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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

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

"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.

ALERE FLAMMAM.

CONTENTS OF VOL. X.

[SECOND SERIES.]

NUMBER LV.

NUMBER LVI.

NUMBER LVII.

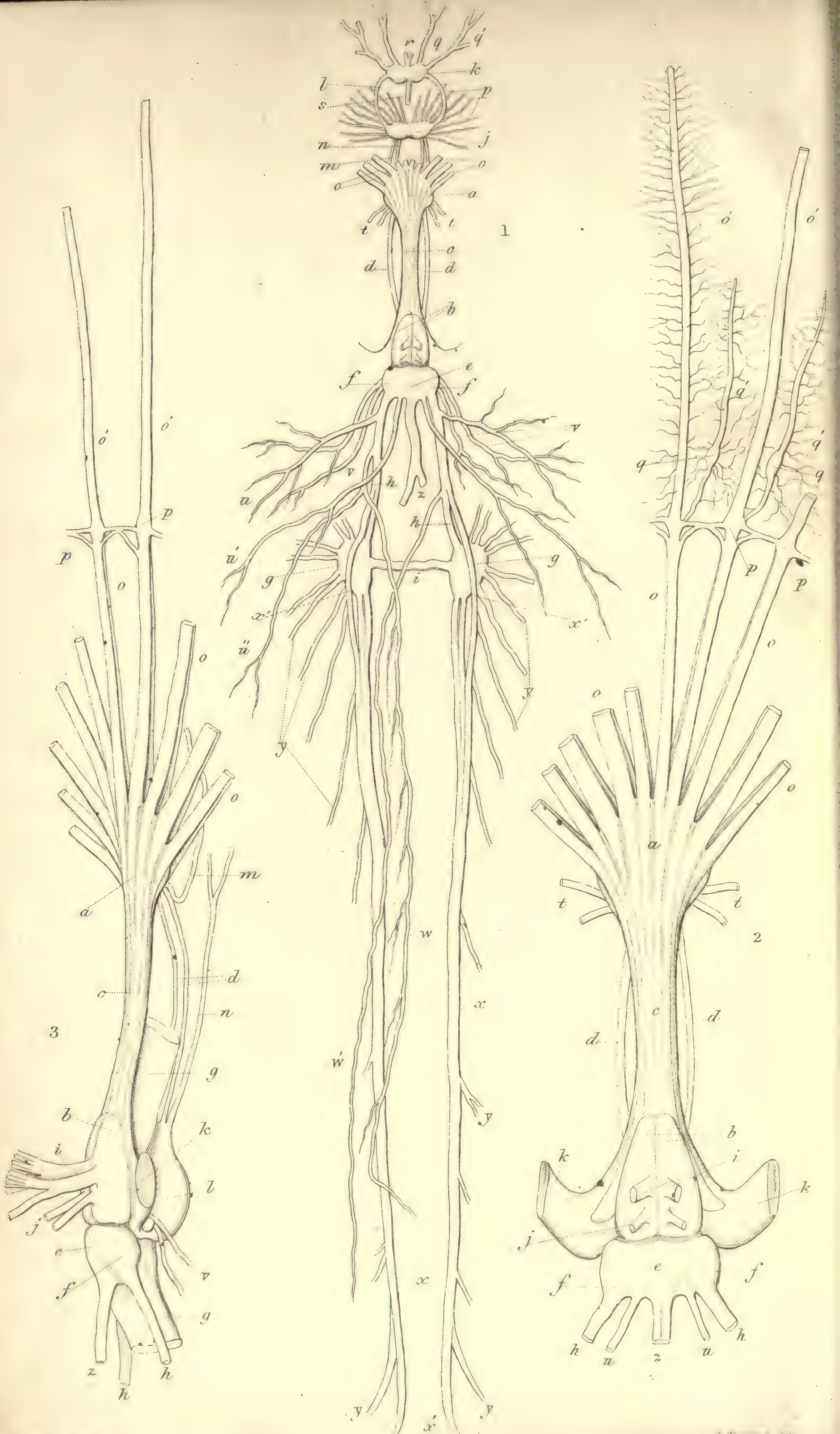
NUMBER LVIII.

NUMBER LIX.

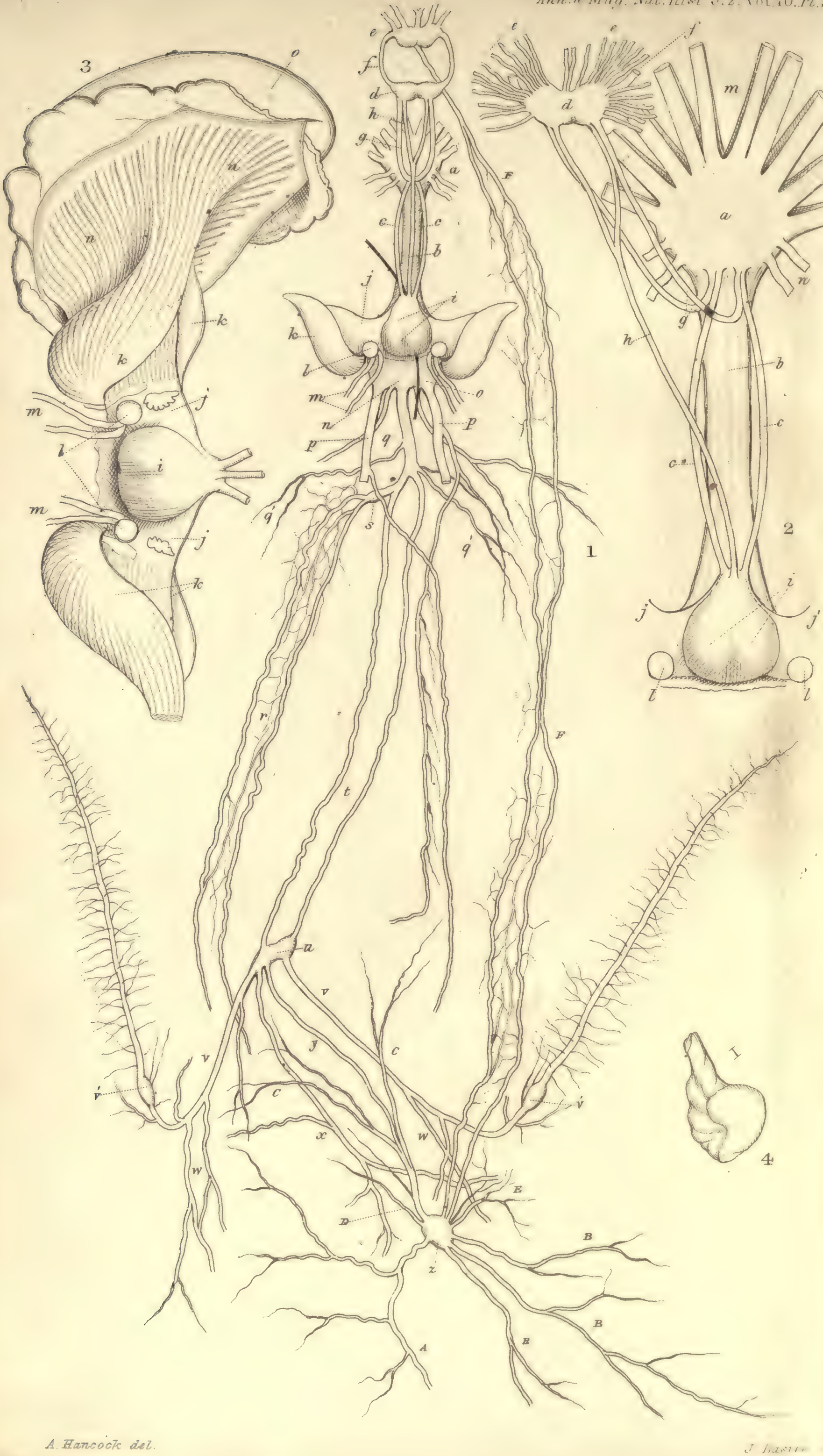
PLATES IN VOL. X.

ERRATUM.

Page 351, line 11 from top, *for* 1844 *read* 1849.



A. Hancock del. J. Basire sc.



A. Hancock del.

J. Basire

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

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

No. 55. JULY 1852.

I.—*On the Nervous System of* Ommastrephes todarus. By ALBANY HANCOCK.

[With two Plates.]

THE Cephalopods are undoubtedly the most highly organized of all the *Mollusca*; their external organs, however, are of so abnormal a character, that any attempt to trace their homologies in the lower groups of that subkingdom would at first sight appear almost hopeless. Notwithstanding, numerous efforts have been made with that view by able naturalists; but apparently without much success, for our knowledge on this subject still remains in a most unsatisfactory state.

For the purpose of elucidating this difficult problem, I have recently dissected with much care the nervous system of *Ommastrephes todarus*—the *Loligo sagittata* of English authors, and now propose to give a detailed description of it, refraining at present from any attempt to arrive at just conclusions respecting the nature and signification of the organs of these active and voracious animals*.

* Before making this attempt, it seems desirable to make a close examination of the anatomy of the neighbouring genera.

On laying open the ventral region of the head of *Ommastrephes todarus*, the subœsophageal ganglions were soon ascertained to hold their normal position. In this Cephalopod, however, they are divided into three masses, one being placed a little in advance of the other two; but all above the alimentary tube. The anterior (Pl. I. figs. 1, 2, 3 *a*) is a depressed, irregularly circular mass, giving off from the anterior border, on each side of the median line, five large nerves (*o*, *o*) to the arms, and from the posterior margin on each side two small ones (*t*, *t*), which were lost in the muscular mass in front of the eyes. A commissure (*c*) running backwards connects this with the second or median mass, and is a very thick cord composed of numerous stout filaments, most of which pass over the ventral surface of the anterior ganglion, and becoming united to the brachial nerves accompany them into the arms. Thus each arm receives a nerve from the median as well as from the anterior masses. A central filament was lost in the substance of the anterior mass.

As soon as the brachial nerves enter the root of the arms they swell out a little, each forming an indistinct oval ganglion (fig. 2, 3 *p*, *p*); these ganglions are united with each other by nervous cords, and thus a complete chain of nerves and ganglions encircles the oral channel. The brachial nerves (o', o') are continued on from the ganglions to the extremity of the arms within a central channel, giving off filaments on either side, several of which pass through the substance of the organ and go to the skin. The surface being thus copiously supplied with nerves is probably highly sensitive. Filaments are given off from the ganglionic chain at the base of the arms; these filaments pass inwards and enter the muscular bands that tie the oral lamina to the arms. This lamina arises from the wall of the oral channel, and advancing embraces the fleshy fringe which immediately surrounds the beaks; it is then turned back upon itself, and forms a broadish scalloped membrane having points or rays which are rather thick and fleshy. These rays correspond to the muscular ties; and on the nervous filaments from the ganglionic chain entering the bases of the rays, they become united to elliptical ganglions (*q*, *q*), from which the nerves (q', q') much enlarged are continued to the extreme points of the rays. These ganglions and nerves distribute numerous filaments which ramify over the oral membrane; the branches are most plentiful towards the points of the rays. This membrane, which corresponds very well with the external and internal labial processes in *Nautilus*, is probably an organ of taste, the sense being more particularly located in the points or rays; it is moreover supplied with numerous large oval follicles, mostly associated in pairs, and having one of their extremities opening by several pores on the surface; these are probably for the purpose of secreting saliva or mucus.

The median mass (Pl. I. figs. 1, 2, 3 *b*) is somewhat depressed, long, narrow, and divided by a median depression in the longitudinal direction. At the upper surface two large nerves (*i*) are given off to the funnel; these nerves spread out in the substance of that organ in a radiating manner. Immediately behind the origin of the funnel nerves the auditory nerves (*j*) come off; each of these is short and passes at once to the auditory sac, which is protected within a cavity in the cartilaginous cranium. The sac completely fills the cavity, and has the inner surface studded with a few tubercles apparently of soft pulpy matter. The minute calcareous otolithe (Pl. II. fig. 4), which also adheres to the inner surface of the sac, is depressed, rounded, and enlarged at one end, and produced into a slightly curved point at the other. The median mass gives off from the anterior margin the great commissure (*c*) that connects it to the anterior mass, and is united above to a broad nervous collar which closely embraces the œsophagus. On the opposite side of the collar, above the alimentary tube, are developed the optic ganglions (Pl. I. fig. 3 *l*, & Pl. II. figs. 1, 2, 3 *i*); they are fused into one, rounded and prominent behind, and produced into an obtuse point before; a slight depression sufficiently indicates its bilateral formation. Each half gives off from its outer margin a large, broad, depressed nerve (Pl. I. figs. 2, 3 *k*, & Pl. II. figs. 1, 2, 3 *j*), which, as it approaches the posterior wall of the eye, is surrounded by a thick fold (Pl. II. figs. 1, 2 *k*) of ganglionic matter; this fold, as well as the nerve, is striated; the former breaks up into numerous filaments (Pl. II. fig. 3 *n*, *n*), which, spreading over the back of the eye-ball, supply the *retina*. The optic ganglions are also directly connected with the median nervous mass, as can be seen by laying open the œsophageal collar, and removing the membrane or sheath. Thus we find that the anterior and median are in connexion with all the organs of the senses that have yet been clearly determined in these animals, and the curious mode in which they give off the brachial nerves would seem to prove that they form but one centre. If this be doubted, however, it is only necessary to refer to other species to show that such is really the case.

In Cuvier's memoir on the Cephalopods it is stated, and the parts are figured, that the nerves of the arms, funnel, and auditory organs are all supplied by a single pair of large ganglions, which by commissures are brought into connexion with the optic centres, evidently much in the same manner as in *Ommastrephes*. And Professor Owen has shown that in the Pearly Nautilus the arms or tentacles, and funnel, derive their nerves from a single pair of large ganglions, the anterior subœsophageal of that author; these ganglions are also in connexion with the optic centres, although they are stated to come off from the "commissure or brain": the auditory organs were not determined. It may therefore be concluded, that however divided in *Ommastrephes*, the anterior and median masses form essentially only one centre.

The position of the optic ganglions is also peculiar. In the Gasteropods, when they exist, they are usually attached to the sides of the cerebroids towards their posterior margins, and give off their nerves upwards—the eyes being invariably placed on the dorsal aspect. In the naked Cephalopods they are also inclined towards the dorsal surface, and the ganglions are directly above the alimentary tube, and they as well as the eyes are enormously developed; had these ganglions therefore retained their usual lateral position, the head must have been inconveniently enlarged. In *Nautilus*, however, the optic ganglions may be said to occupy their normal position, for they are placed at the sides of the "anterior subœsophageal ganglions," and are apparently connected with them as well as with the dorsal commissure or brain. What are here denominated optic ganglions have been called by some writers rudimentary optic lobes, by others the rudiment of a brain. It is pretty evident, however, that they are homologous with the optic ganglions of the Gasteropods, in which the nervous element of the visual organ is divided into three parts as in the Cephalopods. Thus, in *Doris* for instance, there is first a minute ganglion, generally closely attached to the cerebroid; this is succeeded by a nerve, which, on reaching the back of the eye, is in many Gasteropods, particularly in the Nucleobranchs, spread out as an accumulation of nervous matter, which, being the third portion, would appear to correspond to the enlargement of the nerve at the back part of the eye in the Cephalopods.

The anterior subœsophageal mass of *Ommastrephes* gives off from its posterior margin above two nervous cords (Pl. I. figs. 1, 3 *m*, & Pl. II. fig. 2 *g*), one on each side of the median line; these passing upwards and forwards, one on each side of the œsophagus, go to be united to the posterior margin of a pair of rather small, depressed ganglions (Pl. I. fig. 1 *j*, & Pl. II. figs. 1, 2 *d*) adhering to the outer capsule of the buccal mass, forming the buccal retractors, to which these centres send all their nerves (Pl. I. fig. 1 *p*, & Pl. II. fig. 2 *e, e*), which are numerous, and passing forward spread out in a radiating manner. These ganglions are fused into a transversely elongated mass comprising two lateral lobes, and are interconnected with another pair of similar ganglions (Pl. I. fig. 1 *k*, & Pl. II. fig. 1 *e*) lying on the buccal mass immediately below the origin of the œsophagus; the cords (Pl. I. fig. 1 *l*) which unite them pass therefore downwards inclosing that tube, and are joined to the external margins of both pairs. The under pair of buccal ganglions give to the buccal organ four pairs of nerves; the pair (*r*) next the median line go to the tongue and the fleshy laminæ on each side of it, which laminæ being in connexion with the salivary glands and themselves glandular, must be looked upon, if not entirely, at least to some extent, as auxiliary to them; the next pair (*q*) go to the muscles of the under jaw and anterior part of the buccal organ; the outer or external pair (q') supply the muscles of the upper jaw. These three pairs come off from the anterior margin; the fourth pair (*s*) pass off from behind on the median line, and are applied to the under surface of the œsophagus, and accompanying that tube backwards they form a plexus of minute twigs on it, and go to be united to a ganglion on the stomach. This pair of nerves is similar to that which in *Doris* has been considered to represent the *par vagum* of the higher animals. It appears that these four ganglions are the homologues of the buccal ganglions,—the centres which in the Gasteropods supply the tongue, the muscles of the buccal mass, and the salivary glands, and also give off the two œsophageal nerves. But here again, as with the centres which supply the brachial nerves, there are two pairs instead of one, and one of them is placed below the alimentary tube. It is pretty certain, however, that they are only the buccal ganglions, broken up, probably on account of the peculiar arrangement of the parts they supply.

In *Nautilus*, "the parts immediately surrounding the mouth, the muscles of the jaws, and the tongue," take their nerves from the broad "rounded chord or commissure" placed transversely above the œsophagus, and connected by its extremities to the optic and to the great ganglions below that tube. This commissure Professor Owen calls the brain, and considers it analogous with what we have denominated the optic ganglions in the Cuttle-fishes. It would seem, however, that as this commissure in *Nautilus* gives its nerves, four pairs, to the buccal mass and tongue, it is homologous with the four buccal ganglions of *Ommastrephes*. And thus it appears that the buccal ganglions of *Nautilus* are situated above the œsophagus. In the Gasteropods they are always below it.

In the Cephalopods the buccal ganglions are also connected to the optic. A delicate cord (Pl. II. figs. 1, 2 *h*) is given off from the anterior apex of these ganglions in *Ommastrephes*; it passes from the upper side on the median line, and is composed of two filaments which soon diverge, and passing forwards above the œsophagus go to be united to the posterior margin of the upper pair of buccal ganglions.

This connexion of the optic with the buccal ganglions has not been observed in the Gasteropods; but it is possible enough that such connexion may exist, for the commissure which unites the buccal to the cerebroid in these animals leaves the latter not far from the attachment of the optic ganglions. Yet it must be expected that in the lower mollusks some deficiencies with regard to the optic apparatus exist, when the low state of their visual power is compared with its perfection in the Cephalopods.

There is another apparent anomaly in respect to the optic ganglions of *Ommastrephes*. Other two cords or commissures would seem to be given off from the apex of these centres. These cords (Pl. I. figs. 1, 2, 3 *d, d,* & Pl. II. figs. 1, 2 *c*) issue from the sides of the apex and from the under surface; but on close examination have all the appearance of being connected to the median subœsophageal centre through the commissure which unites the latter to the optic ganglions. This, however, was not perfectly demonstrated, though there can be little doubt of the fact. These cords course forwards above the œsophagus, having the optic commissure, just described, between them, and are joined to the upper and posterior margin of the anterior subœsophageal mass close to and behind the roots of the cords which unite this centre to the buccal ganglions. Now it has already been shown that there exists a peculiar connexion between the anterior and median masses below the œsophagus; it is therefore a matter of some interest to ascertain what is the nature of this second union. That first described was effected, it will be recollected, by a cord composed of numerous stout filaments, most of which, though attached to the under surface of the anterior ganglion, did not appear to enter it, and that becoming joined to the brachial nerves from this centre entered the arms in union with them. Thus the nerves that supply these organs are derived from two sources,—have in fact two roots, arising much in the same manner as the sensitive and motor roots of the spinal nerves of the *Vertebrata*. I have observed something of the same sort in the Gasteropods; in *Thetis*, the nerves supplying the veil appear, on passing from the cerebroid ganglions, to have two roots.

The sensitive and motor influences in the *Mollusca* must be assumed to reside in all the ganglions. And here it may be asked, do we not see, in the peculiar manner with which the brachial nerves are supplied in this Cephalopod, something almost approaching to a proof of the fact that these powers have even in the *Invertebrata* their own peculiar centres? The anterior mass would appear to be the source of the motor power of the parts it supplies, while the median, being in connexion with the organs of sense, is probably more particularly the seat of sensation, and the nerves therefore it gives to the arms, sensitive. This interesting part of the subject requires further investigation; but from what has just been stated, it would seem that the ventral connexion of the two subœsophageal masses can scarcely be looked upon in the ordinary light of a commissure; and thus it would appear that the second union,—that passing above the œsophagus, and coming apparently from the apex of the optic ganglions, is the true commissure between the anterior and median subœsophageal masses.

The third or posterior subœsophageal nervous centre is broad and trilobed, and is attached to the posterior margin of the median centre, and is consequently situated close under the œsophagus. The exact mode of attachment could not be determined with sufficient accuracy; but it seems to be effected by a fusion of the lateral parts with the commissure uniting the optic to the median subœsophageal mass; and as the great collar around the œsophagus seems to be formed of three portions, there can be little doubt that the lateral parts of this ganglionic mass are also united above that tube.

This mass is represented in *Octopus* by a large flat ganglion, forming as it were the posterior portion of the mass giving off the brachial nerves; and in *Nautilus* by what has been designated the posterior subœsophageal ganglions.

In *Ommastrephes* the mass is indistinctly formed of three ganglions, the homologues of the visceral and branchial of the Gasteropods; the visceral (Pl. I. figs. 1, 2, 3 *e*) appears to be single, and is placed between the two branchial (*f*, *f*). These ganglions vary very much in form and situation in the lower mollusks, being sometimes above and sometimes below the œsophagus; but the visceral are always connected to the branchial, and the latter to the cerebroids and pedial, and it frequently happens that there is apparently only one visceral ganglion, which is placed between the branchial exactly as in *Ommastrephes*. A similar arrangement occurs in *Onchidium* and *Vaginulus*, and in these mollusks they are situated below the œsophagus. The branchial ganglions of the Gasteropods have been so named, because they are deemed homologous with those of the same name in the *Lamellibranchiata*; and because in *Doris* they send a filament to the branchio-cardiac ganglions of the sympathetic system; and moreover they furnish nerves to the mantle, which, perhaps, in all the *Mollusca* is accessory to the special breathing organs.

Each of the branchial ganglions (Pl. I. figs. 1, 2, 3 *f*, & Pl. II. fig. 1 *o*) of *Ommastrephes* gives off posteriorly a large nervous cord (Pl. I. fig. 1 *h, h*), which on its passage to what has been called the stellate ganglion distributes two or three nerves. The first (Pl. I. fig. 1 *u*) of these passes off almost immediately to the muscles of the mantle a short way behind the head; a little further down another branch (u'') is given off, which, dividing into two portions, sends one of them to the mantle—the membrane investing the viscera. The other (*w*), which is the larger, becomes attached to the anterior aorta; and after supplying this great vascular trunk with numerous twigs, follows a branch of it into the liver, where it was lost. This is the course of this nerve on the right side. A similar nerve (w'), from the cord of the left side, is also applied to the aorta; but how it terminates was not ascertained. Close to the root of the great nervous cord, on the inner side, another pair of nerves (u') leaves the branchial ganglions. These nerves go to the muscles forming the sides of the mantle in front, and to the posterior portion of the funnel. Professor Owen considers these muscles in the Cuttle-fishes to represent the shell-muscles of *Nautilus*; accordingly this nerve, and the two above described as going from the great cord to the mantle, are all that in *Ommastrephes* represent the numerous nerves given from the posterior "sub-œsophageal" (branchial) ganglions to the shell-muscles in *Nautilus*. The comparative, almost rudimentary, condition of these nerves in the naked Cephalopods is naturally accounted for by the rudimentary state of the muscles they supply. A similar reduction of the nervous element is always found when the organ is imperfectly developed, as can very easily be proved by the dissection of a few Gasteropods whose organs are of unequal development. There are, however, other two or three small nerves (Pl. I. figs. 1, 3 *v, v*, & Pl. II. figs. 1, 3 *m*) given off from either side, apparently from the upper surface of the optic nerve, close to a small, round, ganglionic enlargement (Pl. II. fig. 3 *l*), which nerves, perhaps, should be considered as belonging to the branchial ganglions; and if so, the ganglionic enlargements must be accessory branchial ganglions. These nerves go to the skin of the head above and behind. The ganglionic enlargements may, however, represent the olfactory ganglions, which, in the Gasteropods, are not uncommonly confounded with the optic nerve, as for instance in the *Bullidæ*; and if so, the olfactory organ is probably situated in the vicinity of the eye;—a conclusion not altogether improbable, for in *Nautilus* the ophthalmic tentacles have the structure of the dorsal tentacles of *Doris*, which tentacles are assuredly the seat of olfaction. I did not succeed, however, in detecting near the region of the eye of *Ommastrephes*, any organ likely to be the seat of this sense.

The great visceral nerves (Pl. I. figs. 1, 2, 3 *z*), combined as one trunk, come off from the posterior margin of the visceral ganglion, forming the central lobe in the posterior mass. But it is better to defer the description of these visceral nerves until we come to speak of them under the head of Splanchnic system. We will therefore without further interruption examine the only remaining pair of cephalic ganglions. These are the stellate ganglions (Pl. I. fig. 1 *g*, *g*) of authors; they are large, depressed and irregularly ovate, and rest upon the great muscular envelope—the sleeve, one a little on each side of the median line, not far from the anterior border, and having the cyst containing the pen between them. These ganglions are connected to the branchial by a stout commissure (*h*, *h*) which comes off from these latter, as before stated, in connexion with two or three nerves, which we have seen distribute most of their filaments to the mantle. This commissure is united to the anterior margin of the stellate ganglions, and they communicate with each other across the median line by a stout nervous cord (*i*), which passing from their inner margins goes through the wall of the cyst inclosing the pen; at this part the wall of the cyst is thick and fleshy. This latter cord or commissure, which appears hitherto to have escaped detection, is of course above the œsophagus. Were therefore the stellate ganglions only accessory branchial, they would have no connecting commissure above that tube. These ganglions distribute to the sleeve numerous nerves (*y*, *y*, *y*, *y*) which pass off from their outer margin in a radiating manner. The fins are supplied from a different source. Just before the great branchial cord reaches the stellate ganglion it gives off a stout nerve (x' x') which passes freely under that centre, and becomes united to the great posterior sleeve nerves (*x*, *x*); as they pass backwards together these latter distribute their filaments to the sleeve, and on arriving at the commencement of the fin, the large nerve from the branchial cord dips through the muscles and reaches the substance of that organ; it then divides at once into numerous branches, which diverging go to all parts of this powerful propelling instrument.

The fin is then supplied with nerves, not from the stellate ganglions, but apparently from the branchial. From this fact, it would seem that the fin is not a mere development of the sleeve, but must represent some other organ. What this is it is difficult to say.

As the fin nerves pass backwards in connexion with those of the posterior portion of the sleeve, they have, on account of their central position, their parallelism and approximation, somewhat the appearance of a rudimentary spinal cord, as has been before remarked. But certainly they resemble nothing so much as the posterior trunks of the pedial nerves of some of the Gasteropods, —of *Vaginulus* in particular. In that species the great pedial nerves pass along the median line closely approximated, and associated with the visceral and some of the branchial nerves. This cord, so to speak, gives off filaments on either side as it passes backwards, and might very aptly be compared to a spinal cord were its true nature not fully understood. The anterior pedial nerves of this animal come off from their ganglions in a similar radiating manner to those of the stellate ganglions of the naked Cephalopods.

Having now gone over the cephalic ganglions of *Ommastrephes*, we have next to examine the splanchnic system, and this will be found to agree in all essential features with the same portion of the nervous system in the Gasteropods. The great visceral nerves (Pl. II. fig. 1 q) are two in number; these, as before stated, come from the visceral ganglion situated between the branchial. At first these nerves form but one trunk, which is however distinctly composed of two filaments; they soon divide and resolve themselves into four branches; but previously give off two minute twigs (q', q'), one on each side, which go to the mantle. Two (t) of the four branches becoming attached to the wall of the anterior vena cava, pass down that vessel as far as the pericardium, where they unite to form a large, depressed, irregularly quadrilateral ganglion (u) which gives off four branches. The two larger (v, v) of these diverging enter the root of the gills, and after giving a branch to the branchial vein swell out to form, on the wall of each branchial artery, an oval ganglion (v', v'), from which a stout nerve passes up the organ, supplying it with a plexus of filaments as it goes. These two branches from the ganglion on the vena cava give off in their course each a nerve or two (w, w) which go to the generative organs. One (x) of the other two branches from this ganglion accompanies the vena cava into the pericardium, and passing along with that vessel sends branches to the two branchial hearts, to the systemic heart, and to the posterior aorta.

The other pair (r) of visceral nerves from the great trunk come off from one of the branches given to the vena cava as a single stem, which almost immediately forming a small ganglionic swelling (s), divides into two branches. These are not so large as those applied to the vena cava; they become at once adherent to the intestine, and tube of the ink-bag, and supply to the walls of these organs a minute nervous plexus most developed towards the orifices of the tubes. These two nerves were traced as far downwards as the ink-bag, where they were lost in the investing membrane. These four branches of the visceral nerves, the ganglion on the vena cava, and the gastric ganglion to be shortly described, have usually been considered as all that represent in the Cephalopods the *par vagum* and sympathetic system of the higher animals. This, however, is not correct. It has been already stated that the buccal ganglions give off a pair of œsophageal nerves, which passing down that tube give to it a plexus of nervous filaments. These two nerves (Pl. II. fig. 1 F, F) leave the ganglions as one trunk passing from the median line, and are at first applied to the under wall of the tube; they soon, however, divide and approach the sides, and in their course appear to turn completely round the œsophagus. On attaining its lower extremity they go to be united to a considerable elliptical ganglion (*z*), situated on the first stomach or gizzard close to the cardia. From this gastric centre various nerves ramify. Two or three small twigs (E) are given off close to the œsophageal nerves, and are applied to the cardiac portion of the gizzard. From the opposite side of the ganglion a stout nerve (A) goes to the spiral stomach, and two or three large nerves issue from the ends of this centre; those (B, B, B) from one of the extremities, three in number, go to the gizzard; those from the other originate as one trunk, but soon separate into three branches; two of these (C, C) supply the pancreatic organ, and one (*y*) is continued on to be joined to the ganglion on the vena cava, forming the fourth cord issuing from that centre. A small twig (D) also springs from this end and supplies the pylorus.

We see then that the nerves applied to the anterior aorta, and those from the visceral ganglion, and their dependencies, represent only the splanchnic or sympathetic system of the higher animals; while in the œsophageal nerves are found the analogues of the gastric portion of the par vagum. And it is interesting to observe that these two parts of the nervous system—one originating in the visceral, the other in the buccal ganglions, exactly as in *Doris*,—are interconnected by a nervous filament in the same way as they are in that mollusk. The single gastric ganglion in *Ommastrephes* represents the principal centre of the collar of ganglions about the cardiac extremity of the stomach in *Doris*, and the ganglion situated on the vena cava, and those attached to the gills, are the equivalents of the branchio-cardiac and genital centres of that animal. It is therefore evident that this division of the nervous system of the Cephalopod is formed on the type of that of the Gasteropod; the only difference being that the ganglions are much less numerous than in *Doris*. In other Gasteropods, however, these centres are frequently very limited in number.

The cephalic portion, though exhibiting several deviations, is also in general character molluscan. The Cephalopods, however aberrant in external appearance, would therefore seem to be true mollusks.

On taking a glance at the vascular system, the same conclusion is inevitable. Milne-Edwards states, in his article on the circulation of the "Poulpe," that the arterial system of the Cephalopods is fundamentally the same as in the Gasteropodous and Acephalous mollusks; and the heart itself, though considerably modified, he assimilates to that of the *Acephala*. It is truly systemic, having superadded, to meet the changed and active habits of these creatures, additional propelling organs appended to the gills*. In *Nautilus* these latter are deficient, the central apparatus being reduced to a true molluscan ventricle. There is no true pericardium, and the great chamber in which the blood-propelling organs are placed appears to represent the renal cavity in *Doris*; but whether truly so or not, it is probably of the same functional purport. The glandular nature of the walls of the great venous trunks congregated in that chamber cannot fail to suggest the idea that it is designed for the reception of some copious outpouring from the blood; and as it opens externally by two minute orifices at the roots of the gills, its similarity to the renal organ in *Doris* is almost complete. The portal heart, which in that mollusk is connected with this organ, is indeed at present not determined, though it is very likely that the two "fleshy organs" appended to the branchial hearts will prove to be ventricles for propelling venous blood into the liver. These fleshy organs in *Ommastrephes* were examined and found to be hollow, muscular and heart-like, communicating through their pedicle with the branchial hearts, and having the orifice guarded by a valvular constriction. The free side is perforated in the centre, the lips of the orifice being jagged as if torn from a vascular attachment. There can be little doubt that these are organs for propelling blood, and that too in a venous state, and to determine this fact, all that is wanting is a favourable opportunity; but it unfortunately happens that the region of the heart is most liable to laceration; the specimens examined in this instance were ruptured in that locality by rough handling when captured.

Thus we see that the vascular system of the Cephalopods is likewise formed on the molluscan type, and the digestive system

* These are not the only additional blood-propelling organs in *Ommastrephes*. The posterior aorta previous to sinking into the fin is divided into two branches, which, as they penetrate the fleshy substance, are each dilated into a small but well-defined ventricle; these ventricles will undoubtedly throw the blood with increased force into this powerful muscular organ.

leads to the same conclusion. We shall not, however, on this occasion endeavour to trace out the homologies which we believe to exist between the organs of the Cephalopods on the one hand, and the organs of the rest of the Mollusca on the other. To this important and highly interesting subject we hope to return, when a more extended knowledge of the anatomy and physiology of these highly organized animals shall have enabled us to speak with sufficient confidence.

EXPLANATION OF PLATES I. II.

Plate I.

Fig. 1. Ventral view of the cephalic ganglions and nerves of *O. todarus* :—*a*, anterior subœsophageal mass; *b*, median ditto; *c*, their under commissure; *d*, upper ditto; *e*, visceral ganglion; *f, f*, branchial ditto; *g, g*, stellate ditto; *h*, cords or commissures uniting same to branchial ganglions; *i*, transverse commissure of stellate ganglions; *j*, upper buccal ganglions; *k*, lower ditto; *l*, commissure uniting the two pairs of buccal ganglions; *m*, commissure uniting upper buccal ganglions to anterior subœsophageal mass; *n*, commissure between the same buccal ganglions and optic ganglions; *o, o*, brachial nerves; *p*, nerves to muscles of outer buccal capsule; *q*, q', nerves to muscles of buccal mass and jaws; *r*, lingual nerves; *s*, œsophageal nerves or par vagum; *t, t*, two pairs of small nerves lost in muscles in front of the eyes; *u*, u', u'', nerves to the mantle and its muscles; *v, v*, two pairs of nerves to skin of head above and behind; *w*, w', nerves applied to the anterior aorta; *x, x*, great posterior sleeve nerves; x', x', nerves to fin; *y, y*, sleeve nerves; *z*, visceral nerves.

Fig. 2. Enlarged view of anterior and median subœsophageal, visceral, and branchial ganglions:—*a*, anterior mass; *b*, median ditto; *c*, under commissure of same; *d, d*, upper ditto; *e*, visceral ganglion; *f,f*, branchial ditto; *h, h*, commissure uniting branchial and stellate ganglions; *i*, nerves supplying funnel; *j*, auditory nerves; *k, k*, optic ditto; *o, o*, o', o', brachial ditto; *p, p*, ganglionic swellings of same; q', q', nerves to oral lamina, exhibiting ganglionic swellings *q, q*; *t, t*, two pairs of nerves to muscles in front of eyes; *u, u*, nerves to mantle; *z*, ditto visceral.

Fig. 3. Side view of anterior and median subœsophageal, optic, branchial and visceral ganglions:—*a*, anterior mass; *b*, median ditto; *c*, under commissure of same; *d*, upper ditto; *e*, visceral ganglion; *f*, branchial ditto; *g, g*, œsophagus; *h, h*, commissures uniting stellate and branchial ganglions; *i*, nerves to the funnel; *j*, auditory nerves; *k*, optic ditto; *l*, optic ganglions; *m*, commissure between upper buccal ganglions and anterior subœsophageal; *n*, ditto uniting optic and upper buccal ganglions; *o, o*, o', o', brachial nerves; *p, p*, ganglionic swellings of same; *v*, two pairs of small nerves to skin of head above and behind.

Plate II.

Fig. 1. View of splanchnic nervous system seen from above:—*a*, anterior snbœsophageal mass; *b*, under commissure uniting same to median subœsophageal; *c, c*, upper commissure of same; *d*, upper buccal ganglions; *e*, under ditto; *f*, commissure uniting the two pairs of buccal ganglions; *g*, ditto uniting upper buccal ganglions to anterior subœsophageal; *h*, ditto uniting upper buccal ganglions to optic ditto; *i*, optic ganglions; *j*, optic nerves; *k*, enlargement of same at back of eye; *l*, small round ganglion attached to optic nerve; *m*, two pairs of nerves from same; *n*, visceral ganglion; *o*, branchial ditto; *p*, *p*, cords or commissures from same to stellate ganglions; *q*, visceral nerves; *q'*, *q'*, nerves to the mantle; *r*, pair of visceral nerves applied to intestine, and tube of ink-bag; *s*, small ganglion at origin of this pair of nerves; *t*, another pair of visceral nerves supplying the anterior vena cava; *u*, ganglion on the wall of vena cava; *v*, *v*, branchial nerves, each exhibiting a ganglionic swelling *v'*; *w*, *w*, genital nerves; *x*, nerve supplying systemic and branchial hearts and posterior aorta; *y*, cord or commissure uniting gastric ganglion to that on vena cava; *z*, gastric ganglion; A, nerve to spiral stomach; B, B, B, nerves to gizzard; C, C, ditto to pancreatic organ; D, ditto to pylorus; E, ditto to cardia; F, F, œsophageal nerves or par vagum.

Fig. 2. Under view of anterior subœsophageal and optic ganglions:—*a*, anterior mass; *b*, under commissure connecting same to median; *c*, *c*, upper ditto; *d*, upper buccal ganglions; *e*, *e*, nerves supplying the outer buccal capsule; *f*, commissure between same and lower buccal ganglions; *g*, commissure from upper buccal ganglions to anterior subœsophageal mass; *h*, ditto from optic to upper buccal ganglions; *i*, optic ganglions; *j*, *j*, optic nerves; *l*, *l*, small round ganglions on same; *m*, *m*, brachial nerves; *n*, two pairs of nerves to muscles in front of eyes.

