, tubes long.*

Tellinidæ Tellina.

Psammobia.

Syndosmya.

Serobicularia.

Diodonta.

****** Mantle closed, tubes short.*

Anatinidæ Anatina.

Corbulidæ Corbula.

Sphaenia.

Pandora.

Neæra.

Poromya?

Solenidæ Solen.

****** Mantle closed, tubes long.*

Solenidæ Solenicurtus.

Gastrochænidæ ... Gastrochæna.

Saxicava.

Venerirupis.

Petricola.

Myadæ Mya.

Pholadidæ Pholas.

Teredo.

Xylophaga.

THIRD DIVISION.

Gasteropoda lateribranchiata.

cyclobranchiata.

cervicobranchiata.

Hermaphrodite, sine congressu.

** lateribranchiata.*

Dentaliadæ Dentalium.

*** cyclobranchiata.*

Chitonidæ Chiton.

**** cervicobranchiata.*

Patellidæ Patella.

Acmæa.

- Calyptæadæ.....Pileopsis.
 Calyptæa.
 FissurellidæFissurella.
 Emarginula.
 Puncturella.
 HaliotidæHaliotis.

FOURTH DIVISION.

- Gasteropoda pleurobranchiata.
 cryptibranchiata.
 pulmonifera.

Hermaphrodite, congressu.

* *pleurobranchiata.*

- Pleurobranchidæ...Pleurobranchus.

** *cryptibranchiata.*

- PteropodidæHyalea.
 Spirialis.

- AplysiadæAplysia.

- BullidæBulla.
 Bullæa.

- TornatellidæTornatella.

First lateral branch.

*** *pulmonifera.*

- LimacidæLimax.

- HelicidæHelix.

- LimneadæLimnea.

FIFTH DIVISION.

- Gasteropoda pectinibranchiata.
 Bisexual.

First lateral branch continued.

* *Oculi ad basin externam tentaculorum.*

- Cyclostomatidæ...Cyclostoma, branchifer terrestres.

- PaludinidæPaludina.

- NeritidæNeritina.

- LittorinidæLittorina.

Rissoa.

Assiminia.

- SkeneadæSkenea.

- TrochidæTrochus.

Phasianella.

Adeorbis.

- TurritellidæTurritella.

- CerithiadæCerithium.

Aporrhais.

- VermetidæCæcum.

Second lateral branch.

** *Oculi ad basin internam tentaculorum.*

- ConovulidæConovulus? pulmoniferous? hermaphrodite?

Pedipes.

Otina.

- Pyramidellidæ ...Acme, branchifer terrestres.

Carychium, do. do.

Truncatella.

Chemnitzia.

Eulima.

Acis.

The lateral branches now merge in the main line.

*** *subproboscidifera.*

Oculi ad basin externam tentaculorum.

- PeloridæScalaria.

Ianthina.

Natica.

Lamellaria.

Velutina.

**** *proboscidifera et canalifera.*

Oculi ad basin externam tentaculorum.

- MuricidæMurex.

***** *proboscidifera et convolutifera.*

Oculi ad basin externam tentaculorum.

- CypræadæCypræa.

Ovula.

Marginella.

SIXTH DIVISION.

Cephalopoda dibranchiata.
 Bisexual.

- OctopodidæOctopus.

Eledona.

- DecapodidæLoligo.

Sepia.

Sepiola.

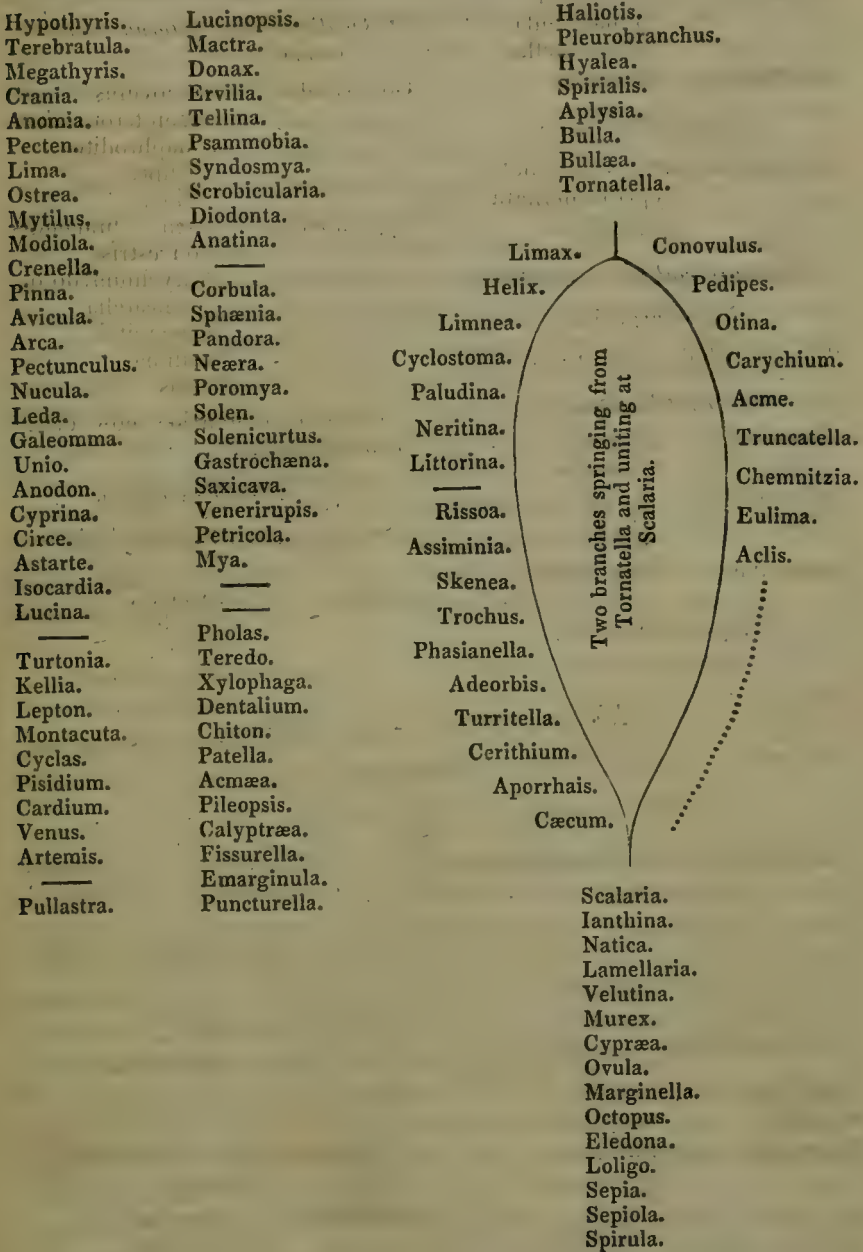
Spirula.

Gasteropoda, genera incertæ sedis.

Seissurella.

Stylifer.

Diagram of the Synopsis, being a strict one of its genera, in natural position, in respect to the main lines and branches, agreeably to our method.



We have made *Tornatella* the point of departure of the branch lines; because, though it has an operculum, it is from its structure and hermaphroditism much more closely allied to *Bulla* than either to *Cyclostoma* on one side, or to *Truncatella* and the Pyramidellidæ on the other. The intervention of *Limax*, *Helix*, and

Limnea between it and *Cyclostoma* is unavoidable, as it would be inconvenient to place them in the direct branch of the Conovuli; we have nevertheless kept the free-air-breathing animals together at the head of each branch, with the exception of *Otina*, which may perhaps prove a pulmonifer. I must here observe that Nature has put a veto on any arrangement that shall be exempt from anomalies and incongruities; we must look at her largely as a class, with a few well-marked divisions, and not be too sensitive about utopian details of strict natural order. We might have placed the Hermaphrodite Pleurobranchidæ, Pteropodidæ, Aplysiadæ, Bullidæ, Helicidæ and Conovulidæ, to follow the inoperculated Muricidæ and Cypræadæ; but we think the union of these families with proboscidal animals, and of distinct sexes, would be more removed from a natural arrangement than the plan we have submitted, and which we are prepared to expect will follow the fate of every other system of classification that has preceded it, however great may be the authorities from which they have sprung. It is universally admitted that the most accredited plans are unsatisfactory, and I venture to predict, that to the end of time our successors will make the same remarks. In short we cannot accomplish an arrangement which Nature herself has not created.

ANALYSIS OF THE SYNOPSIS.

FIRST DIVISION.

Acephala palliobranchiata.

I have removed this section of the *Acephala* from its position at the head of the bivalves, to which I think it has no pretensions. I consider it a distinct inferior group forming the passage from the *Ascidia* and *Cirripoda* to the *Acephala lamellibranchiata*; by its pallial branchiæ it has close relations with *Ascidia*, and with the *Cirripoda* through the long convoluted ciliary buccal appendages, which, though not articulated, in consequence of advanced animality, still prove its connection with that tribe. If the *Palliobranchiata* have the sexes distinct, as some authors have stated, the position I now place them in, with the strict hermaphrodite *Acephala*, would not be correct, and in harmony with my sexual distribution; but I believe that these views of bisexuality in the bivalves are erroneous, and the causes that have led to them are those mentioned in the anatomy of *Pholas dactylus* under the head of the "reproductive organs."

The *Brachiopoda* are very rare British productions: I have only met on the southern coasts with the minute *Megathyris cistellula*, but the *Terebratula caput serpentis* and the *Crania anomala* have

been taken in North Britain sufficiently plentiful to determine their anatomical structure. I refer for an account of the animal of the *T. caput serpentis* to that invaluable work the 'British Mollusca,' and for other general observations to Professor Owen's paper on this family in the first volume of the 'Zoological Transactions.'

SECOND DIVISION.

Acephala lamellibranchiata.

This group are strict hermaphrodites, though it is said that in some of them the sexes are distinct. We dissent from this view, and have assigned in another place our reasons for not concurring in this opinion.

The anatomy of the internal organs of the entire tribe as to generalities is so similar, that it scarcely affords sufficiently decided generic distributive points; my anatomies of *Pholas dactylus* and *Teredo megotara* confirm this position; I have therefore had recourse to an arrangement which combines both internal and external organs, to assist the distribution of this numerous class into convenient groups. A divisional order has been attempted on ligamental bases of internal or external position; but it has been found so unstable and arbitrary, that if strictly followed, the most incongruous species would be associated: for instance, *Maetra solida* would march with *Anatina pratensis*, and the *Cardia* with the *Saxicavæ*. The disposition of the adductor muscles has been tried, and appears to be delusive and unsatisfactory, as most, if not all, Lamarck's *Monomyæ* have two adductor muscles, though the volume of one is much greater than the other. We think the only true *Monomyæ* are the *Pholadidæ*, as we have shown in the memoir on the anatomy, and these are *Dimyæ* with that eminent zoologist.

The teeth and foot as general guides are so variable as not to be available; the best of these aids is perhaps the greater or less closure of the mantle; this last we have adopted. It appears then that the animals cannot be allocated in a continuous natural order with perfect satisfaction by any of these modes: all that can be done by those who make use of such aids is to throw the tribes, genera, and species together by the best mode that agrees with their composition.

It has long been the fashion, without any particular good reason, for *Pholas*, *Teredo*, &c. to commence the *Acephala*, and to terminate them with the *Pectines*, *Ostreae* and *Anomiæ*, &c. I admit, as regards the essential points of natural order, that it is not very material whether *Pholas* and *Teredo* stand first or last in the scale. But in the classification I have adopted, which is founded on the progressive advancement of the reproductive or-

gans, and having removed the Brachiopoda, which custom has placed at the head of the bivalves, to a position of less pretension, it has become necessary to invert nearly the usual order of arrangement, that animals of similar relations may be associated. This change entirely hinges on, and is the result of, the transference of the Brachiopoda from the position they have so long occupied; otherwise the ancient distribution would have been nearly as satisfactory. But the false position of the Brachiopoda, according to our views, has admitted of no alternative.

In conformity with these observations, the *Anomia*, *Ostrea*, and *Pectines* naturally follow the Brachiopoda with which they have relations, and are succeeded by the Mytilidæ, &c., and brought, according to the intervening genera of the synopsis, to the Gastrochænidæ; the remaining families of the Myadæ, Solenidæ, and Pholadidæ, are thus placed at the head of the list and form a very natural group; and I think that their decidedly higher organization—I particularly allude to the Pholades—and superior functions, as those of excavation, together with the compound structure of their shells, as is evidenced by the complication of the accessorial appendages as well as the consideration of the increased importance of the siphonal tubes and the enveloping mantle, bring them by these advances in composition into closer connection with the Gasteropoda than with the Ascidiæ, in the vicinity of which they have been placed from their muscular siphonal sheaths and closed mantle, which have been considered to bear a resemblance to the coriaceous envelopes of those animals. We have no difficulty in admitting *Venerirupis* into the family of the Gastrochænidæ, though, by the teeth, it is allied to the *Veneres*, but we consider the character of the teeth of very inferior value to the closed mantle, which points out its natural position so clearly as to admit of no discussion. *Teredo* terminates the Acephala and passes them to the Dentaliadæ, our primary family of the Gasteropoda, agreeably to the indicia that are pointed out in the last page of the anatomy of *Teredo*.

THIRD DIVISION.

Gasteropoda { *lateribranchiata.*
 { *cyclobranchiata.*
 { *cervicobranchiata.*

The animals of this division are strict hermaphrodites without congression. The Dentaliadæ are the Lateribranchiata of the synopsis, of which family I have already given in the 'Annals of Natural History' a detailed anatomy; they have claims which appear not to be ill-founded, to stand as the first family of the Gasteropoda, from the connection between them, by the position

of the branchiæ, with *Teredo*, the last family of the Acephala. The Chitons approach nearest to the term Cyclobranchiata. The Patellæ and Calyptræadæ, in our method, are cervicobranchiate patelloid forms, with a single non-symmetrical branchial plume. The Fissurellidæ are in the same cervicobranchiate category, as well as the Haliotidæ, but differ from the first patelloid group in having two symmetrical branchial plumes.

As most of these animals will be noticed in the descriptive accounts of the species, it is unnecessary to make further remarks, except to observe, that *Haliotis* does not inhabit this side the British Channel; but M. Cuvier has figured and given an anatomy of it amongst his memoirs.

FOURTH DIVISION:

Gasteropoda { *cryptibranchiata.*
pleurobranchiata.
pulmonifera.

In this division there is an important advance in sexual arrangement; pure hermaphroditism is abandoned, and that of mutual congression has succeeded. The families are the Pteropodidæ, Pleurobranchidæ, Aplysiadæ, Bullidæ, Tornatellidæ, and the Pulmonifera, which carry the branchiæ in particular cavities of the back and neck: they all swim or float except the Helicidæ. It is necessary now to state why the Pteropoda do not constitute with us a separate class; their anatomy is so nearly identical with that of these families that I have preferred placing them in conjunction, rather than with the sexual characters of hermaphroditism with congression, letting them remain in a false position, between groups of the Acephala and Gasteropoda, both of which are strict hermaphrodites, or intercalating them between the bisexual Gasteropoda and Cephalopoda, an equally inconsistent situation.

The term Pteropoda, inferring that the foot or locomotive organ is formed like a wing and fixed more or less around the neck, does not, I think, militate against these animals being considered modified Gasteropoda, in like manner as the Trachelipoda of Lamarck that have them under the neck, which is a modification of the foot, which in many of these animals occupies the extent of the body: all these creatures swim and creep like most of the Gasteropoda.

The Pleurobranchidæ are noticed hereafter, and the Aplysiadæ are too well known to require any remark. The Bullidæ are a difficult family, many of the animals being very minute, and some have never occurred to naturalists. We have preferred depositing the *Velutina otis* of authors, Mr. Gray's *Otina*, ad

interim amongst the Conovuli rather than in this family, as it wants the distinguishing character of the Bullæ, the *gizzard*; and we believe the *Amphisphyræ hyalina* of Lovén, though displaying the form of a *Bulla*, does not belong to that family, as some authors have stated it not to have a gizzard. *Bullæa*, an undoubted branch of this family, is illustrated copiously in our account of the *B. aperta*, also by descriptions of *B. pruinosa*, *B. punctata*, and *B. catena*, published many years ago in vol. iii. p. 339 of the 'Zoological Magazine.'

The remainder of the hermaphrodite Mollusca, whether strictly so, or with congression, consist of the land and freshwater tribes, with a very few bisexual Pectinibranchiata, some breathing air, and others water; the former are represented by *Cyclostoma*, *Acme* and *Carychium*, the latter by *Paludina*, *Neritina* and *Valvata*; and the strict hermaphrodites by the Cyclades and Unionidæ; the Limaces and Helices represent the hermaphroditism of the second degree. Though it is not my plan to enter on the land and freshwater tribes which have been so well illustrated by Mr. Gray in his 'Manual,' I have considered it would be desirable to insert the families and a few of the leading genera, to show their natural position in respect to the other molluscan groups, and preserve unbroken the chain of the synopsis. The Pulmonifera, springing from *Tornatella*, commence one of the lateral branches, followed by the Littorinidæ. The Conovulidæ, also proceeding from *Tornatella* and followed by the Pyramidellidæ, form the second branch, both merging in the main line at *Scalaria*, the first genus of the newly constituted family of the Peloridæ.

FIFTH DIVISION.

Gasteropoda pectinibranchiata.

Bisexual.

The Littorinidæ are so fully mentioned as to require no particular observations. A peculiar group of the animals of this division have eyes at the internal bases of the tentacula; it includes the Conovulidæ and Pyramidellidæ; the first has two genera, *Conovulus* and *Pedipes*, and the provisional one of *Otina*; the latter comprises *Acme* and *Carychium*, land branchifers, and *Truncatella*, *Chemnitzia*, *Eulima* and *Aclis*: both families are branchiferous, except perhaps the Conovulidæ, which may be pulmoniferous and hermaphrodite. We presume *Acme* and *Carychium* to be bisexual, but we are not sure of this; we place them provisionally with the Pyramidellidæ.

Though the Conovulidæ may not as yet have received the last seal of certainty as regards their branchial organization, still their

connection by their habitudes, the position of their eyes, and other points of structure, is so close to the Pyramidellidæ, that they may without violence precede and be associated with that family, which consists of very numerous species, all having eyes at their mesial or internal bases, with short triangular tentacula, and by our present method of a lateral branch springing from *Conovulus* are naturally brought together. In like manner the Trochidæ, Skeneadæ and Turritellidæ, all of which have circular opercula, except *Phasianella pullus*, which however is undoubtedly of the trochidan tribe, follow the Littorinidæ, and with them are part of the components of another lateral branch, and are thus linked together without an invasion of natural position. The newly constituted family of the Peloridæ, with its genera *Scalaria*, *Ianthina*, *Natica*, *Lamellaria* and *Velutina*, are so largely mentioned in the descriptive notes of their respective species as to render further remark unnecessary. The same observation applies to the Muricidæ and Cypræadæ, which terminate the British testaceous Mollusca.

SIXTH DIVISION.

Cephalopoda dibranchiata.

Bisexual.

These singular and highly organized animals are distributed in two families: the Octopodidæ include the genera *Eledona* and *Octopus*; the Decapodidæ, *Loligo*, *Sepia*, *Sepiola* and *Spirula*: they all creep and swim. They are elaborately and anatomically described and illustrated by M. Cuvier in his memoirs, and by Professor Owen in the second part of the second vol. of the 'Zoological Transactions.' We have merely mentioned these animals to preserve intact the chain of the synopsis. To attempt to add novelty to this almost exhausted subject would be a vain and fruitless labour.

I have now finished a limited analysis of my method of the distribution of the British marine testaceous Mollusca. I am led to think the sexual arrangement natural and well-founded, as it cannot fail to have been observed that as the generative influences are more or less perfect, there is a corresponding energy and activity. If we cast a glance at the strict hermaphrodites, as the Acephala and Patella tribes, we find them either fixed or of the most limited locomotion; but as soon as the generative structure is improved, the animals become more lively and locomotive. This view is exemplified in the hermaphrodites with congression, for instance, in the natatory Gasteropoda and Pulmonifera; but when bisexuality is established, there is an evident increase of motion, functions, and I may say, even of intelligence and struc-

tural composition. And lastly, on arriving at the most highly developed generative influences that can attach to the Invertebrata, we see an energy and activity that even exceed those qualities in some of the vertebrate animals,—I instance the powers and locomotion of the Cephalopoda.

The loop of our diagram may be considered as two branches, or either of them a main line, and the other as a branch; perhaps the most simple view would be to regard each segment of the loop a branch, springing from a common lineage, and after a cometal aberration, to centre in the *clara propagine* of the systemic and original line.

In conclusion, we observe, that the diagram of the genera shows the impossibility of an uninterrupted natural line without a dislocation of congruous affinities; nature has not been formed on mathematical bases. We have here perhaps as much connective harmony as the Mollusca can receive. We do not say that there may not be transpositions and certain modifications of the genera to meet the particular views of malacologists, but the general outline may perhaps be as near the truth as the subject will admit of. If zoologists demand a natural line, they cannot have it without excluding from the grand main various families, and suffering them to fall into it, laterally and correlatively. Our classification without the branches would have presented an incongruous series that no art could have arranged without unnatural unions, but by them they are brought as near to each other as nature will allow of. We must submit, as we cannot alter her laws and dispositions. The fact of our line not according a direct totality of natural affinities, proves that nature cannot be thus arranged, because the Supreme Creator, whose handmaiden she is, has not invested her with the power of effecting a symmetry beyond what she has accomplished.

The cause of this memoir bearing the date of May 1850, is, that it was then in the hands of the editors of the 'Annals,' and withdrawn for some rectifications; it was originally written in 1849.

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

Exmouth, Devon, May 22, 1851.