Fig. 3. Upper view of optic ganglions:—*i*, optic ganglions; *j*, *j*, optic nerves; *k*, *k*, enlargement of same at back of eye; *l*, small round ganglions on optic nerves; *m*, *m*, nerves from same to skin of head above and behind; *n*, *n*, filaments from optic nerve applied to back of eye; *o*, eye.

Fig. 4. Otolithe from auditory sac.

II.—*A few Notes on the Structure of the Belemnite.* By Gideon Algernon Mantell, Esq., LL.D., F.R.S., President of the West London Medical Society, &c.

To the Editors of the Annals of Natural History.

"Dr. Mantell, who has adopted Mr. Channing Pearce's generic name of *Belemnoteuthis* for some of these fossils (*Belemnites*), seems to be disposed to detract from the merit of their anatomical restoration, for which the Royal Society awarded the Royal Medal to Professor Owen in 1848, affirming that the true characters of the animal of the Belemnite have yet to be discovered. But he forgets that a change of name does not change the essence of a thing, and that the essential character of a Belemnite is the *phragmocone*."—From the Article entitled "Progress of Comparative Anatomy," Quarterly Review, March 1852, p. 383.

Gentlemen,

The personal imputation, the mystification of the point at issue, and the misstatement respecting the late Mr. Channing Pearce, in the above extract from the extraordinary article misnamed "The Progress of Comparative Anatomy," would not have provoked one line from my pen, but for the assertion that "the essential character of a Belemnite is the phragmocone." As the advancement of our knowledge of the organization of the extinct forms of Cephalopods would be seriously impeded were a statement so erroneous, and emanating from such high authority, to remain uncontradicted, I beg the favour of being permitted to lay before your readers a concise illustration of such parts of the structure of those two distinct types of the highest order of Mollusca—the Belemnite and *Belemnoteuthis*—which were blended together to form the supposed animal of the Belemnite in the memoir above referred to.

The accompanying sketches represent certain fossils from the Oxford clay of Wiltshire, in which the distinctive characters of the two genera are clearly exemplified: the original specimens were examined by many of the eminent foreign naturalists who were attracted to London last summer by the Great Exhibition, and not one of those competent observers dissented from the opinions expressed in my communications on this subject to the Royal Society, and published in the 'Philos. Trans.' for 1848 and 1850; my statement being merely confirmatory of the original views enunciated by Messrs. Pearce, Cunnington, Charlesworth, &c.

I am most anxious, as I have ever been, to abstain from any comments that may lead to controversy, and I therefore restrict myself to a simple description of the specimens, of which figs. 1 and 3 are representations on a reduced scale: the originals in my possession may be seen by any naturalist interested in the inquiry: those in the British Museum are now admirably arranged by the able curator Mr. Woodward*. It is however necessary to state most emphatically, that the essential character of a Belemnite consists, not, as the reviewer affirms, in the possession of a "phragmocone" or conical chambered siphunculated shell, which is common to numerous genera of Cephalopods, but of an osselet of a peculiar form and structure which invested the phragmocone, and extended distally beyond the chambered shell in a solid rostrum or guard. It is this mineralized rostrum which was called *Belemnite,* thunderbolt, or dart-stone, by the early naturalists.

* See my 'Hand-book to the Gallery of Organic Remains in the British Museum.' The characters of the fossil Cephalopods are succinctly and clearly pointed out in Mr. Woodward's excellent 'Manual of the Mollusca.'

The Belemnite.—In the specimen represented (fig. 1), and in the diagram fig. 2, all the known parts of the structure of the Belemnite are displayed: but slight traces of any portion of the organization of the original are preserved, except the sepiostaire, which comprises an external horny capsule, a calcareous osselet of a fibrous structure, and an internal chambered conical shell, termed the phragmocone.

1. *The Phragmocone* (fig. 1 *b*, fig. 2 *d*) occupies the centre of the Belemnite: this is an inversely conical-chambered shell, composed of a series of shallow concave cells of a nacreous substance, traversed by a siphunculus or tube (fig. 2 *c*), which is situated on the ventral region of the cone. The phragmocone terminates distally in an elongated apex, and enlarges towards its basilar part, and two elongated flat processes extend from the dorsal margin of the peristome or upper margin, as shown in figs. 1 & 2 *a, a*: this structure was first detected in a specimen discovered by my son near Trowbridge.

The shape of the phragmocone, as it appears when exposed by the removal of the part next to be described, is seen in fig. 2 *d*: the transverse lines indicate the septa of the cells or chambers; the siphunculus which traverses them is shown at *c*.

Fig. 1.

Belemnites Puzosianus
(¼ natural size, linear).

a, a, the two basilar processes of the phragmocone; *b*, the phragmocone, much fractured and collapsed; *c*, the rostrum or guard of the osselet, containing within the upper part the distal portion of the phragmocone, as seen in fig. 2.

2. *The Osselet* (fig. 1 *c*, fig. 2 *h, i*).—This body is in the form of a very elongated inverted cone, and surrounds the phragmocone throughout its entire length, as shown in section in fig. 2: the basilar or upper part is extremely thin, and blends with the outer integument or capsule (fig. 2 *b, b*): it rapidly increases in thickness as it descends, and closely invests the phragmocone, the delicate elongated apex of which is completely protected by it (fig. 2 *f, g*): beneath this point it becomes solid, and in most

species is prolonged into a cylindrical rostrum or beak, which terminates in a conical apex.

Fig. 2.

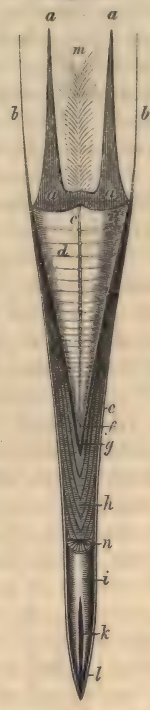


Diagram of the known parts of the structure of *Belemnites Puzosianus.*

a, a, the dorsal basilar processes of the phragmocone.

b, b, upward extension of the attenuated osselet.

c, siphunculus.

d, phragmocone: the transverse lines indicate the septa.

e, the capsule or outer investment of the guard.

f, the distal part of the phragmocone.

g, the alveolus or cavity in the guard.

h, vertical section of the guard.

i, the solid part of the rostrum.

k, a sulcus or groove on the ventral aspect of the guard.

l, shows the continuation of the capsule, in section, continued from *e.*

m, diverging parallel striæ observable between the dorsal processes of the phragmocone.

n, transverse section of half the diameter of the rostrum, to show its radiated structure.

As the solid part of the osselet is generally separated from the upper portion a short space above the apex of the phragmocone, in consequence of the thinness of its walls, the Belemnite is commonly found with a conical cavity in the upper part: this hollow was termed the alveolus, and the solid part the rostrum or guard; and until shown by the specimen figured in my first memoir on the Belemnites, no one suspected that the osselet was continued upwards, and formed a thin envelope around the basilar termination of the phragmocone*.

The osselet of the Belemnite, as is well known, has a radiated structure: it is formed of thin concentric laminæ of very minute prismatic trihedral fibres, which are arranged at right angles to the planes of the successive layers:—see the sections, both longitudinal and transverse, in fig. 2. The solid part, or rostrum, is

* The depression observable in the specimen fig. 1, midway between the letters *b* and *c*, indicates the fracture of the walls of the osselet, and the point where the Belemnite is usually separated from the other parts. It was by removing large blocks of clay, with the imbedded Belemnites undisturbed, that the instructive examples here figured were obtained.

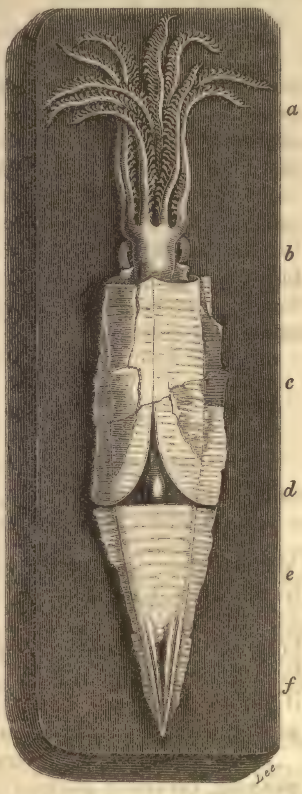
very thick and heavy, and invariably mineralized by calc spar: the original structure was probably light and calcareous, like that of the osselet of the *Sepia*.

3. *The Capsule*, or sheath; a thin horny or testaceous case which invested the osselet, and constituted the external envelope of the receptacle; it is seen partially covering the osselet at *c*, fig. 1, and in section at *e*, *l*, fig. 2. This structure was for the first time demonstrated in my memoir, 'Phil. Trans.' 1848.

With the exception of obscure indications of a carbonaceous fibrous structure between the dorsal processes, the above description comprehends all the facts relating to the organization of the Belemnite with which we are at present acquainted: no soft parts, no traces of arms or tentacles, no vestiges of the eyes or mandibles, have been discovered.

The Belemnoteuthis.—From the extraordinarily perfect state in which some examples of the *Belemnoteuthis* are met with, a brief description will suffice. Fig. 3 (from a drawing with which Mr. Woodward of the British Museum has favoured me) exemplifies the essential parts of the structure of these Cephalopods. The body is of an elongated form, with a pair of lateral fins, two large sessile eyes, eight uncinated arms, and a pair of armed tentacles; each arm was furnished with from twenty to forty pairs of hooks, placed alternately (fig. 4, 4). Like the *Sepia* it had a pigmental sac or ink-bag, which is generally filled with the inspissated secretion. The inferior part of the body is of a conical form, and contains a brown horny osselet, with a siphunculated phragmocone, which terminates in a rostrum of a fibrous structure (fig. 4, 5). The osselet of the

Fig. 3.



Belemnoteuthis antiquus
(½ natural size, linear).

a, the uncinated arms and tentacles; *b*, remains of the head and eyes; *c*, the mantle, with indications of fins; *d*, the pigmental sac or ink-bag; *e*, the osselet: the transverse lines indicate the septa of the phragmocone, which is covered by a horny sheath or capsule; *f*, the solid terminal apex of the osselet.

Belemnoteuthis appears to have been calcareous, like that of the *Sepia*. In all essential points of structure the *Belemnoteuthis* is

Fig. 4.

1, 3. Detached hooks (*natural size*).
2. Three hooks with attached horny rings: from a specimen in the possession of Mr. Cunnington.
4. Part of one of the arms, showing four hooked spines.
5. Transverse section of the distal part of the osselet of *Belemnoteuthis*, exposing the apex of the chambered shell in the centre, surrounded by the radiated osselet, *a*: (*magnified four diameters*).

Horny rings and hooks of *Belemnoteuthis antiquus.*

related to the Calamaries, but the lateral position of the fins, the presence of a chambered shell or phragmocone, and the peculiar character of the tentacles, establish it as a peculiar type. The distinction between the *Belemnites* and *Belemnoteuthis* is too obvious to demand further notice; no one, I presume, will again mistake an osselet of the latter for the phragmocone of the former detached from the alveolus of its guard: and I would fain hope that this attempt to elucidate an important palæontological question, will not again subject me to the imputation of unamiable motives.

I have the honour to be, Gentlemen, your faithful servant,

Chester Square, Pimlico, June 1852. — Gideon Algernon Mantell.

III.—*On a supposed new species of* Eleocharis. By Charles C. Babington, M.A., F.R.S. &c.*

My attention has been recently directed by Mr. H. C. Watson to the British species of *Eleocharis*, and, having been led to concur with him in the idea that there is an undescribed plant belonging to that genus which inhabits the western coast of Scotland, I purpose pointing out in this paper the respects in which it differs from our known species included in the genus, and adding a few remarks upon them.

In the autumn of the year 1844, I had the pleasure of accompanying Professor Balfour of Edinburgh in a tour through the district of Cantyre in Argyleshire. At Tayanloan, on the western coast of that peninsula, he gathered two or three specimens of the plant upon which this paper is founded, but did not observe its difference from *Scirpus pauciflorus*, in company with which it

* Read before the Botanical Society of Edinburgh, June 10, 1852.

was growing, owing to the similarity of their outward appearance. Doubtless plenty of it might have been obtained if it had been looked for.

To Mr. Watson we are indebted for the knowledge of this new species, as he received two small specimens from Dr. Balfour, and forwarded the fruit of one of them to me, with a request that I would endeavour to ascertain its identity with any known species. Through the liberality of Dr. Balfour I have had an opportunity of examining all the plants belonging to this group which are contained in his herbarium, but have only succeeded in finding one additional specimen of the Tayanloan plant; for the permission to retain a portion of it I am much indebted to him.

The similarity in outward appearance of the species included in the groups named *Eleocharis* and *Bæothryon* renders it necessary to pay close attention to the structure and form of their several parts: thus the form of the mouth of the sheaths which surround the base of the stem, the form of the nut, that of the base of the style and of the outer glume, and the length of the hypogynous bristles, have been carefully examined, and found to afford distinctive characters when the more conspicuous organs do not present any describable or constant differences.

I propose the following as a provisional name and character for the plant, as I have totally failed in finding any described species to which it can be referred. The name is given in commemoration of the gentleman to whose acuteness of observation we owe its discovery, and who deserves so well of botanists from his researches concerning the geographical distribution of plants.

Eleocharis Watsoni; spicis terminalibus solitariis oblongis, glumis acutis (?) infima obtusiuscula basin spicæ circumcingente, stylo bifido, *achenio* utrinque convexo *oblongo* obtusissimo basi paululum attenuato angulis rotundatis tenuissime *punctato-striato*, basi styli persistente late depresso, *setis hypogynis* 4–6 *achenio brevioribus*, culmis basi vaginatis, vagina abrupte truncata.

Radix ignota. Squamæ radicales latæ, obtusæ, rubescentes. Culmi 3–4 unciales, tenuissime striati, erecti, nudi, tenues, basi vagina viridi inferne rufescente superne fusco-marginata circumdati. Setæ hypogynæ breves, retrorsum hispidæ, achenio dimidio breviores.

Hab. in palustribus maritimis prope "Tayanloan" in com. "Argyle" Scotiæ.

It might be allowable to stop here, but I think it desirable to add a few remarks concerning the differences between this and the allied plants.

1. The lowest glume is larger than the others, and surrounds the base of the spike in *E. uniglumis, E. Watsoni* and *E. multicaulis,* but does not do so, and is not larger than the others in *E. palustris.*

2. The stigmas are two in all except *E. multicaulis,* which possesses three. They have not been seen in *E. Watsoni,* but the lenticular nut renders it nearly certain that they are two in number.

3. The nut is more or less compressed, but variable in shape, in all except *E. multicaulis,* in which it is acutely triangular and topshaped. In *E. palustris* it is roundish, with or without a slight narrowing or stalklike point at the base. In *E. uniglumis* it is pearshaped. In *E. Watsoni* it is oblong, but a little narrowed at the base. In all of them it is smooth, with the exception of *E. Watsoni,* where its surface is closely punctate-striate throughout.

4. The nut is shorter than the hypogynous bristles in *E. palustris* and *E. uniglumis*; equals them in *E. multicaulis*; and exceeds them in *E. Watsoni.*

5. The sheath surrounding the base of the stem is transversely truncate, but having a very obtuse point on one side in all except *E. multicaulis,* where the point is acute.

It is thus seen that there are very considerable differences between the several plants under consideration, and it is with them alone that *E. Watsoni* is likely to be confounded, since its generic character separates it from the group *Bæothryon.* The other European species of *Eleocharis* are *E. ovata* and *E. atropurpurea,* which form the genus *Eleogenus* of Esenbeck, where the glumes are all equally large and more densely imbricated than in the typical group of species; and *E. carniolica* and *E. acicularis* (to which our plant shows some resemblance in its short bristles), which constitute the genus *Scirpidium* of Esenbeck, where the bristles are deciduous, not persistent, as in *E. Watsoni.* The *Scirpidia* also are trigynous, and their nuts are obovate, much narrowed below and trigonous; *E. acicularis* has a ribbed and transversely striated nut, and *E. carniolica,* which closely resembles it in appearance, has short subulate leaves terminating the sheaths.

It does not seem desirable to extend this paper by discussing the distinctions between *E. Watsoni* and the North American species of *Eleocharis*; let it suffice to state that every endeavour has been made to ascertain if our plant could be identified with any of them, but that none such has been found.

It is earnestly hoped that Scottish botanists will not long allow this curious plant to continue in the dubious position of a species, founded upon so small a number of specimens as hardly to justify its separation from its allies; indeed, could it with any probability have been considered as a state of any one of them, this dissertation would not have been written.

IV.—*On some of the rarer British Gasteropodous Mollusca.* By William Clark, Esq.

To the Editors of the Annals of Natural History.

Gentlemen, Exmouth, Devon, June 1852.

I beg the favour of you to record the discovery of some of the rarer British Gasteropodan Mollusca, which have hitherto either escaped the researches of naturalists, or been mentioned so imperfectly as to afford little assistance to science. During the present May and June I have met with the animals of the *Chemnitzia fenestrata, Ch. scalaris, Ch. clathrata, Ch. acicula*; and seen many specimens of the *Ch. elegantissima* and *Ch. pusilla,* mentioned in the 8th vol. of the 'Annals,' N. S. p. 112, which confirm the distinctness of the two, agreeably to M. Philippi. I have likewise reviewed all the *Chemnitziæ* of my two memoirs in the 'Annals,' N. S. vol. vi. p. 451, and vol. viii. p. 108, and examined others of the animals of this genus, which with me includes the *Odostomiæ* and *Eulimellæ* of authors, and I can confidently state that they do not offer the slightest generic variation; indeed some of them scarcely present, from their similitude, sufficient specific characters.

I cannot doubt but the genus *Chemnitzia* will ultimately comprise these species and some of those of *Aclis*. I consider the Chemnitzian family one of the most interesting and classic of our indigena; nature has stamped it with unmistakeable distinction. I think that a disseverance of its integrity by the distribution of any of its species in other genera, can only be looked on as a disruption of natural affinities.

With regard to the *Rissoæ,* I have examined the animal of *R. proxima,* which has long been a desideratum, to settle the doubts respecting it and Montagu's *R. vitrea*; and also the *R. punctura* and *R. reticulata* of that author: this last discovery solves another difficulty. The *R. striata, R. semistriata, R. costata* and *R. soluta* have also been observed. On my return to Bath, I will arrange the minutes of all that are now mentioned. As these animals have long been sought for, I regret that I cannot at once send the descriptive notes; but I am so immersed in the examination and acquirement of these difficult minute objects, that I am obliged to solicit this postponement; and I hope in the interim still further to diminish the number of our rarer desiderata.

I am, Gentlemen, your most obedient servant,
William Clark.

P.S. I may mention that I have taken here a second example of the *Megathyris cistellula,* and that Mr. Barlee has met with several. I have also dredged at the same haul, in the laminarian zone, *live Lucina borealis* and *L. flexuosa,* and examined both.

June 22, 1852.

I have just captured an example of the species known as the *Lepton convexum,* which will solve the problem of its distinctness or otherwise from the *Lepton nitidum,* concerning the animal of which I have full notes. Whilst I write, I examine my prize, which is very vivacious, free from rusticity, and I feel confident will afford to science the information which has been so long a great desideratum. In the same glass I have a live example of the rare *Chemnitzia obliqua* or *C. decorata,* I cannot yet say which (if they are distinct), for fear of disturbing the animal, which is a splendid, unrecorded creature, displaying specific characters of more than usual beauty and interest. I will prepare without delay an account of my captures.—W. C.

V.—*On the Skeleton of the Great Chimpanzee,* Troglodytes gorilla. By S. Kneeland, Jun., M.D., Boston, U.S.A.

The Boston Society of Natural History has recently received a valuable addition to its cabinet in a nearly complete skeleton of the *Troglodytes gorilla* from Western tropical Africa. It consists of a fine skull, with lower jaw and teeth complete; all the vertebræ except the atlas; the pelvis complete; both scapulæ and clavicles; the humerus, radius, and ulna of left side, the ulna of right side with humerus and radius broken; the right femur, tibia and astragalus, the head and upper part of left femur; all the ribs, except two on the left side; the upper part of the sternum; and a few bones of the hand and foot.

The skull is of great size and strength; the internal capacity is only 27 cubic inches, 8 inches less than in another belonging to the Society. From the great development of the crests, and the massive character of all the bones, this is undoubtedly a male; the jaws, the complete development and worn appearance of the teeth, indicate an adult, if not an old animal. The sutures are hardly discernible, as usual; the superciliary ridges and crests are remarkably developed. The specific characters pointed out by Professor Agassiz, in the decreasing depth of the infra-orbitar canal from before backwards, and the projection outwardly of the inner wall of the orbit, are well seen; there are two infra-orbitar foramina on each side. The nasal bones are united together, in the lower half presenting traces of a median suture, in the upper half a prominent ridge; the portion of the bone between the inner orbitar angles of the frontals seems to confirm Dr. Wyman's * opinion that it is an independent piece, having its own centre of ossification; the foramen existing midway between the incisive foramen of each side and the edge of the alveolus, on the left side is replaced by two as in the Chimpanzee. The zygomatic arches are exceedingly strong, enclosing temporal muscles of immense size. The other anatomical peculiarities of the cranium and face have been sufficiently detailed by Dr. Wyman (*op. cit.*). The following points are interesting:—the dental formula is the same as in Man; the median upper incisors are twice the size of the lateral, the reverse of which is the case in the lower jaw; they are also respectively longer, giving to the upper incisors a convex edge, and to the lower a concave one: in the upper jaw there is an interval of two or three lines between the incisors and canines, and no interval between the latter and the premolars, the reverse being the case in the lower jaw, in which, however, the interval is less: the upper canines extend from the alveolus $1\frac{1}{2}$ inch, the part within the alveolus being at least 2 inches; they are an inch broad and $\frac{3}{4}$ of an inch thick; the upper canines are worn anteriorly by the lower, and posteriorly by the first lower premolar, giving to the tooth a triangular shape, with an anterior, a posterior, and an internal cutting edge; the action of the lower premolar on the upper canine, and of the latter on the lower canine, produces a distinct talon, or heel, at the base of these teeth: the two grooves mentioned by Dr. Wyman as occurring on the inner face are not seen in these canines, probably from the extent of the worn surface; there is the lower portion of a single groove, however, which is lost in the worn surface beyond: to produce these surfaces there must be some lateral motion of the jaw, which would hardly be expected from the great length of these teeth. The premolars and molars agree with Owen's description in the 'Cyclopædia of Anatomy and Physiology' (Art. Teeth); the first lower premolar is much larger than the second, the anterior cusp being so strongly developed, and the posterior so little, that the tooth resembles an enlarged human canine; all the lower molars have three cusps on the outside and two on the inside. The lower jaw is of great strength, the ramus being at right angles with the body of the bone; the condyle is $1\frac{3}{4}$ inch wide and $\frac{5}{8}$ of an inch thick, projecting much internally: the coronoid process is higher than the condyle. The external face of the ramus is deeply concave for the masseter muscle, which is nearly 3 inches wide; the ramus inclines very much outwardly at its lower portion, and is grooved internally for the internal pterygoid muscle: the body of the jaw is $1\frac{3}{4}$ inch high,

* Boston Journal of Natural History, vol. v. p. 426.

and nearly an inch thick; the height and width at the symphysis is 2 inches, the thickness $1\frac{1}{4}$ inch; the chin is convex and retreating, its convexity measuring $3\frac{1}{4}$ inches. The skull measures from the posterior plane of the occiput to margin of incisors $13\frac{1}{2}$ inches; the diameter of face across zygomata is $6\frac{3}{4}$ inches; from the posterior plane of occiput to fronto-nasal suture $7\frac{1}{2}$ inches; from this suture to margin of incisors $6\frac{1}{2}$ inches; breadth of zygomatic fossa 2 inches; length of bony palate $3\frac{1}{2}$ inches; inter-orbitar space $1\frac{1}{3}$ inch; lateral diameter of orbit $1\frac{3}{5}$, vertical $1\frac{3}{4}$ inch.

Trunk.—Of the vertebræ, only the atlas is wanting. The odontoid process of the axis, instead of being almost perpendicular, as in Man, inclines backwards at an angle of nearly 50°: the spinous process is an inch long, spreading out at its apex to nearly the same width, with an evident disposition to fork as in the human type; it is also somewhat concave at the end of its under surface. The bodies of all the cervical vertebræ are higher, but narrower than in Man, and received deeply one in the other. The spinous processes are horizontal, long, and (excepting the third, which is sharp-pointed) are swelled or club-shaped at the end; the fourth is the longest, the third the shortest; their lengths are, from the posterior face of the spinal canal, as follows:—the third, $2\frac{1}{8}$ inches; the fourth, $3\frac{3}{4}$ inches; the fifth, $3\frac{5}{8}$ inches; the sixth, $3\frac{1}{8}$ inches; the seventh, $3\frac{1}{4}$ inches: the use of these long processes is sufficiently obvious, being required for the ligamentum nuchæ necessary for the support of the ill-balanced head. The transverse processes are very long, the posterior an inch in length; the anterior or cervical ribs begin to be seen at the fourth, increasing to the sixth and seventh, which last are of equal size—there being, as a general rule, no cervical ribs to the seventh vertebra of the mammal neck. All are pierced for the vertebral artery on each side; the transverse processes are directed obliquely downwards.

The *dorsal* vertebræ are fourteen in number, as in the Chimpanzee (according to Cuvier; Vrolik gives this last only thirteen). They much resemble the human in shape and size; the last two are rather larger, and more like human lumbar vertebræ; the spinous and transverse processes are much more developed. The spinous process of the first is like the cervical, and $2\frac{7}{8}$ inches long; the spinal canal is less in this and the remainder of the column; the spinous processes of the second and third are compressed laterally at the end, and $2\frac{1}{2}$ inches long. At the fourth the spinous processes begin to descend, as in Man, to the ninth; below this they resemble the lumbar spines, though pointing more downwards. The last dorsal has its rib on the right side firmly anchylosed to the body.

The *lumbar* vertebræ are only *three* in number,—less than in any of the higher mammals; but taking in the dorsals, there is in both the same number as in Man. The bodies are larger and thicker than in Man; the vertical diameter is less anteriorly than posteriorly, making an anterior concavity, and showing that the erect position is as unnatural for this as for the other Quadrumana.

The *sacrum,* which has a slight lateral deviation to the left, consists of eight bones, firmly joined together, the intervertebral spaces being obliterated except between the first and second. The first bone resembles very much a lumbar vertebra, and on one side its transverse process, though bearing the upper portion of the articulating surface for the right ilium, is not connected with the lateral portion of the sacral wing below; on the left side the bony union is complete, and the spinous process is continuous without interruption or foramen with the median sacral crest; this crest at its upper portion is 2 inches high, gradually decreasing, and lost entirely on the sixth bone, where also the sacral canal terminates. The sacrum is long and narrow, having a very decided concavity anteriorly. The articulating surface for the ilium is confined to the first three vertebræ. Whether any coccygeal vertebræ are anchylosed in the sacrum it is not easy to say; from the uncommonly large number of sacral vertebræ, viz. eight, it would seem probable that these also include the coccyx; the terminal bone ends in a rounded projection, which has somewhat the appearance of an articulating surface. In Dr. W. Lewis's description of a Gibbon (Boston Journal, vol. i. p. 35) it is stated that the coccyx consisted of a single bone; in our specimen this single rudimentary coccyx may have been attached to the sacral terminal surface.

The bodies of the second and third cervical vertebræ incline backwards; the direction becomes perpendicular in the fourth, and in the last three a little inclined forwards: at the upper dorsal region the spine is slightly convex, in the lower dorsals and lumbar concave; at the last lumbar and first sacral it is again convex, and in the lowest portion again concave. The whole number of vertebræ is 32, and possibly 33; the length of the cervical, dorsal and lumbar regions is 22 inches: from this it would appear that the spinal column is very nearly as long as the human, which it also comes nearer to in its curves than any of the Quadrumana.

The *pelvis* departs widely from that of the Chimpanzee and Orang, and approaches that of Man in the greater spread of the ilium, its deep anterior concavity, and corresponding posterior convexity, on which a well-marked longitudinal ridge indicates the origin of the glutæus maximus; and a fainter semicircular line, extending from the sciatic notch to near the rudimentary anterior inferior spinous process, about $2\frac{1}{2}$ inches above the acetabulum, the probable origin of the glutæus minimus; the anterior superior spinous processes are fully 6 inches in advance of the plane of the sacrum. The sacrum extends only to the spine of the ischium, about 4 inches from the tuberosities of this bone, so that the pelvis has somewhat of the lengthened narrow form peculiar to the Quadrumana, though it projects far more from the line of the spine than in any other members of the group. The superior aperture has not the narrow elongated shape of the Orang's, the antero-posterior diameter being only half an inch greater than the transverse, these being respectively $6\frac{1}{2}$ and 6 inches; in the female, according to Dr. Wyman's measurements, the difference is 3 inches. The tuberosities of the ischia are very thick and broad, and the rami of the pubes very wide; the whole lower portion indicates great strength and solidity. It is the portion of the pelvis between the acetabulum and the lower edge of the sacro-iliac articulation which is so much shorter than in the Chimpanzee, and which gives to the pelvis its more human aspect. The length of the sacrum is $6\frac{1}{2}$ inches, the width 4; breadth of pelvis between spinous processes of ilia $16\frac{1}{2}$ inches; breadth of ilium 9; length of os innominatum $14\frac{1}{2}$ inches; from outside of one tuber ischii to the other 7·15 inches.

At first sight the *scapula* has much the appearance of the human, having very much its shape, but somewhat enlarged; it more nearly resembles that of the Orang than that of the Chimpanzee, but is more like that of Man than either in its more equilateral form. The spine is nearly in the middle of the bone, making the supraspinous nearly equal to the infraspinous fossa; after about one-third of its length it ceases to have the broad thick edge of the human spine, reaching nearly to the posterior border, but is continued by a sharp well-marked ridge quite to the edge, as in the Orang; the spine is also more perpendicular to the plane of the dorsum than in Man, and its direction more that of the axis of the trunk. The acromial process is longer and less curved than in Man, and wants the strong angle on its posterior surface, a little in advance of the plane of the glenoid cavity; its arch over this cavity belongs also to a much larger circle. The coracoid process has a greater inclination downwards than in Man and the Chimpanzee; this direction, in the Orang, Vrolik considers a sign of inferiority. The glenoid cavity is much the same as in Man, the upper half being less narrow in proportion. The subscapular fossa is very deep, and divided by prominent ridges into five or six smaller depressions. There is no deep suprascapular notch as in the human scapula; but there is a decided concavity at the base of the coracoid process, without the narrowness of a notch, contrasting strongly with the nearly straight line of the upper border of the bone in the Orang. Length of scapula along the base 10 inches; broadest part $7\frac{1}{4}$ inches.

The *clavicles* are shorter and stronger than in Man, and less curved; the edges are more angular; their length in a straight line is $6\frac{1}{4}$ inches; their circumference in the middle 2 inches, thence increasing to each end. The subclavian ridge is well marked.

The *sternum*, at its upper portion, is 4 inches wide, and about half an inch thick; there is a decided semilunar notch, but less than in Man; the lower portions are wanting. There is no sign of division into lateral halves in this upper portion, which is $3\frac{3}{4}$ inches long. The articular surface for the clavicles is less curved and more horizontal than in Man.

The *ribs* are fourteen pairs; of these two are wanting on the left side, at about the middle of the series. They much resemble those of Man, and form a very capacious thorax; they are, however, longer and thicker, and the curves less complicated. Some of them bear marks of old injuries. The angles are very well marked; the last rib is united both to the body and to the transverse process of a single vertebra.

The *humerus* is 3 inches longer than that of Man, and 2 inches greater in circumference at the middle, the latter measurement being 5 inches; the length is $16\frac{1}{2}$ inches; around the middle of the head, horizontally, $8\frac{1}{4}$ inches; greatest width at lower extremity $4\frac{1}{4}$ inches. The bone is of very compact structure and very heavy. It resembles that of Man, but is less twisted on itself; the bicipital groove is deep and wide, having on its sides very large tuberosities for muscular insertions; the ridges for the pectoralis major and latissimus dorsi are well marked, as is also the insertion of the deltoid; the anterior face is rather convex than concave, even more so than in Man. Both the condyles and the condyloid ridges are more developed than in Man; the trochlear portion is less excavated, and the internal ridge less prominent; there is a deep groove between the trochlea and the surface for the head of the radius, which is very slight in Man. The lower extremity is perforated on the right side, but not on the left; the cavity for the olecranon is an inch in width and half an inch deep, while that for the coronoid process, on the anterior surface, is hardly sunk beneath the level of the bone: this difference is much less in Man.

The *ulna* is more curved than the human, as is also the *radius*; they curve in opposite directions, enclosing a wide space between them; the curve of the radius begins at the tubercle, while the ulna is curved its whole length. The length of the ulna is

14·3 inches, that of the radius $13\frac{1}{2}$ inches. The articulating surface for the humerus, on account of the less prominence of the inner ridge of the trochlea, differs from that of Man in being proportionally wider, and in having a deep concave inner wall, which in the human ulna is not only wanting, but the edge of this border of the joint is worn into a deep notch corresponding with the long inner ridge of the human trochlea; at the bottom of this cavity is an irregular long bone, apparently wedged in, and perhaps having a separate centre of ossification; if the olecranon process were taken off through the suture here left open, the head of the ulna would very much resemble the head of the tibia, to which it corresponds in the lower extremity—this is seen on both sides. The articulating surface for the head of the radius is less perpendicular than in Man; the coronoid process is also less prominent, in conformity with the small anterior concavity on the humerus: the styloid process and the accompanying groove occupy a greater proportion of the lower extremity. With the exception of stronger ridges and sharper angles, the remaining portions of the ulna and radius resemble much the same bones in Man on a larger scale. The proportion between the humerus and ulna brings this animal nearer to Man than the Chimpanzee or Orang.

The *femur* in its head and neck is much like the human; it has a roughness, hardly a depression, for the ligamentum teres; the neck of the bone is proportionally shorter, and placed more obliquely with respect to the shaft; the trochanters, especially the great, are much stronger; the space between the great trochanter and the head of the bone is less, and the concavity deeper than in Man; the neck is also more flattened; the whole bone is flatter, especially just above the condyles, and its shaft more curved. Though the inner condyle is so much longer than the external as to give the lower part of the shaft an inclination outwards, as in Man, the curve of the middle and upper portions restores its general direction nearly to the vertical, as in the Chimpanzee. The femur is about 2 inches shorter than the humerus; in this respect the *T. gorilla* recedes from the human type, while he approaches it in the relative lengths of the ulna and humerus.

The *tibia* is considerably shorter than the human ($11\frac{1}{2}$ inches long), and more curved both laterally and anteriorly, enclosing consequently with the fibula a large interosseous space. The right *astragalus* is preserved, resembling the human, but flatter and longer; the articular surface for the tibia is less convex and narrower posteriorly; the surface for the scaphoid is more prominent, flatter, and with a better marked constricted neck; the lateral surface for the tibia is less vertical and more quadrilateral;

the surface for the fibula is less triangular; the posterior portion is wider, with a less deep groove for the flexor longus pollicis; the surfaces for the os calcis with the deep groove are much as in Man.

There are also a few carpal, metacarpal, and phalangeal bones of the fingers and toes; the metacarpal bones are long and curved inwards, with large lower articulating surfaces; the bones of the fingers have their edges much turned under on the anterior surface, for the protection of the vessels, &c. in the act of climbing.

The height of this specimen must have been nearly $5\frac{1}{2}$ feet, and the breadth of the shoulders, judging from the scapulæ and ribs, 2 feet at least, and probably more. The hands extend a little below the knees; the abdomen, judging from the iliac fossæ, must be nearly 2 feet wide; the lower extremities much bowed.

Boston, May 11, 1852.

VI.—*On some genera of the* Icacinaceæ. By John Miers, Esq., F.R.S., F.L.S.

[Continued from vol. ix. p. 492.]

Stemonurus.

There can exist no doubt that the genus *Stemonurus*, proposed by Professor Blume in his 'Bijdragen' in 1826, is the same as the *Gomphandra* of Dr. Wallich, although they have hitherto been considered as distinct; but at the same time there is every reason to conclude, that both are again identical with the *Lasianthera* of Pal. de Beauvois, established as far antecedently as 1805, in his 'Flora Owariensis,' and placed by DeCandolle in his 'Prodromus' (i. p. 636) as a doubtful genus of the *Ampelidæ*: in such case, the latter name, on account of its priority, ought to claim the preference. As however it is contrary to the rules of science to form a compound generic term from both Greek and Latin roots, the name would necessarily require to be modified into *Lasiandra*, one that has long been preoccupied. Besides this, we have to consider the confusion likely to arise from increasing a list of consimilar names, already too numerous, as *Lasiandra, Lasianthæa, Lasiantha, Lasianthus*, and *Lasianthera*, and also, that in reality the latter name is untenable, because of the incorrectness of its signification, for in the present case it will be seen, that it is not the anther, but the filament which is villous. For all these reasons, I strongly recommend the preference to be given to *Stemonurus*, the next in priority, as the most appropriate designation of this genus.

Its most marked peculiarity consists in the character of its stamens; the filaments sometimes shorter, often longer than the petals, are generally very broad, extremely thick and fleshy, obtuse at their summit with a small apical point, to which the anthers are attached, and they have a somewhat prominent internal keel down the middle: the margins of their broad summit and the upper part of the keel are fringed with long transparent white hairs, clavate at their extremity and bent, so as to form a crest over the anthers: from this character both the names of Beauvois and Blume originated. The flowers, sometimes hermaphrodite, are frequently polygamous in the same plant, that is to say, either the anthers are void of pollen, or the ovarium is deficient of any ovules, or both these imperfections occur at the same time: it does not appear to me that they are constantly unisexual, as generally stated. The analysis of the structure of this genus has been attended with much difficulty, because of the frequent abortion of some of its parts, especially the ovarium, which is often deficient of cells or ovules; and even when the ovules exist, it is not easy to detect their presence, on account of their extreme minuteness, in an early stage of the flower. I was for a long while unable to solve the anomalies of its structure, and almost gave up the matter in despair, but patient examination at length overcame the difficulties: not one in twenty instances exhibits the smallest trace of an existing ovule, nothing but a fleshy mass appearing to constitute the ovarium, which is always comparatively small: indications of the existence of more cells than one are sometimes observable, but these are not large enough to be well defined; and even in the case where a single distinct cell exists with two suspended ovules, these are so minute that they might readily be overlooked. After the period of fecundation, however, the petals and stamens fall away, when the ovarium attains a rapid growth, and soon displays itself as an oblong cylindrical body of many times its former dimensions, seated on its small persistent calyx and crowned by a large pulvinate disk: it now unmistakeably exhibits to the naked eye a single cell containing two large suspended ovules and conforming to all the usual characters of the order. With one exception I have never met with flowers in an intermediate stage, and it is not therefore surprising that *Stemonurus* and *Gomphandra* should have been so long considered as two distinct genera. The nature of the pulviniform gland that forms so prominent a feature on the summit of the ovarium, and which evidently suggested the name given by Dr. Wallich, is not altogether manifest. On making a longitudinal section of a pistillum in its early stage, when it consists of a very small, 4- or 5-lobed, short cylinder, it will be seen crowned by a fleshy glandular ring of the same shape, but of a different colour from the lower and central portions, where the ovuligerous cell is seen, whenever discernible: this glandular appendage is sometimes in a small degree conical towards the centre, but more generally deeply umbilicate, and in the middle of this depression is seen a conspicuous prominence consisting of the real style and stigma: this is in the form of a very short hollow tube, crowned by four or five very minute teeth, corresponding in number to the lobes of the ovarium. On the growth of the pistil, in the manner before described, the gland just mentioned also expands, assuming the form of a large pulvinate disk, more or less lobed, which often exceeds in diameter, and therefore overhangs the summit of the ovarium, while the style and stigma become withered into a small central umbilicated depression. This early stage of the ovarium is tolerably well depicted in plate 953. fig. 5. of Dr. Wight's 'Icones,' while its subsequent clavated appearance is shown in plate 954. fig. 6. of the same work. I have frequently quoted instances of the existence of a similar epigynous gland upon the summit of an inferior ovarium, but I know of no instance in which it forms so prominent a mark as in this case.