P.S.—Since I have been here I have had good opportunities of examining the Conovuli, and find that the *Conovulus denticulatus*, now seen by me for the first time, is a very different animal from that usually called the *C. bidentatus*, and its synonym *C. albus*, which I think is an undoubted *Pedipes*, as it has the foot deeply transversely *divided*, which fact, formerly stated by me in the 'Annals,' I have this day again verified, and I am quite certain

the foot of *C. denticulatus* is entire; nevertheless the two genera belong to the Conovulidæ; I have also ascertained that the *C. denticulatus* beyond all doubt breathes free air; but I am not quite so sure with respect to the *P. bidentatus*, though I believe it is a pulmonifer. I am preparing a paper on the above species as a supplement to that on the Conovulidæ in the 'Annals,' vol. vi. p. 447, n. s., see last paragraph, which, as this family has created much doubt as to its branchial dispositions, will I think be acceptable to your readers.

I have just fully observed the animal of the *Chemnitzia Sandvicensis*, which is an unrecorded desideratum.—Exmouth, May 24, 1851.

XLVIII.—On the Tetrasporic Fruit of the genus *Stenogramme*.

In a letter from Dr. C. MONTAGNE to the Rev. M. J. BERKELEY, M.A., F.L.S.

“Paris, May 22, 1851.

“You are aware that a *Floridea*, collected first at Cadiz and published by Agardh under the name of *Delesseria interrupta*, has lately been found on the coast of England, of whose 'Nereis' it is certainly one of the most beautiful gems. This plant, whose conceptacular fruit was scarcely known when I figured the species in Webb's 'Otia Hispanica' (Pent. ii. p. 15. t. 8), from a single specimen with rudimentary conceptacula, must be referred to the new genus *Stenogramme*, founded more recently by Dr. Harvey on an Alga gathered on the shores of California and those of France near St. Jean de Luz.

“But up to the present time, no specimen, whether from Spain, England, France, or California, had exhibited tetraspores, or the second form of fructification in this singular genus. It is to Dr. Welwitsch, the learned botanist and Director of the Garden at Lisbon, that we owe the discovery of the tetraspores, who has sent me many individuals found in the Tagus near Lisbon, together with three specimens bearing perfect conceptacula.

“The tetraspores of *Stenogramme interrupta* are formed, as I was the first to show in *Gymnogongros Griffithsia* (Hist. Nat. Canar. Bot. Crypt. p. 160), in the endochromes of the radiating filaments of the nemathecia which occupy the two surfaces of the frond. These nemathecia are oblong, convex when moistened, but plane and depressed when dry, and then distinguishable by the naked eye only in consequence of the deeper tint of the portions of the frond where they are situated. They are disposed with tolerable regularity in two longitudinal lines, a few however being more or less scattered. More rarely they are confluent, their length not exceeding a line, and frequently not attaining that size. A proof of their being simply a development into filaments or a multi-

plication of the cells which inclose the subepidermal gonidia is afforded by the fact that after they have fallen, whitish spots of the same form are left in the place which they occupied, and if the frond be examined with the microscope, it is evident that these spots are destitute of the cortical stratum, and simply formed of the medullary central tissue. Each articulation of the filaments incloses a nucleus or endochrome which gradually swells and divides into four spores.

“To give you an opportunity of judging yourself of these facts, I inclose a specimen.”

To the above remarks by Dr. Montagne, I take the opportunity of adding, that the Algæ collected by Dr. Welwitsch in Portugal, now in the course of distribution by Mr. W. Pamplin, are said to be of considerable interest. The Fungi, which have passed through my hands for determination, comprise several species which exist in few herbaria; and the seeds of Phænogams, amounting to more than 200 species, contain many of Brotero's species that will be highly welcome to the cultivators of European forms, and for the most part vegetate with the greatest vigour, as I have now the daily pleasure of witnessing.

XLIX.—*On some British species of Chemnitzia.*

By GEORGE BARLEE, ESQ.

To the Editors of the Annals of Natural History.

GENTLEMEN,

Reading, May 22, 1851.

I BEG to offer a few remarks in reply to the paper in your last month's 'Annals,' by my respected friend Mr. Clark, upon the genus *Chemnitzia*; and although I have no materials at hand for reference, my books and specimens being at Falmouth, I think I shall be able to supply from memory certain facts, which will satisfy many of your readers, that as regards two of the species included in Mr. Clark's list, which he proposes to expunge from the catalogue of the British Mollusca, he has formed an erroneous opinion. I fully admit the truth of much that Mr. Clark has stated from time to time in your 'Annals,' as to a predisposition with most collectors to originate new species upon insufficient specialties, and more frequently from mere slight variations of form;—the effect probably of locality, influenced by a variety of causes which seem at present to be scarcely understood or sufficiently appreciated; such as the abundance, scarcity or quality of food, nature of soil, the greater or less purity or strength of water, absence or presence of freshwater streams, sheltered or exposed situation, favouring or interfering with the repose and quiet of the animal, &c.

My object, however, in intruding myself before your readers is simply to endeavour to rescue from total annihilation, by my eminent malacological friend Mr. Clark, from whom I have ever received much courtesy and consideration, two of my rather recent discoveries, the *Odostomia truncatula* of Jeffreys, which I found imbedded in the roots of coralline, trawled up near the Eddystone lighthouse, and which Mr. Clark states to be the adult of *Odostomia cylindrica* (the *Turbo nivosus* of Montagu), and the *Eulimella affinis*, Phil., first taken by me in deep water outside Oban Sound, and which he considers identical with *Eulimella acicula*.

I must here remark, that Mr. Clark, by the bold step he has taken of proposing to expunge from the published list of the British Mollusca, twenty-one species without having seen the animals of scarcely one of them, tacitly admits that a species may be determined by conchological characters; and therefore by such, I am ready to submit my two discoveries to the judgment of conchologists. *Odostomia truncatula* is generally a long, slender, attenuated and very irregularly formed shell, having from six to eight volutions; the two or three lower ones very unproportionally long compared with their width and with the upper ones; and from their extreme obliquity, the half-grown specimens have much the contour of *Rissoa vitrea*. The volutions are much flattened in the centre of each, then abruptly shelving off to the sutural line, and each one seeming to be sunk into that immediately below it, giving the shell a turreted appearance. Three or four of the volutions are generally adorned with very fine striæ, visible under a common lens; often as many as twelve or fourteen lines upon the body whorl and extending quite up to the suture. The aperture is extremely long and narrow, the outer lip running up to a sharp angle, which gives a great length and obliquity to the peristome. The inner lip, just between the umbilical region and the extreme base of the aperture, is often considerably reflected even in young specimens. All these specialties are very distinct from the characters of *Odostomia cylindrica*, which is a short compact shell, of four or five volutions, which are much rounded, more especially the body whorl; while that of the *Odostomia truncatula* is always narrow and flattened: the only striæ upon *Odostomia cylindrica* are confined to the centre of the body whorl, where there are generally four, (never more, but often only two or three visible), thread-like lines, very far apart; rather a peculiar character in this species. The aperture is much rounded and the body whorl rather large in proportion to the rest of the shell. This species has, I believe, never been taken by the dredge, although well known for more than forty years; it belongs exclusively to the littoral zone; is always found

about half-tide way, in corallines or algæ, where it is most abundant. I have taken more than a thousand specimens of all sizes, in various parts of England, Ireland and Scotland, and find them more uniform in size, shape, character and contour, and less influenced by locality, than almost any species I am acquainted with. The *Odostomia truncatula*, on the contrary, has never been taken but in deep water, and that only in one locality, fourteen miles off the nearest point of land, where it is very abundant; and although no species presents so remarkable a variation in form and sculpture, (no two specimens hardly agreeing, some being without striæ, others having it upon one or two volutions only, some upon four or five,) yet so characteristic of the species is each specimen, that I challenge any one to deceive me by mixing one of either of the species in question with hundreds of the other; I could detect it at a glance; indeed the attempt was tried, quite unknown to me, by a very scientific friend of mine at Falmouth; but at first sight I recognized the specimen.

How will Mr. Clark account for the fact, if, as he says, the two species are identical, of the adult, of a common shell, known for more than forty years, and having so many localities, never having been found, where the young, as he calls them, are so extremely abundant, or where also, in shelly sand, it is taken in vast numbers of all ages; while with the adult (my *Odostomia truncatula*), found only at present in one deep water locality, the very fry of the latter are found in great abundance, but all differing from the fry of the littoral zone, *Odostomia cylindrica*, in form and sculpture, and indeed in conchological character? The undoubted fact is, they are totally distinct species.

I am fully aware of the fact, having had ample experience of it, that there are often littoral and coralline zone varieties of the same species; but then there are always conchological characters in common in both, which are quite unmistakeable.

As regards *Eulimella affinis*, I will first refer to what is said by the clever and scrutinizing authors of the 'British Mollusca' as to *Eulimella acicula*, with which Mr. Clark unites the former. After alluding to two or three peculiar forms of the latter, which I procured at Stornaway and Plymouth, they proceed to remark, "that were it not for the more slender shape and less peculiarly short volutions, we should have been tempted to annex it to the *Eulimella scilla*," from which I reasonably infer, that it was the very farthest from their thoughts of allying it (the *Eulimella acicula*) to my *Eulimella affinis*, which is the very next species described by them. The latter differs from the former shell in its much broader base, its more rapid increase from apex to base, its more rounded and proportionally shorter volutions, and by its very uniform and conspicuous character of being of a beautiful

hyaline transparency, showing the entire columella, a character without the slightest variation in any of the specimens from its four known localities. The *Eulimella acicula* is long, narrow and slender; much flattened in the volutions, which have fine striulæ upon them, visible under a good Coddington lens; it is often much contracted at the upper and lower portions of the shell, giving it rather a bulging appearance in the centre; and although subject to much variation of form as regards the flatness or tumidity of the whorls, they are never rounded. It varies much as to colour; some living specimens from Loch Fyne being opaque, china-white, while others are dull semi-pellucid. I would here also undertake to separate a living example of either species from hundreds of the other without a possibility of erring.

I am quite confident that an inspection of my tablets of the four species in question would leave Mr. Clark without a single voice in favour of his opinion, and establish beyond doubt *Odostomia truncatula* and *Eulimella affinis* to be two perfectly good and distinct species. I cannot account for the practised eye of my friend Mr. Clark having so deceived him, as to the specialties of the two species in question; for with the exception of himself, I believe there has been but one opinion about them; nor can I conceive any other possible. I am not prepared, nor do I propose, to discuss the merits or pretensions of the other species discarded by my friend, as I have only seen three or four of them; and am inclined to agree with him in opinion as to many of them, though without the examination of the animal there must be great difficulty in determining species, more especially in the absence of any very decided conchological characters. Yet at the same time I must confess I am strongly disposed to think that *Odostomia albella*, *dubia*, *decorata* and *clavula* will hereafter prove to be good species. I perfectly agree with Mr. Clark as to *Odostomia dolioliformis* being the *Turbo Sandvicensis* of Walker; I never had any other opinion; I have long possessed a fine series of the species. I also fully coincide with him as to *Chemnitzia rufa* and *fulvocincta* being distinct. I have taken them both at Plymouth and Falmouth, and the latter at various parts of Scotland, but I never yet saw an approach to a spiral band upon the former. I give Mr. Clark full credit for the purity of his motives in wishing to drive away all pretenders from this very select group of our mollusks, and consider the public, more especially students, greatly indebted to him for his unabated zeal, perseverance and talents displayed in purifying this branch of natural history from much of its errors and imperfections, and thus facilitating the study of a most delightful science.