At one time (*huj. op.* ix. p. 224) it appeared to me desirable to unite the *Phlebocalymna* of Griffiths, as well as the *Platea* of Blume, with *Stemonurus,* which differ in no respect from the last-named genus, except in the absence of the villous fringe that forms such a remarkable crest overhanging the anthers: from Dr. Wight's 'Icones' I was at first led to believe that this was only a sexual difference, but careful observation does not confirm this conclusion. I find it a constant character in particular species, and on this account it will probably be better to keep *Stemonurus* distinct; but in this case *Phlebocalymna* and *Platea* will merge into another separate genus, the preference being given to the latter name on account of its priority: the differences which are observable between them will be discussed when we come to consider that genus. I propose to unite with them a species which I had placed in *Stemonurus,* under the name of *S. laxiflorus* (Cuming, no. 189, from the Philippine Islands), and also Dr. Wight's variety of *S. polymorpha,* figured in plate 953 of his 'Icones.'

The structure of the putamen bears much analogy to that of *Pennantia*: it is covered with a very small quantity of pulp, and is strongly ribbed by several longitudinal irregular lines: it is more coriaceous than osseous, and is of an oblong form, somewhat flatter upon the ventral face, on which side, a little below the summit, is seen a caruncular prominence, beneath which is a foramen communicating with the interior of the cell. On the same side near the base is another foramen; this however does not penetrate into the cell, but it pierces the substance of the shell obliquely by a hole which comes out in the point of its attachment to the calyx. Between these foramina is a deep groove filled with a thick chord of fibres: this chord, issuing from the interior of the nut, out of the upper perforation, descends through the basal passage just described, and terminates in the torus of the persistent calyx. By making a careful incision through each side of the shell, the cell is seen filled with an oblong seed, which is suspended from a thick funicular support, continuous with the raphe on one hand and with the chord before mentioned on the other: in *Pennantia* these parts are attached to one another, but here the bundle of fibres is continuous with the raphe, as well as with the external chord, that terminates in the basal torus. The raphe does not descend along the centre of the dorsal face of the seed, as in *Pennantia*, but takes a somewhat lateral course towards nearly the bottom, when it makes a sudden turn, and curving in a hippocrepical form ascends the opposite side of the same face, terminating in a caruncular prominence upon the apex of the seed. The thin integumental covering apparently consists of two adherent membranes, in which the raphe is imbedded; but there is no thickening of these membranes at the base, nor any appearance of a chalaza, unless the caruncular swelling at the apex can be so considered. The albumen is fleshy, and its embryo almost divides into two nearly equal portions, interposing a vacant space between them, and leaving on the edges only a very narrow solid rim of its albuminous substance to connect them; the embryo entirely lines this space, and consists of two extremely thin, almost pellicular cotyledons, which are oblong, nearly the size of the albumen, cordate at the summit, with a short terete radicle in its sinus. I have had an opportunity of examining only a single seed, and I can affirm with confidence that its structure was that above described. A result so greatly at variance with other recorded observations will naturally create a suspicion that the seed so examined may have been a malformation, but there appeared in this case no indication of any abnormal deformity: how then can we account for the existence of an embryo so different in size and form from that figured by Dr. Wight? Is it possible that this distinguished botanist, or more probably his draughtsman, can have mistaken the radicle for the entire embryo? This will appear probable when we carefully examine fig. 10 of his plate 954 above referred to, which gives a transverse section of the seed, where exactly the same lunated space is shown across the middle, which I found to exist, lined with the two thin membranes above described, and which I conceive can be nothing but cotyledons; and again, if we compare this with fig. 11 of the same plate, which is a longitudinal section of the same, we perceive a line or long space descending from the supposed embryo at the summit to the base of the albumen, a fact which precisely accords with what I have described in the preceding analysis. Upon such grounds I am inclined to believe, that what I have detailed above is the real structure of the seed in *Stemonurus*. In anatropal suspended seeds with a superior radicle, it is usual to observe the raphe terminate at the opposite extremity to the point of suspension; but in this case we find an exception to this general rule, which seems opposed to the established theory: here the direction of the raphe would seem to indicate a double retroversion of the ovule: so singular a fact may be of more frequent occurrence, but I confess that I have never met with, nor seen the record of, any such development. On the other hand, again, we have an analysis given by Blume of the seed of *Stemonurus secundiflorus* in his 'Mus. Lugd. Bat.,' in which the embryo is small in the summit of the albumen, as represented by Dr. Wight, the radicle being terete and the cotyledons exceedingly small.

The flowers of *Stemonurus* are sometimes 4-, often 5-merous, but I am not aware whether this can be depended on as a good specific character; all I can affirm is, that in those specimens I have seen, where 4-merous flowers prevail, I have occasionally met with some that are 5- or even 6-merous. Generally, the inflorescence is so short, as often to appear like a cluster of axillary fasciculated flowers; in other species it consists of long branching panicles, in which the flowers are sometimes secundly disposed. The flowers are always glabrous, and each articulated upon its separate pedicel, which is often pubescent. I have seen but few of the species on record, and those mostly imperfect specimens. In the following enumeration the characters are therefore given as described by their several authors; they require doubtlessly a more careful revision, for as they generally resemble each other so much in the appearance of the leaves, the shape of which often varies in the same species, it is probable that better and more valid characters may be found in the inflorescence. The outline of generic features here offered is founded wholly on my own observation.

Stemonurus, Bl. Lasianthera, *Pal. Beauv.* Gomphandra, *Wall.* —*Flores* hermaphroditi vel abortu polygami. *Calyx* parvus, brevissime cupularis, limbo fere integro, 4–5-denticulato, vel 4–5-fido, immutatus et persistens. *Petala* 4–5, hypogyna, oblonga, carnosa, summo marginibus mucroneque apicali propendenti inflexis, æstivatione valvata, libera, vel interdum marginibus imo cohærentibus, simulque cum filamentis adhæsis in tubum cylindraceum sic leviter agglutinatis, e medio liberis et reflexis. *Stamina* 4–5, cum petalis inserta, iisdem alterna;

filamenta sæpe aucta et demum exserta, crasso-carnosa, lata, compressa, incurvula, summo truncato ac breviter repente acuto, carinaque interna mediana, pilis longis albidis apice clavatis munita; *antheræ* istis æquilatæ, ovatæ, introrsæ, plus minusve cordatæ, 2-lobæ, lobis singulatim 2-locellatis demum septicidis et longitudinaliter evolutim dehiscentibus. *Pollen* acute 3-gonum. *Ovarium* globoso-conicum, 4–5-sulcatum, disco parvo insitum, glandula crassa sub-annulari aut sub-lobata coronatum, sæpissime sterili, quandoque fertili et tunc cito multoties elongatum et cylindricum, 1-loculare, *ovula* 2 anatropa juxta apicem loculi subcollateraliter superposita, podospermio crasso suspensa. *Stylus* brevissimus, conicus, 4–5-sulcatus, summo cavus, dentibusque 4–5 erectis stigmatosis terminatus, et simul cum glandula (in ovario fertili) in discum magnum pulvinatum sub-lobatum epigynum demum auctus. *Drupa* oblonga, parcissime carnosa, olivæformis, interdum elongata, monopyrena, calyce persistente suffulta, et pulvino coronata: *putamen* lignosum, ovato-oblongum, dorso convexius, uniloculare, monospermum, ad faciem ventralem planiusculam infra apicem foramine parvo (loculo attingente) perforatum, hinc extus fere ad imum longitudinaliter profunde canaliculatum, illinc usque ad fundum introitu diagonali (loculo evitante) pertusum. *Semen* conforme, funiculo infra apicem loculi suspensum; *funiculus* crassus, fibrosus, e rapheo dorsali ortus, per foramen apicale loculi trajectus, tunc canalem externum pervadens, et introitum basalem penetrans, denique in toro amissus; *testa* submembranacea, cum integumento interno cohærens; *ràphe* hippocrepicus in faciem dorsalem testæ immersus, primum ex apice versus latus fere ad imum decurrens, hinc repente deflexus, per latus adversum fere ad apicem accurrens, et in carunculam apicalem desitus. *Embryo* inversus, rectus, *cotyledonibus* magnis, cordatis, textura tenuissimis, latitudine curvatis, in medio albuminis carnosi fere æquanti immersis, *radicula* brevi, tereti, supera, 6-plo longioribus. [Ex iconibus et descriptionbus clar. Wight et Blume *embryo* in apicem albuminis immersus, brevis, *radicula* tereti, supera, *cotyledonibus* minutissimis, compressis.]—Arbores vel frutices *Indiæ Orientalis et Archipelagi Asiatici indigenæ*: folia *alterna, elliptica, vel lanceolata, coriacea, glaberrima, petiolata*; flores *parvi, flavo-viriduli, odoratissimi, in racemos spicatos sæpe 1-laterales, vel in cymas axillares rarius oppositifolias dispositi, interdum (præsertim in ovuligeris) fasciculato-aggregati*; fructus *purpureus*.

1. *Stemonurus pauciflorus*, Bl. Bijd. 648;—foliis oblongis, acuminatis, basi acutis, glabris; pedunculis brevibus apice 2–3-fidis, 2–3-floris.—Java.

2. *Stemonurus secundiflorus,* Bl. Bijd. 649;—arbor 10-pedalis; foliis oblongis, acutis, basi angustatis, coriaceis, glabris, aveniis, apice spicis 3–4-fidis, floribus secundis, filamentis carnosis, linearibus, petalis æquilongis, pilis longissimis clavatis ciliatis; drupa valde elongata, apice attenuata.—Java.

3. *Stemonurus Javanicus,* Bl. *l. c.*;—foliis oblongis, utrinque acuminatis, coriaceis, glabris, venosis; cymis solitariis geminisve densifloris.—Insul. Nusa Kambanga.

β. foliis ovalibus, utrinque acuminatis, submembranaceis, glabris, junioribus ad costam infra puberulis; cymis dichotomis solitariis.

4. *Stemonurus quadrifidus,* Bl. Mus. Bot. Lugd. Bat. 249;—foliis e basi acutiusculis, oblongis v. oblongo-lanceolatis, obtuse acuminatis, membranaceis, cymis umbellato-4-fidis, multifloris.—Sumatra.—Folia $3\frac{1}{4}$ ad 6 poll. longa, 1–$1\frac{3}{4}$ poll. lata.

5. *Stemonurus prasinus,* Bl. *l. c.* S. Javanicus, *Krthls.*;—foliis e basi acutiuscula ellipticis, v. elliptico-oblongis, longiuscule acuminatis, membranaceis; cymis 3-furcatis, multifloris.—Sumatra.—Folia $4\frac{1}{2}$–6 poll. longa, $1\frac{3}{4}$–3 poll. lata.

6. *Stemonurus macrocarpus,* Bl. *l. c.*;—foliis e basi acutiuscula ellipticis, v. elliptico-oblongis, obtuse acuminatis, subcoriaceis; pedunculis solitariis paucifloris, fructibus elongato-ellipsoideis.—Ins. Borneo.—Folia $4\frac{1}{2}$–6 poll. longa, $2\frac{1}{4}$–3 poll. lata (evidenter ♀).

7. *Stemonurus macrophyllus,* Bl. *l. c.*;—foliis e basi acuta ellipticis, obtuse acuminatis, coriaceis; racemis geminis confertisve; fructibus cylindraceis.—In Archip. Indico.—Folia $5\frac{1}{2}$–9 poll. longa, $2\frac{3}{4}$–$4\frac{1}{2}$ poll. lata.

8. *Stemonurus parviflorus,* Bl. *l. c.*;—foliis e basi acuta vel obtusa oblongis vel elliptico-oblongis, acuminatis, membranaceis, cymis brevissimis densifloris, drupis cylindricis.—Sumatra.—Folia 5–10 poll. longa, 2–4 poll. lata.

9. *Stemonurus? littoralis,* Bl. *l. c.*;—foliis e basi acutiuscula v. obtusa ellipticis, acuminatis, coriaceis.—Nova Guinea.—Folia 6–9 poll. longa, $3\frac{1}{2}$–4 poll. lata.

10. *Stemonurus? membranaceus,* Bl. *l. c.*;—foliis e basi acuta elliptico-oblongis vel oblongo-lanceolatis, acuminatis, membranaceis.—Java.—Folia 6–10 poll. longa, $2\frac{1}{2}$–$3\frac{1}{4}$ poll. lata.

11. *Stemonurus Africanus.* Lasianthera Africana, *Pal. Beauv. Fl. Owar.* i. 85. tab. 51; *D.C. Prodr.* i. 636;—suffrutex scan-

dens, foliis lanceolato- vel ovato-oblongis, cuspidatis, imo rotundatis, apice longe acuminatis vel cuspidatis, cyma opposititifolia, apice umbellatim ramosa, ovarii stylo brevi, stigmate obtuso.—Africa tropica; Chama, fl. St. Jago.—Folia 6 poll. longa, 2 poll. lata, petiolus 1-pollicaris: inflorescentia 2-pollicaris, ramis 4–5-umbellatis, floribus apice agglomeratis.

12. *Stemonurus coriaceus.* Gomphandra coriacea, *Wight, Ill. Ind. Bot.* i. 103;—dioicus, foliis coriaceis, ovalibus, utrinque attenuatis vel obovato-cuneatis, floribus 4-andris, cymis ♂ axillaribus, 4 floris; ♀ floribus solitariis vel 2–3, racemosis, fructibus oblongis, cylindraceis.—Ind. Oriental.

13. *Stemonurus polymorphus.* Gomphandra polymorpha, *Wight, Ill. Ind. Bot.* i. 103; *Icon. Pl.* tab. 953–954;—glaber, foliis oblongis vel obovato-lanceolatis, acuminatis, membranaceis, subtus glaucis, breviter petiolatis; cymis axillaribus solitariis vel geminis petiolum æquantibus, masculis plurifloris, fœmineis 2–5-floris, calyce integro minute 4–5-dentatis, petalis 4–5, glabris, staminibus exsertis, cristato-pilosis, fructibus ovoideis.—India orientalis.

Var. *α. acuminata, β. oblongifolia, γ. angustifolia, δ. longifolia, ε. ovalifolia.*

This species is described as being commonly diffused over the whole Peninsula of India, and subject to many varieties of form, but I suspect that if these were more carefully examined, several specific differences would be found to exist among them. I have copied the character from Dr. Wight's description, omitting however three features, viz. "dioicus"—"petalis basi in corollam tubulosam coalitis"—and "antheris minute cristato-pilosis." I find in all cases the petals are quite free, although strongly agglutinated by their edges, and that they do not open even at the summits until some time after impregnation, and then they gradually become separated at their edges to the base, after which, in time, they fall off. There seems to have been a general conviction among botanists, that in *Gomphandra* the anthers are pilose; this is so stated by Endlicher and Wight, but in every instance I have found the clavate hairs that form a hooded crest over the anthers all spring from the filaments. Dr. Wight, in his 'Icones,' represents the male plant in this species as having beardless stamens (see figs. 1 & 4. tab. 953), and it is worthy of note that the ovarium is here depicted as being ovuligerous (see fig. 6): the female plant in plate 954 has bearded stamens with a fertile ovarium, the progress of the development of which, to the state of ripened fruit, is here shown: it has hence been inferred by that distinguished botanist, that the occurrence of bearded or beardless stamens constitutes a true sexual distinction. My observation upon dried specimens leads me to an opposite conclusion, for I find in every instance I have examined, that the stamens are bearded even in the male flowers, that is to say, where the ovarium has been quite sterile: and even in what are called female flowers, that is, where the ovarium is ovuligerous, the stamens are equally barbed, whether the anthers be charged with pollen or filled only with a grumous mass. I am therefore led to the irresistible conclusion, that the plant figured by Dr. Wight as the male plant of *Gomphandra polymorpha* belongs to a distinct genus, being a species of Blume's *Platea*, which will be hereafter described. As additional evidence in favour of this conclusion, I may mention the fact, that Dr. Wight describes the male plant in plate 953 as flowering in the months of March and April, and the female plant in plate 954 as having its fruit ripened in the same months: this would occur probably alone on the supposition that the fruit was the production of a previous year's growth.

Among the Ceylon collection of the late Mr. Gardner (no. 102) is a plant which I take to be the variety *longifolius* of this species: it is certainly different from the *longifolius* of Dr. Wallich's collection, which will be presently described; the leaves are here of a light pallid green; two or three short dichotomous racemes grow out of each axil; the calyx is entire, but the petals and stamens have all fallen away; the ovarium is long and cylindrical, and is terminated by a flattened 5-lobed disk, which considerably exceeds in diameter that of the ovarium; it is 1-celled, with two large ovules suspended from near the summit of the cavity: on account of the clavate form of the ovarium this affords a good illustration of Dr. Wallich's genus *Gomphandra*, and is well represented in Wight's 'Icones,' tab. 954. figs. 6 & 7. The remarks offered upon the development of the ovarium in *S. affinis* will equally apply to the present instance*.

14. *Stemonurus Gardneri*, n. sp.;—glaber, ramulis teretibus, subflexuosis; foliis ellipticis, utrinque acutis, apice obtusiusculo breviter lineari-angustatis, glaberrimis, valde coriaceis, utrinque eveniis, costa nervisque supra impresso-sulcatis, subtus prominentibus, inferne subferrugineis margine revoluto, petiolo longiusculo, tereti, superne haud sulcato; racemo oppositifolio, petiolo longiori, floribus masculis paniculatis 5-meris, staminibus in alabastro petalis brevioribus, pilis clavatis antheris brevioribus munitis; fructu oblongo, disco 10-lobo umbilicato coronato.—In Mont. Neilgherrensib.

The plant here described was sent to me by the late Mr. Gardner as the *Gomphandra polymorpha*, being collected by him as

* The analysis of the structure of the flowers and of the seed of this species will be shown in plate 13 of the 'Contributions to Botany,' &c.

such, in company with Dr. Wight, in the Neilgherry Hills: it might therefore be considered as an authentic sample of this species. Its characters however will be seen to be quite at variance with those given by Dr. Wight of other plants of this species, collected by him in the same neighbourhood, where the leaves are said to be membranaceous and shortly petioled: here, on the contrary, they are extremely opaque and thickly coriaceous: the inflorescence is not only there described, but figured as being axillary; here, on the contrary, it is always opposite to the leaves. It is not easy to say whether this plant is referrible to any of the varieties mentioned by Dr. Wight, but from the differences here shown, it certainly claims the rank of a species distinct from his *Gomphandra polymorpha*. The leaves are $2\frac{3}{4}$–$3\frac{1}{4}$ inches long, $1\frac{1}{4}$–$1\frac{1}{2}$ inch broad, on a petiole half an inch in length; the male panicle is branching, nearly an inch in length, with flowers oval in bud, about $1\frac{1}{2}$ line long; both the male and female inflorescence, as in the following species, spring from the side of the stem opposite to the petiole: the calyx is cupshaped, with a 5-denticulated margin; the five petals are oblong, with inflexed margins and apex; the stamens, shorter than these, have fleshy filaments, with glandular hairs scarcely longer than the anthers: the ovarium is oblong, glabrous, sterile, with a conical hollow style. The fructiferous raceme is $\frac{3}{4}$ of an inch long, bearing an oblong drupe, 7 lines in length, surmounted by a depressed, umbilicated, 10-lobed disk, and supported upon its minute, persistent calyx. The internal structure of the fruit has been already described in a foregoing page.

15. *Stemonurus Penangianus.* Gomphandra Penangiana, *Wall.*;—ramulis teretibus, pallide ferrugineis; foliis oblongo-lanceolatis, imo cuneatis, apice lineari-angustatis, coriaceis, glaberrimis, subtus pallidioribus margine revoluto, petiolo brevi, crassiusculo, profunde canaliculato; cyma oppositifolia, subumbellatim et 2–3–4-chotome ramosa, floribus hermaphroditis, secundis, cum pedicellis articulatis, valde deciduis, carina interna petalorum in appendice longe propendenti inflexa maxime producta, filamentis longe ciliatis, antheris polliniferis, ovario brevissimo, 5-gono, apice pulviniformi et umbilicato, stylo conico, sub-brevi, tubuloso, dentibus 5 erectis acutis terminato.—Penang.—(*v. s. in herb. Soc. Linn. Wall. Cat.* 7204.)

This species is very distinct on account of its singularly branching racemes, with long rows of secund flowers, which are always placed on the side of the stem opposite to the insertion of the petiole. The stems are quite glabrous and of a dull light brown colour. The leaves are about $5\frac{1}{2}$ inches long, $1\frac{1}{2}$–$1\frac{3}{4}$ inch broad, on a petiole 3 or 4 lines in length. The primary peduncle is 3 to 6 lines long, branching somewhat umbellately into from three to six branches, which are again dichotomously, or sometimes umbellately subdivided into lengthened curving branchlets, from 6 to 9 lines long, closely and pectinately beset with pedicels, from which the articulated flowers have fallen off, all being quite glabrous and of an ochreous colour. The calyx is small, cupshaped, minutely 5-toothed; the petals adhere by their margins below in a tubular form, the summits being quite free; the stamens are the length of the petals, but the long ciliated crests are far exserted; the filaments are thick and fleshy, having their margins and apices charged with very long clavate white hairs; the upper part of the inner keel interposes between the lower part of the two lobes of the anthers, which are oval, deeply separated at their base, the lobes being attached dorsally at their junction to the apical point of the filament; they are polliniferous, the granules of pollen being sharply 3-angular: the ovarium is distinctly ovuligerous.

16. *Stemonurus longifolius.* Olax longifolia, *Wall.*;—ramulis teretibus, gracilibus, glabris, ochraceis; foliis valde lanceolatis, utrinque acutis, apice lineari-angustatis, glaberrimis, flavovirentibus, subtus pallidioribus, petiolo gracili; panicula pauciflora, glaberrima, petiolo vix longiori, floribus glabris, petalis 4, staminibus 4, filamentis crassis, dilatatis, longe ciliolatis, antheris effœtis, ovario sterili, 4-sulcato, stylo conico tubuloso 4–5-dentato coronato.—Sylhet.—(*v. s. in herb. Soc. Linn. Wall. Cat.* 6782 *A. et B.*)

This species is remarkable for its very long narrow leaves, which are attenuated at their apex into a lengthened linear extension; they are of a pale colour above, of a glaucous yellowish hue below, about 6 inches long, including the linear apical extension of an inch in length, and $\frac{7}{8}$ of an inch broad, upon a slender petiole 3 or 4 lines in length. The inflorescence seldom exceeds 4 lines in length, several flowers about 2 lines long being almost fasciculated on an axillary peduncle of 2 lines in length, all quite glabrous: the calyx is small, cupshaped and 5-toothed; petals 4, linear; stamens 4, with very fleshy filaments nearly the length of the petals, furnished on their margins and apex with a dense fringe of long clubshaped hairs; the two anther lobes are each 2-celled, sterile, and filled with grumous matter; the ovarium is smooth, cylindrical, $\frac{1}{4}$ or $\frac{1}{6}$ the length of the stamens, sterile, and terminated by a hollow, tubular, conical style, divided at its apex into four acute erect teeth.

17. *Stemonurus Heyneanus.* Olax Heyneanus, *Wall.*;—ramulis

subflexuosis, glabris; foliis oblongis, utrinque acutis, apice breviter repente angustatis, glaberrimis, opacis, petiolo gracili; racemo axillari, petiolo sublongiori, bifido, vel subdichotome ramoso, floribus secundis, vel subaggregatis; calyce cupuliformi, 5-denticulato, petalis 4–5, linearibus, apicula inflexa longe propendenti, staminibus 4–5, crassis, demum elongatis et exsertis, pilis clavatis antheris fertilibus 2-plo longioribus munitis; ovario sterili, subgloboso, 4–5-sulcato, apice pulviniformi, subumbilicato, stylo brevissimo, fere obsoleto.—India. Orient.—(*v. s. in herb. Soc. Linn. et Hook., Wall. Cat.* 6780.—Ceylon, *Gardner,* 102.)

This plant bears much the aspect of *Stemonurus polymorphus*; the leaves are of a pale green, of nearly the same hue on both sides; the specimens in the herbarium of the Linnæan Society are oblong, with parallel sides, or sometimes tapering a little towards the base from the upper part, where they are broadest, and then suddenly contracted into a narrow and obtuse point; they are 3 to $3\frac{1}{2}$ inches long, $1\frac{1}{2}$ inch broad, on a slender petiole about 4 lines in length. In the Ceylon specimens the leaves taper more regularly to each extremity, and are somewhat narrower. The flowers are generally 5-, rarely 4-merous; sometimes the hairs of the stamens are short and nearly obsolete, at other times double the length of the anthers; the cells of these are in some specimens replete with perfect pollen, in others filled with grumous matter: the ovarium is generally depressed or globose, and I have never met with a single instance of their possessing ovuligerous cells.

18. *Stemonurus axillaris.* Gomphandra axillaris, *Wall.* Lasianthera tetrandra, *Wall. Flor. Ind. Or.* vol. ii.;—ramulis teretibus, flexuosis, substriatis, glabris; foliis oblongis, utrinque acuminatis, apice angustato-attenuatis, glabris, opacis, subtus pallidioribus, margine revoluto; panicula ramosa, petiolo paullo longiori, glabra, floribus crebris, subsecundis, 4–5-meris, calyce cupuliformi, 5-denticulato, petalis margine inflexis, apice longe propendenti, staminibus fertilibus, longissime ciliolatis, ovario sæpe sterili, interdum ovuligero, oblongo, vel subgloboso, 4–5-gono, stylo conico, tubuloso, apice 4–5-dentato.—Sylhet. —*v. s. in herb. Soc. Linn. Wall. Cat.* 3718.)

As in *S. Penangianus,* I have observed that in many cases where the ovarium is ovuligerous, the anthers have been charged with perfect pollen, so that such flowers may be said to be truly hermaphrodite: in most instances, however, the ovarium is sterile. The leaves are from $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long, including a narrow and almost linear apical point of half an inch in length; they are $1\frac{1}{4}$ to $1\frac{1}{2}$ inch broad, on a petiole half an inch long: the racemes, $\frac{5}{8}$ to $\frac{3}{4}$ inch long, have numerous crowded flowers which do not exceed 3 lines in length: the hairs of the filaments are three or four times the length of the anthers, and arch over them in a very graceful manner: the pollen-grains are acutely 3-gonous.

19. *Stemonurus Cumingianus*, n. sp.;—ramulis flexuosis, teretibus, ferrugineo vel flavido-tomentosis; foliis oblongis, utrinque acutis, apice repente attenuatis, supra glabris, subtus brunneis et sparse pubescentibus, costa nervis petioloque ferrugineo-pilosulis, margine subrevoluto; panicula ramosa, petiolo tenui vix longiore, pubescente, floribus ♂ crebris, subcapitatis, 5-meris; calyce brevissimo, 5-denticulato, piloso, petalis glabris, oblongis, summo marginibus apiculaque longa propendenti inflexis; staminibus iisdem brevioribus, latis, crassis, pilis clavatis longissimis ciliolatis; ovario oblongo, piloso, dentibus 5 coronato.—Insul. Philip.—*v. s. in herb. Hook. et Lindl.* (Cuming, 796).

The leaves here are 5–6½ inches long, and 2½–3 inches broad, on a petiole 5–7 lines in length; the panicle is trichotomously branched, with crowded 5-merous flowers, which are still in bud; the upper margins of the petals are deeply inflected, together with their long apical points, which are all closely agglutinated into a long process that hangs down in the centre of the anthers; the filaments are rather short and broad, fringed with extremely long glandular hairs; the ovarium, seated on a short glabrous disc, is cylindrical, and altogether very pilose, growing smaller and more conical towards the summit, where it is hollow and 5-toothed.

20. *Stemonurus Ceylanicus*, n. sp.;—ramulis glabris, ochraceis; foliis oblongis, utrinque virentibus, subtus pallidis, costa mediana prominenti; paniculis axillaribus, geminis, dichotome ramosis, petiolo brevi 3-plo longioribus, pubescentibus, floribus in ramis secundis, crebris, calyce 5-denticulato, glabro, petalis linearibus, sicco aurantiacis, staminibus iisdem æquilongis, apice carinaque interna longissime ciliolatis; ovario sterili, glabro, depresso-10-lobato, apice profunde umbilicato, stylo brevissimo in cavitatem incluso.—Ceylon.—*v. s. in herb. Lindl. et Hook.* (Macrae, 428).

This species differs from *S. Penangianus* in the axillary origin of its inflorescence, in its much shorter and geminate panicles, in which the flowers, though somewhat secund, appear almost aggregated. The leaves, which are thin and almost membranaceous in texture, appear when dried of a darkish green above, and of a very pale green beneath, with prominent nervures and veins; they are about 6 inches long, and nearly 2 inches broad, on a petiole barely exceeding 3 lines in length. The panicles are scarcely 9 lines long; the calyx is small, obsoletely 5-toothed; the five petals are linear, with a long inflected apex; the five stamens are equal to them in length, with broad, thick, fleshy filaments, the internal keel, upper margins and summit being closely fringed with very long clavated hairs, which are three times the length of the anthers; these consist of two oval lobes, fixed together by a point near the apex, where they are attached to the filaments, the lobes below being separated by the summit of the keel, so that they rest in two cavities in the apex of the filaments, as occurs in most species of this genus; the ovarium is globular, somewhat 10-lobed, depressed at the summit, and deeply umbilicated in the centre, in the cavity of which, the obsolete style and stigma, forming a depressed lobe, lie concealed; the body of the ovarium is fleshy, with no apparent cells*.

21. *Stemonurus Walkeri*, n. sp.;—ramulis teretibus, subdichotome divisis; foliis oblongis, imo vix acutis, apice valde obtuso et hinc subito attenuatis, utrinque glaberrimis fuscis et concoloribus, crasso-coriaceis, supra nitido-opacis, costa sulcatis, nervis immersis, subtus costa crassiuscula nervisque tenuissimis prominentibus, margine subrevoluto, petiolo breviusculo; racemo axillari, brevi, paucifloro, floribus ♂ 4-meris, ♀ 5-meris, filamentis crassis, apice sub-breviter ciliolatis.—Ceylon.—*v. s. in herb. Hook.* (♂ *Col. Walker*, ♀ *Gardner*, 101).

This species is distinguishable by its much darker and more fleshy, smooth leaves, which are nearly 4 inches long, and 1½ inch broad, on a rather stout petiole, about 4 lines in length; the calyx is small, and rather deeply 5-toothed; the male flowers have oblong petals, with an internal longitudinal keel, and a long inflexed apical joint, four stamens equal to them in length, with very broad, thick, fleshy filaments, which are furnished on the upper margin with a row of clavate hairs, scarcely longer than the anthers; the pollen is acutely 3-angular; the ovarium is sterile, oblong, with a rather long, conical, hollow style, toothed at its apex. The female flowers have five thick fleshy petals, and five stamens formed like the others, but the cells are filled with grumous matter; the ovarium is nearly the length of the stamens, somewhat 5-grooved, globular in its lower moiety, smaller and cylindrical in its upper half, which presents here somewhat excentrically, a single cell with two distinct ovules suspended from near the summit, on the side towards the axis: the apex of the very short ovarium is crowned with a conical, 5-lobed,

* A representation of this species, with the details of its floral structure, will be given in plate 13 of the 'Contributions to Botany,' &c.

disciform process, equal to it in diameter, the summit being terminated by five very minute teeth*.

22. *Stemonurus affinis*, n. sp.;—ramulis tortuosis, nodosis; foliis ellipticis, utrinque subacuminatis, apice obtusiusculo attenuatis, opacis, supra in costam sulcatis, subtus pallidioribus, costa nervis venisque prominulis, margine subrevoluto, petiolo tenui teretiusculo superne sulcato; panicula axillari, pauciflora, petiolo vix longiore, pedicellis pubescentibus, calyce 5-dentato petalisque oblongis breviter apiculatis glabris, staminibus iisdem vix æquilongis, filamentorum apicibus carinaque interna longissime ciliatis, ovario fertili, longitudine staminum, longe cylindrico, paullulo incurvo, apice pulvinato.—Malacca.—*v. s. in herb. Hook.* (Griffiths).

This species is near *S. polymorpha*, but differs in several particulars. It appears to be a remarkably knotty and scrubby tree; its leaves are about $3\frac{1}{2}$ inches long, $1\frac{1}{4}$ to $1\frac{3}{8}$ inch broad, on a petiole 4 or 5 lines in length; its panicles are 6 or 8 lines long, and its flowers offer a very instructive exemplification of the development of the ovarium; the last-mentioned species exhibiting an intermediate stage, between that described in *S. Penangianus*, and this, which offers another manifest instance of Dr. Wallich's genus *Gomphandra*. Here the fleshy petals are linearly oblong, with a comparatively short inflexed apex; the stamens are not equal to them in length; the filaments exceed the anthers in breadth, but are not quite so thick as in other species; they are suddenly contracted to a sharp point at the apex, and have a less prominent internal keel, the summit of which, together with the upper margins of the filaments, are fringed with very long clavate hairs; the anthers are 2-lobed and sagittate from near the almost apical point of their attachment; the lobes are membranaceous, each longitudinally split open and quite void of pollen or other matter, so that it is not apparent whether they have been fertile or sterile. The ovarium is the length of the stamens, is cylindrical, a little curved, and rather thicker towards the apex; in diameter it is scarcely broader than the filaments, quite smooth, and surmounted by a short, compressed, umbilicated, and somewhat 5-lobed disciform process, which partly overhangs the summit; the body of the ovarium exhibits only a single large cell, of nearly its whole length, from one side of which, near the summit, two ovules, that almost fill the cavity of the cell, are suspended, each from a short cupshaped strophiole†.

* A figure of this species, and an analysis of its floral structure, will be shown in plate 14 of the 'Contributions to Botany,' &c.

† This species, and the details of its floral structure, will be exhibited in plate 15 of the 'Contributions to Botany,' &c.

VII.—*Notes on* Chalcidites, *and Descriptions of various new species.* By Francis Walker, F.L.S.

[Continued from vol. ix. p. 43.]

Perilampus maurus, mas. *Ater, antennis apice ferrugineis, tarsis fulvis, alis limpidis.*

Body black: head as broad as the chest, nearly smooth, slightly shining; hind part slightly striated across; front shining, very deeply excavated, extending on each side of the face and of the epistoma which are small and rhomboidal; epistoma larger than the face: mouth pitchy: feelers nearly filiform, black, ferruginous towards their tips which are conical: chest coarsely and deeply punctured, dull, hairy: abdomen smooth, shining; ventral plate dull, slightly striated: legs black, clothed with short tawny hairs; feet tawny: wings colourless, very pubescent; veins pitchy; humerus at some distance from the fore-border, less than half the length of the wing; ulna about one-third of the length of the humerus; radius rather more than half the length of the ulna; cubitus full one-third of the length of the radius; brand small, not furcate. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

Port Natal. In the British Museum.

Eupelmus basicupreus, fem. *Viridis, axillis et scutello nigris, metathoracis lateribus auratis, abdomine cupreo basi micante, antennis nigris, pedibus fulvis, femoribus viridibus, alis subfulvis.*

Body green: head very little narrower than the chest, coarsely punctured; crown black; channel for the reception of the first joint of the antennæ very deep, finely squamous, bright green with a blue disc: eyes large: feelers black, slender, filiform, more than half the length of the body; first joint green, very long, slightly curved; second bright green: axillæ and scutellum black; axillæ very large, nearly contiguous; scutellum obcordate, with a very slight longitudinal suture: sides of the hind-chest golden green: abdomen cupreous black, nearly spindle-shaped, depressed above, keeled beneath, bright cupreous at the base, rather less than twice the length of the chest; sheaths of the oviduct black, ferruginous towards the tips, extending beyond the abdomen to one-fourth of its length: legs tawny; thighs bluish green; fore-shanks black at the base; a ferruginous band near the base of each hind-shank: wings slightly tinged with tawny; veins tawny; humerus rather more than one-third of the length of the wing, slightly widened towards its tip; ulna a little shorter than the humerus; radius much shorter than the ulna; cubitus about one-fourth of the length of the ulna, slightly curved; brand very small. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

Para. In the British Museum.

Sparasion Sinense, mas. *Viridi-cyaneum, abdomine cyaneo-purpureo, antennis pedibusque nigris, femoribus cyaneis, tibiis tarsisque anticis piceis, alis subfuscis.*

Body convex, rather hairy: head and chest dark greenish blue, roughly punctured: eyes and eyelets piceous: feelers black, nearly filiform, shorter than the chest; first joint long, stout, shining; second short, cup-shaped; third very long, subclavate; fourth and following joints to the tenth short, transverse, nearly equal in size, but gradually decreasing in length and breadth towards the tips of the feelers: fore-chest extremely short, forming a narrow line in front of the middle shield, the sutures of whose parapsides are distinct; scutcheon obconical: hind-chest obconical, declining: breast smoother than the chest; the punctures being fewer and smaller: petiole very short: abdomen long spindle-shaped, thickly striated, bluish purple, bluish green at the tip, narrower than the chest and about twice its length; sides nearly smooth or having only a few indistinct punctures: legs black, hairy; hips and thighs shining, the former dark blue; fore-shanks and fore-feet piceous: wings slightly brown, somewhat darker along the fore-borders from the middle to the tips; veins brown. Length of the body 4 lines; of the wings 6 lines.

Fou-chou-fou, China. In the British Museum.

Smiera torrida, fem. *Fulva nigro varia, capite antico flavo, antennis nigris subtus ferrugineis, pedibus fulvis, femoribus anterioribus flavis, tibiis posticis nigro vittatis, alis ad costam subcinereis.*

Body tawny, roughly punctured, thinly clothed with short tawny hairs: two black spots behind the head; front and face yellow: feelers black, filiform, ferruginous beneath and at the tips; first joint tawny: three black stripes on the shield of the middle chest; the inner one obconical; the side pair oblique, slightly waved, tapering towards the fore-border; axillæ black, parted by near one-third of the breadth of the scutcheon, which has a triangular black spot resting on its hind-border: propodeon smooth, shining: petiole slender, cylindrical, a little longer than the propodeon, with a short black stripe on each side: abdomen spindle-shaped, smooth, shining, punctured towards the tip, more than twice the length of the petiole; metapodeon large; octoon about half the length of the metapodeon; ennaton, decaton and protelum together as long as the octoon; paratelum and telum of equal length, together longer than the octoon; ventral segments concealed: legs tawny; anterior thighs yellow; a black stripe on each hind-hip; hind-thighs armed beneath with seven teeth whose tips are black; first and second very small, the other five large; a black stripe on each hind-shank: wings very pubescent, slightly gray along the fore-border; veins tawny; supplementary veins distinct as in other large species; humerus much more than one-third of the length of the wing; ulna less than half the length of the humerus; radius as long as the ulna; cubitus not more than one-sixth of the radius; brand very small. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Para. In the British Museum.

Smiera nigro-rufa, mas. *Rufa, nigro varia, petiolo nigro, abdomine rufo, antennis nigris, alis limpidis.*

Body red, roughly punctured: head black; sides of the front tawny: mouth tawny: feelers black: breast, hind-chest, paraptera, axillæ and sides of the middle chest black: three black stripes on the shield; the side pair broad and oblique; a three-lobed black mark on the scutcheon: petiole black, slender, cylindrical, smooth, shining: abdomen smooth, shining, short, globose, less than twice the length of the chest: legs red; hips black; anterior thighs black at the base; middle shanks striped with brown towards the base; hind-shanks at the base and at the tips and hind-feet black: wings colourless; veins brown; humerus near half the length of the wing; ulna not one-third of the length of the humerus; radius much longer than the ulna; cubitus about one-fourth of the ulna; brand rather large, slightly forked. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

East Indies. In the British Museum.

Callimome cyaneus, Kollar, fem. *Purpureus cyaneo viridique varius, antennis nigris, pedibus fulvis, femoribus purpureis, metatibiis piceis, alis limpidis.*

Fem. Body purple, pubescent, varied with green and blue: feelers black, subclavate, a little shorter than the thorax; first joint fulvous: head and thorax punctured, in structure like the other species of *Callimome*: podeon very short: abdomen purple, smooth, shining, nearly as long as the thorax; metapodeon blue, green at the base: legs fulvous; coxæ and thighs purple; metatibiæ piceous; tips of the tarsi piceous: wings limpid, rather short; nervures fuscous; ulna much shorter than the humerus; radius very short; cubitus a little shorter than the radius; stigma very small; oviduct fulvous, much longer than the abdomen; its sheaths black.

Inhabits Germany.

Chalcedectus, n. g.

Eupelmo affinis, at quoad pedes posticos *Chalcidi* similis.

Chalcedectus maculicornis, fem. *Viridis, cupreo cyaneo et purpureo varius, antennis nigris, articulo 5° supra albo, tarsis piceis, tarsis intermediis nigris basi flavis, alis fusco subnebulosis.*

Body brilliant green, narrow: head a little narrower than the chest: crown narrow; front largely and deeply punctured, with a very deep almost smooth bluish green channel for the reception of the first joint of the feelers; face broad: mouth pitchy: eyes rather large: feelers black, filiform, slender, as long as the chest; first joint very long; second linear, long, nearly half the length of the first; third and fourth indistinct; fifth white above, a little shorter than the second; the following linear, very compact, successively decreasing in length: chest spindle-shaped: fore-chest broader than long, rounded in front, much lower than the middle-chest, very finely shagreened: shield and scutcheon of the middle-chest very largely and deeply punctured: shield rather flat, adorned with a broad coppery band whose edges are tinged with blue and purple; sutures of the parapsides distinct; axillæ parted by about one-third of the breadth of the chest; scutcheon obconical, with a coppery spot at its base: hind-chest small, subquadrate, finely punctured, with two or three slight cross ridges: propodeon and podeon short: abdomen lanceolate, longer and a little narrower than the chest, slightly pubescent, transversely and very finely striated, almost flat on the disc towards the base, adorned above with coppery purple and blue colour; metapodeon of moderate length; octoon shorter; ennaton longer; decaton shorter; the three following segments short; underside finely punctured, not keeled, dorsal segments approximate beneath, parted only by two linear, parallel, very slender plates which extend along the whole length of the body: legs green, slightly pubescent, adorned with blue and purple colour: fore-thighs rather thick; fore-shanks purple, armed at the tips with a slender curved spine; fore-feet pitchy, tawny at the base; middle thigh long and slender, grooved beneath; tip of each middle shank armed with a stout straight tawny spine; middle feet black, pale yellow at the base; hind-legs formed like those of *Chalcis*; hips long; thighs very large, armed beneath with seven oblique teeth, those towards the tips are small; shanks very much curved, widening from the base to the tips; hind-feet pitchy, with a slight metallic tinge: wings almost colourless, fore-wings slightly clouded with brown in the disks and with gray at the tips; veins black; humerus much more than one-third of the length of the wing; ulna about one-third of the length of the humerus; radius nearly as long as the humerus, extending almost to the tip of the wing; cubitus straight, very slanting, less than one-fourth of the length of the radius, widening from its source to the brand which is small; a few supplementary veins in the disk, as is usual in the large species of the tribe. Length of the body 5 lines; of the wings 6 lines.

Para. In the British Museum.

This is one of the tropical forms whose characters are more compound or complicated than those of any genera which inhabit more temperate regions; and may be considered either as a connecting link between families, or as a common and governing centre, representing various remote groups, and associating them together. It comes between the *Pteromalidæ* and the *Eupelmidæ*, and is one of the *Cleonymidæ*, and is most allied to *Lycisca*; but it has the head of *Perilampus*, the thoracic sculpture of the *Perilampidæ* and the *Eurytomidæ*, and the hind-legs of the *Leucospidæ* and of the *Chalcidæ*.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

November 26, 1850.—R. H. Solly, Esq., F.R.S., in the Chair.

An Account of Fishes discovered or observed in Madeira since the year 1842*. By the Rev. R. T. Lowe, M.A.

Family Zenidæ.

1. Zeus conchifer. *Lilacino-cinereus, capite inermi; thorace pinnaque dorsali analique utrinque scutatis; spinis dorsalibus anterioribus brevissime filamentosis; pinnis ventralibus* 1 + 5-*radiatis; caudali lunata.*

D. 9 v. 10+25 v. 26; A. 2 + (1 + 25 v. 26); P. 13; V. + 5; C. $\frac{1+\overline{\text{I.}+\text{V.}}}{1+\overline{\text{I.}+\text{VI.}}}$; M. B. 7; Vertebræ, 13 abd. + 21 caud. = 34.

An example of this very fine new Dory was communicated, with a short notice, to the Zoological Society in 1845 †. The row of large and remarkable naked bony scutellæ on each side, at the base of the dorsal and anal fins, and along the breast or ventral line, afford a very striking character. They resemble the depressed shells of a *Fissurella* seen in profile, and are beautifully radiato-striate, with a bright iridescent rose or lilac lustre, like the inside of a *Trigonia.* The umbo forms a smooth short strong spine or recurved prickle. The dark thumb-mark on the middle of the sides is present, as in *Z. Gallus*, L. Three examples only have occurred, measuring from eighteen inches to a little more than two feet in length.

The supposed affinity between *Zeus* and *Oreosoma*, Cuv.‡, is much corroborated by this fish.

2. Argyropelicus Olfersii. (*Sternoptyx Olfersii*, Cuv. R. An. (2nd edit.) ii. 316. t. 13. f. 2.)

A single example, caught with a boatscoop on the surface of the water in the Bay of Funchal, June 6, 1845.

The name of *Pleurothysis*, proposed in the 'Fishes of Madeira,' p. 64, for this portion of the Cuvierian genus *Sternoptyx*, has been anticipated by that of *Argyropelicus*, previously assigned to a Mediterranean species by the Italian naturalist Cocco, and adopted in the 'Fauna Italica' by the Prince of Canino.

I have now succeeded in obtaining both the Cuvierian species of *Sternoptyx* in this part of the Atlantic; though *St. diaphana* (Le St. d'Herman, Cuv.) cannot, like *Arg. Olfersii*, be perhaps fairly claimed at present to belong to the Madeiran fauna §.

The Atlantic and Mediterranean species of *Argyropelicus* may be thus distinguished:

Arg. Olfersii, Cuv. *Corpore altiore, altitudine dimidium lon-*

* Ann. Nat. Hist. S. 1. vol. xiii. p. 390.

† Proc. Zool. Soc. part 13. p. 103.

‡ Fishes of Madeira, Preface, p. xii.

§ Ann. Nat. Hist. vol. xiii. p. 393.

gitudinis (dempta pinna caudali) superante; parte postica (caudali) abbreviata; capite duplo altiore quam longo; sterno postice in forcipem, præoperculo inferne in aculeum simplicem desinente. (St. Olfersii, *Cuv. l. c.*)

Arg. hemigymnus, Cocco. *Corpore angustiore, altitudine dimidium longitudinis (dempta pinna caudali) æquante; parte postica (caudali) elongata; capitis longitudine altitudinem æquante; sterno postice in angulum simplex acutum, præoperculo inferne in aculeos duos desinente.* (Arg. hemigymnus *v.* Sternoptyx mediterranea, *Cocco et Buon. Faun. Ital. cum fig.*)

This extraordinary group of fishes offers many points of analogy with *Berycidæ.*

Fam. Lichiidæ.

3. Temnodon vadigo. (*Lichia vadigo,* Cuv. et Val. viii. 363. t. 235.)

A single example was taken in February 1846, but it appeared to be quite unknown to the fishermen, and is therefore to be regarded as a mere straggler in these seas.

If the genus *Temnodon* be retained, this fish has precisely the same claims to a place in it as the common "Anchova" of Madeira (*T. saltator,* Cuv. et Val.).

Fam. Scombridæ.

4. Scomber colias (Gm.), Cuv. et Val. viii. 39. t. 209. (*The Spanish Mackerel,* Yarr. Brit. Fish. i. 131.)

In April 1844, the market in Funchal was plentifully supplied with these fishes for two or three successive days. They were said to have been brought from Porto Santo.

5. Auxis vulgaris, Cuv. et Val. viii. 139. t. 216.

A single example, February 3, 1845. Not quite unknown to the fishermen, but its occurrence said to be a mere chance.

6. Pelamys sarda, Cuv. et Val. viii. 149. t. 217.

October 27, 1844: a single example, called "Sarda" by the fishermen, to whom it is not absolutely unknown, though, like the last, of merely casual occurrence.

Fam. Tænioidæ.

7. Trachypterus gryphurus. *Corpore elongato, macula posteriore laterali spatio tertiam partem totius longitudinis æquante a basi pinnæ caudalis amota; pinnarum radiis scabris; linea laterali inermi, postice supra marginem ventralem desinente.*

D. $5+166$; P. 10 v. 11; V. $1+5$; A. 0; C. $\frac{\text{VIII.}}{5}$; M. B. 6.

Intermediate between *T. falx* and *T. iris* of Cuvier and Valenciennes' 'Histoire,' vol. x. pp. 333, 341; approaching, perhaps, nearest to the latter, but differing in its deeper shape $\left(D=\frac{L}{5\frac{1}{2}}\right.$, instead of $\frac{L}{9 \text{ or } 10}$), and in the backwarder position of the third dark side-spot. The ventral fins are short, only equalling one-twelfth of the body without the caudal fin, and the four first produced rays of the first dorsal are equal in length to the ventral fins. The lateral line ends as in MM. Cuvier and Valenciennes' figure (t. 297) of *T. iris*, but is quite unarmed. The ventral line is serrulate, and the whole surface, particularly towards the ventral line, is finely shagreened or granulate; the granulations becoming stronger towards the ventral line, as in the same figure.

In shape and proportions it agrees better with *T. falx*, but differs in several important particulars from MM. Cuvier and Valenciennes' description of that fish.

The only individual examined of this beautiful and extraordinary fish occurred in June 1845, and has been added by me to the collection of the Cambridge Philosophical Society. It was scarcely quite dead when I first saw it, and was in the most perfect state of preservation. Another *Trachypterus* had occurred in June 1844, and was probably the same species; but the example was unfortunately thrown away by the person to whom it had been mis-sent without my seeing it. It was said to have been about three feet long.

The whole body is pure bright silver, appearing as if frosted from the fine granulations of the surface. The fins are of a delicate scarlet or vermilion, the lower point or angle of the caudal being tipped, and the hinder end of the dorsal edged with black. On the sides are three blackish oval or elliptic spots. This example was twenty-five inches long, exclusive of the caudal fin, which resembles a bat's or griffin's wing, and is erected in a fan-like manner; the lower lobe or portion being suppressed or undeveloped, and only indicated by the presence of five short spinules or abortive rays.

Fam. Labridæ.

8. Labrus larvatus. *Flavus, capite humerisque griseo-nigrescente larvatis; pinna dorsali antice caudaque utrinque infra lineam lateralem rectiusculam unimaculatis; corpore oblongo elongato; dentibus validis crebris, antice biseriatis; pinnæ caudalis apicibus analisque ventraliumque margine cœruleo-nigris.*

D. 17+13; A. 3+11; P. 16; V. 1+5; C. $\frac{3 \text{ v. } 4+\text{VI.}}{2 \text{ v. } 3+\text{V.}}$; B. M. 5; Squamæ lin. lat. 42—45.

In general appearance, shape, and the peculiar straightness of the lateral line, this fine species much resembles *Cossyphus Darwini*, Jen.; but it is a true *Labrus*, with the dorsal and anal fins naked, and the preopercle quite entire. Its nearest allies are therefore *L. mixtus* and *L. Scrofa*; from which however, besides other characters, the numerous strong teeth distinguish it. A single example only has occurred, measuring seventeen inches and a quarter in length.

Fam. Cheironectidæ.

Gen. Chaunax, Lowe.

Gen. Char. Corpus *subcubico-oblongum, sufflabile, nudum, cute præsertim ad ilia ventremque flaccidissima laxa; antice obesum, postice abrupte attenuatum subcompressum.* Caput *osseum magnum subtetrahedrum, superne nuchaque latum planatum, utrinque s. ad genas declive; oculis lateralibus, spatio interoculari convexo; ore rictuque amplissimis transversis plagio-plateis s. depressis.* Dentes *intermaxillares vomerinique palatinique parvi scobinati.* Nares *simplices* (*nec pedicellatæ nec tubulosæ*). Spiracula (*foramina branchialia*) *postica s. ad ilia pone pinnarum pectoralium axillas.* Pinna *dorsalis unica; pectoralibus* (*pedicellatis*) *carnosis; ventralibus jugularibus spathulatis carnosis; analis postica; caudalis simplex truncata.* Cirri, *præter unicum in fossula internasali, nulli.*

9. Chaunax pictus, Lowe in Trans. Zool. Soc. iii. part 4. p. 340. t. 51.

D. 11; A. 5; P. 11; V. 4; C. $\frac{1+\text{IV.}}{2+\text{II.}}$

Species adhuc unica. *Hab.* in mari Maderensi.

I have nothing to add to the full account of this curious fish above referred to, except by way of correction to the second paragraph in p. 344, which has been erroneously printed, and should stand thus:

"Whilst *Cheironectes* seems its most natural, *Halieutæa* is its nearest technical ally. Agreeing with *Lophius* in the wide transverse mouth, and in the backward position of the breathing orifices in the flanks, but with *Cheironectes* more in shape, in the granular or velvety roughness of the skin, and in colour; it differs from both, and approaches *Halieutæa*, in the absence of crests or cilia on the back, and in the single dorsal fin. In these last two points, and in the roughness of the skin, it agrees with *Halieutæa*, but differs in its Diodon-like shape, and in the position of the breathing-holes considerably behind, instead of above or before, the axils of the pectoral fins."

Fam. Scopelidæ.

Gen. Phænodon.

Gen. Char. Caput *magnum compressum, oculis magnis, rostro brevissimo obtuso, rictu magno pone oculos longe diducto, mento subtus ad symphysin cirro barbato.* Dentes *intermaxillares uniseriati; anteriores* (5 *v.* 6 *utrinque*) *validi tenues prælongi laniarii subrecurvi remoti distincti, extrorsum supra labia invicem claudentes; ossibus palati dentibus minoribus uniseriatis, lingua biseriatis, armatis.* Opercula *simplicia plana.* Corpus *elongatum compressum nudum? s. exsquameum; abdomine punctis argenteis* (*ut in* Scopelo) *seriatis.* Linea lateralis *recta pinnæque fere ut in* Scopelo, *pectoralibus brevioribus.*

10. Phænodon ringens. (*Scopelus barbatus*, nob. MS. olim.)

$$1^{ma}\text{ D. }16;\ 2^{da}\text{ D. }0;\ \text{A. }16;\ \text{V. }7;\ \text{P. }9;\ \text{C. }\frac{9+\overline{\text{I.}+\text{IX.}}}{6+\underline{\text{I.}+\text{VIII.}}};\ \text{M. B. ?}$$

Closely allied to *Scopelus*, but with the head and teeth of *Echiostoma*, which it also resembles in its single cartilaginous beard or barbule.

A single example occurred in May 1845, and was placed by me in the collection of the Cambridge Philosophical Society, under the MS. name of *Scopelus barbatus*. It was seven inches long, and the above fin-formula is taken from it.

I have been favoured by the Duc de Leuchtenberg this winter with the opportunity of examining a second individual, procured from a fisherman. It agreed in all important details with the former, but was only from five to six inches long, and had a much shorter barbule.

Both these examples were entirely devoid of scales, but from certain appearances I am inclined to attribute this defect to injury.

The colour is a uniform brownish or coal-black, except the silver pits, which are disposed in rows along the throat and belly, exactly as in *Scopelus*.

11. Scopelus maderensis (Suppl. in Trans. Zool. Soc. iii. part 1. p. 14).

Appears to be distinguished from *Sc. Humboldti* by the forwarder (medio-dorsal) position of its first dorsal fin, and by the long pectoral fins, which are contained from four to four and a half times in the whole length, and reach to the end of the base of the first dorsal fin. The anal fin has fourteen rays.

Examples have occurred of two other forms or species, with shorter pectoral fins, in one of which the anal fin has fourteen, and in the other twenty-two rays. In the first of these, the length of the pectoral fin is one-sixth of the whole length of the fish $\left(\text{P}=\frac{\text{L}}{6}\right)$; in the second it is one-fifth and four-sevenths of the same $\left(\text{P}=\frac{\text{L}}{5\frac{4}{7}}\right)$; *i. e.* rather longer. But further investigations will be requisite before these can be safely proposed as species. In general habit, colour, and appearance, they agree with *S. maderensis*.

12. Metopias typhlops (Proc. Zool. Soc. 1843, vol. xi. p. 90).

Another example has occurred of this most curious and anomalous little fish. It was brought to me in May 1849, from the same place, Magdalena, at which I obtained the former. It is of much larger size, measuring three inches and a half in length. I find nothing whatever to correct in the account above referred to, except that the maxillary teeth, instead of being "uniseriate," are in a scobinate or brush-like band in both jaws; narrow in the upper, broader in the lower jaw.

The acquisition of a second example, confirming the peculiar characters before set down, is the more satisfactory, from the former having been unfortunately destroyed by the wasting of the alcohol in which it was kept.

Fam. Gadidæ.

13. Phycis furcatus, Flem. (not Bowdich); Yarr. Brit. Fish. ed. 1. ii. 201. (*Le Merlus barbu,* Duham. Cuv. R. An. ed. 2. ii. p. 335.)

A single example occurred May 8, 1845; not quite agreeing with the figure in the 'British Fishes,' yet certainly distinct from the common "Abrotea" of Madeira (*P. mediterraneus,* Lar.), of which, on the other hand, the *P. furcatus* of Bowdich (Excurs. p. 122. f. 28) was unquestionably a mere accidentally fork-tailed individual.

Fam. Echeneidæ.

14. Echeneis vittata, Suppl. to Synops. in Trans. Zool. Soc. vol. iii. part 1. p. 17, and Hist. Fish. Mad. p. 77. t. 11.

The acquisition of an adult example measuring 2 feet 6½ inches in length, has proved the fish above described to have been a young individual of *E. vittata,* Rüppell (Neu. Wirbel. p. 82). It is fortunate that the happy coincidence of name necessitates no change or confusion in rendering justice to my learned friend's prior claim in the establishment of this well-marked species. The lateral dark band or *vitta* becomes indistinct in adult individuals. In the large full-grown example above mentioned it had disappeared entirely.

Fam. Murænidæ.

Gen. Leptorhynchus, *nob.*

Gen. Char. Caput *scolopaciforme, callo elongato distinctum; maxillis in rostrum tenue productis, utraque dentibus minutissimis limæ instar scabra; rictu pone oculos diducto.* Nares *oculis contiguæ approximatæ, simplices nec tentaculatæ.* Oculi *magni.* Corpus *nudum anguilliforme compressum, gracile, elongatum; postice longissime attenuato-productum filiforme, apice acuto.* Aperturæ *branchiales sat magnæ, ante pinnas pectorales oblique deorsum fissæ.* Pinnæ *pectorales distinctæ lanceolatæ, sat magnæ; pinna dorsali ad nucham paullo ante, anali ad gulam paullo post pinnas pectorales incipiente; utraque usque ad apicem caudæ continuata, membranacea, nec cute cooperta, sed radiis sat validis distinctis.*

15. Leptorhynchus Leuchtenbergi. (*The Snipe-Eel.*)

I am indebted for an opportunity of describing this interesting new type of *Murænidæ* to the favour of His Imperial Highness the Duc de Leuchtenberg, to whom an example was brought by a fisherman in January last. It approaches the *Anguillidæ* by its well-developed pectoral fins. The prolonged beak-like muzzle also reminds one of that of *Leptognathus,* Swainson. The unique individual examined, which measured 2 feet 9 inches in length, scarcely half an inch in height, and four lines in thickness, is included in the extensive collections formed with so much scientific ardour and discrimination by His Imperial Highness the Duc de Leuchtenberg, during his late six months' residence in Madeira.

Fam. Balistidæ.

16. Monacanthus auriga. *Hispidus, cauda utrinque dense hispido-villosa; pallide olivaceo-murinus, sublutescens, fusco-lutoso-maculatus v. interrupte longitudinaliter subfasciatus; fasciis luteis inconspicuis evanescentibus* 3 *v.* 4 *ab oculis antice oblique radiantibus; radiis* 1 *v.* 2 *anticis dorsalis primæ aliquando in filamentum productis.*

1ma D. 1; 2da D. 31; A. 30 v. 31; P. 13 v. 14; C. 1+X.+1.

From eight to ten or eleven inches long. On each side, towards the base of the caudal fin, is an oblong patch, like plush or velveteen, of close thickset hairs or bristles. The occasional production of the second or first two rays of the second dorsal fin is perhaps sexual. Such examples have the muzzle rather longer and more produced before the eyes than those which have not the elongated dorsal filament. They are perhaps the *M. filamentosus* of M. Valenciennes, to whose figure and description, however, in MM. Webb and Berthelot's 'Canarian Fishes,' I regret I have not access.

Several examples have occurred, chiefly in the autumn, during the last five or six years, of this previously in Madeira unobserved or unrecorded species.

SQUALIDÆ.

Fam. Alopecidæ.

17. Alopias vulpes, Buon. (*The Fox Shark,* Yarr. ii. 379.)

An example occurred this spring of unusual size, measuring eighteen feet in length, of which the tail was ten feet. The skin was preserved by the Duc de Leuchtenberg.

Fam. Spinacidæ.

18. Centrophorus squamosus, Müll. und Henle, p. 90, with a figure.

The *Ramudo* or *Raimudo* of Madeira, not unfrequently taken off the Dezertas at a depth of twelve or fourteen "*linhas,*" i. e. from 350 to 400 fathoms, belongs apparently to the above species, the habitat of which was unknown to its describers, MM. Müller and Henle. I have only examined female examples, and the fishermen profess themselves to be entirely unacquainted with the male, which I have however formerly (March 10, 1838) once seen, though without opportunity for a close or accurate examination, and so perhaps without remarking any spine near the tips of the claspers or ventral fin-appendages. The individuals examined were five or six feet long, but the fish is said to grow to a much larger size.

Madeira, May 25, 1850.

December 10.—Prof. Owen, V.P., F.R.S., in the Chair.

Description of several new species of Entomostraca. By W. Baird, M.D., F.L.S. etc.

Genus Lepidurus, Leach.

1. Lepidurus viridis, Baird.

Body of animal, including the flap of tail segment, about two inches long and one broad. The carapace and whole body are of a fine green colour, the carapace covering about two-thirds of the abdomen; the edges of the notch in the posterior part of the carapace are strongly toothed, and those of the inferior half of the carapace are very finely serrated; these teeth are of two sets, the one much larger than the others; the larger teeth are of a green colour, tipped at the point with dark brown; they are about eleven in number, and between each there are two or three much smaller ones interspersed. The appendages of the first pair of feet are very short and small, scarcely extending beyond the edge of the carapace. The segments of the abdomen are each studded with a row of stout, slightly curved spines of a green colour tipped at their edges with dark brown. The tail flap is oval, keeled down the centre, the keel being beset with short sharp spines, and the edges of the flap are finely serrated. The long setæ of the tail are nearly the length of the whole animal, and are covered with short hairs.

Hab. Van Diemen's Land. British Museum.

Genus Cypris, Müller.

1. Cypris Donnetii, Baird.

Carapace valves elongate oval. Anterior extremity narrower than posterior, and considerably flatter; posterior extremity rounded and very convex; dorsal edge arched; ventral slightly reniform. The surface of the valves is smooth and shining, of a brown colour, variegated with patches of a darker shade. The pediform antennæ are provided with about six bristles of considerable length.

Hab. Freshwater ponds, Coquimbo; collected by — Donnet, Esq., Surgeon R.N. Brit. Mus.; from the collection of H. Cuming, Esq.

2. Cypris cuneata, Baird.

Carapace valves wedge-shaped, much broader at anterior than posterior extremity. Dorsal margin highly arched; ventral deeply sinuated in the centre, giving the shell a reniform appearance. Valves very convex in the centre, and surrounded by a prominent margin, which at the anterior extremity, when highly magnified, is seen to be minutely and finely serrated. The whole carapace is of a deep green colour, and covered with fine hairs.

Hab. Duddingston Loch, near Edinburgh; August 1850.

Genus Candona, Baird.

1. Candona lactea, Baird.

Carapace valves oblong ovate, convex. Dorsal margin nearly straight; ventral slightly sinuated in the centre. Anterior and posterior extremities of nearly equal size. Surface of valves smooth and shining, and of a dull white colour.

This species resembles in shape the *Candona reptans*, but is only about one-fourth the size, and is of a uniform dull white colour.

Hab. Freshwater pond at Charing, Kent; collected by W. Harris, Esq., to whom I am indebted for specimens. Regent's Park (*T. Rupert Jones, Esq.*).

Genus Cythere, Müller.

1. Cythere tarentina, Baird.

Carapace valves obovate. Anterior extremity much broader than posterior, and having a broad flat margin striated on the surface and toothed round the edge; posterior extremity pointed, having the same margin, but not so broad, and with much fewer teeth. The valves are very convex in the middle, of a greyish colour, with a white patch in the centre, and are slightly pitted all over. Dorsal and ventral margins both somewhat prominent.

Hab. Tarentum. In Mr. Williamson's collection.

2. Cythere setosa, Baird.

Carapace valves oval. Anterior extremity narrower than posterior. Dorsal margin arched; ventral sinuated about its anterior third. Surface of valves shining white, and studded all over with short stiff hairs.

Hab. Moreton Bay, Australia, and Tenedos. Mr. Williamson's collection.

Genus Cythereis, Jones.

1. Cythereis australis, Baird.

Carapace valves somewhat quadrilateral. Dorsal and ventral margins nearly straight. Anterior extremity broader than posterior, and finely toothed; teeth numerous. Posterior extremity emarginate on upper or dorsal edge, and toothed on ventral; teeth few, and stronger than those on anterior margin. Surface of valves roughened with small asperities, and having one tubercle on about the anterior third of its length. A raised margin encircles the whole valve.

Approaches very near *Cypridina hieroglyphica* of Bosquet, Entomost. Maestricht, t. 3. f. 4.

Hab. Moreton Bay, Australia. Mr. Williamson's collection.

2. Cythereis runcinata, Baird.

Carapace valves ovate, flat. Anterior extremity broader than posterior, and rounded; posterior extremity emarginate on upper or dorsal margin. Surface of valves very flat and rugose; a flat projecting border surrounds each valve, which is serrulated at anterior extremity and toothed on posterior; a high raised sharp ridge runs across the centre of the valve somewhat in a diagonal direction, which is serrulated along its whole length, and a smaller similar ridge is seen near the ventral margin.

Hab. Tenedos. Mr. Williamson's collection.

3. Cythereis fistulosa, Baird.

Carapace valves nearly quadrilateral, elongate. Anterior extremity a little more rounded than posterior, and armed with seven or eight small teeth; posterior extremity armed with five or six larger teeth. Dorsal and ventral margins nearly straight. Surface of valves granular and ornamented by four elevated straight ridges, which are perforated near their margins with small round holes.

Hab. Manilla. Mr. Williamson's collection.

4. Cythereis prava, Baird.

Carapace valves subquadrangular. Anterior extremity considerably broader than posterior, rounded, smooth round the edge, and having a broad flat margin beset on inner edge with small round tubercles; posterior extremity emarginate, and furnished on inferior half with several short teeth. Valves extremely gibbous in centre, and the surface very rough, wrinkled, and tubercled.

Hab. Tenedos. Mr. Williamson's collection.

5. Cythereis deformis, Baird.

Carapace valves ovate, short and gibbous; the two extremities of nearly the same size. Dorsal and ventral margins nearly straight. Surface of valves very coarsely granulated and tubercled; roughly ridged, but the ridges not perforated as in the preceding species.

Hab. Manilla. Mr. Williamson's collection.

6. Cythereis senticosa, Baird.

Carapace valves flat, ovate. Anterior extremity broader than posterior, and rounded. Dorsal margin sloping towards posterior extremity; ventral nearly straight. The surface of the valves is very rough, wrinkled, and beset all over, but especially near the margins, with strong spinous laciniæ.

Hab. Tenedos. Mr. Williamson's collection.

Genus Cypridina, M.-Edwards.

1. Cypridina Zealanica, Baird.

Carapace valves of an oval form, somewhat flattened, but convex in the centre and striated; the striæ are numerous, close-set, and of a waved appearance. Surface of valves 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 posterior. The whole carapace is of a uniform white colour. Natural size one-fourth of an inch long and one-fifth of an inch broad.

Hab. New Zealand. Two specimens were sent to the British Museum by the Rev. R. Taylor, of Waimati in New Zealand, along with a collection of marine and freshwater shells, but without any history attached to them.

2. Cypridina interpuncta, Baird.

Carapace valves oval. Anterior extremity narrower than posterior;

the notch near anterior extremity very wide, and its anterior margin blunt and projecting in form of a beak straight upwards; posterior extremity obtusely rounded, and terminating near the ventral margin in a short blunt point. Dorsal and ventral margins nearly straight or slightly arched. The surface of the valves is of a dull white colour, and is densely and rather coarsely covered with impressed punctations.

The carapace is convex, but much less so than in *C. M'Andrei*, and is of a much more oval shape.

Hab. Near the Isle of Skye; collected by R. M'Andrew, Esq., August 1850.

3. Cypridina Mariæ, Baird.

Carapace valves elongate oval, of exactly the same size at each extremity; extremities rounded. Dorsal and ventral margins nearly plane, or very slightly arched. Surface of valves of a white shining colour, mottled with a few spots of a dull white, and covered with minute superficial punctations. Notch or ventral margin of anterior extremity blunt, leaving the upper and lower margins of the notch very obtuse.

Approaches *Asterope elliptica* of Philippi somewhat in figure of carapace, but is much more elongate, and is one-third larger.

Hab. Off the Isle of Skye; collected by R. M'Andrew, Esq., August 1850.

ROYAL INSTITUTION OF GREAT BRITAIN.

Friday, May 7, 1852.—W. R. Grove, Esq., M.A., F.R.S., Vice-President, in the Chair.

On the Supposed Analogy between the Life of an Individual and the Duration of a Species. By Prof. Edward Forbes, F.R.S.

In Natural History and Geology, a clear understanding of the relations of Individual, Species, and Genus to Geological Time and Geographical Space is of essential importance. Much, however, of what is generally received concerning these relations will scarcely bear close investigation. Among questionable, though popular notions upon this subject, the Lecturer would place the belief that the term of duration of a species is comparable and of the same kind with that of the life of an individual.

The successive phases in the complete existence of an individual are, Birth, Youth, Maturity, Decline, and Decay terminating in Death. Whether we regard an individual as a single self-existing organism however produced, or extend it to the series of organisms, combined or independent, all being products of a single ovum, its term of duration can be abbreviated, but not prolonged indefinitely, nor can the several phases of its existence be repeated. Conditions may arrest or hasten maturity, or prematurely destroy, but cannot, however favourable, reproduce a second maturity after decline has commenced.

Now, it is believed by many that a species (using the term in the sense of an assemblage of individuals presenting certain constant characters in common, and derived from one original protoplast or stock) passes through a series of phases comparable with those which succeed each other in definite order during the life of a single individual,—that it has its epochs of origin, of maturity, of decline and of extinction, dependent upon the laws of an inherent vitality.

If this notion be true, the theory of Geology will be proportionately affected; since in this case the duration of species must be regarded as only influenced, not determined, by the physical conditions among which they are placed;—and, thus, species should characterize epochs or sections of time, independent of all physical changes and modifying influences short of those which are absolutely destructive. Now, geological epochs, as at present understood, are defined by peculiar assemblages of species, and the amount of change in the organic contents of proximate formations or strata is usually accepted as a measure of the extent of the disturbances that affect them. Yet this latter inference, involving as it does the supposition that the spread and continuity of species in time are dependent upon physical influences, is adverse to the notion of a Life of a Species as stated above.

If we seek for the origin of this notion, we shall find that it has two sources; the one direct, the other indirect. It is not an induction, nor pretended to be, but an hypothesis assumed through apparent analogies. Its first and principal source may be discovered in the comparison suggested by certain necessary phases in the duration of the species with others in the life of an individual, such as each has its commencement, and each has its cessation. Geological research has made known to us, that prior to certain points in time certain species did not exist, and that after certain points in time certain species ceased to be. The commencement of a species has been compared with *Birth*, the extinction with *Death*. Again, many species can be shown to have had an epoch of maximum development in time. This has been compared with the maturity of the individual.

Between the birth of an individual and the commencement of a species in the first appearance of its protoplast, the analogy is more apparent than real. We know how the former phænomenon takes place, but we have no knowledge of the latter.

Between the maturity of the individual and the maximum development of a species there is no true analogy, since the latter can easily be proved to be entirely dependent on the combination of favouring conditions, and during the period of duration of a species there may be two or more epochs of great or even equal development, and two or more epochs of decline alternating with epochs of prosperity. The epoch of maximum of a species may also occur during any period in its history short of the first stage. Geological and geographical research equally show that the flourishing of a species is invariably coincident with the presence of favouring and its decline with that of unfavourable conditions. Hence there is no analogy between the single and definite phase of maturity of the individual, and the variable and sometimes often-repeated epochs of luxuriant development in the duration of a species.

Between the death of the individual and the extinction of a species there is an analogy only when the former event occurs prematurely through the influence of destroying conditions. But in their absence, an individual after its period of vitality has been completed must necessarily die; whereas we have no right to assume that such would be the fate of a species so circumstanced, since in every case where we can either geologically or geographically trace a species to its local or general extinction, we can connect the fact of its disappearance with the evidences of physical changes.

[The Lecturer illustrated these points by diagrams and special demonstrations, selecting for explanation two local cases, the one marine and the other freshwater; the former taken from the geological phænomena of Culver Cliff and the neighbouring bays in the Isle of Wight, of which a beautiful and original model had been communicated by Capt. Ibbetson for the purpose, and the latter from his own recent researches (unpublished) on the succession of organic remains in the Purbeck strata of Dorsetshire, conducted as part of the labours of the Geological Survey of Great Britain.]

The second and more indirect source of the notion of *the life of a species* may be traced in apparent analogies, half-perceived, between the centralization of generic groups in time and space, and the limited duration of both *species* and *individual.* But in this case ideas are compared which are altogether and essentially distinct.

The nature of this distinction is expressed among the following propositions, in which an attempt is made to contrast the respective relations of *individual, species,* and *genus* to Geological time and Geographical space.

A. The *individual,* whether we restrict the word to the single organism, however produced—or extend it to the series of organisms, combined or independent, all being products of a single ovum—has but a limited and unique existence in time, which, short as it must be, can be shortened by the influence of unfavourable conditions, but which no combination of favouring circumstances can prolong beyond the term of life allotted to it according to its kind.

B. The *species,* whether we restrict the term to assemblages of individuals resembling each other in certain constant characters, or hold, in addition, the hypothesis (warranted, as might be shown from experience and experiment), that between all the members of such an assemblage there is the relationship of family, the relationship of descent, and consequently that they are all the descendants of one first stock or protoplast—(how that protoplast appeared is not part of the question)—is like the individual in so much as its relations to *time* are *unique*: once destroyed, it never reappears.

But (and this is the point of the view now advocated), unlike the *individual,* it is continued indefinitely so long as conditions favourable to its diffusion and prosperity—that is to say, *so long as conditions favourable to the production and sustenance of the individual representatives or elements are continued coincidently with its existence.*

[No amount of favouring conditions can recall a species once destroyed.—On this conclusion, founded upon all facts hitherto observed in palæontology, the value of the application of Natural History to Geological science mainly depends.]

C. The *genus*, in whatever degree of extension we use the term, so long as we apply it to an assemblage of species intimately related to each other in common and important features of organization, appears distinctly to exhibit the phænomenon of centralization in both *time* and *space*, though with a difference, since it would seem that each *genus* has a *unique centre* or *area of development* in time, but in geographical space may present *more centres than one.*

a. An individual is a positive reality.

b. A species is a relative reality.

c. A genus is an abstraction—an idea—but an idea impressed on nature, and not arbitrarily dependent on man's conceptions.

α. An individual is *one.*

β. A species consists of *many resulting from one.*

γ. A genus consists of more or fewer of these *manies resulting from one* linked together not *by a relationship of descent* but *by an affinity dependent on a divine idea.*

And, lastly,

a. An individual cannot manifest itself in two places at once; it has no extension in space; its relations are entirely with *time*, but the possible duration of its existence is regulated by the law of its inherent vitality.

b. A species has correspondent and exactly analogous relations with time and space,—the duration of its existence as well as its geographical extension are entirely regulated by physical conditions.

c. A genus has dissimilar or only partially comparable relations with time and space, and occupies areas in both having only partial relations to physical conditions.