I am, Gentlemen, yours very obediently,

GEORGE BARLEE.

BIBLIOGRAPHICAL NOTICES.

A Geological Inquiry respecting the Water-bearing Strata of the country around London, with reference especially to the Water-Supply of the Metropolis. By J. PRESTWICH, Jun., F.G.S. London: Van-Voorst.

AT the present time, when the Water question is engaging the attention of the Government and the inhabitants of the metropolis, the appearance of this work is opportune, and more worthy especial notice, as the author, in deviating from all the previous recommendations on this subject, has entered upon a new field of inquiry, and suggested the probability of obtaining an ample supply of the important element from sources not hitherto rendered available for the purpose, as far at least as London is concerned.

The author is well known for his researches into the geological structure of the country around London, and during his investigations has thus had ample opportunities of making himself acquainted with the chemical and mineral characters, the permeability and extent of the various strata. These observations, as well as others subsequently undertaken and bearing more immediately upon the subject under notice, are concisely embodied in the volume before us, with a view of supplying some portion of geological information upon the general question of Artesian wells; not however "with any purpose of treating it in that detail which the special nature of the subject would require, but rather with the hope of calling attention to the practical application of geology in an important æconomical question, and of establishing some general principles which may serve to guide to further and more exact investigations."

M. Boué long ago observed, in his observations on the value and importance of Artesian wells, that correct data upon which the engineer should found his operations could only be obtained from the geologist. Mr. Prestwich proposes to adopt the Artesian system—a system having its advocates and opponents, but which we believe has not been fairly discussed, partly from a notion that seemed to prevail of its uncertainty and value, partly in consequence of the operation being generally restricted to the tertiary strata, *i. e.* the sands above the chalk, and no suggestion having arisen as to its application to lower and more copious water-bearing strata, *i. e.* the sands below the chalk, but which it is the special object of the present work to suggest. Most of our readers are aware that London is situated towards the centre of a large trough-shaped district, formed of a series of strata belonging to the tertiary and cretaceous deposits, cropping out in zones around it. By piercing the superincumbent strata down to the lower cretaceous deposits, comprising the upper and lower greensand, the presumed new sources of supply will be found. When we examine the effective area of these deposits in comparison with those of other water-bearing strata as indicated in the geological map which accompanies the volume, and consider their permeability and the amount of rain-fall, we shall be prepared for the following remark:—

"The total superficial area of the Upper Greensand occupies 173

square miles, and that of the Lower Greensand 650. The average fall of rain on them amounts respectively to about 191,000,000 and 695,000,000 of gallons daily. As also the thickness of the one formation averages 50 feet, and that of the other 367 feet, the latter consisting in great part of the most perfectly permeable strata, I cannot but think that, taking the question in all its bearings,—considering the results obtained from strata of much more limited dimensions, and the relative fall of rain in the several districts,—we have in these facts a further argument in favour of the conclusions to which we have before arrived, viz. that a daily supply of from six to ten million gallons of water might be drawn from the Upper Greensand, and of from thirty to forty million gallons from the Lower Greensand, beneath London and within a circle of five miles around it. For these large supplies the open texture of the sands themselves affords naturally the necessary channels and reservoirs. All parts of the surface can communicate freely with the subterranean reservoir, which presents a capacity for storage comparatively unlimited in its extent. If it were not to rain for a whole year, the effect upon the volume of water held in the strata would be scarcely perceptible; for let it be borne in mind that the effective permeable beds of the lower greensand are 200 feet thick, that they occupy an area above and below ground of 4600 square miles, that a mass of only 1 mile square and 1 foot thick will hold more than 60,000,000 gallons of water, and some idea may be then formed of the magnitude of such an underground reservoir. A fall of 1 foot in the water-level throughout the whole area of outcrop would give more than the quantity of water required for a year's consumption of London."

It will be unnecessary here to extract further details, but merely to direct the reader to some of the principal contents of the work, which includes a general account of the geological structure of the country around London, with reference to the conditions which determine the water-bearing capacity of the several deposits, their extent and structure, thickness and probable depth beneath London, and to the rainfall upon them, followed by a comparison of the dimensions and relations of these strata, as to the quantity of water that may be probably obtained from the different groups, and the effects of disturbances of the strata on the subterranean passage of the water. A variety of interesting facts are also given in the appendix, including the analyses of the waters of some Artesian wells in France, and the river and well waters used in and near the metropolis.

The numerous references throughout to foreign and English authorities bearing on the subject, fully indicate that the author has spared no labour to render this work as practically useful as possible to the geologist, the engineer, and those interested in the water-supply; and the reader who peruses the amount of facts and carefully-considered evidence collated in its pages will feel that there are reasonable grounds for believing "that there probably is no large city in Europe, the situation of which is so peculiarly favourable as that of London, for obtaining by means of Artesian wells an abundant supply of water which would prove both pure and good."

Drops of Water—their marvellous and beautiful Inhabitants displayed by the Microscope. By AGNES CATLOW. London: Reeve and Benham.

The illustrious Nicolaus Klim, in his wonderful 'Unterirdische Reise,' tells us that by tumbling down a great chasm in the "Mountain Flöjen," near "Bergen in Norway," he became acquainted with an altogether new world, peopled with plant-men, animated fiddles, and such like eccentricities of nature. But that was in the 17th century. In the 19th, thanks to the progress of the sciences, we have not to go so far as Bergen in Norway to find wonders quite as great.

For a consideration far more trifling than the many years' absence—the shipwrecks—the break-neck falls—the humiliation endured by the great Klim—we may each and all of us become possessed (by favour of Messrs. Ross or Smith) of a 'Mountain Flöjen' of our own, by the mere looking through which—without tumbling—we may find every drop of stagnant water to be a world peopled with inhabitants stranger than those of the planet Nazar, or even than those of the "Musicanten-land."

To those who have not yet paid a visit to these mysterious regions—who stand yet hesitating and seeking for a guide, before they venture among living and revolving "globes, tops, trumpets, pincushions with pins in ready for use, telescopes, balls, leaves, sticks, threads, bells, hollow spheres" (p. 24), we may very properly recommend the pleasing little work of Miss Catlow.

We cannot wish the authoress better than that her work may be the means of inducing many to seek for other and higher sources of information—perhaps even to become themselves investigators—and rescue here and there a fragment from the domain of ignorance.

Works in the Press.

We have much pleasure in announcing that a Third Edition of Babington's "Manual of British Botany" will be published in a few days.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

June 18, 1850.—Robert Brown, Esq., President, in the Chair.

Read a paper "On the Structure of the Fruit in *Punica*." By H. F. Hance, Esq., Ph.D.

Mr. Hance's observations were made chiefly on double flowers, exhibiting several varieties of monstrosity, obtained from a plant growing in his garden at Hong Kong, and compared with the normal state. He refers to the opinions of Mr. Griffith and Dr. Wight, and agrees with the latter in considering the pistillum as compound, many of the double flowers distinctly exhibiting the imperfect cohesion of the carpidia, and the styler laminae being even in some instances quite separate to the very summit. His own explanation of the remarkable disposition of the cells of the fruit of the Pomegranate

is given in the following terms :—“ The lower cells arise from a central row of carpella, the cohering apices of which constitute the diaphragm, the ovula springing from the two united margins of the same carpellary leaf, and consequently being directed towards the circumference of the ovarium ; while the upper cells are formed by an exterior series of longer carpels alternate with the others, their cohering summits constituting the whole, or at all events the external portion, of the style, and the ovula are borne on the entire inner face of the carpidia, as in *Nymphæaceæ*, the cells being in addition frequently divided by spurious septa arising from the midribs.”

With respect to the affinities of the genus, Mr. Hance would certainly remove it from *Myrtaceæ*, and believes it must be viewed as an osculant genus connecting the Myrtles with *Onagrariæ* and *Lythraræ*, and hereafter to form with other yet undescribed genera a new natural order.

In conclusion, he refers to some remarks of Mr. Griffith in a letter to Dr. Wight, which he had not met with until some time after writing his paper, in which Mr. Griffith speaks of *Punica* as belonging to an order, with *Duabanga* and *Sonneratia*, between *Myrtaceæ* and *Lythraceæ*, and describes it as being 6-7-carpellary-leaved.

Read also the conclusion of “ Observations on the Botany of Texas.” By William Bollaert, Esq. F.R.G.S., &c.

In this memoir Mr. Bollaert gives some account of the physical geography of the State of Texas, with notes on its geological character and mineral productions ; he describes the soil and climate of its various regions ; and, lastly, enters into a detailed account of its vegetable productions, describing successively the forests and forest-trees, together with the fruits, and the herbaceous plants, including the cereals, grasses and other plants useful to man, especially those cultivated either for food or ornament. Among these he enters into particular details with respect to the *Zea Mays* or Indian Corn, and a species of *Smilax* which he believes to be new, but which appears to be identical with *Smilax lanceolata*, L., and is known to the inhabitants by the name of Indian Bread. Of Maize he states the average crop to be sixty bushels per acre ; and adds that a man and young boy have been known in Eastern Texas to raise and gather in one year fifteen hundred bushels from two crops. He describes a great variety of modes in which this valuable plant is turned to advantage, and gives a rough analysis of the component parts of the grain. From this it results that the starchy matter in malting takes on a saccharine character, which by fermentation produces alcohol, and independently of the carbonic acid evolved, another acid is formed, which may be either a new acid or the acetic. When the fermented liquor is allowed to stand for some days, a bright yellow oil floats to the surface, and appears to be composed of three proximate substances : viz. 1. a body like Elaine ; 2. a small portion like Stearine ; and 3. a substance which he calls Maizaline, which last has a decided diuretic quality, and is regarded by the author as the cause of the diuretic effects produced by Maize-bread upon

persons unaccustomed to its use. With regard to the Indian-bread, called by the Carancahua Indians *Toqui*, Mr. Bollaert states that he found it in great abundance in the pine-woods of Huntsville, lat. 31° N., long. $95^{\circ} 30'$ W. The edible part is the root: immediately below the stem commences the formation of irregularly-shaped potato-like tubers, rather larger than the potato, and so abundant that one plant will yield two bushels. These are used by the Indians made into a sort of bread; and the pioneer, trapper and backwoodsman are frequently obliged to have recourse to it for the same purpose, and sometimes obtain from it by fermentation a liquor of a pink colour to which they give the name of beer. Of this plant, and of the mode of growth of its tubers, sketches accompanied the paper, which concludes with a notice of some of the botanists who have visited the State of Texas for the purpose of collecting plants, and with a list of the plants collected by Mr. Lindheimer in his Earlier Journey, and by Dr. Kenan.