The investigation of these distinctions and relations forms the subject of a great chapter in the Philosophy of Natural History. That Philosophy contemplates the laws that regulate the manifestation of life exhibited in organized nature, and their dependence upon and connection with the inorganic world and its phænomena. None teaches more emphatically the difficulties with which man's mind must contend when attempting to comprehend the wisdom embodied in the universe, and none holds out a more cheering prospect of future discovery in fresh and unexpected fields of delightful research.

BOTANICAL SOCIETY OF EDINBURGH.

Thursday, 8th April, 1852.—Dr. Seller, President, in the Chair.

Dr. Murchison exhibited some curious specimens of Extract of Tea, prepared in the form of lozenges by the Chinese. These lozenges were of various forms, and had impressed upon them mottos in Chinese characters, and the figures of different insects, musical instruments, and other objects. They had been brought from Pekin in the year 1812, and were stated to be used by the Chinese when travelling; when introduced into the mouth, they were said to dissolve slowly, preventing thirst, and proving very refreshing. Though it was forty years since they had been brought from China, they still retained a very perceptible flavour of tea.

The following papers were read:—

1. "On the Œconomic Uses of Chicory (*Cichorium Intybus*, L.)," by Mr. James Fulton. The author, after giving a general account of the history of the Chicory plant, and alluding to the antiquity of its cultivation, proceeded to point out the wide range of œconomic uses to which it might be made applicable, and urged the importance of extending its cultivation. Its extensive use as an ingredient in coffee is well known. As a forage plant, it forms some of the best meadows in the south of France and Lombardy, succeeding in all seasons; while its use as a salad is likewise extensive. Since 1835, large quantities of the root have been imported from the continent; it is now cultivated in several parts of England. It had occurred to Mr. Fulton that the bitter of the chicory root might be employed as a substitute for hops, and he had accordingly used it with success, and found that the root not only communicates a pleasant bitter, but that it is likewise in some measure a substitute for the malt by possessing a large amount of saccharine matter.

2. "Analysis of the *Sabal umbraculifera*, as grown in the Botanic Garden," by Mr. Allan B. Dick. The following is Mr. Dick's analysis:—

	Organic matter.	Inorganic.
Lamina	91·90	8·10
Petiole	95·00	5·00

Silica	37·00
Sulphuric Acid	11·15
Lime	15·90
Potash	8·65
Soda	2·50
Chloride of Sodium	8·45
Phosphoric Acid	1·70
Oxide of Iron	1·30
,, Manganese	1·40
Magnesia	4·75
Carbonic Acid	0·99
Charcoal	5·95
	99·74

3. "On Plants found in the neighbourhood of Ripon, Yorkshire, in March 1852," by Mr. James B. Davies.

4. "Report on the state of Vegetation in the Edinburgh Botanic Garden, from 10th March till 8th April 1852, as compared with the years 1850 and 1851," by Mr. M'Nab.

5. "Notice of Plants found in flower at Bowhill, Selkirkshire, on 23rd March," by Dr. Balfour.

May 13th, 1852.—Dr. Seller, President, in the Chair.

Dr. Balfour read a letter from Dr. Dickie, mentioning that he had added two mosses to the Flora of Ireland, viz. *Polytrichum hercynicum* and *Hypnum rufescens.*

The following papers were read:—

1. "Notice of Chinese Vegetable Products transmitted for the Museum of Œconomic Botany," by Mr. Robert Fortune.

2. "On Plants found in Yorkshire, Westmoreland, and Cumberland, in April 1852," by Mr. James B. Davies.

Mr. Davies gave a complete list of the plants observed by him, with their dates of flowering.

Professor Balfour exhibited a young plant of *Victoria Regia,* from one of the hothouses in the Botanic Garden, showing the remarkable difference in the form of the leaves produced in its early stage of growth from those afterwards formed. The plant showed the first-formed linear leaf, followed by the sagittate form, after which, leaves of a more or less rounded-cordate form are produced.

June 10, 1852.—Dr. Seller, President, in the Chair.

The following papers were read:—

1. "On a supposed new species of *Eleocharis,*" by Charles C. Babington, M.A. This paper will be found in the present Number of the 'Annals.'

2. "Analysis of the Fluid (known as Gram Oil) from the leaves of Gram (*Cicer arietinum*)," by Thomas Anderson, Esq. This paper consisted of an analysis made by Mr. Russell Aldridge:—"On evaporation it yielded a black residue which would not dissolve in cold water, but did so readily when heated; and on cooling it became turbid, showing the presence of oxidizable extractive. To a small portion of the fluid chloride of calcium was added, and a precipitate of oxalate of lime obtained, showing the presence of oxalic acid; it was then filtered, and to a portion of the filtrate potash was added, no precipitate was obtained, therefore no tartaric acid. To the remainder of the filtrate ammonia was added, which gave no precipitate when cold; but upon boiling it a slight one was obtained, showing a trace of citric acid. The remainder of the original solution was evaporated down, and the residue taken up with alcohol, a small quantity of gummy matter separated; on evaporating the alcoholic fluid, it left some sugar; the residue was then placed in a platinum capsule and subjected to red heat, the ashes (which were of a brown colour) were then taken up with water, and a few drops of hydrochloric acid added, which gave to the fluid a yellow colour, showing the presence of oxide of iron. It was then filtered, and carbonate of ammonia added, which gave a distinct trace of lime, again filtered, and to the filtrate phosphate of soda added, which gave a trace of magnesia. Potash and soda were present in minute quantities.

"The results thus are:—

"Oxalic acid (copious), citric acid (traces), oxidizable extractive, gum, sugar, lime, magnesia, iron, potash and soda."

3. "Notice relative to the Transmission of Foreign Seeds in Soil,"

by Mr. M'Nab. The author stated that he had been long in the belief that the transmission of fruits and seeds in a fit state for germination would be better accomplished by being packed in soil than by any other known method. This experiment was fully tested by himself during 1834, when he brought over the seeds of many of the rarer American oaks and other trees in boxes filled with soil, while portions of the same kinds of seeds packed, both in brown paper and cloth bags, were in many instances totally useless.

4. "On a variety of the *Orchis mascula* (*O. speciosa*, Host), found in the county of Wicklow," by Mr. D. Moore of Glasnevin. This communication consisted of parts of two letters from Mr. Moore addressed to Mr. N'Nab:—

"27th May 1852.—I have just been looking over a proof figure of *Orchis speciosa*, Host. It was discovered by me and another person last year in the county of Wicklow, where I went again a few days ago and found two more plants. Koch makes it a variety of *O. mascula*, which it probably ought not to be kept separate from; the difference being more in appearance than in well-defined characters. It is however a noble-looking plant, growing nearly 18 inches high."

"28th May 1852.—I herewith send you one of the smallest specimens of the *Orchis speciosa*, Host, which I will thank you to show to Dr. Balfour. Some of the flowers in the rachis are imperfect, wanting the labellum. The specimen figured had also imperfect flowers, which would appear to be characteristic of the species. I confess I cannot find good characters to distinguish it from *O. mascula*, though it differs so widely in general appearance."

In regard to the *Orchis*, Dr. Balfour read the following communication from Mr. Babington:—

"I see that Mr. Moore has sent you a paper upon the supposed *Orchis speciosa* of the county of Wicklow, and that it is to be brought before the Botanical Society on Thursday next. He has been so good as to send me a specimen of the plant, and I have informed him very recently that I could not concur in the opinion that it is the *O. speciosa* of Host. I believe it to be nothing more than a very luxuriant state of the *O. mascula*. A few days since I found two specimens, exactly corresponding with the Wicklow plant, in the wooded part of the Devil's Ditch, in this county of Cambridge. They possess the remarkable size of Mr. Moore's plant, and the rather acuter segments of the perianth, such as he finds on his specimens. The true *O. speciosa* (which is itself only a variety of the *O. mascula*) has very much more attenuated segments of perianth. It is figured by Reichenbach in his recent elaborate volume upon the Orchidaceæ (forming 'Icon. Fl. Germ.' vols. xiii. & xiv.), and I have lately received a plant which is much more like it than is the Irish plant, from Mr. Keys of Plymouth. Our English *O. mascula* is noted by continental botanists as an obtuse-petaled form of the species. Mr. Moore's plant is far nearer to the continental type of the species.

5. "On Plants observed in Westmoreland and Cumberland in May 1852," by Mr. James B. Davies.

LINNÆAN SOCIETY.

February 4, 1851.—Robert Brown, Esq., President, in the Chair.

The President exhibited specimens of stems of *Kingia australis*, R. Br., and *Xanthorrhœa arborea*, R. Br., together with drawings of the former, illustrative of its structure, especially of the siliceous covering of the vascular fasciculi of the persistent bases of the leaves; and in both genera, the means by which the stems are protected from the scorching fires of the natives.

Read the following "Notice concerning Linnæus's Iter Dalecarlicum," extracted from a letter of Mr. Charles Hartman, M.A., to the Secretary of the Royal Academy of Sciences of Stockholm, in which he gives a report of his examination of the collections and manuscripts of Linnæus in the possession of the Linnean Society of London; which letter is printed in the Academy's Proceedings at the Meeting on the 12th September 1849 (being No. 7 of the 6th year), p. 185. Translated from the Swedish by N. Wallich, M. et Phil.D., V.P.L.S. &c.

After mentioning the library of Linnæus, Mr. Hartman proceeds as follows:—

But what especially interested me was to find a manuscript of Linnæus, consisting of 176 folio pages, containing a complete account of his journey in Dalecarlia in 1734, arranged according to the plan adopted in his other published Travels, and enriched with remarks on divers subjects, marginal notes of contents, such as 'Œconomica, Geographica, Botanica,' &c. After the proper diary follows a small appendix of the names, and an extremely short but graphic character of clergymen and other persons in the parishes of the Dalas (valleys, Dalecarlia) which were visited; a faithful chart executed by the geographer to the party; and lastly, a seemingly jocose warrant, issued to their mineralogist, in the handwriting and under the sign manual of Linnæus himself. As this journey has never, as far as I know, been published, or even noticed, it may not be improper to give here a transcript of its title and preface, which will best serve to give an idea of the contents of the MSS., and the plan and object of the journey itself. The writing as well as the whole report being in Swedish, in the not always very legible handwriting of Linnæus, I have had some difficulty in deciphering it, and have been obliged to omit some words in two places.

The title is as follows:—*Caroli Linnaei, P.S.R. Iter Dalekarlicum jussu & impensis Viri Generosissimi et Excellentissimi Dni Nicolai Reuterholmi Gubernatoris Provinciæ Dalekarlicæ institutum per Dalekarlicam Sueciæ provinciam quoad orientalem, Alpinam & occidentalem partem, observationibus constans Geographicis, Physicis, Mineralogicis, Botanicis, Zoologicis, Domesticis & Oeconomicis quotidie collectis a mensis Julii die* 3 *ad Augusti d.* 17 *Anni* 1734.

The first page contains the following preface, relating to the extent of the journey, &c.

"L. B.

"Having been charged, last summer, by Governor Reuterholm to make a tour through the Eastern and Western Dalas (valleys) in his province, I proceeded to Fahlun, where I enjoyed that distinguished gentleman's hospitality, and obtained a generous stipend for the journey. As soon as the time and objects of the journey became known, I was visited by some of the cleverest and most zealous Students of the Academy of Upsala, who were anxious to accompany me at their own expense. I very thankfully accepted of their prompt offer; and in order that everything might be properly regulated, my companions formed themselves into a Society, with laws and statutes to be kept conscientiously: *e. g.**

C. Linnaeus	Smoland.	Praeses publice et privatim.	
Reinh. Näsman.	Dalekarl.	Geographus.	Pastor.
Carl Clenberg	Helsing.	Physicus	Secretarius.
Ingel. Fahlstedt	Dalekarl.	Mineralogus	Master of the Horse.
Claud Sohlberg	Dalekarl.	Botanicus	Quartermaster.
Eric Emporelius	Dalek.	Zoologist.	Huntingmaster.
Petr. Hedenblod	Dalek.	Domesticus.	Aide-de-Camp.
Beniam. Sandel.	Americ.	Oeconomius	Accountant.

"Thus organized, the journey commenced on the 3rd July, 1734, from Fahlun through the Eastern Dalar, the hills, the Western Dalar, through Biursås, Lexan, Rättvik, Ore, Orsa, Mora, Elfdahl, Serna, Fiell, Röräs in Norway, Lima, Malung, Näs, Floda, Gagne, Åhl, ending at Fahlun the 17th Aug. ej. anni. Observations were made daily, as far as possible, according to the subjects assigned to each of our party, by which the duties of the undertaking were facilitated. Thence it may be seen that much remains still unknown in the country and . . . . . . ; that each province possesses its advantages and how they may be developed; that it would be of incredible advantage to Sweden were all her provinces similarly examined, and that one province might thus be assisted by another. Should the reader approve, thanks are due to him who originated the journey, without whose aid it could not have been undertaken, and who deserves to be looked to as a pattern to all, who love, pursue and patronize studies, who excels in reasoning powers, and who deserve to . . . . . To the Great God, who has ordered this world in such an indescribable manner, and has created and preserved us to be its . . . . and Spectatores, be praise and thanks for our having performed our journey in safety.

"Dabam Fahlu Kongsgård "CARL LINNAEUS."
1734 Aug. 25."

* Consult *Egenhändiga Anteckningar af Carl Linnaeus* (C. L.'s own Annotations), p. 107.

The following list of acquaintances made during the journey, with remarks on each, is placed at the end of the journal :—

Biursås	Pastor	Lundvall, Mr. Joh.	juvenis, fidus.
Rättvik	Dean	Humblaeus, Mag. Olaus.	sublimis, 60genarius.
	Accountant.	Olof Laresu	simplex, Mineralogus.
Orsa	Pastor	Schedevin, Mag. Dan.	doctus, oeconom.
	Commander	Olof Laresu	simpl., bonus.
Mora	Dean	Emporelius, Mag. Joh.	70genarius.
	Adjunctus	Wistblad, Mag. Tob.	sibi sapiens.
Elfdahl	Pastor	Näsman, Eric	hospitalis.
Serna	Pastor	Floraeus, Mr. Gabr.	adustus.
Röräs Norveg.	Director	Bredahl, Mr. Land.	humanissimus omnium.
	Hyttskrifv.	Irrgens, Mr. Hennig.	bonus & astutus.
	Overstigare.	Bortgrevin, Mr. Leonh.	bonus animus germanic.
Lima	Pastor	Gezelius	phlegmat.
Transtrand	Comminist.	Dale, Mr. Lars	curiosiss., pauperrimus, abjectiss. doctissimus.
Malung	Pastor	Harkman, M. Vindikt	phlegmat.
Näs	Pastor	Dicander, M. Eric	doctus, sapiens.
Floda	Pastor	Rabenius, Mr. Joh.	humaniss., sapiens.
Gagne	Comminist.	Biörkman, Mr. Sven	bonus vir, non hospitalis.
Åhl	Pastor	Lundberg, Mr. Joh.	simplex.

Lastly is added a copy of the warrant alluded to above, which is furnished with the seal and signature of Linnæus :—

" We præses and membra of the *Reuterholmian Travelling Society through Dalecarlia* make known by this letter patent to all concerned, that we have nominated and appointed our master of the horse, Mr. Ingel. Fahlstedt, at his own request and on account of his science, as our ordinary Membrum Mineralogicum, and as such to be as industrious as is in his power, to attend to his branch of researches as regards the province of Dalecarlia for the good of the public and the honour of our country, and to consider himself responsible to the Society for the due execution thereof. Done at Fahlun Kongsg. 1734 July 2.

CARL
LINNAEUS.
(Sigill.) C. CLENBERG.
Secret. Societ.

Warrant for Ingel. Fahlstedt,
Mineralogist.

(L.S.) The cost of Charta Sigillata 1 Rtdr. Speue paid into the Treasury.

BEN. SANDEL,
Account."

MISCELLANEOUS.

Ornithological Notes. By JOHN ALEXANDER SMITH, M.D.*

1. *Of the* WOODCOCK (*Scolopax rusticola,* Linn.), *breeding in Perthshire and Morayshire, &c.*—It is scarcely necessary for me to remind the Society that the Woodcock (*Scolopax rusticola*) is one of our regular winter visitors, arriving in Britain from the north generally in the beginning of October, and leaving again on its northern journey in March and April. And although this is beyond all doubt the general rule, still a good many instances have occurred from time to time of their remaining to breed both in England and Scotland; and these have apparently become more frequent of later years, or perhaps from the increased number of observers they are now more carefully watched than formerly. But although we have notes of the occurrence of their nests at various times in Scotland, still the young birds have been very rarely seen by our Edinburgh naturalists, so that I have thought it of sufficient interest to call your attention to the subject by exhibiting this *couple of young Woodcocks* which were taken in the neighbourhood of Dunkeld in the end of the month of April last. Judging from their appearance they seem to be about a month, or perhaps six weeks old; and they closely resemble the old bird in their mottled plumage: the first primary however has the outer web edged with a very light-coloured brownish stripe, while the others have the triangularly shaped brown spots like the adult; the bill is rather more than $1\frac{3}{4}$ inch in length, and the whole bird about 9 inches; whereas the bill of the adult is nearly 3 inches in length, and the whole bird about 14 inches. These birds I have been informed were come upon, when the whole family party were busily engaged catering for food; and on their being disturbed, the parent birds, strange to say, attempted to fly off with their young in their claws, dropping some of them however in their flight, when the young birds were caught by two men who witnessed the whole proceedings: three young birds were caught, but the fourth was believed to have been safely carried off; they were kept alive for a short time, but they soon pined away and died. The Woodcock has been observed to breed at various times in this district around Dunkeld; it is however by no means a common occurrence. Mr. Muirhead, Queen Street, tells me, that when in Morayshire last summer, about the 18th or 19th of June, one of the Earl of Moray's gamekeepers, at Darnaway Castle, assured him that some of the Woodcocks occasionally remained and bred in the neighbourhood, and on Mr. M. (who had never heard anything of the kind before) hinting a doubt on the subject, the keeper offered to show him one of their nests, and remarked that what was far more extraordinary was the fact, that occasionally on coming near a Woodcock's nest, he had seen the old bird rise from it carrying one of her young brood in her claws. And accordingly on going with him to a piece of dry grassy ground, co-

* Read before the Royal Physical Society of Edinburgh, April 7, 1852.

vered with copse wood, where there was a Woodcock's nest with young birds, and carefully approaching the place, they heard the old bird, as they supposed, give a peculiar cry or "squeel," and saw it immediately fly up with a young bird in its claws; and Mr. Muirhead declares he could not have made any mistake, as the bird was not above ten or twelve yards from him, so that he saw it most distinctly; they then went forward to the nest, and found another fledged young bird still remaining squatted in it, which he was prevented handling, by the keeper informing him that if he did so, it would in all probability be removed, and not brought back again to the nest. He was told that there were generally three or four eggs in the nest. I have the pleasure of also exhibiting an *egg of this bird* which was taken from a nest near Durris, Kincardineshire; it is about 1 inch 10 lines in length, and 1 inch 4 lines in breadth; of a yellowish white, blotched and spotted with gray and various shades of yellowish brown; the spots being more frequent towards the larger end. We have in these instances another detailed account of the curious and extraordinary circumstance of birds attempting to rescue their young from anticipated danger, and in the Woodcock these are by no means to be considered as solitary examples; some three instances of a similar kind occurring in this country being quoted in Yarrell's 'British Birds' (vol. ii. p. 591), from that valuable storehouse of facts in zoology, the 'Magazine of Natural History.' Cases of this kind however seem to be so very strange, that we are inclined to give various explanations before we can persuade ourselves of their possibility, and to one of these I may in passing allude: for example, a bird-fancier told me he had seen instances where the presence of an addled or unhatched egg in the nest of some of his breeding birds, had given rise to the appearance at least of the old bird carrying a young one out of its nest. The bird was sitting very closely on her recently hatched young, the addled egg being accidentally broken, its contents spreading over the breast of the mother as well as over one of the young birds; and on her rapidly leaving the nest to feed, the young one, having become adherent to its mother's breast, was carried out with it; the heat of the mother while in the nest helping to dry the albumen, and in this way glue the two together, and in some instances so closely, that he had been obliged to seize the mother for the purpose of removing the young one, while in other instances it dropped off shortly after the bird left the nest: and this he had seen to occur both in pigeons and canaries. I am not aware how far a similar cause may be considered as explaining any of the instances described as occurring among birds in their state of native freedom; although in many cases I should suppose it impossible to be perfectly certain how the young bird was carried by the mother, whether accidentally or by manifest design. And I suspect it will require more extended and carefully minute observation before we shall be quite able to explain them; still in the several instances noticed by Yarrell, as well as in those to which I have alluded, there seems no reason for doubting the fact of the young bird being actually carried off in the claws of the anxious parent bird. From these young Woodcocks being hatched so early in the season as the middle of March, if not earlier, and the others in the month of June, one would be inclined to suppose that these birds may occasionally rear two broods in the year (?); or it may be explained merely by some accidental circumstances retarding the nidification of some individuals until such a late period.

2. I also take this opportunity of exhibiting to the Society this very peculiar specimen of the COMMON or CORN BUNTING (*Emberiza miliaria*, Linn.), which at first sight has more the appearance, in colour at least, of an overgrown mealy canary. Its whole upper and under parts being of a pale yellow, with the exception of a very few brownish spots or feathers scattered over it; these spots consist apparently of the darker colour along the quill of the feather, still remaining in a few instances; the wing-coverts are pure white, but the quills are of the usual brown colour, edged with lighter brown, with the exception of the second quill in each wing, and two or three of the secondaries of one wing, which are also pure white. The tail-coverts are yellowish white, and the lateral tail-feathers are white, the central ones being of a very pale brownish colour; indeed only three feathers retain their usual colour. The under mandible is also pale yellow; but the eyes were of their ordinary dark brown or black, contrasting strangely with its light-coloured plumage. The bird is an adult female, being fully 7 inches in length, and was in plump and well-fed condition. It was shot on the 7th of February last, to the north of the village of Maxton, Roxburghshire.

The Common Bunting, as it is called, is by no means a very common bird in this locality, and indeed it would seem to be now much rarer than formerly, as, unfortunately for its peace and safety, the quill-feathers are highly esteemed by the anglers in the district for making a very killing variety of artificial fly for trout-fishing.

I have brought with me a specimen of the bird in its ordinary plumage, that those of you who are not very familiar with its usual appearance may see the great contrast exhibited by this pale yellow specimen, where the dark colours are almost entirely obliterated, and the naturally yellowish tinge of the lighter brown parts has become extended over the whole bird and transformed into a pale yellow or yellowish white.

3. I exhibit also a specimen of the LESSER REDPOLE (*Fringilla linaria*, Linn.), shot near Stirling, which has the upper and back parts of the head and sides of the neck pure white, and there are also a few white feathers thinly scattered over other parts of its body. It shows very well the more usual extent in which this accidental white-coloured variety of plumage is generally found.

4. I shall next notice this specimen of the SISKIN (*Carduelis spinus*, Cuv.), which was taken on Arthur's Seat, about the middle of last September; and my reason for doing so is that some of our naturalists seem to me to consider it much rarer in the neighbourhood of Edinburgh than it really is. Our bird-catchers I am informed are in the habit of taking considerable numbers in this neighbourhood by means of their call-birds and nets, all through the winter months; in

some seasons however they catch them in much greater numbers than in others; and although it is one of our winter visitors, still some of them undoubtedly remain to breed, of which indeed several instances have been recorded; and I have myself seen a specimen of the bird which was shot in this neighbourhood in the end of the month of April.

5. I am indebted to my young friend Mr. W. Dumbreck for being able to exhibit to the Society a Scottish specimen of a very rare bird, the Black-winged Stilt, or Long-legged Plover (*Himantopus melanopterus*, Tem.). It is one of the accidental visitors to Britain which are met with now and then at very uncertain intervals, and of which only some two or three instances are recorded of its occurrence in Scotland. This I hope will be a sufficient apology for exhibiting it; although it was killed a good many years ago, and no notice has ever been given of its capture. It was shot in the breeding season on the south bank of the river Clyde, nearly opposite to Dumbarton Castle, and when seen was squatting on the ground, so that it was at first supposed to be merely a young *Lapwing*, or some such bird. It is easily distinguished by its extremely long stilt-like legs, with three toes in front and none behind; and it appears to be a young bird; the back part of the head and neck being dusky, the scapulars brownish black, the rest of the wing greenish black; and the length of the primaries from the carpal joint to their extremity being only $5\frac{1}{2}$ inches, instead of 8 inches as in the adult, in which they extend considerably beyond the tail; whereas in this specimen they do not reach to within $1\frac{1}{2}$ inch or so of its extremity. The tail is ash-coloured, and the rest of the body is white. It measures about 13 inches in length, and from the termination of the feathered part of the tibia to the foot it is $7\frac{1}{2}$ inches long.

6 & 7. I am also informed that the person who shot this bird was fortunate enough when a young man to capture other two of our rarer birds, which may be worth a passing notice; the one is the Wryneck (*Yunx torquilla*, Linn.), of which an individual was killed in the neighbourhood of Glasgow; and the other (which I have seen) is the Rose-coloured Pastor (*Pastor roseus*), which was shot in a garden near Caldwell, Renfrewshire.

I allude to these birds, as I am anxious to impress upon the Members of the Society the propriety of recording all the instances of the occurrence of any of our rarer birds which may happen to come to their knowledge; as it is only in this way that anything like a correct idea of the ornithology of a particular district, or of our country itself, is to be obtained.

8. Through the politeness of Mr. Dickson, of the well-known firm of John Dickson and Co., Gunmakers, Princes Street, I am enabled to show this beautiful specimen of the very rare Great-Billed or Surf Scoter (*Oidemia perspicillata*, Flem.). It is a fine adult male, and was shot in Musselburgh Bay on Friday last the 2nd of April. The Scoters are true sea ducks, seeking among the waves and surf for their varied molluscous diet. Three species are described as being found occasionally on our coasts during the winter months;

the Black, the Velvet, and this, the Surf Scoter; but the last of these is only a very rare visitor. They are dark or black plumaged ducks, the females being brown; and this species is easily distinguished from the others by the rounded patch of white on its forehead, between and in front of its eyes; and the somewhat shield-shaped patch, square above, and pointed posteriorly, on the nape and running down the neck. The rest of the plumage is deep bluish black tinged with brownish on the quills and the wedge-shaped tail. The appearance of the bill is singular: prominent in the middle over the nostrils, which are pervious (and to which point the feathers come down), then sloping with a concave outline to the slightly rounded nail at its point; and it is also very prominent at the lateral parts of its base. Its colour is of a reddish orange, paler at the sides, and becoming yellowish towards the nail; and there is a very strongly defined square-shaped black patch on each of the two lateral protuberances, edged with the reddish orange of the bill, except at its superior and anterior angle, and in front, where it is succeeded by a triangularly-shaped spot of bright bluish white, terminating at the nostril. The under mandible is of a much paler reddish colour. The bill measured on the side is nearly $2\frac{3}{4}$ inches in length by $1\frac{1}{2}$ inch in height, and about the same in breadth across the lateral protuberances at its base. The eyes are placed high on the head, not far indeed from the top, about $1\frac{1}{4}$ inch above and slightly behind the angle of the mouth. The iris was of a beautiful white, reminding one almost of white china ware. The tarsi are of a reddish orange colour in front and dusky behind, and the toes are also reddish orange with dusky spots at the joints, the intervening membranes being of a dusky black; the claws are small and black. The whole bird is about 21 inches in length; and from the carpal joint to the extremity of the first and second primaries which are the longest, it is $9\frac{3}{4}$ inches, the wing reaching only to a very little beyond the base of the tail. Fleming in his 'British Animals' mentions that the Surf Scoter is said by Temminck to have occurred in Orkney. And I shall quote a short passage from Sir W. Jardine's interesting 'Ornithology of Great Britain,' part iv. p. 162 (Naturalist's Library), which seems to give the best summary of its occurrence: he says,—"The Surf Scoter is an extremely rare bird in Britain, and even in Europe; the coasts of North America (where it is plentiful) being its real habitation. It has been stated by most of our modern British ornithologists, that specimens of this bird occur now and then in the vicinity of the Orkney and Shetland Islands, but we are not aware of any being lately procured there. In the 'Birds of Europe,' a specimen is stated to have been killed in the Firth of Forth, and Mr. Yarrell records another instance of a recent specimen coming into the possession of Mr. Bartlett of London: all these in this country have occurred in winter. It is of nearly equal rarity on the continent, and few notices of it occur either in any of the recent works devoted to natural history, or in those books of tours which lately, under the apology of sport, have recorded some interesting anecdotes on the habits of little-known species." So that this beautiful adult male is to be considered apparently as the second instance of the bird's occurring in the Firth of Forth, and only the third or fourth time that it has been observed in Britain.

9. And in conclusion I may call your attention to a fine specimen of the PINK-FOOTED GOOSE (*Anser brachyrhynchus*, Bail.), or *Anser phœnicopus*, Bart., which seems to be not very uncommon in this district at this time of the year. It was only pointed out as a new species in this country so recently as 1839, and is easily known by its short bill and pink feet, which the names given to it point out, and which distinguish it from the Bean Goose (*Anser segetum*), which it much resembles. The whole bird measured some 28 inches in length, the narrow bill being (along the side) little more than $1\frac{1}{2}$ inch long, and much shorter than the head; its colour is black, except a band across its middle which is bright reddish pink. Legs and feet reddish pink, in some parts brighter than in others, with the claws dusky. I have observed a few specimens of this bird in the poulterers' shops lately, said to have been shot towards the west country. This specimen was killed in the Carnwath district, adjoining this county to the south-west. I have had sent me the following note, giving notice of these geese occurring in the neighbourhood of Midcalder (Edinburghshire), by the friend who shot this one on the 4th of this month: this you may perhaps consider of some little interest, as not much appears to be known of the habits of this particular kind of goose; and with it I conclude: he says,—"At this season yearly, the geese come in considerable numbers for the purpose of feeding on the sown fields, particularly in the moorland districts, where the country is open and they see about them; they are very shy and easily disturbed; where they are in numbers today, there are none tomorrow; they rarely settle near the same place after being disturbed; the evening about dusk is the time to creep upon them, when they are arranging their sleeping berth commonly at the side of some out-of-the-way bit of water—lakes, ponds, not running streams. About a hundred of them passed over this house on Sunday evening a little before 8 o'clock; they speak much to each other, and very loud, giving ample notice of their approach to bed; those on Sunday evening were within shot, and must have gone to sleep at some short distance at the Curling Ponds. The bird you got was shot about nine miles from this, in the Carnwath district; and was one of a considerable flock, in the act of taking up their sleeping quarters. They are sometimes got by laying in wait for them about the sown fields. I sent the bird for a *roast*—the culinary qualities are much prized—mode of proceeding, see 'Meg Dodds.' I was on the look-out for them till 9 o'clock last night, but no success. The getting them is quite a matter of chance.—April 6th, 1852."

CORFIOTE SHELLS. BY SYLVANUS HANLEY, ESQ.

Although the accompanying list of species contains nothing remarkable, yet being, I believe, the only published catalogue of the shells indigenous to that most beautiful island, it may possibly prove not devoid of utility to those who study the geographical distribution of the Mollusca. The want of a dredge forbad any extended research, and the time of year (January) was most adverse to any successful search for the land or freshwater kinds : consequently the list is most imperfect, the whole of the marine shells having been collected, on the shore, within three miles of the capital of Corfu. Those distinguished by an asterisk were evidently washed up, and were untenanted.

As the 'Enumeratio Molluscorum Siciliæ' of Philippi is in the hands of every conchologist, the names adopted by him, in his second volume, have been accepted, for facility of reference.

Venus decussata.
Cardium rusticum (=edule var. glaucum).
Cardita sulcata*.
Spondylus Gædaropus*.
Arca Noæ*.
 barbata*.
Chiton Siculus.
Patella Lusitanica (= punctata of Lamarck).
 Tarentina.
 cærulea.
Helix aspersa.
 striata.
 Carthusianella.
 Corcyrensis (of Pfeiffer, Monog. Helic.).
Bulimus acutus.
Achatina acicula.
Cochlicopa Algira.
Clausilia papillaris.
Cyclostoma elegans.
 tessellatum (as figured in Sowerby's Thesaurus).
Rissoa Montagui.
 costata.
 elata.
 Bruguieri.
Truncatella truncatula (most abundant under stones in shallow but decidedly *salt* water).
Haliotis tuberculata ! (not our British shell, but the lamellosa of Reeve's Monograph).
Vermetus gigas*.
Trochus articulatus.
 fanulum.
 divaricatus.
 varius.
 Adriaticus.
Phasianella pullus.
Littorina Neritoides.
Cerithium vulgatum.
 lima.
 fuscatum.
Pleurotoma Ginnanianum.
Murex brandaris*.
 trunculus*.
Ranella lanceolata.
Buccinum variabile.
 D'Orbignyi.
 scriptum.
 pusio (maculosum of Lamarck).
 corniculum.
Columbella rustica.
Mitra Savignyi.
Conus Mediterraneus.

It is not unworthy of remark, that the plicated and dwarf varieties of *Buccinum corniculum* are found intermingled with the ordinary form, without any diminution of their varietal peculiarities.

ON LITTORINA PALLIATA. BY WILLIAM THOMPSON.

To the Editors of the Annals of Natural History.

Weymouth, June 6, 1852.

Gentlemen,—Messrs. Forbes and Hanley in their account of the *Littorinæ*, at page 52. vol. iii. of the 'British Mollusca,' state their conviction that the result of a completed knowledge of this genus would be a reduction of the number of true British species ; and in page 53 they feel almost sure that *Littorina palliata* will fall under *L. littoralis*.

A curious fact has lately come under my observation, which is evidence in favour of Messrs. Forbes and Hanley's opinion. On the 19th of December 1851, whilst searching the region of *Fucus nodosus* and *F. vesiculosus*, I obtained several examples of the male *Littorina rudis* in copulation with *Littorina littoralis* (formerly *Nerita littoralis*): in every instance *rudis* was the male. What will their progeny be like? I think we find it in *Littorina palliata*; the characters of the two former are so intimately blended in *L. palliata*. It may be described as a *littoralis* with the convex whorls and rounded body, and I may add, the spire of *rudis*, whilst the smaller size and the narrower basal confluence of the lips may fairly enough be considered as the effect of hybridism. From these circumstances I infer *Littorina palliata* to be the hybrid progeny of *L. rudis* (male) and a female *L. littoralis*. The only doubt in my mind as to this inference is, that I have not as yet found any specimens of *L. palliata* on this coast; but neither have I found any other shell that might in any way be considered as the produce of *rudis* and *littoralis*. I found in all eight couples; and I think, that the copulation being only chance, the probability of the unfruitfulness of some (which probability is greater than in cases where both are of the same species), and the further probability of the hybrids not being prolific—taking all these together,—will, I think, form just grounds for the rarity of the species.

Should this prove to be the case, it will be a question whether *L. palliata* is entitled to be considered a species or merely a variety. If it be capable of reproducing like Mollusca, I think it should be retained as a species; it may be a question, however, whether a hybrid incapable of reproduction is entitled to be considered a species.

Gentlemen, yours obediently,

William Thompson.

NEW LOCALITY FOR TULOSTOMA MAMMOSUM.

To the Editors of the Annals of Natural History.

The Willows, Swansea, June 9, 1852.

Gentlemen,—Believing the plant mentioned below to be somewhat rare, I shall be obliged by your insertion of the following:—

Tulostoma mammosum, near Pennard Castle, Glamorganshire. Found only on one spot—not very plentiful there.

Your obedient servant,

Matthew Moggridge.

On the Preservation of the Fecundated Eggs of Fishes. By M. Coste.

I communicated to the Academy, at a previous meeting, the result of an experiment tending to prove that it was possible to preserve the eggs of salmon and trout out of the water a sufficient time to transport them to great distances and to make them hatch in places where it was desired to introduce these fish. The following fact shows that these eggs can be preserved during more than two months without losing the power of development. If this fact be confirmed, we shall possess the means of procuring species living in distant parts of the globe and acclimatizing them in regions which they have never yet inhabited. This result, obtained by MM. Berthot and Detzem, is evidently of great importance; the following are the means adopted by these gentlemen.

Eggs of salmon artificially fecundated were placed in a deal box in layers alternating with damp sand. The box was then placed, *for two months*, in a cold room, the temperature of which, however, was sufficiently high to preserve them from freezing. At the expiration of this time the eggs were shrivelled, and before taking them out of the box they were placed in water so that they might become moistened through the sand with which they were covered; for when this precaution is neglected, they perish.

Some of these eggs were sent to me by MM. Berthot and Detzem. I placed them in my apparatus, where they have since hatched. The experiment has therefore succeeded.—*Comptes Rendus*, April 5, 1852, p. 507.

POSTSCRIPT TO MR. CLARK'S PAPER ON RARE BRITISH MOLLUSCA AT PAGE 22.

June 23.—The *Chemnitzia* I mentioned yesterday turned out to be the *Chem. obliqua*, with a perfectly smooth shell; and after I had despatched my postscript note I met with the *Chem. decorata*, an animal of more modest pretensions, having the basal volution of the shell finely and superficially striated. This discovery settles the distinctness of the two, which I doubted, having stated in vol. vii. p. 394 of the N. S. of the 'Annals,' that the *C. decorata* is the *C. obliqua*: I make this admission with the reservation that my present shell is the *obliqua*, if such a species is in esse. And this morning I captured the rare *Chem. insculpta* alive. I have notes of the three animals of this peculiar little section of the *Chemnitziæ*.

IRISH MOLLUSCA.

To the Editors of the Annals of Natural History.

Windsor Lodge, Monkstown, co. Dublin,
May 22, 1852.

GENTLEMEN,—The following Mollusca have been obtained by me off the Dublin coast, some of which are new to that locality: will you please at your earliest convenience to publish their occurrence?

Teredo megotara, Hanley. Drift wood, Killiney Bay.

Xylophaga dorsalis, Turton. Some very fine live specimens were trawled off the Skerrie Islands.

Sphænia Binghami, Turton. In the thick valves of *Ostrea edulis*: dredged in Dalkey Sound, 14 fathoms.

Thracia villosiuscula, Macgillivray. Dredged in about 14 fathoms, Dalkey Sound.

T. convexa, Wood. Trawled off Skerries.

Solecurtus coarctatus, Gmelin. Same locality as the last.

Psammobia tellinella, Lamarck. Dredged in Dalkey Sound.

Tellina pygmæa, Philippi. Same locality as the last.

Cytherea Chione. One valve: dredged in about 14 fathoms, Dalkey Sound.

Circe minima, Montagu. Two odd valves: same locality as the last.

Astarte sulcata, Da Costa. Same locality as the last.

Cardium nodosum, Turton. Same locality.

C. fasciatum, Montagu. Same locality.

Lucina spinifera, Montagu. Trawled off the Calf of Man.

Leda caudata, Donovan. Two live specimens with some odd valves dredged in 13 fathoms, Dalkey Sound.

Lima Loscombii, Sowerby. Dredged in a live state from 12 to 14 fathoms, Dalkey Sound.

Lima hians, Gmelin. A beautiful live specimen was dredged last month in Killiney Bay in about 15 fathoms.

Anomia striata ?, Lovén. Dredged in Dalkey Sound.

Chiton lævis, Pennant. Same locality.

Trochus exiguus ?, Pulteney. South Bull, Dublin Bay.

T. granulatus, Born. Trawled off the Calf of Man.

T. Montagui, Gray. Dredged in from 12 to 14 fathoms, Dalkey Sound.

Fusus propinquus, Alder. Trawled off the Skerries; but I have obtained much better specimens last summer off the Saltees.

Mangelia gracilis, Montagu. Trawled off Skerries, in company with *M. turricula*, *Trophon clathratus* and *Nassa incrassata*.

Yours truly obliged,

William White Walpole.

On the Sun Column as seen at Sandwick Manse, Orkney, in April 1852. By C. Clouston.

The perpendicular column of light which appeared repeatedly at sunset and sunrise during April, deserves a more particular account than the usual monthly report contains, as this is the most northern locality in which I have yet heard of its appearance.

When seen in the evening, it was generally immediately after the sun had sunk either below the horizon, or behind a bank of clouds there.

It was rather wider than the apparent diameter of the sun, and extended upwards for about 15°, widening a little towards the top, and becoming fainter, so that there was no defined boundary; but it was sometimes much shorter, and could be distinctly seen, when it was less than the semidiameter of the sun above the horizon, either when vanishing by descending, as it generally did, or as it last appeared on the 3rd of May, without rising more than about 1°.

Though at first it seemed to be a law that it must descend as the sun descended below the horizon, yet on one occasion, at least (on the 26th), it vanished by ascending, or the base disappeared first.

It was generally remarkably perpendicular, but sometimes had a perceptible inclination to one side, and followed the course of the sun northwards.

It had periods of greater and less brightness, but for the most part was steady, something like a sunbeam among the clouds, and never had any approach to the rapid motion of the aurora.

Its colour was pale or whitish in its upper portion, or when it appeared contrasted with the dark sky; but in passing through the red, copper, or orange-coloured sky that prevailed lower down, it partook of its shade, and tinged the thin strata of cloud that lay across it with a brighter hue of their own colour. Fifty-five minutes was the longest period that it was visible any evening. I am told that it also appeared very bright some mornings before sunrise.

If the phænomenon was uncommon, so was the state of the atmosphere when it occurred. The drought was unprecedented; only about $\frac{1}{10}$th of an inch of rain falling in April, which is about $\frac{1}{20}$th of the average quantity in that month in previous years. The atmospheric pressure was great, the mercury never being lower than 30·07, nor higher than 30·32. The temperature was also high for the month, being 47°·64, or more than 4° above the average for April.

The atmosphere was very calm, and the sky near the horizon of that red or copper colour which generally indicates dry and warm weather, so that at last we could anticipate its appearance. I do not presume to explain the mode of its production, but these circumstances may assist others in so doing.

METEOROLOGICAL OBSERVATIONS FOR MAY 1852.

Chiswick.—May 1. Overcast: cloudy: clear. 2. Cloudy and cold: frosty at night. 3. White clouds: fine: clear and frosty. 4. Dusky clouds: clear and frosty. 5. Densely clouded: clear and frosty at night. 6. Cloudy: clear. 7. Overcast: very fine. 8. Cloudy: fine. 9. Fine. 10. Fine: rain at night. 11. Boisterous, with heavy shower, partly hail. 12. Heavy rain: thunder. 13. Cloudy: overcast: boisterous at night. 14. Showery and boisterous: clear. 15, 16. Very fine. 17. Slight drizzle: overcast: thunder, lightning and rain at night. 18. Very fine: rain at night. 19. Very fine. 20. Hazy: fine: showers. 21. Overcast. 22. Cloudy: clear. 23. Cloudy. 24, 25. Overcast: fine. 26. Rain. 27. Overcast. 28. Densely clouded. 29. Rain. 30. Fine: cloudy. 31. Fine: cloudy: clear and cold.

Mean temperature of the month	51°·45
Mean temperature of May 1851	51 ·16
Mean temperature of May for the last twenty-six years ...	54 ·07
Average amount of rain in May	1·74 inch.

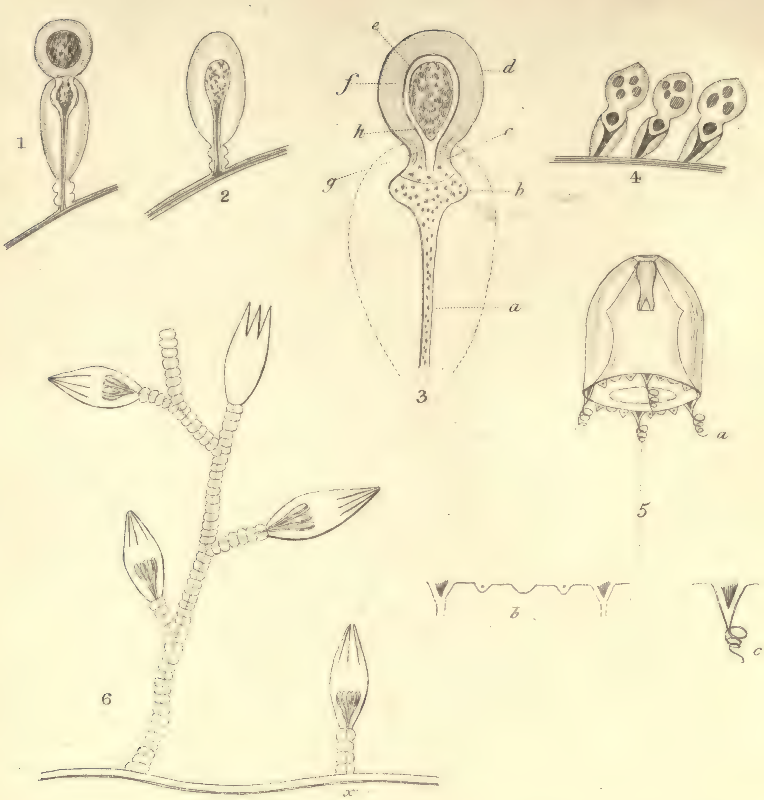
Boston.—May 1. Cloudy. 2. Cloudy: rain A.M. 3, 4. Cloudy. 5. Cloudy: rain A.M. 6. Cloudy. 7. Fine. 8. Cloudy. 9, 10. Fine. 11. Cloudy. 12—14. Cloudy: rain A.M. 15, 16. Fine. 17. Cloudy. 18. Cloudy: rain A.M. and P.M. 19. Cloudy: rain A.M. 20. Fine. 21. Cloudy: rain A.M. and P.M. 22—25. Cloudy. 26. Cloudy: rain P.M. 27—29. Cloudy. 30. Fine. 31. Cloudy.

Sandwick Manse, Orkney.—May 1. Cloudy: fine. 2. Clear: fine. 3. Cloudy: fine: clear: fine. 4. Cloudy: fine. 5. Drops: fine: cloudy: fine. 6. Clear: fine: cloudy: fine. 7. Drops: rain: clear. 8. Drops: showers. 9. Rain: clear. 10. Drops: clear: aurora. 11. Cloudy: showers. 12. Bright: clear. 13. Rain: clear: fine. 14. Bright: showers. 15. Clear: cloudy. 16. Clear. 17. Clear: fine. 18, 19. Clear: fine: aurora. 20—23. Clear: fine. 24. Bright: fine: clear: fine. 25. Clear: fine. 26. Cloudy. 27. Cloudy: fine. 28. Bright: cloudy: showers. 29. Bright: showers: cloudy: hail-showers. 30. Sleet-showers. 31. Sleet-showers: showers.—This month has been fine, warm and dry.

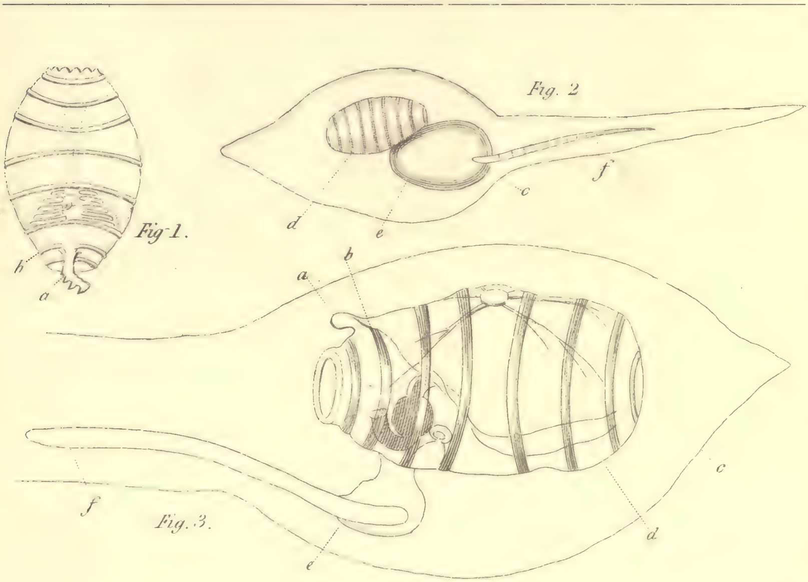
Mean temperature of May for twenty-five years previous ...	47°·88
Mean temperature of this month	50 ·49
Average quantity of rain in May for six years	1·72 inch.

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

Days of Month. 1852. May.	Barometer. Chiswick. Max.	Barometer. Chiswick. Min.	Barometer. Boston. 8½ a.m.	Barometer. Orkney, Sandwick. 9¼ a.m.	Barometer. Orkney, Sandwick. 8½ p.m.	Thermometer. Chiswick. Max.	Thermometer. Chiswick. Min.	Thermometer. Boston. 8½ a.m.	Thermometer. Orkney, Sandwick. 9¼ a.m.	Thermometer. Orkney, Sandwick. 8½ p.m.	Wind. Chiswick. 1 p.m.	Wind. Boston.	Wind. Orkney, Sandwick.	Rain. Chiswick.	Rain. Boston.	Rain. Orkney, Sandwick.
1.	29.873	29.729	29.33	29.85	29.98	57	34	47.5	50	46	n.	n.	n.	......	......	......
2.	30.082	29.980	29.62	30.08	30.15	51	25	44	50	47	ne.	n.	nw.	.01	.04	......
○ 3.	30.171	30.101	29.70	30.22	30.28	57	28	47	53	45	ne.	n.	......	......	......	......
4.	30.190	30.162	29.80	30.28	30.29	56	27	48	50	51	ne.	n.	wnw.	......	......	......
5.	30.240	30.216	29.78	30.27	30.24	59	30	50	51	52	ne.	n.	wsw.	......	.02	......
6.	30.239	30.162	29.76	30.14	29.90	54	34	51	55	55	ne.	nw.	......	......	......	......
7.	30.106	30.040	29.60	29.85	29.82	70	38	55	50½	48	w.	nw.	se.	......	......	......
8.	30.061	30.043	29.50	29.67	29.57	69	43	63	55	51	w.	w.	wsw.	......	......	.20
9.	30.055	30.026	29.46	29.48	29.70	73	40	57	53½	49	sw.	w.	sw.	......	......	.10
☾ 10.	29.945	29.852	29.34	29.61	29.20	60	43	58	54	50½	sw.	ssw.	se.	.05	......	.02
11.	29.883	29.831	29.27	29.12	29.16	61	46	55	52	47½	w.	sw.	sw.	.09	......	......
12.	29.724	29.639	29.13	29.34	29.40	67	49	55	51	47	sw.	s.	wsw.	.25	.04	.23
13.	29.714	29.680	29.18	29.42	29.43	59	51	61.5	47	48	sw.	w.	n.	.02	......	.15
14.	29.953	29.586	28.99	29.40	29.48	62	38	54	49	46	w.	sw.	w.	.02	.04	......
15.	30.077	29.935	29.58	29.76	29.60	65	39	55	50	50½	sw.	w.	sse.	......	......	.12
16.	29.825	29.811	29.30	29.55	29.46	74	47	59	51½	50	w.	s.	sse.	......	......	......
17.	29.851	29.719	29.33	29.53	29.63	66	47	64	54	51	sw.	calm	sw.	.33	......	......
18.	29.662	29.569	29.20	29.89	30.05	72	45	61	54	50	e.	ne.	n.	.11	.02	......
● 19.	29.937	29.785	29.30	30.06	30.02	72	43	60	53½	49½	se.	wsw.	ne.	......	.16	......
20.	29.985	29.971	29.50	30.09	30.14	67	48	56	53½	49	ne.	ene.	n.	.10	......	......
21.	29.992	29.972	29.50	30.14	30.15	61	46	50	55	48½	n.	nne.	e.	......	......	......
22.	30.039	29.995	29.56	30.24	30.28	61	47	51	53	53	ne.	nne.	ne.	......	.06	......
23.	30.062	30.027	29.60	30.26	30.21	57	45	52	56	46	e.	ne.	e.	......	......	......
24.	30.036	29.970	29.64	30.17	30.18	66	49	54	57	48	ne.	nnw.	e.	......	......	......
25.	29.955	29.876	29.55	30.18	30.21	61	49	52.5	58	48	ne.	nne.	......	.11	......	......
☽ 26.	29.850	29.790	29.48	30.18	30.18	54	49	50.5	56	51	ne.	ne.	n.	.35	......	......
27.	29.902	29.875	29.48	30.16	30.08	54	47	50	55½	51	ne.	nne.	......	.01	.07	......
28.	29.844	29.779	29.40	29.98	29.93	57	46	52	54	45	ne.	n.	n.	.03	......	......
29.	29.689	29.611	29.30	29.80	29.73	51	35	52	45	43	ne.	nne.	nw.	.25	......	.12
30.	29.763	29.686	29.26	29.59	29.60	57	38	48	49	45½	nw.	nw.	nw.	.01	......	.35
31.	29.847	29.795	29.33	29.61	29.66	60	34	51	47	46	w.	nnw.	nw.	......	......	.13
Mean.	29.953	29.845	29.44	29.868	29.861	61.61	41.29	53.7	52.35	48.64				1.74	0.45	1.42



B.



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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

No. 56. AUGUST 1852.

VIII.—*Notes on the Reproduction of the* Campanulariadæ; *with a description of a new species of* Laomedea. By the Rev. THOMAS HINCKS, B.A.

[With a Plate.]

To the Editors of the Annals of Natural History.

GENTLEMEN,

IN the present state of our knowledge respecting the reproduction of the Campanularian Zoophytes, it is not undesirable that the observations of as many independent inquirers as possible should be recorded, and material be thus accumulated, which may aid the physiologist in his attempts to solve the many difficult questions connected with it.

Every observer possessed of tolerable accuracy and patience, and placed in favourable circumstances, may be able to contribute some facts previously unnoted, or at least to afford valuable confirmation of results already announced.

Some of the reproductive phænomena amongst the *Campanulariadæ* would seem to be of comparatively rare occurrence. It is but seldom, perhaps, that one individual is privileged to witness the entire series, and his researches, however carefully conducted, will require to be supplemented by those of others, who have had the opportunity of reading a different chapter of the wonderful history.

The observations of Dalyell and Van Beneden would give us an imperfect view of the subject, if unaccompanied by those of Lovén and others. It is through the cooperation of many naturalists, carrying on their investigations at different seasons and under different local circumstances, that we must hope to arrive at a *complete* knowledge of this interesting department of physiology. While there are still many points altogether undetermined, and many more respecting which greater certainty is desirable, every contribution of accurate observation, however humble, has a certain value. It is with this conviction that I have prepared the following notes, embodying the observations which I have been able to make on some of the British *Campanulariadæ*.

Campanularia Syringa.

The polype of this pretty species is furnished with sixteen tentacula, or even more. It is very slender and graceful, and protrudes far beyond the mouth of the cell.

The conical *operculum* is composed of many pieces. These give way to allow of egress, and close as soon as the body of the polype is withdrawn.

The vesicles are oval, mounted on a very short stalk with one or two rings. I am unable to say whether they are of rare occurrence; but they are not described by either Dr. Johnston or Sir J. G. Dalyell.

Towards the close of April I obtained a specimen of the *Campanularia* parasitical on *Sertularia argentea*, on which the vesicles occurred in great profusion. They presented a very remarkable appearance. Each vesicle was surmounted by a spherical body containing an opake nucleus, which occupied nearly the whole of its interior (Pl. III. fig. 1). The vesicle itself was traversed by a central column, which widened as it approached the top and expanded into a somewhat roundish mass immediately below the orifice. Occasionally one was met with in an earlier stage of development. Here the external sac with its contained ovum was wanting, and the vesicle exhibited the appearance represented in Pl. III. fig. 2. The column extended only about half way up the vesicle, and terminated in an oval body containing granular matter, and freely supplied by the nutrient stream which pervaded the entire zoophyte. This was evidently an "ovigerous bud" in process of formation. In by far the greater number of cases, however, the ova-bearing bodies had passed beyond the mouth of the vesicle and were attached to the top of it.

I was not fortunate enough to see any of the ova in the act of escaping, but one was found in the watch-glass which had evidently just emerged from its prison-house. It was circular, opake white, and set round with very fine *cilia*. Subsequently I noticed one of the sacs with a rent or opening in its side, towards which the ovum seemed to be working its way.

By compressing some of the vesicles between glass, and then examining them with the microscope, the details of their structure were readily determined. They will be understood by a reference to Pl. III. fig. 3.

The column (*a*) which traverses the centre of the vesicle is a membranous tube containing granular matter,—a prolongation of the animal substance which permeates the creeping stem. Through this flows the stream of nutrient particles. Immediately below the orifice it expands into a kind of pouch (*b*), which in the living state is filled with granular matter. When emptied of its contents, it appears as a delicate membranous sac within the vesicle. A kind of neck (*c*) connects this with the mouth of the vesicle and the external ovigerous body (*d*). In the centre of the latter is a distinct cavity (*e*) within which the ovum is contained. The external envelope (*f*) is of varying, often of considerable, thickness. From the lower part of the central cavity a canal (*g*) passes downward and opens into the granular mass (*b*). The lower extremity of the ovum, which is somewhat produced, just penetrates this canal at *h*, and through this channel and at this point the nutrient stream finds entrance to the ovum. Such is the structure of the vesicle.

The following is a summary of the results obtained with respect to the propagation of *Campanularia Syringa* :—

1. At certain seasons oval vesicles are produced in great abundance on the creeping fibre, into which an offshoot from the common animal substance penetrates,—a membranous tube containing granular matter.

2. After a time this offshoot expands at the top into an oval body, in which granular substance accumulates, and through which the nutrient stream circulates.

3. This body gradually enlarges, and at length passes beyond the mouth of the vesicle, where it remains attached, receiving supplies of the nutrient fluid through a canal which descends from its lower extremity.

4. In the course of its development a portion of the granular substance is aggregated into a central nucleus separated from the rest of the structure and lying in a distinct cavity. Nourished by the general circulation this is matured into a perfect ovum, which at length escapes through the ruptured walls of the containing sac.

The ovigerous body must increase considerably,—probably undergoes most of its development after passing beyond the mouth of the vesicle, for it is often met with of such a size that it could not be contained within.

With respect to the membranous pouch inclosing granular matter, which always occurs immediately below the orifice, it is no doubt the early stage of an ovigerous body destined to succeed the external one when it has discharged its contents and withered away. I have never seen more than one such in the same vesicle.

The mode of reproduction which I have described is very different from that which is commonly met with amongst the *Campanulariadæ*. No Medusoids were seen to issue from the vesicles of *Campanularia Syringa*. Nor do the ovigerous bodies which surmounted them resemble those described and figured by Lister and Lovén as occurring on certain species of *Laomedea*; for the latter assumed a true Medusan form, and tentacles were developed at the upper extremity.

The vesicles of *C. Syringa,* on the contrary, bear a very close resemblance to those which occur at times on *Sertularia argentea* and others of the same genus, and which have been well described by Sir J. G. Dalyell as "compound vesicles." In the case of the *Sertularia,* it would appear from the observations of this naturalist, that the ovigerous body is sometimes completely developed *within* the vesicle, and does not pass beyond it; and so it may be at times with the *Campanularia,* though I have not met with such a case.

Taking into consideration the facts presented by the joint history of the *Sertularia* and *Campanularia in connexion with this mode of propagation,* it appears that the ovigerous body is a spherical expansion (bud) of the offshoot from the common animal substance, which penetrates the vesicle, within which the ovum (or ova) is developed in a distinct central cavity, to which the nutrient stream has free access; that the development is sometimes perfected within the vesicle, when (in the case of the *Sertularia*) the *Planula* escapes through the orifice; while at others the ovigerous body passes beyond the case and remains attached to it externally, still maintaining its connexion with the central tube, until the ciliated ovum or Planula has reached maturity and has liberated itself.

There is a perfect analogy between the *Campanularia* and *Sertularia* in respect to this method of propagation. To show the close resemblance of the compound vesicle of *Sertularia argentea* to that of *C. Syringa,* as just described, I have copied Sir J. G. Dalyell's figure of the former (Pl. III. fig. 4). The relation of this mode of reproduction to that by free Medusoids I have not been able to determine.

Campanularia volubilis.

Whilst examining specimens of *C. volubilis,* procured in February, my attention was attracted by one or two very minute Medusæ which were jerking themselves about in the watch-glass containing the zoophyte. At first I observed only one, but subsequently two more made their appearance, and I could have little doubt that they were the progeny of the *Campanularia*. The zoophyte was covered with vesicles containing Medusoids in various stages of development. One was observed working its way slowly towards the orifice by means of the characteristic jerk. It was furnished with curled arms resembling those of the free Medusa in the watch-glass, and though I could not determine its shape with accuracy, I have no doubt of the identity of the two.

The Medusa was an exquisite little creature, about the one-fortieth of an inch in height, of graceful form and the purest transparency. Its presence was indicated to the naked eye by five opake white dots marking the four arms and the peduncle. Its perfectly translucent umbrella could only be detected by the aid of the microscope. My specimens only lived for two or three days. During that period they were tolerably active, and jerked themselves about in Medusa-fashion with some rapidity.

The following is a description of the Medusoid (Pl. III. fig. 5). *Umbrella* globose or subconic, a little depressed at the top, perfectly transparent; a membranous veil round its inner margin. *Tentacles* four, curling, muricate, colourless, springing from a somewhat triangular tubercle. Between each pair of arms on the margin there are three tubercles, the central one the largest; the two smaller ones have each a little circle or ocellus towards the upper end. *Radiating vessels* four, very distinct, running to the four tentacles. *Subumbrella* somewhat conic. *Peduncle* short, swollen towards the base, with a narrow neck, and expanding slightly towards the mouth. No colour could be detected on any portion of the body. The arms were generally curled up in three coils, but occasionally were unrolled. Height $\frac{1}{40}$th of an inch.

I have seldom met with a lovelier being than this fairy-like Medusa. In some points it reminded me of the *Modeeria* figured in Professor Forbes's 'Monograph on the Naked-eyed Medusæ.'

The *Campanularia* was infested by a strange crustacean (?) parasite. I observed one which had made its way *within* a cell, and attached itself to the body of the polype. Afterwards it emerged and fastened upon one of the tentacles.

Laomedea geniculata and gelatinosa.

The bell-shaped progeny of *L. geniculata* have nearly thirty tentacles. There is a prominent ocellus at the base of every other arm. The Medusoids are excluded in very different stages of development; some small, with the arms stunted; others much larger, with the arms of considerable length. The Medusoids of the *Laomedea gelatinosa* I have always found with sixteen arms.

In other respects they resemble those of *L. geniculata*. Each vesicle contains about five of them.

New species of Laomedea.

Dr. Johnston describes and figures a species of *Campanularia* under the name of *C. lacerata*. I have lately had the opportunity of ascertaining that this is only the early state of a *Laomedea* which has occurred to me in considerable abundance on the Devonshire coast, and which is as yet, I believe, undescribed. It may be thus characterized :—

Laomedea lacerata (Hincks). (Pl. III. fig. 6.) *Stem filiform, ringed throughout; cells on short pedicles, ovato-conical, the upper portion divided into a number of deep convergent segments.*

This is the smallest of the British *Laomedeæ* and is of extreme delicacy. The largest specimen which I have met with does not exceed the sixteenth of an inch in height.

The stems, which are slender and slightly ringed throughout, rise from a creeping fibre and bear the cells on short pedicles, composed of four or five rings, and somewhat irregularly disposed. The cells are ovate, the upper part conical and cleft into a number of deep segments, which converge and form an acute apex. The polype when issuing pushes aside the pieces, which close again upon its retreat. They form an admirable operculum to the cell.

In its young state this *Laomedea* is identical with the *Campanularia lacerata* of Dr. Johnston's work. Single cells are frequently met with, supported on short ringed pedicles, which spring immediately from the creeping fibre, as represented in Plate III. fig. 6 *x*.

Laomedea lacerata was obtained abundantly in tufts of *Bowerbankia*, and on weed, at Exmouth.

I remain, Gentlemen, your obedient servant,

Thomas Hincks.

Exeter.

P.S.—In a paper entitled "Notes on British Zoophytes," which was published in the 'Annals' for November 1851, I described a species of *Farrella* as new, under the name of *F. producta*. Since that time Mr. Wyville Thomson has directed my attention to Van Beneden's figure and description of *Laguncula elongata*, which I had not previously seen, and I have now no doubt of the identity of the two species.

The name *F. producta* must therefore be cancelled, and I would substitute for my former note under this heading, a record of the occurrence of the *Laguncula elongata* of Van Beneden (*Farrella elongata* it *should* be) as a British species.

EXPLANATION OF PLATE III.

Fig. 1. Vesicle of *Campanularia Syringa.*
— 2. The same in an earlier stage.
— 3. The same, highly magnified, to show the details of structure.
— 4. "Compound vesicle" of *Sertularia argentea* from Sir J. G. Dalyell.
— 5 *a.* Medusoid of *Campanularia volubilis.* *b.* Two of the tentacles and the intermediate tubercles. *c.* A tentacle and its bulb.
— 6. *Laomedea lacerata* (highly magnified). *x.* The same in the young state.

IX.—*Contributions to the Palæontology of the Isle of Wight.* By THOMAS WRIGHT, M.D. &c.*

IT has been supposed that the tertiary beds of England, when compared with those of the continent of Europe, are deficient in mammalian remains; this opinion, like many other hasty generalizations, if it be not entirely fallacious, requires modification. The valuable series of mammalian remains obtained from time to time from the lacustrine strata of Kyson, Hordwell, and the Isle of Wight, lead us to believe that if similar facilities existed in these localities for working the beds from whence mammalian bones and teeth are obtained, as is the case in the neighbourhood of Paris, the richness of the English tertiaries in these remains would no longer be a doubtful question. We have been led to this conclusion from facts which have come under our observation during the two consecutive summers we were engaged in drawing up a description of the coast sections of Hampshire and the Isle of Wight, and which have already appeared in the pages of this Journal. Until last summer no remains of the new genus *Dichodon* had been found, except in one spot in the Hordwell section, when I had the good fortune to discover, near Alum Point, Isle of Wight, a portion of the lower jaw of this singular genus with the true molars "*in situ*" in beautiful preservation. This jaw fortunately supplies some points in the anatomy of this rare mammal, which were absent in the only specimen hitherto found, and which it is the object of this note to furnish.

Dichodon cuspidatus, Owen.

The dental formula of the lower jaw of *Dichodon cuspidatus*, according to Professor Owen, consists of three incisors, one canine, four premolars, and three true molars, arranged in a continuous series in each ramus, and it is inferred that these were

* Read at Cheltenham at a Meeting of the Cotteswold Naturalists' Club, May 4, 1852.

opposed by the same number of teeth in the upper jaw. "There are wanting therefore to establish *ex visu* the entire dental series, only the first and second premolars of the upper jaw and the last true molar of the lower jaw, the germ of which had not been sufficiently calcified at the time of the animal's death to yield satisfactory evidence of its true form*." Having recently discovered a portion of the left ramus of the lower jaw of this rare mammal in the lower freshwater formation of the Isle of Wight, containing the three true molars in an admirable state of preservation, I am enabled to supply a description thereof.

The crowns of all the true molars exhibit a double series of sharp conical lobes; the teeth are fixed obliquely in the jaw, their crowns having a direction forwards, inwards and upwards, the obliquity of the inclination increasing from before backwards; the first and second molars are nearly alike in size, form and structure; the first, however, is somewhat smaller than the second; the crown of each tooth rises high above the ramus of the jaw; it consists of four semiconical-shaped lobes, two external and two internal, separated from each other by a deep transverse and a shallow longitudinal valley; the two external lobes are sharply lanceolate; each has a median ridge of enamel and two sharp supernumerary processes or cusps, situated at the external sides of the base of each lobe; the inner surface is convex and smooth, and as the apices of the lobes are not worn, the double fold of enamel, with its intermediate dentine, is beautifully shown in our specimen.

The internal lobes are larger and more fully developed than the external pair, but their apices do not attain the same height as those of the external lobes; their internal surface is smooth and convex, their external surface is moderately concave, and inclined to a high angle; at the base of the external surface of each of the internal lobes there are two small tubercles or rudimentary cusps: the posterior marginal surface of all the lobes is slightly polished by dentrition, whilst their sharp lanceolate points are not worn, from which circumstance it may be logically inferred, that the lobes of the teeth of the lower jaw locked into corresponding spaces in those of the upper jaw, as in the hedgehog (*Erinaceus europæus*), the mole (*Talpa vulgaris*), and other Insectivora.

The third true molar differs from the first and second in possessing six instead of four lobes; the four anterior lobes are of the same form and structure as those of the second molar, only they are somewhat larger; the third or posterior pair are smaller than either of the others, and they have a more rudi-

* Quart. Journ. Geol. Soc. vol. iv. p. 42.

mentary form; the anterior cusp is absent at the base of the external lobe, and the posterior cusp is a small process which rises between the external and internal lobes.

Locality.—I found this rare fossil in a bed of greenish tough tenacious clay, being No. 35 of my section*, and which stratum I have shown to be the equivalent of No. 14 of my section of Hordwell, Beacon, and Barton Cliffs†, from whence Mr. Falconer obtained the specimen which formed the subject of Professor Owen's paper. It is important, therefore, to note that these mammalian remains have been found in precisely the same geological horizon on both shores of the Solent sea; thus affording another link in the chain of evidence which proves the former union of these tertiary beds. I have promised the loan of this specimen to Professor Owen, who will figure it in the forthcoming new edition of his 'British Fossil Mammalia;' for this reason I have not figured it here.

Tooth of an unknown Saurian.

I had the good fortune to meet with a very perfect reptilian tooth in the Wealden clay of Brixton Bay; the accompanying figure, of the natural size, was drawn on wood by Mr. W. H. Baily, as it is important that palæontologists should possess a faithful drawing of its singular form, to enable them to compare future discoveries with the subject of this note, and eventually to determine the genus of Saurians to which it belonged. I had the pleasure of showing this tooth to Professors Forbes, Gervais and Owen, Dr. Mantell, and Messrs. Waterhouse and Woodward, who were all unacquainted with the form. Dr. Mantell thought it had some resemblance to a tooth found in the Wealden of Tilgate Forest, and which he imagined belonged to the *Hylæosaurus*. "These teeth," he observes, "are about $1\frac{1}{4}$ inch in height, and commence at the base with a cylindrical shank, which gradually enlarges into a crown of an obtusely lanceolate form, convex in front, slightly depressed, and terminating in an angular rounded apex, the margins of which are generally more or less worn, as if from dentrition. The crown is solid, but the fang encloses a small pulp-cavity; the surface is enamelled, and covered with very fine longitudinal striæ; the base in every specimen appears broken transversely, and has not a smooth surface, as if it had been loosened by absorption and shed naturally‡." The Doctor has given a figure of this tooth which dif-

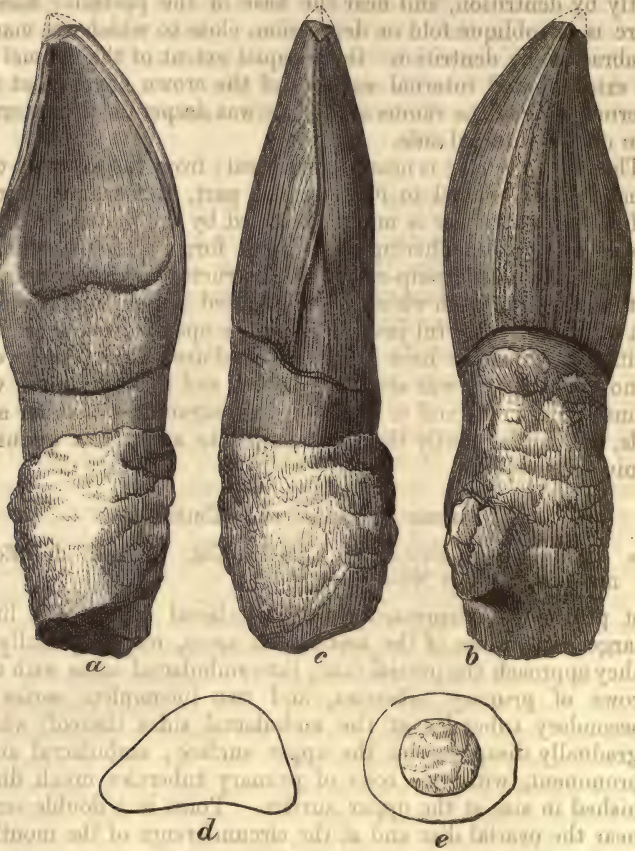
* Dr. Wright, Geology of the North-West coast of the Isle of Wight (Annals of Nat. Hist. S. 2. vol. vii. p. 14).

† Annals of Nat. Hist. S. 2. vol. vii. p. 433.

‡ Hand-Book of the Fossils of the British Museum, p. 326.

fers so much from our specimen, that we cannot suppose it belonged to a reptile of the same genus.

Description.—Our new tooth is divisible into the crown and the root: the line of demarcation between these parts is clearly defined by the terminal undulation of the enamel. The crown is somewhat of a bayonet-shape; from the frontier line of the enamel to the apex, it measures in front 1 inch and $\frac{13}{20}$ths; behind 2 inches and $\frac{1}{20}$th; the antero-posterior diameter at its widest part exceeds 1 inch, and its transverse diameter is $\frac{6}{10}$ths of an inch (*d*).



The crown (*d, b, c*) is unequally convex in front and concave (*a*) behind. The general form of the crown is shown in *a, b, c*; the anterior side thereof (*a, b*) is convex and sabre-shaped, and the posterior border (*a, b*) is slightly concave; the external convex surface (*b*) is covered with smooth enamel, which forms four blunt ridges on its most prominent part, and terminates inferiorly in a delicate rugous structure, forming a well-defined arch (*b*), the convexity of which is directed towards the apex; the posterior surface of the crown (*a*) is flat below and concave above; the enamel is smooth above and rugous below, as on the anterior surface, but it extends much farther down the crown (nearly half an inch) and forms an arch, the convexity of which is directed towards the root; the internal surfaces of the anterior and posterior borders (*a*) are abruptly truncated, apparently by dentrition, and near the base of the posterior border there is an oblique fold or depression, close to which are marks of abrasion by dentrition: the unequal extent of the enamel on the external and internal surfaces of the crown proves that the external plate of the ramus of the jaw was deeper on the external than on the internal side.

The root (*a, b, c, e*) is nearly cylindrical; from the external terminal fold of enamel to its fractured part, it measures 1 inch and $\frac{8}{10}$ths; its surface is much concealed by the matrix, and has masses of pyrites adhering thereto; it forms a hollow cylinder (*e*) which inclosed a pulp-cavity; the structure and form of the root is that of a tooth which was implanted in a distinct alveolus of a large and powerful jaw. Part of the apex is broken off, the position of which we have indicated by dotted lines; there can be no doubt that it was sharply pointed, and that this tooth was an instrument destined to pierce the soft structures of other animals, and consequently that it belonged to an extinct genus of carnivorous reptiles.

Diadema Autissiodorense, Cotteau.

Syn. *Diadema Autissiodorense*, Cotteau, Cat. Méthod. des Echinides dans l'étage Néocomien, p. 5.

Test pentagonal, depressed; interambulacral tubercles a little larger than those of the ambulacral areas, more especially as they approach the ovarial disc; interambulacral areas with two rows of primary tubercles, and two incomplete series of secondary tubercles at the ambulacral sides thereof, which gradually disappear on the upper surface; ambulacral areas prominent, with two rows of primary tubercles much diminished in size at the upper surface. Pores in a double series near the ovarial disc and at the circumference of the mouth.

Height $\frac{4}{10}$ths of an inch; transverse diameter $\frac{1}{2}\frac{8}{0}$ths of an inch.

Description.—In its general outline this beautiful Urchin resembles *D. depressum* of the Inferior Oolite, but the details of its structure are very distinct from that form. The circumference is pentagonal from the convexity of the ambulacral areæ, and the base and summit are much depressed.

The interambulacral areas are one-third broader than the ambulacral; two rows of primary tubercles occupy the centre of the plates; there are about ten pairs of tubercles in each area, which are of a moderate magnitude, and gradually diminish in size from the circumference to the base and summit; the mammillary eminences are small, their summits are deeply crenulated, and the tubercles, of proportional size, are deeply perforated; at the circumference six rows of granules separate the tubercles from each other, but towards the upper surface the four central rows are absent, which leaves a naked space in the middle of the area; three rows of granules in like manner separate the tubercles from the poriferous valleys; at the base of the area, and extending as far as the circumference of the test, are incomplete rows of secondary tubercles; these gradually diminish in size and disappear at the upper surface, which is occupied with an unequal-sized, close-set granulation about three rows deep; the ambulacral areas are one-third narrower than the interambulacral, they are however very prominent and convex, and are occupied with two rows of primary tubercles about ten in a row; the lower six pairs of tubercles are nearly as large as the corresponding tubercles in the interambulacral areas, but the upper four pairs are much smaller, so that whilst there is a great uniformity in the size and form of the tubercles on the base and circumference of the test, there is a very marked difference between those of the ambulacra and those of the interambulacra in the vicinity of the ovarial disc; the intertubercular space is occupied by a zigzag band of granulation, which is narrow below where the tubercles are large, but becomes broader above where they are small. The pores are arranged in double pairs near the summit and mouth, but in the other part of the avenues they are in single pairs; the apical disc is absent in our specimen, and the mouth is large and decagonal.

Affinities and differences.—This species nearly resembles *D. Bourgueti*, Ag., but differs from it in the rudimentary condition of the upper tubercles of the ambulacra, and in having the pores in double pairs above and below; the intermediate granulation is likewise less homogeneous than in *D. Bourgueti.*

Locality.—I collected this Urchin from the lower greensand at Atherfield, in No. 4 of the Cracker group of Dr. Fitton's section: it must be very rare, as none of the cabinets of Atherfield fossils hitherto examined by me contain a specimen of this *Diadema*. It has been collected by M. Cotteau from the Néocomien stage at Auxerre, where it is likewise very rare.