November 5.—Robert Brown, Esq., President, in the Chair.

Mr. W. W. Saunders, F.L.S., exhibited specimens and a drawing of a species of *Cyclamen* (probably *C. hederæfolium*, Dec.), found by him in the neighbourhood of Hastings; he regards it as undoubtedly wild.

Read a Paper on “The Ternstroemiaceous Plants of Hong Kong.”
By Capt. Champion, 95th Regiment.

The author commences by referring to the number and beauty of the trees and shrubs of this family which are natives of India and China; and suggests that the elevation at which they are generally found, flowering in China alongside of the Azaleas which have been so successfully introduced into England, indicates that many of them might also be advantageously cultivated here as hardy or half-hardy plants. He then proceeds to the enumeration of the species which have been found in the small island of Hong Kong.

1. *CAMELLIA SPECTABILIS*; arborea, foliis lanceolatis acuminatis glabris crenatis subtus reticulatis, floribus solitariis (magnis albis) axillaribus et subterminalibus, sepalis coriaceis fructibusque (pomi magnitudine) sericeis.

Hab. in Insulâ Sinensi Hong Kong, in sylvis.

2. *Camellia Japonica*, *L. Sp. Pl.* 982.

Of this species Capt. Champion states that but two trees are at present known growing wild in Hong Kong; they were discovered by Col. Eyre, R.A., and are loaded in October with single pink flowers. The leaves are more elongate than in most cultivated plants.

3. *CAMELLIA SALICIFOLIA*; arbuscula, ramulis pubescentibus flexuosis, foliis subsessilibus elongato-ovatis acuminatis serratis pubescentibus, floribus parvulis (albis), sepalis acuminatis pubescentibus, capsulis glabris parvis rostratis 1-3 sæpius 1-spermis.

Hab. in Insulâ Sinensi Hong Kong, in sylvis.

As species this and the next are most nearly allied to *C. caudata*, Wall. A specimen of the present has recently been introduced by Mr. Braine into Kew Gardens.

4. *CAMELLIA ASSIMILIS*; frutex, ramulis glabris, foliis subsessilibus lanceolatis acuminatis serratis glabris, floribus parvulis pendulis (albis), sepalis sericeis obtusis, capsulis glabris parvis rostratis.

Hab. in Insulâ Sinensi Hong Kong, in Monte Victoria et Monte Gough.

5. *Thea Bohea*, L., is cultivated in Hong Kong, but is not indigenous. As a genus Capt. Champion does not regard it as distinct from *Camellia*.

6. *EURYA MACARTNEYI*; dioica, frutescens, glabra, foliis majusculis coriaceis subellipticis margine revolutis serrulatis, floribus majusculis; ♂ staminibus 19-22; ♀ stylis distinctis revolutis, fructibus (purpureis) circiter 14-spermis.

Hab. in Insulâ Sinensi Hong Kong, in sylvis rupibusque. Floret et fructus fert Aug.-Nov.

A shrub from 6 to 8 feet high, and as a species coming near *E. elliptica*, Gardn. Specimens brought from China by Lord Macartney are in the herbarium of the British Museum.

7. *Eurya Japonica*, Thunb., and *Eurya Chinensis*, R. Br.

These two species Capt. Champion finds mixed up indiscriminately in his collection, and he believes them to be identical.

8. *PENTAPHYLAX EURYOIDES*, Gardn. & Champ.

This new and curious genus is described in Hooker's Journal of Botany, No. 8. p. 244-246.

9. *IXIONANTHES CHINENSIS*; subarborea, foliis petiolatis alternis glabris integris elongato-ellipticis apice emarginatis reticulatis, corymbis longè pedunculatis axillaribus plurifloris dichotomis, staminibus 10 longissimis, capsulis supra-uncialibus.

Hab. in Insulâ Sinensi Hong Kong, in sylvis.

Seeds of this species, which forms a small tree, sent by Capt. Champion to the Royal Gardens at Kew, have vegetated. The author states that having since compared his specimens with Jack's description of his Sumatran species (*Ixionanthes reticulata*), he feels some doubt of the distinctness of the plant of Hong Kong. It differs however in the larger size of the leaves (5 in place of 3 inches long), and will probably on comparison be found to do so in other particulars.

The paper was accompanied by drawings of *Pentaphylax euryoides* and *Ixionanthes Chinensis*, with details of their fructification.

Read also "Descriptions of two new species of *Paussidæ* from Australasia in the collection of the Jardin des Plantes at Paris." By J. O. Westwood, Esq., F.L.S. &c.

GENUS CERAPTERUS.

Subgenus *Arthropterus*, MacLeay.

Cer. (*Arthropterus*) *parallelocerus*; ferrugineus, antennarum lateribus parallelis; articulo penultimo tribus præcedentibus simul sumptis lon-

gitudine exactè æquali, capite et pronoto rude punctatis; hoc capite latiori subquadrato anticè parum latiori angulis anticis rotundatis setosis, elytris tenuiter transversim punctatis punctis setigeris, tibiis anticis extùs acutè productis; quatuor posticis extùs acuminatis angulo extremo truncato.—Long. corp. lin. 5.

Hab. in Australasiâ. In Mus. Hist. Nat. Paris. (Verreaux) et Westw.

This species is most nearly allied to *C. subsulcatus*, but is broader, with the thorax more broadly quadrate, the clava of the antennæ broader and of uniform width, the elytra without any appearance of longitudinal sulci, the pronotum slightly channelled in the middle, the tibiæ broader, the head more thickly punctured, and the elytra much less setose.

Cer. (Arthropterus) brevis; nigro-piceus nitidus lævis, capite punctato, antennis latis; margine antico subrecto; margine supero vel postico serrato, prothorace cordato-truncato lineâ mediâ tenui longitudinali impressâ disco tenuissime punctato, elytris brevibus ferè lævibus nitidis, tibiis anticis apice submarginato angulo apicali acuto; tibiis quatuor posticis apice externo obtusè rotundatis.—Long. corp. lin. 3.

Hab. in Australasiâ. In Mus. Hist. Nat. Paris. (Verreaux) et Westw. (Mossman).

ZOOLOGICAL SOCIETY.

May 14, 1850.—William Yarrell, Esq., V.P., in the Chair.

DESCRIPTION OF A NEW PUPINA AND TWO NEW HELICINAS, FROM THE COLLECTION OF H. CUMING, ESQ. BY DR. L. PFEIFFER.

1. PUPINA BILINGUIS, Pfr. *P. testâ oblongo-ovatâ, tenui, pellucidâ, nitidâ, carneâ; spirâ sensim attenuatâ, obtusiusculâ; suturâ impressâ, vix callosâ; anfractibus 6, supremis 3 convexis, confertim striatis, sequentibus subplanis, lævigatis, ultimo $\frac{1}{3}$ longitudinalinis paulo superante; aperturâ verticali, subcirculari, bicanaliculatâ, canali utroque aperto, ascendente, supero lamina validâ, linguiformi, triangulari formato; peristomate subincrassato, breviter expanso, margine columellari plano, linguiformi, acuto.*

Long. 10, diam. 5 millim.

Hab. in Australiâ orientali.

2. HELICINA INTUSPLICATA, Pfr. *H. testâ depresso-globosâ, tenuiusculâ, lævigatâ, nitidâ, carneâ; spirâ breviter conoideâ, vix acuminatâ; anfractibus fere 5 convexiusculis, celeriter ac-crescentibus, ultimo rotundato, basi planiusculo; columellâ recedente, planâ, retrorsum in callum tenuem dilatatâ; aperturâ parum obliquâ, semiovali-subtriangulari, altiore quam latâ, ad columellam angulatâ et plicâ intus fere ad marginem decurrente munitâ; peristomate simplice, breviter expanso, margine basali ad columellam subangulato.*

Diam. 10, alt. $7\frac{1}{2}$ millim.

Locality unknown.

3. HELICINA DIAPHANA, Pfr. *H. testâ subconoideo-depressâ,*

temi, obliquè striatula, diaphana, nitidula, fulvo-lutescente; spirâ subelevatâ, apice obtusâ; anfractibus 4 planiusculis, ultimo obsolete subangulato; columellâ brevissimâ, basi subnodosa, in callum circumscriptum, sub lente granulatum retrorsum dilatatâ; aperturâ subobliquâ, semilunari; peristomate simplice, breviter expanso, margine basali leviter arcuato, in nodulum columellarem sensim transiente.

Diam. 5, altit. $3\frac{1}{2}$ mill.

Hab. Honduras; Mr. Dyson.

May 28.—William Yarrell, Esq., Vice-President, in the Chair.

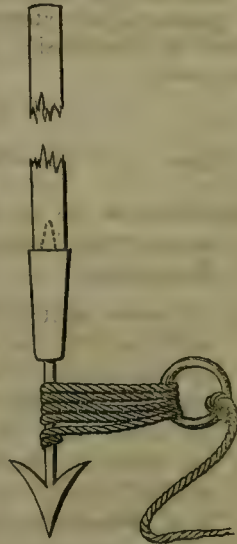
The following papers were read:—

1. ON SHARK FISHING AT KURRACHEE. IN A LETTER FROM DR. BUIST, LL.D., F.R.S. ETC., OF BOMBAY, TO COLONEL SYKES. (COMMUNICATED BY COLONEL SYKES.)

There are thirteen large boats, with crews of twelve men each, constantly employed in the shark fishery at Kurrachee; the value of the fins sent to market varying from 15,000 to 18,000 rupees, or 1000 to 1200 rupees for each boat, after allowing the Banian or factor his profit. One boat will sometimes capture at a draught as many as one hundred sharks of different sizes. The fishermen are very averse to revealing the amount of their captures. Inquiries of this sort are supposed by them to be made exclusively for the purpose of taxation. The average capture of each boat probably amounts to about 3000, so as to give the whole sharks captured at not less than 40,000 a year. The Great Basking Shark, or Mhor, is always harpooned: it is found floating or asleep near the surface of the water; it is then stuck with a harpoon of the size and form indicated in the annexed woodcut.

The fish, once struck, is allowed to run till tired; it is then pulled in, and beaten with clubs till stunned. A large hook is now hooked into its eyes or nostrils, or wherever it can be got most easily attached, and by this the shark is towed on shore; several boats are requisite for towing. The Mhor is often 40, sometimes 60 feet in length; the mouth is occasionally 4 feet wide.