History.—Discovered by the author in the Isle of Wight in 1850, and by M. Cotteau in France in 1851, but first described by the latter in his 'Catalogue Méthodique des Echinides recueillis dans l'étage Néocomien,' and which brochure I received since I read this communication. As there is no figure of this Urchin extant, I intend giving one of the beautiful specimen before me, along with some other new forms of that group which I hope shortly to publish in the 'Annals of Natural History.'

X.—*Descriptions of some newly discovered species of* Araneidea. By JOHN BLACKWALL, F.L.S.

IN November 1850, Francis Walker, Esq., of Arno's Grove, Southgate, afforded me an opportunity of inspecting an extensive collection of spiders made by him in England and Switzerland in the summer of the same year; and a request that I might be permitted to describe the following species comprised in the collection, which appear to be new to science, was most obligingly complied with by Mr. Walker.

Tribe OCTONOCULINA.

Family LYCOSIDÆ.

Genus *Lycosa*, Latr.

1. *Lycosa calida.*

Length of the male $\frac{1}{5}$th of an inch; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{14}$; breadth of the abdomen $\frac{1}{16}$; length of a posterior leg $\frac{7}{16}$; length of a leg of the third pair $\frac{3}{10}$.

Cephalo-thorax large, convex, glossy, compressed before, with a slight longitudinal indentation in the medial line of the posterior region; its colour is dark brown, approaching to black at the anterior part; a broad band of reddish brown extends along the middle, another occurs on each side, and a narrow one of the same hue is situated immediately above each lateral margin. Four of the eight eyes are minute and form a transverse line in front, the two intermediate ones being somewhat larger than the lateral ones; the other four are large, and are situated on the sides and in front of the cephalo-thorax, constituting a quadrilateral figure, whose anterior side is rather the shortest; the anterior eyes of the quadrilateral are the largest of the eight. Falces conical, perpendicular, armed with a few teeth on the inner surface, and of a pale reddish brown colour, with two obscure, longitudinal streaks of dark brown in front. Maxillæ strong, short, straight, somewhat enlarged and rounded at the extremity, and of a pale yellowish brown colour. Lip nearly quadrate, dark brown at the base, but paler at the apex. Sternum almost circular, with blackish spots on the margins, and a longitudinal streak of the same shade extending from its anterior part, on each side of the medial line, more than half of its length. Legs long, slender, provided with hairs and sessile spines; they are of a pale reddish brown colour, the femora of the anterior pair being dark brown at the base; each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base. The humeral joint of the palpi is dark brown; the cubital and radial joints are reddish brown, the latter, which is much the stronger, being abundantly supplied with black hairs; the digital joint is brown, of an oblong oval form, convex and hairy externally, concave within, comprising the palpal organs, which are moderately developed, not very complicated in structure, rather prominent, with a short, projecting, pointed process near the outer side, and are of a brownish black colour tinged with red. The concavity of the digital joint does not extend to its termination, which is compact. Abdomen slender, oviform, convex above, projecting a little over the base of the cephalo-thorax; it is of a light orange-brown colour, with an irregular band of black on each side of the medial line; these bands converge towards the spinners, where they meet, and on the anterior part of the light orange-brown space comprised between them there is a narrow oval figure of orange-brown circumscribed by a fine black line; the sides are spotted with brownish black, and a longitudinal line composed of confluent spots of the same hue occurs on each side of the under part, the intermediate space being densely covered with white hairs.

This species was captured in June at Interlacken in the canton of Berne.

Family Salticidæ.

Genus *Salticus*, Latr.

2. *Salticus notatus*.

Length of the female $\frac{1}{4}$th of an inch; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{16}$; breadth of the abdomen $\frac{1}{10}$; length of a posterior leg $\frac{1}{6}$; length of a leg of the second pair $\frac{1}{8}$.

Legs robust, provided with hairs and sessile spines; they are of a pale yellow colour, the coxæ of the posterior pair having a black spot on the upper side; the fourth pair is the longest, the first and third pairs are equal in length, and the second pair is the shortest; each tarsus is terminated by two curved claws, below which there is a small scopula. The palpi resemble the legs in colour. Cephalo-thorax nearly quadrilateral, and sparingly clothed with black and whitish hairs; it slopes abruptly in the posterior region, and is prominent in front, projecting beyond the base of the falces, which are small, vertical, and armed with a few teeth on the inner surface: the sternum is oval. These parts, with the maxillæ and lip, are of a brown-black colour, the last two, which are the palest, having a reddish tinge, particularly at their extremities. Eyes disposed in three rows, constituting three sides of a square, in the front and on the sides of the cephalo-thorax; the intermediate eyes of the anterior row are greatly larger, and the intermediate eye of each lateral row is much smaller than the rest. Abdomen oviform, pointed at its posterior extremity, convex above, projecting over the base of the cephalo-thorax; it is of a brown-black colour, with short whitish hairs thinly distributed over its surface; a pale yellowish brown band, broader in the posterior than in the anterior region, extends along the middle of the upper part, and an obscure, narrow band of whitish hairs is curved round the anterior part and produced on the sides nearly to the spinners; the sexual organs are reddish brown.

An adult female *Salticus notatus* was found in June among herbage in a wood at Southgate.

Family Thomisidæ.

Genus *Thomisus*, Walck.

3. *Thomisus umbratilis*.

Length of the male $\frac{3}{20}$ths of an inch; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{12}$; length of an anterior leg $\frac{1}{5}$; length of a leg of the third pair $\frac{1}{7}$.

Eyes disposed on the anterior part of the cephalo-thorax in two transverse curved rows, forming a crescent, whose convex side is in front; the eyes of each lateral pair, which are seated on a tubercle, are much larger than the intermediate ones, those of the anterior row being the largest of the eight. Cephalo-thorax large, convex, abruptly sloping behind, compressed before, glossy, and of a brownish black colour, with a longitudinal band of red-brown on each side, and a broad one of the same hue extending along the middle. Falces short, strong, subconical, vertical, of a dark brown colour, with reddish brown extremities, and an obscure spot of the same hue in front. Maxillæ convex near the base, pointed at the extremity, and inclined towards the lip; they are of a pale reddish brown colour, and have a dark brown spot at the base on each side. Lip triangular and reddish brown, the apex being the palest. Sternum oblong, heart-shaped, approaching to oval; it is of a pale reddish brown colour, with dark brown spots on the margins, opposite to the insertion of the legs. Legs robust, provided with hairs and spines; they are of a pale reddish brown colour, the entire femora of the anterior pair, the anterior extremity of those of the other pairs, a spot on each side of the genual joint, and one on each side of the tibiæ of the posterior legs being brownish black; the first and second pairs are decidedly longer and more powerful than the third and fourth pairs, the first pair being the longest, then the second, and the third pair the shortest; each tarsus is terminated by two curved pectinated claws. The palpi are short; the humeral joint is brownish black, and the cubital, radial and digital joints are of a pale reddish brown colour marked with a few dark brown spots; the radial joint is stronger than the cubital, and projects two apophyses from its anterior extremity; one on the outer side, which is long, slender and pointed, and the other, which is strong, prominent, obtuse, with a protuberance at its base, on the outer side, is situated underneath; the digital joint is oval, convex, and hairy externally, concave within, comprising the palpal organs; they are moderately developed, rather complicated in structure, and are of a dark reddish brown colour. Abdomen depressed, corrugated on the sides, broader at the posterior than at the anterior extremity, the latter, which appears as if cut in a straight line across, projecting over the base of the cephalo-thorax; its colour is dark brown tinged with olive and freckled on the upper part with minute yellowish brown spots, those on the posterior part, being confluent, form a few obscure transverse bars; five circular yellowish brown depressions occur on the upper part; the three anterior ones are much the most conspicuous, and describe a triangle whose vertex is directed forwards; immediately before this vertex there is a small yellowish white spot; a narrow band of the same colour, spotted with brown, extends along each side, and a short, obscure, curved, yellowish white line is situated near the outer side of each branchial operculum.

This spider was taken at Interlacken in June.

Genus *Philodromus*, Walck.

4. *Philodromus vivax.*

Length of the female $\frac{1}{4}$th of an inch; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{8}$; length of a leg of the second pair $\frac{3}{8}$; length of a posterior leg $\frac{7}{24}$.

Cephalo-thorax short, broad, slightly compressed before, convex and glossy; it is of a dark brown colour, with a large yellowish brown oval in the cephalic region, comprising an oblique brown line directed backwards from each lateral eye of the posterior row; these lines converge towards the posterior extremities of two fine and nearly contiguous lines of the same hue originating immediately behind the intermediate eyes of the anterior row, the four lines presenting the form of a small anchor; on each side of the medial line of the posterior part of the cephalo-thorax there are several short, oblique, yellowish brown streaks, and the lateral and frontal margins are yellowish white. Falces short, subconical, vertical, and yellowish brown in front, except at the base, which, with the outer side, is dark brown. Maxillæ gibbous at the base, inclined towards the lip, convergent at the extremities, and of a pale yellowish brown colour. Lip oval, dark brown, with a yellowish tinge at the apex. Sternum heart-shaped; it is of a yellowish brown colour, the lateral margins and an obscure, narrow, longitudinal line in the middle being dark brown. Legs long, moderately robust, provided with a few sessile spines; they are of a yellowish brown colour, with spots and longitudinal streaks of dark brown; the second pair is the longest, then the first, and the fourth pair is the shortest; each tarsus is terminated by two curved claws, and has a climbing apparatus on its under side. The palpi are short and resemble the legs in colour. Eyes disposed on the anterior part of the cephalo-thorax in two curved, transverse rows, forming a crescent whose convexity is directed forwards; the lateral eyes of each row are seated on distinct prominences, and the intermediate eyes of the anterior row, which are nearer to each other than those of the posterior row, are rather the smallest of the eight. Abdomen somewhat depressed, broader in the posterior than in the anterior region, but rather pointed at the spinners, projecting a little over the base of the cephalo-thorax; on the upper part and sides it is of a dark olive-brown colour, spotted with numerous irregular, yellowish white spots; those on the sides are the largest, several small ones, forming a row immediately above the spinners, being angular, with their vertices directed forwards; the under part is yellowish white, three brown bands extending along the middle and uniting in a point at the base of the inferior pair of spinners; the sexual organs are of a deep reddish brown colour.

This interesting *Philodromus* was captured at Interlacken in June.

Family Drassidæ.

Genus *Drassus*, Walck.

5. *Drassus reticulatus.*

Length of the female, not including the spinners, $\frac{2}{5}$ths of an inch; length of the cephalo-thorax $\frac{1}{6}$; breadth $\frac{1}{8}$; breadth of the abdomen $\frac{1}{7}$; length of a posterior leg $\frac{5}{12}$; length of a leg of the third pair $\frac{5}{16}$.

The eyes are round, and are disposed on the anterior part of the cephalo-thorax in two nearly parallel, transverse rows; the posterior row is rather the longer, and the intermediate eyes, which are the smallest, and nearer to each other than they are to the lateral eyes of the same row, form a square with the intermediate eyes of the anterior row, which are much the largest of the eight and black, all the others being diaphanous. Cephalothorax oval, convex, pointed before, and thinly covered with hairs: maxillæ long, convex at the base, depressed near the middle, enlarged at the extremity, which is obliquely truncated on the inner side and curved towards the lip, which is long, oval, and rounded at the apex: sternum oval, broader in the posterior than in the anterior region, and supplied with hairs, which are densest on the margins: legs robust, moderately hairy, and provided with a few sessile spines; the fourth pair is the longest, the first slightly surpasses the second, and the third pair is the shortest; each tarsus is provided with hair-like papillæ on the under side, and has two curved, pectinated claws at its extremity. These parts, with the palpi, are of a yellowish brown colour, the digital joint of the latter and the lip being the darkest. The falces are powerful, conical, armed with one or two very minute teeth on the inner surface, slightly prominent, and of a red-brown hue. Abdomen of an elongated oviform figure, projecting a little over the base of the cephalo-thorax; it is sparingly clothed with short whitish hairs, and is of a pale olive-brown colour, reticulated with fine, dull, yellowish white lines; the sexual organs are minute and reddish brown; and the spinners are prominent, cylindrical, and of a pale yellowish brown colour.

The spider from which the foregoing description was made was captured in August near Lancaster.

Family Linyphiidæ.

Genus *Linyphia*, Latr.

6. *Linyphia pernix.*

Length of the male $\frac{1}{10}$th of an inch; length of the cephalothorax $\frac{1}{16}$; breadth $\frac{1}{24}$; breadth of the abdomen $\frac{1}{24}$; length of an anterior leg $\frac{1}{4}$; length of a leg of the third pair $\frac{1}{7}$.

Falces long, powerful, subconical, with a protuberance at the base, in front, and a few teeth on the inner surface; they are inclined towards the sternum, and are of a reddish brown colour. Maxillæ rather darker-coloured than the falces, straight, and somewhat enlarged at the extremity, which is curvilinear at its exterior angle. Lip semicircular, prominent at the apex, and, like the sternum, which is heart-shaped, of a very dark brown colour. Cephalo-thorax oval, convex, glossy, with an indentation in the medial line of the posterior region, and some coarse hairs, directed forwards, behind the eyes; its colour is dark brown. Eyes disposed on black spots on the anterior part of the cephalo-thorax; the four intermediate ones form a trapezoid whose anterior side is the shortest, and those of each lateral pair are seated obliquely on a protuberance and are nearly contiguous; the anterior eyes of the trapezoid are the smallest of the eight. Legs long, slender, provided with hairs and spines, and of a red colour; the first pair is the longest, then the second, and the third pair is the shortest; each tarsus is terminated by three claws; the two superior ones are curved and minutely pectinated, and the inferior one is inflected near its base. The palpi are short, and resemble the legs in colour, with the exception of the digital joint, which is dark brown; the radial joint is stronger than the cubital, and has some long hairs in front; the digital joint is somewhat oval, having a large lobe on the outer side, near its base; it is convex and hairy externally, concave within, comprising the palpal organs, which are highly developed, complicated in structure, with a broad, compressed, curved process projecting nearly at right angles from their base, on the outer side, and are of a dark reddish brown colour. Abdomen oviform, very sparingly supplied with short hairs, convex above, projecting over the base of the cephalo-thorax; it is of a yellowish brown colour on the upper part and sides, a series of black angular lines, whose indistinct vertices are directed forwards, extending along the middle of the former; the extremities of the anterior lines of the series are much the most strongly marked, and a small yellowish white spot occurs immediately above the spinners; the under part is of a pale brown colour.

This species was found among juniper bushes at Southgate in May.

Family Epëiridæ.

Genus *Epëira,* Walck.

7. *Epëira calva.*

Length of the female $\frac{1}{6}$th of an inch; length of the cephalo-thorax $\frac{1}{16}$; breadth $\frac{1}{18}$; breadth of the abdomen $\frac{1}{10}$; length of an anterior leg $\frac{1}{6}$; length of a leg of the third pair $\frac{1}{8}$.

Eyes disposed on the anterior part of the cephalo-thorax; the four intermediate ones are placed on a black prominence and describe a quadrilateral figure, whose anterior side is the shortest; those of each lateral pair are seated on a small black tubercle and are almost in contact; the posterior eyes of the quadrilateral figure are the largest, and the anterior ones are the smallest of the eight. Cephalo-thorax rounded on the sides, compressed before, elevated and convex in the cephalic region, depressed behind, glossy, and of a very dark brown colour, with a broad band in the middle, which decreases in breadth to its posterior extremity where it is yellowish white, the anterior part being yellowish brown. Falces powerful, conical, vertical, armed with teeth on the inner surface, and of a reddish brown colour, the base being the darkest. Maxillæ short, straight, enlarged and rounded at the extremity: lip semicircular, but somewhat pointed. These parts are of a very dark brown colour, their extremities being faintly tinged with red. Sternum heart-shaped, with small prominences on the sides, opposite to the insertion of the legs; its colour is brownish black. Legs moderately long, provided with hairs and a few fine spines; they are of a yellowish brown colour, the femora being marked with brown longitudinal streaks; the first pair is the longest, then the second, and the third pair is the shortest; each tarsus is terminated by the customary number of claws of the usual structure. The palpi are short and of a yellowish brown colour, the radial and digital joints being the darkest. Abdomen oviform, convex above, projecting greatly over the base of the cephalo-thorax; it is of a pale yellowish brown colour on the upper part, and is marked with four minute brown spots which form a quadrilateral figure whose anterior side is the shortest; a narrow, irregular, dark brown line extends along each side, from the anterior part, more than two-thirds of its length, and contiguous to the inferior margin of these lines, which are most distinct at their extremities, there is a parallel band of yellowish white; the sides are dark brown freckled with paler brown, and the under part is brownish black, bounded laterally by a yellowish white band extending from the anterior extremity beyond the spinners; the sexual organs are almost concealed by a scale-like process situated on each side of them.

The specimen of *Epëira calva* described above was taken in June at Interlacken.

XI.—*Note of the Mollusca observed during a short visit to the Canary and Madeira Islands, &c., in the months of April and May* 1852. By R. McAndrew, F.L.S.

On the 12th of March I sailed from Liverpool in a small yacht, on a voyage undertaken to benefit the health of some members of my family. We reached Lisbon after a boisterous navigation of ten days passed without any occurrence worthy of note, and were afterwards, by a continuance of bad weather, detained in port till the end of the month. In addition to the species of land shells previously met with by me in the neighbourhood of Lisbon, such as *Helix porentina, H. barbula,* &c., I obtained a *Pupa* the size of *P. secalina,* and a *Testacellus.* The weather only once permitted of my attempting to dredge, when I tried in deep water towards the south side of the Tagus, but got very little of anything. *Nassa scalariformis* was the only addition to my previous list from the locality. *Cymba Olla* is sold in the market of Lisbon, and doubtless eaten by the natives. We set sail from Lisbon on the 1st of April, and almost immediately after passing the bar, began to observe numerous marine animals, such as *Vellellæ, Salpæ* (in chains), Portuguese men-of-war, &c. In lat. 34°, and about fifty or sixty miles from the nearest land, a *Loligo* was brought on board by the patent log:—a similar circumstance occurred on another occasion further north, and at a still greater distance from land.

5th April.—Dredged two hauls at eight miles from the shore, off Mogador, depth 35 to 40 fathoms, bottom fine sand and mud.

Obtained twenty-two species of shells, all known inhabitants of the British seas, with the exception of the six following, viz. a *Tellina, Venus* undescribed, but previously dredged by me in Gibraltar Bay, *Dentalium dentalis, Buccinum modestum, Ringuicula auriculata,* and a *Natica,* species not ascertained. One of the species (*Venus striatula*) would hardly have been looked for so far south.

We spent two days in the port of Mogador, during which a strong wind with a heavy surf coming into the harbour rendered landing inconvenient, and dredging all but impracticable; I managed however to work a little under the lee of the island which forms the harbour, by going very early each morning before the breeze freshened up. I had no opportunity of examining the shore of the main land—indeed only landed there once, but the country in the vicinity of the town was far from inviting—presenting nothing but bare sand, rising behind into hills topped with a shrubby vegetation. The island, on the contrary, at the time of our visit was covered with a perfect carpet of flowers. The only land shells I could find there were—

Helix lactea.	Bulimus decollatus.
aspersa.	acutus.
pisana (the most abundant).	pyramidatus.
A Caracolla (white with pink inside).	

Of marine shells, between what were collected on the shore and those dredged, I got ninety-eight species; of which fifty-four are common to the British seas, ninety are known to inhabit the Mediterranean, one (*Psammobia rugosa*) the south coast of Portugal, one (a *Kellia* or *Galeomma*, but genus not ascertained) the coasts of Algarve and Asturias, one (*Marginella glabella*) Senegal and the Canaries, five (two small *Marginellæ*, a *Chiton*, a *Buccinum*, and *Mitra zebrina*) I met with in the Canaries, and one (a *Turbo*) is new to me.

Laminariæ are as abundantly developed in Mogador harbour as on our own coasts, the prevailing species apparently identical with the common tangle, but of a paler colour; numerous specimens of *Patella pellucida* are found upon it.

Two days' sail from Mogador brought us to Lancerote, one of the Canaries. Among these islands we spent exactly a month, which allowed time for only a partial examination of a small portion of the coasts of Lancerote, Grand Canary and Teneriffe, and I appropriated a full fortnight to the latter island. I have reason to think that Fuerteventura, and the smaller islands of Graciosa, Alegranza, and Monte Claro, which I did not visit, would have furnished results of greater interest.

The marine Mollusca described in the costly work of Webb and Berthelot on the Natural History of the Canaries, comprise 138 species, of which eight are Cuttle-fishes, and six naked Mollusca, leaving 124 species of marine shells, of which a list was furnished to me by my friend Prof. Edw. Forbes. Of these I did not succeed in taking

Argonauta Argo.
Planaxis lævigata.
Conus betulinus, Prometheus and guinaicus.
Cymba Neptuni, porcina and proboscidalis.
Marginella lineata.
Cassis flammea and testiculus.
Cerithium nodulosum.
Murex trunculus.
Scissurella Berthelotii.
Mytilus elongatus.
Arca Noæ.
Cardium costulatum.
Cardita corbis.
Crassatella divaricata.
Lutraria rugosa.
Mitra ebenea.
Trochus, two or three species doubtful.

But as several of these are known African shells, and were received from fishermen, it is possible that some may have been obtained from the coast of Africa, the great Canarian fishing-ground.

Of six species of Hyalæa I only procured three.
Of five species of Cleodora I only procured three.
Of two species of Atalanta I only procured one.

Several of the species I have obtained are either new or not identified; but when they are all worked out and named, I reckon that my list of shells of the Canaries will include about 260 to

270 species, of which 100 are enumerated in the work referred to, and 160 or 170 are new to the fauna of the district.

List of Shells procured in the Canary Islands.

	Species.		
Teredo	1		
Gastrochæna .	1		
Saxicava	1	..	arctica.
Venerupis ..	1	..	irus.
Corbula	1	..	nucleus.
Neæra	2	..	cuspidata and costulata.
Pandora	2 ?	..	obtusa, rostrata ?
Thracia	2	..	phaseolina, pubescens.
Solecurtus ..	2	..	candidus, coarctatus.
Solemya	1	..	mediterranea.
Psammobia ..	3	..	vespertina, costulata, ferroensis.
Tellina	4	..	depressa, distorta, balaustina, serrata.
Donax	1	..	anatinus ?
Ervillia	1	..	castanea.
Mactra	2	..	subtruncata ?, stultorum.
Cytherea	3	..	chione, one new ?, one undescribed.
Venus	3	..	verrucosa, casina, and one ?
Circe	1	..	minima.
Astarte	2 or 3	..	incrassata, compressa ?, triangularis.
Cardita	1	..	calyculata.
Cardium	5 or 6	..	echinatum, rusticum, papillosum, lævigatum, fasciatum, and one ?
Lucina	8	..	Adansoni, leucoma, flexuosa, divaricata, pecten, spinifera, transversa ?, and one (minute).
Diplodonta ..	2	..	rotundata, apicalis.
Kellia	2	..	rubra ?, suborbicularis.
Modiola	2	..	tulipa, and one (costulata of *W. & B.*, but nearer M. petagnæ of *Scacchi*; inhabits masses of nullipore, preserving its communication with the external world by means of a trumpet-shaped prolongation of the epidermis).
Crenella	2	..	rhombea, marmorata.
Chama	1	..	gryphoides.
Arca	4	..	lactea, tetragona, antiquata, imbricata.
Pectunculus..	1	..	glycimeris.
Avicula	1	..	tarentina.
Pinna	1	..	rustica.
Lima	3	..	squamosa, hians, subauriculata.
Pecten	8	..	Jacobæus or maximus, opercularis ?, corallinoides, pusio, pes felis, gibbus, and another.

	Species.		
Spondylus ..	1	..	Gædaropus.
Ostrea	1 or 2	..	not identified.
Orthis	4	..	truncata, and three not identified.
Hyalæa	3	..	trispinosa, and two others.
Spirialis	1		
Cleodora	3		
Atalanta	1		
Cuvieria	1		
Chiton......	4	..	fascicularis, canariensis, and two others.
Patella	4	..	crenata, guttata, Lowei, and one new?
Dentalium ..	3	..	dentalis, rubescens, and one undescribed.
Umbrella....	1	..	(small).
*Lottia	1		
Calyptræa ..	1	..	vulgaris.
Fissurella ..	2	..	reticulata, gibba.
Emarginula ..	2	..	elongata, reticulata?
Haliotis	1	..	tuberculatus.
Trochus	12 or 13	..	exiguus, striatus, magus, conulus, granulatus, ziziphinus, Sauleyii, and five or six species not identified.
Monodonta ..	1	..	Berthelotii.
Solarium	2	..	*luteum, and another.
Bifrontia	1	..	zanclæa.
Turbo	2?	..	rugosus, and another?
Phasianella ..	1	..	pullus.
Ianthina	2	..	fragilis, and one (small).
Littorina	3	..	striata, affinis, neritea.
Rissoa	14	..	canariensis, costata, parva?, purpurea, elata?, textilis?, striata?, punctata, and about six species not identified.
Jeffreysia....	1?		
Skenea	1		
Turritella....	1	..	triplicata.
Cæcum	2		
Cerithium ..	5	..	vulgatum, fuscatum, perversum, lima, and another.
Scalaria	10	..	pseudoscalaris, Webbii, cochlea?, crenata, clathratula, and five not identified.
Aclis?	2		
Eulima......	3	..	distorta, nitida?, and one.
Stilifer	1		
Chemnitzia ..	4 or 5	..	rufa, elegantissima, pusilla?, indistincta?, and one undescribed.
Odostomia ..	5 or 6	..	conoidalis, and four or five.
Eulimella	1	..	scillæ.
Truncatella ..	1		
Natica	5	..	porcellana, millepunctata, sericea, bicallosa?, and another.

	Species.	
Neritina	1	.. (marine) viridis.
Lamellaria ..	1 or 2	
Cancellaria	1 or 2	
Cerithiopsis .	1	.. tuberculatus.
Ranella	1	.. abbreviata? of *W. & B.* = lævigata, *Lam.*?
Murex	4 or 5	.. corallinus, Edwardsii, *Brandaris, *saxatilis, and one or two of doubtful generic position.
Purpura	3	.. hæmastoma, viveratoides, and one?
Buccinum ..	2	.. minus, and one new?
Nassa	7	.. reticulata, incrassata, mutabilis, variabilis, canariensis, prismatica, scalariformis?
Dolium	1	.. *perdix, and fragments of species not identified.
Terebra	1	.. senegalensis.
Fusus	3	.. maroccanus, rostratus, pulchellus.
Triton	4	.. nodiferum, pileare, cutaceum?, and one.
Mangelia	9 or 10	.. purpurea, Lefroyii, striolata, Vauquelina, lineata, Ginniniana, gracilis, teres, and one or two more.
Pleurotoma ..	2	.. elegans, balteata.
Mitra	4	.. columbellaria, nigra, zebrina, littoralis?
Columbella ..	2 or 3	.. rustica, cribrella, and another?
Conus	2	.. mediterraneus, papilionaceus.
Cypræa	6	.. spurca, *lurida, pyrum, *moneta, pulex?, candidula?
Ovula	1	.. spelta?
Marginella ..	5	.. glabella, guancha, and three others.
Cylichna	5	.. cylindracea, truncata, mammillata, one undescribed, and one new?
Bulla	2	.. ampulla, hydatis.
Aplysia	2 or 3	.. hybrida, and one or two (large).
Auricula	1	
Spirula......	1	.. Peronii.
Octopus	1	
Ditrupa	1	
Echinus	6	
Asterias	3 or 4	.. canariensis, &c.
Comatula ..	1	
Acasta	1	
Pollicipes....	1	

In the foregoing list the species marked * were not found by myself, but given to me as native; those mentioned as "undescribed" I had previously obtained in the Mediterranean.

It is to be remarked that the genera *Nucleus* and *Leda* are not represented in the Canary or Madeira Islands.

Marginella glabella and Conus mediterraneus } are common in Lancerote and Grand Canary, but were not observed in the more westerly island of Teneriffe.

Of land and freshwater shells fifty-seven are enumerated in the work already referred to;—of these I did not procure above half; they are generally of a peculiar and interesting character.

Of *Vitrina* I believe there are two species; one of them, the smaller, found under stones in dry situations; the other I met with living in moist wood of laurel-trees not far from Laguna. An adult specimen of the animal measured fully $1\frac{1}{2}$ inch in length when living. In the same locality I found dead a very thin, pellucid shell of a green colour, and carinated like a *Caracolla*. It differs from any that I am acquainted with.

On our way from Teneriffe to Madeira we landed for some hours on the Great Salvage, an island of about a mile in extent in either direction, uninhabited, except for a few weeks in the year, when it is visited for the collection of barilla, feathers, &c.

We found upon it a few goats, and rabbits in vast abundance, so that our people were able to catch some in their hands; also sea fowl, which quietly allowed themselves to be taken from under the ledges of rock, and innumerable lizards. After diligent search I could only find one species of land mollusk, a snail allied to *Helix pisana*, but apparently distinct from it. On the rocks of the shore were *Littorina striata*, three or four species of *Patella*, and a *Trochus*, all of large size, and in great abundance.

16th May.—Arrived at Madeira: dredged three times in Funchal roads and once in the bay of Porto Santo: obtained

	Species.	
Gastrochæna	1	
Saxicava	1	arctica.
Venerupis	1	irus.
Neæra	2	costulata, cuspidata.
Poromya	1	granulata.
Lyonsia	1	striata.
Thracia	1	phaseolina.
Solecurtus	2	candidus, coarctatus.
Tellina	5	depressa, distorta, donacilla, balaustina, and another.
Psammobia	1	costulata.
Ervillia	1	castanea.
Cytherea	2	chione, and one undescribed.
Venus	2	verrucosa and casina.
Circe	1	minima.
Cardium	5	echinatum, rusticum, papillosum, lævigatum, and another?
Cardita	1	calyculata.
Lucina	4	spinifera, divaricata, pecten, and another.

	Species.		
Diplodonta ..	2	..	rotundata, apicalis.
Kellia	1	..	rubra.
Modiola	1		
Arca	1	..	tetragona.
Pectunculus..	1	..	glycimeris.
Avicula	1	..	tarentina.
Lima	1	..	squamosa.
Pecten	9	..	maximus or Jacobæus, pusio, similis, coralloides, polymorphus, pes felis, opercularis ?, gibbus, and another.
Ostrea	1		
Argiope	1 or 2		
Hyalæa	4	..	tridentata, trispinosa, and two others.
Cuvieria	1		
Chiton	1		
Patella	1		
Dentalium ..	1		
Calyptræa ..	1	..	vulgaris.
Fissurella	1	..	reticulata.
Emarginula ..	2		
Trochus	5	..	crenulatus, lævigatus, ziziphinus, magus, and another.
Solarium	1		
Bifrontia	1	..	zanclæa (operculum pyramidal, graduated).
Ianthina	3	..	communis, and two others.
Turbo	1	..	rugosus.
Phasianella ..	1	..	pulla.
Rissoa	4 or 5	..	violacea, cimex, and two or three.
Cerithium ..	3	..	lima, adversum, and another.
Turritella ..	1	..	new ? and one undescribed.
Scalaria	3 or 4	..	Turtoni, cochlea, and one or two others.
Eulima	3	..	subulata, nitida, and one other.
Chemnitzia ..	3	..	rufa, and two others.
Eulimella ..	1	..	scillæ.
Natica	2	..	porcellana ?, and another.
Neritina	1	..	viridis.
Cancellaria ..	1	..	undescribed.
Murex	3	..	corallinus, Edwardsii, and cristatus.
Cassis	1	..	sulcosa.
Buccinum ..	1	..	minus.
Nassa	3	..	prismatica, incrassata, variabilis.
Mangelia	5 or 6	..	teres, nana, Vauquelina, Ginniniana, and one or two others.
Mitra	2	..	zebrina, littoralis ?
Cypræa	2	..	pulex, candidula ?
Columbella ..	1 or 2	..	rustica, and one other ?
Marginella ..	1	..	guancha ?
Ringuicula ..	1	..	auriculata.

	Species.	
Cylichna	3	... cylindracea, and two others.
Amphispira ..	1	.. hyalina.
Philine ...	1	.. aperta.
Spatangus ..	1	
Asterias	1	
Ditrupa	1	

Of the foregoing species (about 125) 58 inhabit Britain, 98 to 100 the Mediterranean or coasts of Portugal (including all the British species); of those remaining, 16 are common to the Canaries, 1 (a *Tellina*) to Mogador, leaving 3 species of *Rissoa*, 2 of *Emarginula*, 1 of *Scalaria*, 2 of *Argiope*, and 1 of *Turritella*, supposed to be new.

The land shells of these islands having been well worked out by other parties, it is unnecessary to say anything upon them. I was much struck by their great abundance in the Dezertas and Porto Santo.

Beaumaris, July 5, 1852.

XII.—*On some genera of the* Icacinaceæ. By John Miers, Esq., F.R.S., F.L.S.

[Continued from p. 44.]

Platea.

In commenting upon the genera of the *Icacinaceæ*, I have frequently spoken of *Phlebocalymna*, a manuscript name proposed by Mr. Griffiths for a plant collected by him in the Malacca Peninsula, but as I am unable to discover that any of its characters are appreciably distinct from the *Platea* of Blume, the former must necessarily merge into the latter genus, which was first established by that distinguished botanist in his 'Bijdragen,' and more lately recorded in his 'Mus. Bot. Lugd.,' where he enumerates another new species. In describing the characters of *Stemonurus*, I have stated (*ante*, p. 32), that the chief or perhaps only feature that can distinguish *Platea*, is the absence of the glandular hairs, that form a beautifully fringed crest over the anthers in the former genus, and as this was believed only to be a sexual difference, I had considered *Platea* as identical with *Stemonurus*. In the former, as also occurs in many species of the latter genus, the filaments are said by Blume to be short and broad (whence probably the generic name from πλατεῖα, *amplus*), while in *Phlebocalymna*, although when in bud they are short and broad at base, they become afterwards long and linear: the differences in regard to their relative length and breadth are probably only specific, as we find them to occur in *Stemonurus*. After desiccation, the flowers of *Phlebocalymna* appear of an orange colour, which is probably retained from the living state; they are somewhat more transparent and agglutinated at their edges than in *Stemonurus*, the calyx is more distinctly 5-lobed, and the segments are imbricated in æstivation, a feature also recorded by Blume in his character of *Platea*: in Griffiths's plant from Mergui, the calyx is furnished at its base, at the point of its articulation with the pedicel, with a distinct bract. In this plant, and in another from Moulmein, the flowers are axillary, and almost fasciculated in a very short raceme, but in Cuming's plant from Manilla, the inflorescence is in a spreading panicle, with numerous flowers upon lengthened pedicels. Blume, in his generic character of *Platea*, states that the flowers are diœcious, and that in the female flowers the corolla and stamens are altogether wanting. The same might almost be said of several species of *Stemonurus*, for as soon as the fertility of the ovarium is clearly discernible, the petals and stamens will be found to have fallen off, and from analogy we may safely conclude the same to have occurred in *Platea*. Mr. Griffiths in his manuscript note on *Phlebocalymna* says, "genus novum Icacinearum, familia singularis ob albumen in lobos divaricatos et tegumen seminis vasculosissimum:" this remark can hardly apply to his proposed genus, of which it does not appear that he had seen the seed, and it is more than probable that the allusion was made to *Bursinopetalum*, a genus placed by Dr. Wight (Icon. tab. 956) in the *Olacaceæ*, of which the *Icacineæ* had been universally held to be a tribe: in that genus, by the growth of the placentary column of the abortive cells, and its protrusion into the cavity of the fertile cell, the albumen becomes hippocrepically folded, and somewhat divided into two lobes, in the manner clearly demonstrated in the figure referred to. I have elsewhere shown that *Bursinopetalum* belongs to the *Aquifoliaceæ*. Blume in his 'Mus. Bot. Lugd.' gives a new generic character of *Platea*: this will require some modification, if we include in it *Phlebocalymna*, and with this view I now offer the following diagnosis:—

Platea, Blume. Phlebocalymna, *Griffiths*.—*Flores* hermaphroditi vel sæpissime abortu polygami: an unquam vere dioici? *Calyx* brevissimus, cupularis, 5-dentatus, dentibus in præflorationem imbricatis, persistens, sed non augescens. *Petala* 5, linearia, carnosula, æstivatione valvata, apice propendenti inflexo, marginibus rorido-glandulosis, imo in tubum laxe adhærentibus, e medio libera et reflexa, in flor. fem. fertil. cito decidua. *Stamina* 5, cum petalis inserta, iisdem alterna, *fila-*

menta interdum brevia, sæpe petalis fere æquilonga, linearia, compressa, imo cum petalis laxe adhærentia: *antheræ* ovato-oblongæ, basi breviter bifidæ, dorso affixæ, 4-loculares, 2-lobæ, lobis singulatim 2-locellatis, demum septicidis, et longitudinaliter evolutim dehiscentibus. *Pollen* globosum, reticulatum. *Ovarium sterile* disco 5-gono 10-striato piloso immersum; *fertile* liberum, conicum, pilosulum, disco annulari glabro insitum, abortu 1-loculare, ovula 2 juxta apicem loculi subcollateraliter suspensa. *Stylus* brevis, sulcatus, pilosus, dentibus 3 stigmatosis erectis terminatus, demum in discum magnum sessile pulviniforme fructus coronans auctus. *Drupa* baccata, monopyrena, *putamen* oblongum, lignosum, angulato-rugosum, 1-spermum. *Semen* structuram Stemonuri æmulans?—Arbores *Asiæ tropicæ,* folia *elliptica, coriacea, glaberrima, vel juniora interdum subtus lepidota, breviter petiolata,* flores *perpauci in cymas vel racemos breves axillares dispositi, interdum fasciculati, sicce aurantiaci*: fructus *atro-purpureus.*

1. *Platea excelsa,* Bl. Bijdr. 646;—arbor 80–100 ped., foliis oblongo-lanceolatis, acuminatis, integerrimis, subtus cinereo-virentibus.—Java.

2. *Platea latifolia,* Bl. Bijdr. 646;—arbor 40–60-ped., foliis ovalibus, acuminatis, basi parum attenuatis, integerrimis, costatis, subtus griseo-lepidotis.—Java.

3. *Platea Sumatrana,* Bl. Mus. Bot. Lugd. Bat. 249;—foliis e basi obtusata vel rotundata elliptico-oblongis, acuminatis, subcoriaceis, venosis, subtus cinereo-virescentibus.—Sumatra.