All other varieties of shark are caught in nets, in somewhat like the way in which herrings are caught at home. The net is made of strong English whip-cord; the meshes about six inches; they are generally 6 feet wide, and from 600 to 800 fathoms, or from three-quarters to nearly a mile, in length. On the one side are floats of wood about 4 feet in length, at intervals of 6 feet; on the other,



Line, 600 fathoms.
Cane shaft, 8 feet.
Iron shaft, 1 foot 6 inches.
Barb, 5 inches.

pieces of stone. The nets are sunk in deep water, from 80 to 150 feet, well out at sea. They are put in one day and taken out the next; so that they are down two or three times a week, according to the state of the weather and success of the fishing. The lesser sharks are commonly found dead, the larger ones much exhausted. On being taken home, the back fins, the only ones used, are cut off, and dried on the sands in the sun; the flesh is cut off in long strips, and salted for food; the liver is taken out, and boiled down for oil; the head, bones and intestines left on the shore to rot, or thrown into the sea, where numberless little sharks are generally on the watch to eat up the remains of their kindred.

The fishermen themselves are only concerned in the capture of the Sharks. So soon as they are landed, they are purchased up by Banians, on whose account all the other operations are performed. The Banians collect them in quantities, and transmit them to agents in Bombay, by whom they are sold for shipment to China.

2. ON THE IGUANA OF ST^A LUCIA, *METOPOCEROS CORNUTUS* OF WAGLER. BY LIEUT. TYLER, R.E.

This species attains a length of five, and sometimes even of six feet, the tail being about twice and three-quarters the length of the body. When first hatched it measures four inches. The tail is thick at its commencement, and is so connected with the body that it becomes difficult to define precisely their respective limits. The fore and hind legs are thick and muscular, with five toes on each, armed with strong hooked talons, by any one of which the animal can support itself. Of the fore-legs the third and fourth toes are the longest; and of the hind-legs the fourth toe is of an enormous length, and has five joints. Under the toes the scales form a double row of denticulations. The nostrils are large, oval, and not mobile, and above them are two horns, with five or six tuberculous excrescences between them and the nostrils, and surrounding the horns. The mouth is large, and armed with two rows of maxillary and two of palatal teeth, which appear simply to be intended to crop leaves and to provide the stomach with vegetable food. Each maxillary tooth is a little double-edged saw, and they are so lapped over each other that the reptile, in closing its mouth upon a leaf, cuts through it completely. The tongue is divided at the point, is very wide, and can be extended out of the mouth, although it is fastened to the interior of the lower jaw near its extremity. The tongue is curiously used by the animal to draw food into the mouth, and to forward it down the gullet, or to repel it at will, and the only use of the palatal teeth appears to be to secure the food while the tongue moves forward to afford fresh assistance in its journey down the throat*. Between the lower jaw and the chest is a pouch, which the animal draws in or extends simultaneously with the compression or swelling out of the body when enraged or excited. The portion of the gular pouch attached to the jaw is inflatable, and food is sometimes retained in it for a consider-

* The tongue is always covered by a glutinous secretion, which is perceptibly appended to the jaws when the mouth is open.

able period, but the lower part is merely extensible. On the anterior part of this pouch or dewlap, and immediately below the jaw, are from five to seven denticulations similar in substance and colour to the dorsal crest, but not so long.

This crest or mane commences behind the head, with three or four excrescences of different sizes, then suddenly becomes, in larger Iguanas, an inch and a half or two inches in length, and runs uninterruptedly down the back and tail, gradually diminishing, excepting above the commencement of the tail, where a slight increase again takes place, until, at the extremity of the tail, it is undistinguishable. The dorsal crest consists of about fifty protuberances, and the caudal crest of about 218, each of the latter becoming gradually harder as they decrease in height, and so altering their shape as to resemble, down the greater part of the tail, the edge of a saw.

The ear is covered by a thin scale, which gives to the touch, but does not seem sensitive. There is no external opening, nor does the sense of hearing appear to be very acute or much used by the animal, who trusts more to the eye to discover both his food and his enemies.

The eye is bright and prominent, and is protected by an inner cuticle as well as the lower eyelid; the upper lid not moving to aid in covering it, but only when the direction of sight is altered in a perpendicular direction. There are soft brows over the eyes of a spherical shape, and projecting above the remainder of the upper part of the head.

The general colour is bright green in the young and dirty grey in the old Iguanas, with about six black streaks across the body and fifteen across the tail, each streak being darker towards the head, and gradually shaded off towards the tail. These streaks extend over the dorsal and caudal crests, which partake entirely of the variegations of the body in the younger, but, in the older individuals, are tipped with red and yellowish brown at their bases and extremities. These black streaks do not unite under the belly or under the anterior part of the tail, but towards the extremity of the tail they gradually elongate and become more dull, encircling the tail, and at last becoming hardly discernible, mixing with the green or grey into one dull tint.

The dewlap, as well as the folding skin in front of the shoulder, connected with it, is interspersed with black and yellowish brown, of which colours the denticulations of the dewlap also partake. The upper part of the head is of a darker and richer green in the young, fading as the animal advances in years, and becomes weather-beaten, as is the case with the human species, and with all animal and vegetable life. The whole of the under part of the body is of a lighter colour in both old and young. The female has a more delicate colour and general appearance than the male.

Whilst always retaining the same colours, this Iguana has the power of considerably changing his hues, but these changes are gradually performed. The colours become more dull as the period of the change of skin approaches, which is not, however, frequent. Each scale has its own tint, and the colours being thus irregularly blended, an appearance is given, particularly to the younger reptiles, very much

like that of worsted-work. The colour of the eye is dark brown, the pupil being surrounded by a golden rim.

Every part of this curious reptile is covered with scales, and these are of every variety of shape and size. Those on the top of the head are large, smooth, and unequal; between them and the mouth runs a row of smaller scales, while the mouth itself is surrounded, both in the upper and lower jaw, by large scales terminated at the extremity between the nostrils, by one large brownish and softer scale in the upper jaw, and a similar though smaller scale meeting it in the lower jaw. From this latter, and below those immediately surrounding the mouth, is a range of scales or rather plates, each larger than its predecessor, terminated on either side by a very large plate under the auricle. Below this row of scales is the gular pouch (Fanon) covered by small, smooth scales. The eye is protected above by small, smooth, unequal scales, which also form part of the covering of the top of the head. The scales of the lower eyelid are peculiarly small and delicate; and a row of semispherical scales, resembling somewhat a string of small pearls on each lid, surrounds the eye. At the back of the head the scales become tuberculous, and a few on each side of the neck assume a pyramidal or rather a conical form. The scales of the neck and back are almost circular, but nearer the tail they become rhomboidal and carinated, their posterior points elongating, and their centres projecting more and more, both above and below, as they reach the extremity of the tail, so as to give it the form of a many-edged saw, the most severe edge being that presented by the caudal crest. The scales above the fore-legs are equal, carinated, and imbricated, assuming, at the foot and along the toes, a convex and smooth appearance. Under the fore-legs they are smaller, and peculiarly so at the joints and under the feet; the most delicate, however, are those under the leg, and connecting it with the body. The hind-legs are similarly clothed to the fore-legs, excepting that they are provided with a single row of femoral pores, fourteen or fifteen in number, and which increase in size with the growth of the reptile. These pores are large and fully developed in the male, but small and sometimes even hardly perceptible in the female.

The scales of the belly are very different from those of the back, being larger, equal, and carinated, although generally worn almost smooth in the old individuals. They are divided by a distinct line from the termination of the dewlap to the vent.

The Iguanas live principally in trees, and near the windward coast of the island. They are not much seen excepting in the months of February, March, and April, when they quit their hiding-places, and repair to the sea-shore or other sandy places to lay their eggs in the sand. The older females lay a great number of eggs; I have known an instance of one in confinement laying five in one day; and thirty-two, within the space of ten minutes, five days afterwards, making thirty-seven in all. I have taken the eggs from the bellies of small females in less numbers, such as eight, fourteen, and seventeen. They are not found in successive stages of advancement as in the hen, the tortoise, and many other animals, but all of the same size, and arrived

at the same degree of maturity. Nor are the eggs always disposed, as I have seen it stated, in two rows, one on each side of the belly of the female. When very small, they are arranged in a long irregular cluster, closely packed together, and they seem to retain the same relative position as they increase in size. The eggs are very liable to destruction from ants, which fact probably accounts for their being usually deposited in sea sand. They are also hunted for and eaten by the *Pilori* (*Mus pilorides*), or "Rat Musqué," and by a bird called the "Trembler." They are soft and without any white, and their shell resembles the most beautiful kid used for French gloves, of a very light straw-colour. They are about the size of those of a pigeon, but rather longer; they vary however in dimensions, according to the age and size of the Iguana.

This Iguana is not averse to water, when not too cold, taking to it only when the sun is shining; in fact, not moving about much at any other time. Its mode of swimming differs from that of other lizards, inasmuch as it places its four legs close by the side of its body, and swims entirely with its tail. It dives with great facility, and remains sometimes for a considerable time under water. I believe that the Iguana never ventures into the sea. The tail is a very valuable limb; for besides being the sole means of swimming possessed by the animal, it is of great use in climbing trees, although not prehensile; and it is a most important weapon of defence, a blow from it being frequently sufficient to inflict a severe wound. In fact, this reptile is rather formidable when brought to bay in the woods. It is hunted by the natives with dogs trained for the purpose. The dog immediately upon scenting it gives tongue, and if on the ground, the dog seizes it by the back, and either kills it or maims it, which makes its capture easy; if in a tree, the Iguana is either shaken down, a matter ordinarily of no small difficulty, or the branch is cut off. It is almost useless to attempt to find these reptiles without dogs, as the resemblance of their colour to that of the trees they inhabit prevents them from being easily seen. Few dogs but those accustomed to the sport will touch them, as, in addition to the blows which they inflict with their tails, they bite and scratch furiously; and when once they lay hold of anything with their teeth, they can only be made to let go by an inducement to bite, some other attractive object being offered to them. They run into holes when chased, if an opportunity offers, and when their eyes are hidden from view, they fancy that their whole body is safely covered. The flesh, particularly of the female, is a great delicacy; it is cooked in various ways, sometimes in a fricassee, with the eggs whole, sometimes roasted or stewed. The eggs have a very glutinous taste. The flesh is said to disagree with some constitutions, although it does not, I believe, as has been asserted, disagree peculiarly with those persons who have been affected with venereal diseases.

This Iguana is said by some of the natives to eat lizards and insects, but I have opened several, and I have never succeeded in finding any but vegetable matter in the stomach, sometimes, however, covered with innumerable small worms, the eggs of which must

doubtless have been swallowed with the leaves, fruit, or bark of trees, upon which, I conceive, it feeds entirely.

Unless caught young, it is very difficult to induce these reptiles to feed in confinement, and particularly when watched. Their disposition is sulky and savage, and I have known some of them die in confinement from starvation rather than feed. This has caused me to try the following plan, which I find very successful, of affording them nourishment. I hold them by the lower part of the body with one hand, and with the other I irritate them, until they open their mouths and attempt to bite, when I insert food; and by annoying them in this way, I have not only made them eat their natural food, but I have killed some of them by forcing them to eat corn, and leaves which appear to have disagreed with them.

This Iguana has a small rounded heart, reddish lungs, an oblong gall-bladder, a large dark-coloured flat liver, and a white, and very extensible oblong stomach.

BOTANICAL SOCIETY OF EDINBURGH.

April 10, 1851.—Professor Balfour, President, in the Chair.

Mr. M'Nab exhibited, from the garden of Dr. Neill, a large specimen of *Gentiana verna*, in full flower in a pot. The patch was eight inches in diameter, and the number of flowers was 106; when first brought into the room all the flowers were closed, but under the influence of gas-light they opened, and in the course of an hour they were fully expanded. Mr. James Thomson (Dr. Neill's gardener) was requested to make a few experiments on the effects of light and heat upon the plant; the following particulars have since been furnished by him:—

1. On 11th April, the Gentian was placed in a warm plant-stove, the temperature of which was about 63° , and the flowers soon opened (in the absence of light) and continued open so long as exposed to the high temperature.

2. On the 12th April the plant was removed to a cool room (temperature 48°) in which a jet of gas was burning. In this situation the flowers likewise opened about an hour after the plant was put in.

3. On 14th April, about mid-day, the plant, in full bloom, was taken to a cool dark cellar, where the flowers closed almost immediately.

4. On the 15th April it was placed in a cold dark place, from six A.M. till two P.M., during which period the flowers were all partially closed: the plant being then exposed to light, the flowers expanded in about half-an-hour.

Mr. M'Nab exhibited a flowering specimen of *Lathræa squamaria* from Dr. Neill's garden at Canonmills, where it has been blooming since the beginning of March. The plants were placed on the roots of pear, filbert, and hazel; on the latter only did it succeed, and it now covers a space of ground three feet in diameter, annually producing numerous flower-stems, as large and perfect as in its native locality.

Mr. M'Nab exhibited a flowering plant of what is now generally cultivated in the British gardens under the name of *Bryanthus erectus*. The original plant was produced during the year 1841, by Mr. James Cunningham of the Comely Bank Nurseries, from seed of the *Phylodoce* (*Menziesia*) *empetriformis*, fertilized with the pollen of *Rhododendron Chamæcistus*. This mule is exceedingly beautiful and flowers abundantly in the open border during the months of May and June, and is one of the few instances we have of a hybrid raised between two distinct genera.

The following communications were read:—

1. "On a supposed new species of *Rubus*." By Fenton J. A. Hort, B.A. (See p. 374.)

2. "Notice of *Narcissus* (*Ajax*) *lobularis*, Haw." By John T. Syme, Esq. Mr. Syme exhibited a plant of this *Narcissus* in flower, the bulb of which he had received from the Rev. W. T. Bree, Allesley Rectory, who cultivated it in his garden from roots found apparently wild near Tenby, in Pembrokeshire, by the late Joseph Boulton, Esq. It differs from the *N. Pseudo-Narcissus* in having the cup divided into six distinct lobes, and of the same colour as the segments of the perianth, which are broadly ovate and rather sharply acuminate. It is a very handsome plant, and unlike any species known in gardens.

Dr. Balfour read a communication from the Rev. W. Smith, of Lewes, giving a detailed account of his examination of the Diatomaceous Peat from Cantyre, referred to in a previous report. The following is a list of the species detected by him:—

Epithemia sores.	Encyonema prostrata.
— zebra.	Gomphonema acuminatum.
— gibba.	— dichotomum.
— granulata.	Navicula major.
Eunotia diodon.	— viridis.
Himantidium pectinata.	— radiata.
Fragilaria capucina and hyemalis.	— oblonga.
Cyclotella operculata.	— amphibæna.
Melosira orichalcea.	— placentula.
Campylodiscus costatus, n. s.	— gibberula.
Surirella biseriata.	— gibba.
— splendida.	— ovalis.
Cymatopleura solea, n. g.	— attenuata.
— elliptica.	Stauroneis phœnicentron.
Synedra ulna.	— gracilis.
Cocconeis pediculus.	— acuta, n. s.
Cymbella cuspidata.	— cardinalis.
Cocconema lanceolatum.	Amphora ovalis.
— cymbiforme.	Tabellaria fenestrata.
— cistula.	

The above are all of them *freshwater* species; in the inner deposit occur numerous spicula of *Spongilla fluviatilis*. One of the rare species mentioned above is *Stauroneis acuta*; this Mr. Smith has also found in the Irish deposit: it is figured in the Histological Catalogue

of the College of Surgeons, pl. 12. f. 26, having been collected by Dr. Mantell's son, at Plymouth, New Zealand.

Dr. Balfour likewise read a communication from Dr. James Duncan, on the supposed poisonous effects of the seeds of *Abrus precatorius*. This communication had reference to the case of three children in a family, who after swallowing some of the seeds, well-known as the red West Indian Peas with black specks on them, had been attacked with vomiting, giddiness, and other symptoms of poisoning. The peas had been swallowed about three in the afternoon, and the symptoms developed themselves about eight in the evening. Under the use of emetics the children all recovered. It was remarked that considerable difference of opinion exists as to the qualities of these peas. Dr. M'Fadyen in his 'Flora of Jamaica' says, that they are merely indigestible, and not poisonous; while Lindley and others state that they belong to the narcotic division of leguminous plants. The present case confirms the latter view, and points out the necessity of caution, in allowing children to amuse themselves with these seeds.

MISCELLANEOUS.

GONOPLAX ANGULATA.

To the Editors of the Annals of Natural History.

Weymouth, May 20, 1851.

GENTLEMEN,—I send you an additional description of *Gonoplax angulata*, the Angular Crab of Bell's Crustacea, and at the same time have the satisfaction of recording it as an inhabitant of the Dorsetshire coast. The following description is taken from the younger of two male specimens in my collection.

Six individuals, all males, have passed through my hands within this last twelvemonth, all of which were taken in the bay formed by the Isle of Portland on the western, and Whitmore Head in the Isle of Purbeck on the eastern horn. This space comprises Weymouth Bay (properly so called), Portland Roads, and a margin beyond of about one mile and a half.

Description.—A depressed wavy line in the form of a circumflex with the ends directed forwards, and of a much deeper red than the remainder, runs across the carapace, dividing it in two nearly equal halves: this line divides the colours, the anterior portion being much darker than the posterior. The anterior portion of the carapace is of a dark, almost vinous red, the posterior portion being of a cream colour slightly tinged with pink. All the legs, with the exception of the anterior legs, are of a uniform pale cream colour beneath and mottled with red above. At the base of the second joint in each of the last two pairs of legs is a very dark brown oblong depressed spot, which, under a lens, appears a new piece of shell growing over a fracture, and has a curious appearance; these spots are present and very regularly so in both my specimens. The under parts of the wrist and arm are of a uniform cream colour, but of the hand mottled with pale red. The upper portion of the hand, arm and wrist, and

the basal portion of the moveable finger is marbled and mottled with two shades of bright reddish brown; the middle portion of the moveable finger is black and the tips pure white. *The right hand much larger than the left.* In one of my specimens, apparently the younger, there is a black spot on the under part of the immoveable finger near the tip.

This species is caught in the trawl. I have seldom heard of their being dredged, clearly showing them to inhabit sandy or muddy ground.

I am, Gentlemen, yours obediently,

WILLIAM THOMPSON.

THE KESTRIL IN PURSUIT OF PREY.

To the Editors of the Annals of Natural History.

The Willows, Swansea, May 13, 1851.

GENTLEMEN,—Although a similar fact is mentioned in Yarrell's excellent work on British Birds, you may perhaps think the subjoined note worthy of being transferred to your pages.

“April 19, 1851.—While on the banks of the Loughor river, opposite Duffrin, I saw within thirty yards a Summer Snipe (*Tringa hypoleucos*), which was pursued by a male Kestrel, dash into the water. The hawk instead of his quarry struck the water and seemed much confused at his novel position. Disentangling himself with some difficulty from the strange element, the bird of prey flew to a tree to plume himself. When he was gone the Summer Snipe rose to the surface, after an immersion of some thirty seconds, at about twelve feet from the place where he had disappeared, and flew off uttering his merry cry as if rejoicing in his escape.”

I am, Gentlemen, your obedient servant,

MATTHEW MOGGRIDGE.

Additions to the Fauna of Ireland.

By WM. THOMPSON, Esq. of Belfast.

MOLLUSCA.

Cylichna (Bulla) strigella, Lovén, Index Moll. Scandinaviæ, p. 10.—This species has been found at Arran, off the Galway coast, in 1848 or 1849, by Mr. Barlee. (Communicated by Mr. Jeffreys, Nov. 1849.)

Succinea oblonga, Drap.—At the beginning of May 1846, a few specimens of this shell, found along with *Balæa fragilis* under the stones of a dry wall adjoining the village of Baltimore (co. Cork), by Mr. M'Andrew, were kindly sent to me by that gentleman. Neither Mr. Alder nor myself could regard them positively as *S. oblonga*; but Professor E. Forbes and Mr. M'Andrew did so. In Feb. 1850, I was favoured by Mr. Isaac Carroll of Cork with well-marked specimens of the *S. oblonga*, Drap., which he had found within a mile of that city, where the species was first detected by Mr. Samuel Wright.

Scissurella crispata, Flem.—Two dead shells were dredged at a depth of 27 fathoms, in Belfast Bay, in Aug. 1850, by Mr. Hyndman.

Puncturella noachina, Linn. (sp.).—One dead shell was dredged with the last.

ANNELIDA.

Planaria arethusa, Dalyell, Observations on Planariæ, p. 85, f. 11-14.—Apr. 27, 1851. A Planaria, which I found attached to the under-side of a stone at Shanes Castle Park, Lough Neagh, and brought away for critical examination in a living state, appears to be of this species, to a history of which nearly thirty pages are devoted in the work quoted. My specimen when in repose is $4\frac{1}{2}$ lines long by an average of 2 lines broad; its eyes are visible without the aid of a lens. *Planaria nigra*, Müll., *P. torva*, Müll., and *P. lactea*, Müll., were attached to the same stone.

ENTOZOA.

Tetrarhynchus megacephalus was found in the abdomen of a large specimen of the Blue Shark in Dublin, by Dr. Carte, Curator to the Museum, College of Surgeons, Ireland. (Communicated by Dr. Bellingham, July 1848.)

Echinorhynchus gigas, Rudd.—Specimens supposed to have been obtained in Ireland, but respecting which there is no positive note, have been for many years in the Museum just named. (Communicated by Dr. Bellingham, July 1848.)

BOTANICAL INFORMATION.

Sale of the Extensive Herbarium and of the Books of the late George Gardner, Esq., F.R.S., Director of the Royal Botanic Gardens, Peradenia, Ceylon.

In consequence of the lamented death of Mr. Gardner, instructions have been given to the executors to sell without reserve the entire of the above-mentioned Collections of this gentleman, which have recently been received in London for that purpose.

The whole Gardnerian Herbarium, that is, the Collection arranged by himself for his own use, it is wished should be disposed of separately and by private contract; it is admirably arranged, and as fully and correctly named as probably any of the like extent, all the specimens upon the best stout white demy folio paper, measuring 16 inches long by $10\frac{1}{2}$ broad.

Every genus is included in one or more envelopes of the same paper, in folded sheets, and marked on the outside with the name of the genus, that of the natural family, and numbered according to the numbers and arrangement in Endlicher's Genera Plantarum. The specimens are invariably in excellent condition, no trace of insects having been seen in any of them, and we have reason to believe that they are all poisoned: from as accurate a calculation as has yet been made, there are about 14,000 papers containing specimens, and we think we are within bounds when we say that there are 12,000 species of Phænogamous Plants and Ferns. The Collection is, as may be anticipated, extremely rich in Brazilian and Ceylon plants, gathered mostly by himself, during $5\frac{1}{2}$ years' travels in the former country (and they are the authority for his many published species), and during his four years' sojourn in Ceylon. It further includes numerous plants prepared by himself in Mauritius, and a still more extended assortment from the Neilgherries; a rich collection of Malacca plants

from the late Mr. Griffiths; Hongkong plants from Capt. Champion; South European ones from Mr. Bentham; and others from various parts of the globe; the whole forming an extensive and well-authenticated Herbarium, such as is seldom offered for sale to the botanical world. Mr. Samuel Stevens, 24 Bloomsbury Street, London, is charged with the disposal of this, and further particulars may be obtained on inquiring of him.

The Books, almost exclusively botanical, and a few unarranged bundles of duplicate plants, will be sold by public auction, at Mr. Stevens's Room, King Street, Covent Garden, and full particulars will be announced previous to the sale.

Visit to the Cave of the Edible Bird's Nest, 1850 :—Extract from Mr. Edgar Layard's Journal.

“From Rattmaley to Hellsay is a distance of sixteen miles to the Chinaman's house, to find which we procured guides from Hellsay. The by-path turns off to the left before the traveller arrives at the village of Hellsay, and winds up the side of the hill, in which is the cavern. It is situated about 500 feet up the hill, called by the natives Diagalagoolawa or Himumoolocota (illegibly written); after scrambling over stones and fallen trees we came upon the cave, a huge mass of rock, which has slipped from its position, and rests against some boulders below its original site, forming a hollow triangle in section. The cave is about 50 feet long by 25 broad and 20 high; there are three entrances, one at each end, and a smaller one near the centre. The floor consists of large boulders, covered to the depth of 2 or 3 inches with the droppings of the birds and bits of stick and other matter brought in by them with which to fabricate their nests. I captured two young birds on the nest (*one nearly full fledged*); the parent bird escaped me in the darkness. As soon as my eyes got accustomed to the dim light, I could discover on the surface of the *fallen* rock several hundred nests, glistening like flakes of ice; from a small ledge within reach I got down several, but none of the *first* quality. My opinion is, that it was too late in the season for *good* nests; the old Chinese, with whom I conversed in September last, told me one of the '*harvests*' was in October, and this was confirmed to my satisfaction by my finding two young birds in separate nests, one of which on being handled was fledged enough to escape. The nests I gathered were evidently of an inferior quality, and had been on that account left by the Chinese for the rearing of the young birds. They were composed of dry grasses, mosses, hair of cattle, agglutinated together and fastened to the rock, and lined with the saliva of the birds. This substance appears to be laid on most irregularly and in unequal masses; in one nest now before me the foundation is in thick patches, clean and semidiaphanous; the interior is lined with thin threads of it, crossing and recrossing each other in every direction; the ends of the materials added to it are all drawn together to the two upper corners of the nest, spread out *widely* in the middle, thus forming a semicircular shallow cup. Where fastened to the flat surface of the rock, and particularly at the angles, the nest

is very strong and solid : a deserted, incomplete specimen now in my hand shows the gradual formation of this, and the successive layers round the rim of the cup, which the birds lay on in building the nest, diverging, as I before observed, to the *centre*. The depth of my nest, and most perfect specimen (that from which I took the young bird), is about $1\frac{3}{8}$ inch, or $2\frac{3}{4}$ long by 2 inches broad. I do not find any *appearance of blood* in it, as the Rev. J. Baroer (name illegibly written) remarks in J. A. S. chap. xv. page 363. On applying the nest to fire a strong smell of burnt animal matter at once shows the nature of the gummy substance or saliva.

“It would be presumptuous in me to attempt to clear up the confusion which exists as to the identification of the various species of Edible-nest-builders. No one has hitherto troubled himself to procure the different swallows of the island, or to ascertain if more species exist on it and *build*; neither have I books or specimens to refer to. My only notice is one received in a pamphlet printed for private circulation and intended to elucidate information; this it is well calculated to do, and I hope the author (Dr. Blyth) will not find his labour unproductive; to this I must therefore confine myself, and name my birds from his description, with which they agree—*Collocalia nidifica*. It would not be amiss here to give a slight description of them: they belong to the family *Cypselidæ*, genus *Collocalia* of G. R. Gray. In structure they are true *Cypselidæ*, but comparatively feeble, having the first quill shorter than the second, and the wings and tail broad. The feet and legs differ from the well-feathered claws of the true *Cypselus* (?) in being naked and the hind-toe not rotating forwards, but well-opposed, resembling in this respect those of *Acanthylis* (?). The present species is about $4\frac{1}{2}$ or $4\frac{3}{4}$ inches in length; middle tail-feathers about 2 inches, outer $\frac{3}{8}$ longer, thus forming when spread an indented tail; length of wing about $4\frac{1}{2}$ inches. The general colour is a glossy fuscous (illegible) brown, light on the body, below very pale; the bill is very short, nostrils broad and prominent, the eye large and sunken; flight rapid and sailing, soaring to immense altitudes; even while on the plateaux of the cave I could see many hundreds circling, but just within sight, looking like *mites* in the clear blue space! When in Kandy in November last, by lying on the ground and keeping my eyes long fixed on the sky, I could perceive what I now find to be this species, sailing round and round on extended wings. I shot several on the hills around Kandy, and in September I shot a specimen from a flock hunting? (illegible) low over a paddy field at Cotta, evidently in passing to their haunts, and I am able to say positively that the birds I saw in Kandy were the same birds as those at Diaggalagoolawa; from habit I can at once detect its flight from that of the little *Cypselus balasiensis*, which is a much slimmer bird, having a forked tail, which it is continually spreading and folding, and is the only swift which resembles this in size and colour. It builds in the dead (—) of palmyrah-trees a somewhat similar nest to *Col. nidifica*, but composed of soft downy substances and with less saliva. I have not yet been able to ascertain how far *Col. nidifica* extends over the island, but it certainly has not fallen under the notice of my fellow-member and ornithologist, — Brodie, Esq., of

Putlam, who, in allusion to a note of mine on this species, asks me jocosely in a letter of so late a date as December 19, 'What black swift have you invented?'

"From these circumstances I conclude *C. nidifica* to be a strictly hill species; the natives call it 'Wahælæna.' There are probably many other breeding places; the aspect of the country through which I passed is favourable to this supposition, and I saw many flocks flying round the summits of the hills. Other species may be found about the cliffs at Trincomalee; a *Fucifaga* (?) for instance, being probably an exclusively coast species: its nests are far more valuable than those of the species before us, and are worthy the attention of any gentleman residing on the eastern part of the island. I much regret I have never yet had it in my power to visit that locality."

METEOROLOGICAL OBSERVATIONS FOR APRIL 1851.

Chiswick.—April 1. Very fine. 2. Slight rain. 3. Cloudy: fine: rain. 4, 5. Fine: sharp frost at nights. 6. Cloudy: clear and frosty at night. 7. Cloudy and cold. 8. Showery. 9. Cold rain: clear and frosty. 10. Densely clouded. 11. Heavy clouds. 12. Fine: cloudy. 13. Cloudy: clear: slight frost. 14. Cold haze. 15. Uniform haze. 16. Slight haze: heavy rain. 17. Cloudy and mild: showery. 18. Cloudy. 19. Very fine. 20. Very fine: rain at night. 21. Cloudy: rain. 22. Rain. 23. Very fine. 24. Slight haze: clear. 25. Cold haze: cloudy: clear. 26. Foggy: very fine: frosty at night. 27. Cloudy and cold: clear and frosty. 28. Very fine. 29. Showery: clear and frosty.—30. Fine: showery: frosty.—Fourteen nights in this month were more or less frosty.

Mean temperature of the month 44°·56

Mean temperature of April 1850 48·41

Mean temperature of April for the last twenty-five years ... 47·43

Average amount of rain in April 1·64 inch.

Boston.—April 1. Cloudy: rain A.M. and P.M. 2. Rain: rain A.M. 3. Cloudy: rain P.M. 4, 5. Cloudy. 6, 7. Fine. 8. Fine: rain P.M. 9. Rain: rain A.M. 10. Fine: rain A.M. 11—16. Cloudy. 17. Cloudy: rain early A.M. 18. Cloudy: rain P.M. 19. Fine. 20. Fine: rain P.M. 21, 22. Cloudy. 23—25. Fine. 26. Fine: rain P.M. 27. Cloudy. 28. Fine. 29. Rain A.M. and P.M. 30. Cloudy: rain A.M.

Applegarth Manse, Dumfries-shire.—April 1. Fair but cloudy. 2. Dull and showery. 3. Fair and fine: very mild P.M. 4. Fair and fine. 5. Fair A.M.: a few drops P.M. 6. Fair and fine. 7. Fair: dull. 8. Fair: clear P.M. 9. Fair: gray: cold. 10. Frost hard: clear and fine. 11. Frost: dull: clear P.M. 12. Cold, but not frost: a few drops. 13. Frost gentle: cold P.M. 14. Frost keen: droughty. 15. No frost: cold and dry: a few drops. 16. Frost again: keen: cloudy P.M. 17. Heavy rain nearly all day. 18. Rain: very beneficial. 19. Frequent showers P.M. 20. Fair till nine P.M.: rain. 21. Fair all day, but cloudy. 22. Showers A.M. and P.M. 23. Remarkably fine day. 24. Remarkably fine day: thunder. 25. Thunder again: a few drops. 26. Slight shower of snow: rain P.M. 27. Slight shower of snow: frost A.M. 28. Frost: a few drops of rain P.M. 29. Cold: keen: frequent showers: thunder: sleet on hills. 30. Cold, but no frost: a few drops.

Mean temperature of the month 43°·7

Mean temperature of April 1850 46·3

Mean temperature of April for twenty-nine years 44·3

Average rain in April for twenty-four years 1·81 inch.

Sandwick Manse, Orkney.—April 1. Cloudy. 2. Clear: fine A.M. 3. Fine A.M. 4, 5. Fine. 6. Drops: fine: drops. 7. Fine. 8. Fine: cloudy. 9—12. Fine. 13. Drops: drizzle: showers. 14—16. Cloudy. 17. Bright: cloudy. 18. Fog: showers. 19. Bright: clear A.M. 20. Cloudy. 21. Drops: rain: clear. 22. Cloudy: showers: clear. 23. Drizzle: showers: clear. 24. Cloudy: damp. 25. Cloudy: sleet showers. 26, 27. Sleet-showers: hail-showers. 28. Sleet-showers. 29. Rain: cloudy. 30. Clear: rain.

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