4. *Platea Griffithiana,* n. sp.;—ramulis substriatis, subrugosis, foliis oblongo-ovatis, e medio inferne paullo angustioribus, apice obtusiusculo breviter ac lineari-angustatis, coriaceis, utrinque pallidis et concoloribus, nervis inferne prominentibus, margine revoluto, petiolo brevi, canaliculato, racemo axillari, petiolo vix longiori, pedunculo pedicellisque aspero-pilosulis, floribus cum pedicellis articulatis, et hinc bracteatis; calycis glabri lobis ciliatis, petalis carnosulis, glabris, filamentis linearibus, compressis, imo latioribus, ovario brevissimo, sterili, disco pentagono immerso, stylo conico, piloso, dentibus tribus stigmatosis pube celatis.—Mergui.—*v. s. in herb. Lindl. et Hook.* (Griffiths, 849).

The leaves are $5\frac{3}{4}$ inches long, nearly 3 inches broad, on a deeply channelled petiole 4–5 lines in length; the raceme is about 7 lines long, few-flowered; the lobes of the calyx are distinctly imbricated; the petals conjoin by their margins in a tubular form, leaving the upper portion free and reflexed; the filaments for half their length adhere to the petals, but are easily separated, they are narrow, linear, compressed, and three-fourths of the length of the petals; the anthers are filled with pollen.

5. *Platea Lobbiana*, n. sp.;—ramulis angulatis; foliis ellipticis imo subacutis, apice obtusiusculo subito attenuatis, glaberrimis, coriaceis, supra lucidis, utrinque pallidis et concoloribus, costa supra sulcatis, nervis utrinque prominulis, venis immersis, margine valde revolutis, pagina inferiori minute cavo-punctatis, petiolo brevi, tereti, flavescenti, transverse rugoso, superne paullo canaliculato; racemo brevissimo, axillari, petiolo vix longiori, floribus subfasciculatis, sicce aurantiacis, hermaphroditis, calyce piloso, petalis linearibus, glabris; ovario piloso, ovuligero, disco annulari glabro insito.—Moulmein.—*v. s. in herb. Hook. et Lindl.* (Lobb, 385).

The leaves in this species are $4\frac{3}{4}$ to $5\frac{3}{4}$ inches long, and $1\frac{3}{4}$ to $2\frac{1}{4}$ inches broad, on a rather slender terete petiole about $\frac{1}{4}$ inch in length: the flowers are hermaphrodite; the lobes of the calyx are imbricated; the petals adhere by their margins in a tubular form, leaving the upper portions free and reflexed; the filaments for half their length cohere to the petals, but are easily separated, they are narrow, linear and compressed, nearly the length of the petals; the pollen is globular and reticulated; the style is hollow, terminated by three erect obtuse teeth; the ovarium is conical, hairy, seated on an annular glabrous disk; it is 1-celled, with two ovules collaterally suspended from near the summit of the cell.

6. *Platea Wightiana*. Gomphandra polymorpha, var. *Wight, Icon.* tab. 933;—foliis oblongis, apice obtusiusculo repente attenuatis, glabris; panicula axillari, divaricatim dichotomoramosa, folio 4-plo breviori, floribus aggregatis, staminibus exsertis, filamentis linearibus, apice latioribus.—Coonoor in Mont. Nielgherrensibus.

This is the plant to which I alluded when speaking of *Stemonurus* (*ante*, p. 37): although figured as the male plant of *Gomphandra polymorpha*, it would seem to be hermaphrodite, for the ovarium, as shown in the section given in fig. 6, is represented as ovuligerous.

7. *Platea laxiflora*, olim *Stemonurus laxiflorus*, n. sp.;—ramis flexuosis, nodosis, ramulis teretibus, subglabris, rugoso-striatis; foliis oblongis, utrinque acutiusculis, apice repente attenuatis, utrinque glabris et concoloribus, venis subtus prominulis, petiolo subtenui canaliculato; paniculis solitariis vel

geminis, axillaribus, 3-chotomo-ramosis, et laxe divaricatis, pedunculis pedicellisque gracilibus parce pubescentibus, calyce corollaque glabris.—Ins. Philip.—*v. s. in herb. Hook. et Lindl.* (Cuming, 891).

The leaves are about $5\frac{1}{2}$ inches long and $1\frac{3}{4}$ inch broad, on a petiole 5 lines in length; the panicles are about $1\frac{1}{2}$ inch long, the peduncle and its widely spreading branchlets being long, slender, and nearly glabrous; the persistent calyx is smooth, with five small teeth; the petals are linear and thin in texture; these in the greater number of instances, together with the stamens, are wanting, having fallen away, as almost universally occurs in the female flowers of *Stemonurus* found in herbaria; and it is probably owing to this circumstance, that Prof. Blume, in his generic character of *Platea*, states that the female flowers are deficient of corolla and stamens. The stamens are the length of the petals, the filaments being quite free, very compressed and broad at the base, tapering above, thin, and almost membranaceous in texture, somewhat inflexed at their summit, where they are terete and affixed near the dorsal sinus of the anthers, which are oblong, 2-lobed, bifid and sagittate at base, and emarginated at the apex; the lobes are membranaceous, opened by a longitudinal fissure, the cells being quite void. The ovarium is cylindrical, as long as the stamens, and crowned with a sessile 5-lobed pulvinated disk, which is slightly umbilicated in the centre, where a short prominence is seen, this being the withered style and stigma: its single cell contains two large suspended ovules. It is worthy of remark, that in all the flowers retaining the corolla, I could find no instance in which the petals presented any appearance of opening, so that it is very probable that these, together with the stamens, in falling away retain the cylindrico-cupular form they present in the bud.

Sarcostigma.

The following observations on the structure and affinities of *Sarcostigma* were completed in readiness for the press, when the last part of the 'Plantæ Javanicæ Rariores' made its appearance: in that important work we are favoured with an interesting account and an excellent figure of a new species of this genus from Java. The remarks there offered, in regard to the affinities of *Sarcostigma*, will be seen to be greatly at variance with my own deductions; and hence it becomes necessary that I should offer a few explanatory words on the subject. It would be presumptuous in me to attempt to contravene the inferences there deduced by the most profound botanist of our time, showing the relation which that genus bears to *Phytocrene*, *Nansiatum*, and

Iodes; but fully acknowledging all that is there affirmed, I may venture to show, that a yet stronger and much closer extent of analogy will be found to exist in the structure and development of the floral parts, as well as a greater approximation in habit, to what we find in *Stemonurus* and *Pennantia*. From the facts shown below, it will be seen that *Sarcostigma* accords with nearly all the essential characters I have endeavoured to establish in the preceding series of memoirs, as the leading features of the *Icacinaceæ*, viz. trees with alternate, glabrous, coriaceous, petiolated, exstipulate leaves; an axillary racemose inflorescence, with small flowers, more or less polygamous, and distinctly articulated on a short pedicel; a small cupshaped, persistent calyx supporting the fruit, and unchanging with its growth; a corolla of four or five fleshy, linear petals, with valvate æstivation, arising from the hypogynous or stipitated support of the ovarium; free stamens, equal in number to, and alternate with the petals; introrse 2-lobed anthers; an ovarium presenting a similar form, the same internal structure, and the subsequent development of that seen in *Stemonurus* and *Pennantia*, and a fruit, in all appearance, closely analogous to that existing in those genera. Hence it seems evident from the facts here shown, that wherever *Pennantia*, *Stemonurus*, and *Platea* are placed in the system, *Sarcostigma* should follow in juxtaposition with them, unless the evidence now wanting, of the structure of its seed, should tend to a different location. If therefore *Sarcostigma* be found to hold a relation with the *Phytocreneæ*, the questions will naturally arise, whether this hitherto dubious family should not be brought into a more proximate position in the system with the *Icacinaceæ*, or whether I have been in error in referring the genus under consideration to the latter family. The group of the *Phytocreneæ* was first proposed by Endlicher as a suborder of the *Menispermaceæ*, a family with which they hold little relationship. Prof. DeCaisne, if I mistake not, first pointed out the identity of *Phytocrene* with the *Gynocephala* of Blume, a genus placed among the *Artocarpaceæ*: hence *Phytocrene* and *Nansiatum* were removed by Prof. Lindley and other botanists to that family. This conclusion appears to me to have been too hastily drawn, for the *Artocarpaceæ* differ from them essentially in their stipular leaves, the presence of only a single floral envelope, which is often imperfect or altogether wanting, in their having fewer stamens than the number of the lobes of its perianthium, in their bifid style, which is often basilar, in their ovarium, with only a single suspended ovule, which is amphitropal or orthotropal, and an exalbuminous seed, often erect, though sometimes pendulous, with a thickened testa, and thick, fleshy cotyledons, often unequal in size. *Phytocrene* is very different in habit from any of the *Artocarpaceæ*, having exstipulate leaves, flowers with a regular and symmetrical calyx and corolla, stamens equal in number to the petals, an ovarium with two anatropal ovules, suspended from the summit of the cell, and a seed with a considerable quantity of albumen, enclosing an embryo with large foliaceous cotyledons, and a small inferior radicle. In regard to the structure of the seed of *Phytocrene*, our evidence is yet quite uncertain. Prof. Lindley (Veget. Kingd. p. 274) describes and figures an albumen of a very granular, or rather ruminated texture, enclosing two large foliaceous cotyledons, with a very small inferior radicle; and Mr. Brown, in his generic character, greatly confirms this view, by stating it to possess an embryo with large foliaceous cotyledons, enclosed in albumen. Prof. Blume, on the contrary (Mus. Bot. Lugd. Bat. p. 41. tab. 7), describes and figures the embryo as being quite exalbuminous, with large foliaceous crumpled cotyledons of a rugosely granular texture, possessing a short superior radicle: he here acknowledges *Phytocrene* to be identical with his *Gynocephala*, the fruit of which he describes as consisting of an aggregation of several elongated drupes, upon a fleshy receptacle, forming a globe as big as a man's head. It must at the same time be acknowledged, that the extremely villous habit of *Phytocrene*, the peculiar structure of its woody stem, its closely aggregated flowers in globular heads, the membranaceous texture of its calyx and corolla, both clothed externally with very dense long hairs, and its peculiar stamens, present characters to which little resemblance can be traced in *Sarcostigma*. I urge these reflections, however, with extreme hesitation, in deference to the conclusions of an authority, whose determinations all botanists will regard with the highest consideration. It is to be regretted, however, that Mr. Brown has not favoured us with his views, and the reasons on which they are based, in regard to the real affinities of the *Phytocreneæ*; but he says decidedly that *Sarcostigma*, which in his opinion "so obviously belongs to" this group, bears no relation to *Hernandiaceæ*, to which family that genus had originally been referred by Drs. Wight and Arnott. We may, however, infer something more tangible on this point from his admission of "its near relationship" to *Pyrenacantha*, a genus with a single floral envelope, and other characters, that have led to its position near the *Antidesmeæ*. The genera *Phytocrene*, *Nansiatum*, and *Iodes* form a very natural group, possessed of consimilar features, offering constantly a regular calyx and corolla, divided into segments equal in number to the stamens, all alternating with each other in distinct series; they have therefore every claim to rank among the *Dialypetalæ* of Endlicher; but this disposition does not exist in *Miquelia*, a genus carefully figured and described by Prof. Blume (*loc. ante citat.*), and placed by him and Mr. Brown among the *Phytocreneæ*: this genus, with a very different habit, offers only a single floral envelope, with stamens alternate with its segments, and a 1-celled ovarium with two suspended ovules, characters similar to those of *Pyrenacantha*, from which it differs in its exalbuminous seeds: these two genera are therefore clearly referable to the *Apetalæ* of Endlicher, which are nearly equivalent to the *Monochlamydeæ* of DeCandolle. If *Sarcostigma* then be related to the *Phytocreneæ*,—an affinity which, if we accept, we must admit has not yet been demonstrated,—it is clear that it cannot bear any relation to the two genera before mentioned, which appear to have been associated with that group upon very insufficient grounds; and if, as above indicated, the *Phytocreneæ* be allowed to rank among the *Dialypetalæ*, it appears to me their position would not be far from the *Tiliaceæ* or *Dipterocarpeæ*, to which families they offer many analogous characters: from Prof. Blume's analysis, they would much resemble the latter in the structure of the seed; under Prof. Lindley's view, they would more nearly approach the former.

The observations that now follow were written several months ago, and as they are confined wholly to the description of facts, there is no occasion to retract anything there advanced in consequence of what is said above.

The genus *Sarcostigma*, to which I have alluded (*huj. op.* ix. p. 223) as belonging to the *Sarcostigmeæ*, one of the tribes of the *Icacinaceæ*, was founded in 1832 by Drs. Wight and Arnott, on an Indian plant collected by Dr. Klein, and described by them in the 14th volume of the 'Edinburgh New Phil. Journal.' Like *Desmostachys*, it is somewhat scandent in its habits, but it has large oblong leaves upon very short petioles, and, as in that genus, it has an extremely long and slender spicated inflorescence, studded at close intervals with fascicles of small flowers, which in drying retain their bright yellow colour, and are very deciduous, being articulated upon very short and almost obsolete pedicels. The flowers, in the only case I have seen, are all female, and their stamens, which are sterile, are alternate with the petals; the internal structure of the ovarium corresponds with the usual character of the order: in the form of its epigynous stigmatoid summit it resembles *Stemonurus*, and what I have stated concerning the nature of this part in that genus appears confirmed by the circumstances that occur here: in some cases this appears like a flat, glabrous, fleshy disk, with a depression in the centre, as in the following genus *Discophora*, but it seems afterwards to attain the form of a somewhat conical umbraculiform process, overhanging the ovarium, with a crenated margin, and hollow in the centre. This process therefore, as in *Stemonurus*, would seem to be a growth subsequent to the period of impregnation: it will be remembered that a somewhat analogous succeeding development on the summit of the ovarium has been described in the case of *Apodytes*. In the rugous surface of its putamen, as recorded in the manuscript of Dr. Klein, it resembles *Mappia* and *Stemonurus*. Dr. Vogel collected another species, now first described, at Cape Palmas, on the Guinea coast of Africa; in its general appearance, the size and shape of its leaves, and in its singularly long, slender, spicated inflorescence, it bears a striking resemblance to Dr. Klein's plant and to that from Java, and although all the flowers have fallen off at the articulations with the pedicels, the identity of the genus cannot be mistaken. The following generic character has been derived, partly from my own observations as far as the specimen I have seen has afforded evidence, partly from Dr. Klein's original notes, and I have since added other features from Mr. Brown's description:—

Sarcostigma, W. & A.—*Flores* polygami. *Calyx* minimus, breviter cupulatus, obtuse 5-dentatus, persistens. *Petala* 5, lineari-oblonga, glabra, imo disci stipitati adnata, æstivatione valvata, sub anthesi patentim reflexa, marcescentia et persistentia. *Stamina* 5, cum petalis inserta, iis alterna et æquilonga, in flor. fem. sterilia et subbreviora; *filamenta* linearia, compressa, in sterilibus apice antheris fere obsoletis 2-loba, (in fertilibus *antheræ* ovales, versatiles, loculis parallelis, approximatis, longitudinaliter dehiscentibus, sec. cel. R. Br.). *Ovarium* in flor. masc. parvum, sterile, pubescens, in flor. fem. cylindricum ventricosum pubescens, disco seu gynophoro brevi tereti stipitatum, 1-loculare; *ovula* 2 ex apice loculi subcollateraliter superposita, podospermio carnosa suspensa: (*stylus* brevis crassus et *stigma* capitatum sec. Klein): in ovario adolescente, *stylus* nullus, nisi id quod videmus in discum sessilem stigmoideum umbraculiformem margine crenatum centro cavum demum mutatum, et *stigma* verum centrale proinde obsoletum. *Drupa* oblonga, compressa, monopyrena; *putamen* rugosum; cætera ignota.—Frutices *Asiæ meridionalis, Javæ, et Africæ tropicæ, subscandentes*; folia *majuscula, alterna, oblonga, coriacea, glaberrima, breviter petiolata*; racemi *longissimi, graciles, simpliciter spicati e fasciculis* 1–4-*floris alternis*; flores *minusculi, sicce flavi, cum pedicellis fere obsoletis articulati, et cito caduci.*

1. *Sarcostigma Kleinii*, W. & A. Edinb. New Phil. Journ. xiv. 299;—subscandens, glaberrima, laxe ramosa, ramulis teretibus; foliis oblongis, basi rotundatis vel subacutis, apice ob-

tusiusculo acuminatis, et paullulo attenuatis (junioribus lanceolatis), coriaceis, supra pallidis, venis valde reticulatis prominulis, subtus stramineis, nervis venisque prominentibus, margine cartilagineo, petiolo subtenui, canaliculato, rugoso; racemo gracili, extra-axillari, folio magno multo longiori, floribus 1–4 minusculis, in fasciculis subsessilibus aggregatis, articulatis, calyce pilosulo, drupa ovali, breviter pedicellata.—India Orientalis ad Travancore.—*v. s. in herb. Hook.* (*Wight*, 943, *cum descript. cl. Doct. Klein*).

The branchlets are slender and somewhat scandent; the leaves are of a pallid hue on both sides, but a little more yellow beneath; they are of a very coriaceous substance, rather polished, with raised reticulations above, the margins somewhat revolute and cartilaginous, with the nervures and reticulated veins very prominent beneath; they are 6 to $8\frac{1}{2}$ inches long, $2\frac{3}{4}$ to $3\frac{3}{4}$ inches broad, on a short, deeply channelled petiole half an inch in length, and transversely rugous as in *Platea*; the raceme arises from the side of the stem opposite to that on which the petiole is inserted, as in some species of *Stemonurus*; it is about 11 inches long, very slender, and charged for nearly its whole length with clusters of few flowers, in which the calyx is somewhat pilose, but the petals are quite glabrous, and retain their yellow colour in drying; they are about a line in length. The drupe is supported by its calyx and corolla, both unchanged, withered, and persistent, upon the gynophorus, which is now elongated to a pedicel of the length of $1\frac{1}{2}$ line; it is 11 lines long, and 7 lines broad when dried; a single drupe alone remains in the specimen referred to. Dr. Klein in his manuscript note says, that several aggregated lengthened racemes sometimes grow out of the leafless nodes of the old wood*.

2. *Sarcostigma Vogelii*, n. sp.;—suffrutex glaberrimus, ramulis teretibus, subrugosis; foliis majusculis, oblongis, utrinque acuminatis, apice acute et breviter attenuatis, coriaceis, glaberrimis, supra pallidis, subtus flavescentibus, nervis venisque reticulatis et transversis prominentibus, petiolo brevissimo, canaliculato, rugoso; racemo spicato, extra-axillari, longissimo, gracili, floribus subaggregatis, articulatis, caducis; drupa carnosa, rubra, pendula.—Guinea ad Cap. Palmas.—*v. s. in herb. Hook.* (Vogel, 25, 27 et 68).

This plant was collected in the Niger Expedition by Dr. Vogel, who describes it as a shrub (*strauch*): it bears very much the habit and appearance of the former species, but the leaves are

* A drawing of this plant, with details of the structure of its female flowers, will be given in plate 18 of the 'Contributions to Botany,' &c.

not quite so thick in texture; they are smooth, somewhat undulating on the margins, 7 to 10 inches long, and 3 to $3\frac{1}{2}$ inches broad, on a very short, channelled and rugous petiole, about 3 lines in length; the raceme is distantly extra-axillary, and inserted on the opposite side of the stem, as in the former species; it is 12 or 13 inches long, very slender, slightly pubescent and angular at base, for the length of about 3 inches, and in the remainder is glabrous and beset with alternate nodules, consisting of single or aggregated, very short pedicels, left bare by the falling away of all the articulated flowers. The fruit, according to Dr. Vogel's notes, is red, fleshy, oval and pendulous, and from his rough sketch of a transverse section it would appear to be somewhat compressed and to contain two seeds: if this be the case, it would bear out a still stronger analogy to the instance I have recorded in *Pennantia* *.

3. *Sarcostigma Horsfieldii*, R. Br. Pl. Jav. Rarior. 241. tab. 47. —Java.

Discophora.

The characters that warrant the establishment of this genus are few, but when taken in conjunction with the peculiar habit of the plant and the different country of its origin, they serve to mark its place. The specimen upon which it is founded is a native of Guiana, with ovuligerous flowers which are far advanced, for the petals and stamens are fallen away, leaving only the calyx and ovarium, which is crowned with a discoid process: in the internal structure of the ovarium, and the form of its persistent calyx, articulated on its pedicel, it is strictly conformable with other genera of this family; and in the peltoid disk that crowns the ovarium it resembles *Sarcostigma*, *Pennantia*, and *Stemonurus*, all of Asiatic origin; but in this case this process is much smaller and somewhat reniform. In one instance I found a single petal remaining, just sufficient to mark its character. As it cannot be referred to any one of the genera above mentioned, I propose to call it *Discophora*, from *δίσκος*, *discus*, *φέρω*, *fero*. The few characters known may be designated in the following manner:—

Discophora, gen. nov.—*Calyx* minimus, brevissime cupuliformis, fere integer, obsolete 5-denticulatus, persistens. *Petala* 5, linearia, glaberrima, textura tenui, nervo mediano longitudinali notata, cito caduca. *Stamina* ignota, mox decidua. *Ovarium* liberum, cylindricum, glabrum, 1-loculare; *ovula* 2, juxta apicem loculi superposita, podospermio crasso subcolla-

* This plant will be figured in plate 19 of the 'Contributions to Botany.'

teraliter suspensa, anatropa. *Stylus* cum *stigmate* confusus, demum subreniformi-discoideus, parvus, subconcavus. *Fructus* ignotus.—Frutex *Guianensis*; folia *alterna, oblonga, majuscula, glaberrima, petiolata*; racemi *axillares, divaricatim ramosi*; flores *parvi, cum* pedicellis *articulati.*

1. *Discophora Guianensis*;—omnino glaberrima, ramulis teretibus, substriatis; foliis oblongis, utrinque acuminatis, apice lineari-angustatis, coriaceis, supra nitidis, nervis sulcatis, venis immersis, subtus fuscis, nervis rubentibus cum venis transversis prominentibus, punctis minutis resinosis notatis, margine revolutis, petiolo incurvo canaliculato; racemis axillaribus petiolo 2–3-plo longioribus, dichotome et divaricatim ramosis, pedicellis bracteatis, bractea oblonga obtusa crassiuscula pubescenti, floribus cum pedicello articulatis.—Demerara.—*v. s. in herb. Hook.* (*Parker*).

The branches are terete with a smooth bark; the axils are $1\frac{1}{2}$ to 2 inches apart; the leaves are quite smooth, thick, and coriaceous, 8 inches long, $2\frac{1}{2}$ inches broad, on a petiole of $\frac{1}{2}$ to $\frac{3}{4}$ inch in length: a raceme about $1\frac{1}{2}$ inch long springs out of each axil, sending out from the base upwards several alternate branches at nearly right angles, which are again divided; the branchlets and pedicels are slightly pubescent and furnished at their base with a short, obtuse, fleshy bract, covered with short fine hairs; the ovarium is 4 lines long, $1\frac{1}{2}$ line diameter; the stigmatiferous disk is about one-third of the diameter of the ovarium; the calyx and petals are quite glabrous; the latter are linear, submembranaceous, marked with three parallel nervures, and are of a reddish yellow colour when dry*.

XIII.—*Upon the genus* Doliolum *and its species.* By Dr. A. Krohn†.

[With a Plate.]

Quoy and Gaimard describe and figure in their work, the 'Voyage of the Astrolabe' (p. 599. pl. 89. figs. 25–28), a small crystalline Tunicary not 2 lines long, which they first discovered at Amboyna, and subsequently found again on the coast of Vanikoro. For this animal they created a genus, to which they gave the very appropriate name of *Doliolum,* placing it in the near

* A representation of this species, with analytical details, will be seen in plate 20 of the 'Contributions to Botany.'

† Wiegmann's Archiv für Naturgeschichte, 1852. — Translated by Thomas H. Huxley, F.R.S., Assistant Surgeon R.N.

neighbourhood of *Salpa.* The species was called *D. denticulatum.* I am not aware whether this animal has been since examined by other naturalists, although it occurs not unfrequently in the Mediterranean.

Once, on a previous occasion, I found it at Messina; but in the course of last spring I took it frequently at Naples, and persuaded myself that not only in point of structure (not very perfectly made out by Quoy and Gaimard), but also in development, it is decidedly an Ascidian. It is a free swimming Ascidian, which in many respects closely resembles the *Salpæ,* and so far forms an interesting transition between the two orders of the Tunicata. The genus, however, is not limited to this one species, as I discovered three other kinds at the same place and time.

Before proceeding to describe the different species, it will be desirable to consider what they all have in common.

The genus *Doliolum* is mainly characterized by the circumstance, that the body of the animal (as the name indeed indicates) resembles a cask open at each end. The anterior somewhat broader end is prolonged into a very short, often hardly perceptible tube, which answers to the ingestive or respiratory siphon of other Ascidians, and, like this, has its lip divided into a number of segments. These lobes, generally about ten in number, are somewhat pointed. At the opposite end, whose aperture represents the cloacal aperture of other Ascidians, the body becomes gradually narrower*.

The mantle is relatively very thin, and contains scattered granules in its substance. The second layer of the body (*Leibesschicht*) is, as in all Tunicata, that which supports the nerves and muscles.

The nervous centre consists of a round ganglion placed in the middle of the dorsal surface; from it three anterior and as many posterior branches proceed. Two of these pass divergingly to the sides of the body, the third runs along the median line. The muscular apparatus closely agrees with that of *Salpa* in its arrangement. It consists, according to the species, of either eight or nine flat bands, which, like hoops, encircle the body at tolerably regular intervals, and so give it a still stronger resemblance to a little cask.

The anterior band surrounds the base of the respiratory siphon, the posterior immediately encircles the margin of the posterior aperture. Both are less strongly marked than the other bands.

With regard to the internal organs, the respiratory apparatus

* The two apertures are diametrically opposite likewise in the *Pyrosomata*; and here also the cloacal aperture, which opens into the cavity of the common mass, has a smooth edge (see Savigny, Mém. sur les Anim. sans Vertèbres).

presents the most striking deviation from the ordinary arrangement. Instead of a sac, it forms a partition stretched across the cavity of the body, flat in one species, bent at an angle in another; and dividing the space into an anterior and a posterior compartment.

Its structure is much simpler than that of the compound Ascidians, since it is pierced by only two series of symmetrical, transverse, or somewhat oblique clefts (*"stigmates branchiaux,"* Milne-Edwards), the edges of which are, as in all Ascidians, beset with cilia. In the median portion of the branchial membrane the clefts are wider, beyond it they narrow again.

These clefts then are the only means of communication of the anterior and posterior divisions of the cavity of the body with one another.

Upon the walls of the anterior division, the ciliary apparatus for conducting food to the mouth is arranged; *i. e.* the well-known ventral groove and its prolongations, which are less known, and may be here more minutely described. The anterior end of the relatively short ventral groove gives off two narrow ciliary bands, which diverge from one another and run up at the base of the respiratory siphon, along the parietes of the cavity of the body to the dorsal surface; here, converging towards one another, they become united in front of the nervous ganglion. A third ciliated band runs from the posterior extremity of the ventral groove to the mouth*.

Upon the wall of the posterior space lie the reproductive organs and the alimentary canal; and anteriorly to the latter, in its pericardial cavity, the heart, which pulsates very rapidly, and is, as in the *Salpæ*, a short sac. The circulation and the course of the blood are not to be perceived, as the blood is pellucid and contains no granules.

The alimentary canal is but moderately developed in proportion to the size of the body. The mouth is placed upon the branchial membrane, upon the great longitudinal ridge between the lateral clefts. It leads into a short œsophagus, to which the rounded stomach with the intestines bent into a loop succeeds.

Like the compound Ascidians and the genus *Clavelina* among the simple forms, *Doliolum* propagates both by ova and by buds.

* A similarly constructed ciliary apparatus is to be found in all Tunicata, according to my investigations. The anterior ciliated band, forming a complete circle, has been described by some zoologists as a vascular ring, sometimes as a nervous ring. So also an accessory part of the same apparatus, especially frequent in the *Cynthiæ* as a rounded prominence, has been regarded sometimes as a nervous centre, sometimes as an organ of peculiar structure and doubtful function (see Siebold, Vergleichende Anatomie, p. 260). This elevation is distinguished, however, by no other circumstance, than by being marked upon its surface by a spiral ciliated groove.

But while in the former this double means of multiplication is allowed to each single creature, in the latter each generation possesses only a single mode; so that, as in the *Salpæ,* the first generation propagates by ova, and the second multiplies by budding, the third again producing ova, and so on in a continual alternation. In support of this view I may adduce the fact, that on examining a certain number of adult individuals of the same kind, in some, generative organs are always found, in others only a *stolo prolifer*—the producer and bearer of the gemmæ. Further evidence will be adduced in the section upon Development.

In the sexual generation the male and female organs are sometimes united in the same, sometimes carried by different individuals. The gemmarium (*keim-stock*) of the asexual individuals is a short, cylindrical, somewhat curved, posterior process, which arises close in front of the posterior aperture and exactly in the middle line; in some species upon the dorsal, in others upon the ventral side. It can be moved to a slight extent, by one of the posterior muscular bands, which appears to be peculiarly modified for this purpose in all asexual individuals; of which more by and by. The buds, whose number is but small, are developed only from the extremity of the gemmarium, along which we find them arranged one behind the other as more or less projecting prominences.

The asexual generation, developed from ova, has to undergo a metamorphosis. As in other Ascidians the larva is Cercariform.

All the species move by jerks, as Quoy and Gaimard state; by a sudden contraction they dart forwards, and then remain at rest for awhile.

Description of Species.

A. Species with eight muscular bands and the gemmarium ventral.

1. *Doliolum denticulatum** (Q. & G.).

The branchial membrane is bent into a sharp angle projecting backwards, and extends further than in the succeeding species. Its upper half reaches as far as the second muscular band, and at times beyond it; the lower half extends as far as the third muscular band only.

The mouth is placed upon the lower half of the branchial membrane; from it the œsophagus passes in a curved direction backwards and downwards to the deeper-seated stomach. The intestine describes a wide arc, passing at first backwards and

* This specific denomination is unfitting, since in the other species the anterior aperture is toothed. I propose therefore for this species the name of *D. Ehrenbergii.*

eventually upwards upon the right side of the cavity of the body.

In the sexual individuals of this species I have only been able to discover the males, and I thence presume that the sexes are separate. The male apparatus lies upon the left lateral wall of the posterior cavity, and consists of a testis and a relatively long and wide seminal canal. This canal is commonly distended with spermatozoa, and extends as far as the fourth muscular band. The testis is composed of single rounded lobes, which, like the folioles of a rosette, are grouped round the commencement of the seminal canal.

As to the asexual individuals, the change in the arrangement of their muscular bands produced by the development of the gemmarium, consists in the separation of the ends of the penultimate band; the narrow and pointed extremities of which run for some distance upon the base of the gemmarium. Fully developed individuals of this kind attain the length of 2 lines or a little more.

2. *Doliolum Mülleri* (Krohn).

This species is wider in the middle, and thence resembles a more squat cask. The mantle is very soft and almost mucilaginous, so that foreign bodies readily become imbedded in it. The branchial membrane has the form of a vertical partition placed in the posterior part of the cavity of the body and slightly convex behind; there are about twelve pair of clefts. The mouth seemed to be nearer the lower half. The alimentary canal, on the other hand, is in the middle of the cavity, remote from either wall. The œsophagus descends towards the stomach, to which the short intestine succeeds, descending at first and then curving upwards in a loop.

The sexual individuals of this species are hermaphrodite. Close to the stomach and intestine we distinguish three structures closely applied to one another. The largest, the testis, is pyriform, and lies with its narrower end near the anus. The two other bodies are spherical; the one is filled with clear nucleated vesicles, which I consider to be germs; whence the whole must be regarded as an ovarium. The other body is unquestionably a fully developed ovum, in which we easily recognize the outer investment, the granular yelk and the germinal vesicle with its spot. In some individuals I found it free, in the posterior cavity of the body.

With regard to the asexual individuals I will only observe, that their penultimate muscular band is arranged similarly to that of the preceding species.

Varieties of this very common species, which is often met with in swarms in March and April, have a red-spotted body, and the alimentary canal blue or pale red.

Fully grown individuals reach the dimensions of $1\frac{1}{2}$ line in length.

B. Species with nine muscular bands, and with the gemmarium upon the dorsal surface.

1. *Doliolum Nordmanni* (Krohn).

In form this species appears at first so nearly to approach *D. denticulatum*, that they may be readily confounded together. It is only upon more close examination that the characteristic differences in the branchial membrane and the number of the bands become obvious. The branchial membrane in this species forms a flat septum stretched obliquely from above and behind, downwards and forwards across the cavity of the body, with only four pair of clefts. The mouth is exactly in the centre of the branchial membrane. The alimentary canal in all respects resembles that of *D. Mülleri.*

I have nothing to say about the generative organs and the sexual relations, since all the individuals observed were asexual. With respect to the gemmarium I must observe, that a peculiar filiform, transversely annulated, or rather wrinkled appendage is attached to its free extremity, which is found in no other species. The modification of the arrangement of the muscular bands, which has been already referred to, affects here the ante-penultimate band, which, in consequence of the position of the gemmarium, is open above.

This is the smallest of the species, since in its full-grown state it is not more than 1 line in length.

2. *Doliolum Troschelii* (Krohn).

I have but rarely observed this species. It is much larger than that just described, as I have met with individuals more than 3 lines in length. Upon the whole it resembles *D. denticulatum* and *Nordmanni*, only that the body is more elongated. It is especially remarkable from its singularly broad muscular bands*. The alimentary canal is quite similar to that of the preceding species; but of the branchial membrane I can say nothing, since it was accidentally absent in all the specimens, having been probably injured and torn off in some manner.

* Upon superficial examination, this species, on account of its broad muscular bands, might readily be taken for a very young *proles solitaria* of *Salpa punctata* (Forskahl). Among the *Salpæ* observed by me at Messina (Annales des Sciences Nat. 1846), this solitary Salpa-form is the only one *all* whose muscular bands form complete and relatively very broad circles.

Sexual individuals were not seen. In the asexual ones the ante-penultimate muscular band has the same arrangement as in *D. Nordmanni**.

Development and Metamorphosis.

The development of the buds was observed in *D. Mülleri*, but presented no remarkable feature. The buds shoot one after another, as it seems, from the gemmarium, for the outermost is always the largest, and often already changed into a young Ascidian, whilst the others are far behind in their development, and indeed the more, the greater their distance from it. Buds which are so far developed as to allow the majority of the organs, and among the rest the swiftly pulsating heart, to be distinguished, are placed vertically (like those of the Compound Ascidians and Clavelinidæ according to Milne-Edwards), with the anterior extremity forwards, and are attached to the gemmarium by a short pedicle. This pedicle is inserted upon the abdominal surface close below the alimentary canal; when the bud is detached it falls with it, and subsequently wholly disappears. Such recently detached budded forms may be so far confounded with young asexual individuals, inasmuch as their pedicle may be readily taken for the little-developed and as yet budless gemmarium, which has the same form and position. More close examination, however, will eliminate this error, since all free bud-forms already exhibit the rudiments of the sexual organs.

The asexual individuals developed from ova are born, as has been said, in the form of Cercaria-like larvæ, and therefore undergo a metamorphosis. This metamorphosis is characterized, however, by many peculiarities, whose explanation is only to be found in the mode of life of the adult animal. It is well known that in the larvæ of the fixed Ascidians, the tail very soon disappears, as an organ which has become useless, when the larva has found a fitting locality in which to fix itself. Only after this has taken place does its body become gradually changed into the perfect animal.

In *Doliolum*, on the other hand, which, as we have seen, is a free swimmer, there is no need for the tail to disappear so soon;

* I must leave it undecided whether the cask-like Tunicary with eight muscular bands, but much larger than *D. denticulatum*, which is described by Quoy and Gaimard as *D. caudatum* (*l. c.* p. 601, pl. 89. fig. 29. & 30), really belongs to this genus. In the figure the one end of the body is indeed siphon-like, but its lip is without lobes. From the opposite extremity a dense pyramidal process projects, like the processes of many associated *Salpæ*. I should be inclined to regard the animal rather as a *Salpa* than as a *Doliolum*, especially since the completely circular muscular bands which it possesses, are, as we have seen above, no decisive criterion of the genus *Doliolum*.

it persists during almost the whole period of development of the new creature, serves as an organ of locomotion, and begins to wither away only when the young has reached its perfect development and independence*.

The tail, however, dies away quite as Milne-Edwards has already observed in the course of metamorphosis of *Amouroucium proliferum,* and as I a short time since observed in larvæ of *Phallusia mammillata* obtained by artificial fecundation.

The contractile central portion or axis of the tail, composed of a simple series of rectangular, nucleated cells, is gradually retracted from its sheath into the body of the young animal and so becomes gradually shorter and shorter. Soon the young animal casts off its larval investment, and only slight traces of the tail are left upon its ventral surface, close under the digestive canal, in the form of a round body which soon disappears.

The following observations will afford more detailed evidence of the above view; they were made upon separate, not yet fully developed individuals of *D. Nordmanni.*

To all these individuals the tail was still attached; in some it remained in all its integrity, while in others it had begun to disappear. The whole, tail and animal, was surrounded by the larval tegument, a very thick, glassy membrane, which must not be confounded with the mantle, which is closely applied to the body of the young animal. This could be readily distinguished from the homogeneous larval tegument by the granules imbedded in its substance. The larval tegument was about a line long, and drawn out at each end into a tolerably acute point. The relatively short and very thin tail, or rather its wasted axis, appeared articulated from the presence of the above-mentioned cubical cells, and external to these a thin muscular layer was perceptible, whose fibres ran longitudinally from the root to the point†. The root projects far into a vesicular appendage attached close under the intestinal canal, and filled with a clear fluid, which is probably only a dilatation of the second tunic (*Leibes-schicht*), and diminishing *pari passu* with the tail, collapses, and at length disappears. The young animal appears in most specimens to be already so far developed, that all the organs and the lobes of the anterior aperture (which are at first turned inwards, and only

* The animal described by Joh. Müller as *Vexillaria flabellum* (Archiv, 1846), and considered by him to be probably the larva of *Amouroucium proliferum,* is, according to my observations, an incompletely developed Ascidian, whose tail, as in *Doliolum,* appears to persist until the perfect form is nearly assumed. The perfect, as yet unknown animal will probably be found to agree with *Doliolum* in its mode of life.

† This layer of fibres seems to be wanting in no Ascidian larva. In the tail of the *Vexillariæ* it has been already quite correctly described by J. Müller. It perfectly accounts for the rapid movements of the tail.

subsequently unfold themselves and project) are visible. Upon the dorsal surface the rudimentary gemmarium had already made its appearance in the form of a conical projection. The young animal was not capable of any independent movement, and its tail was only seen at intervals slightly twitching and vibrating.

Final Remarks.

In the course of the preceding observations, the analogies which connect the genus *Doliolum* with the *Salpæ* have been referred to. These analogies consist not only in the similar mode of life, the similar diametrical opposition of the apertures, and especially in the similar muscular apparatus of each, but also, as I have endeavoured to show, in the similar mode of propagation, according to the laws of the Alternation of Generations, by which, as in the *Salpæ*, sexual and asexual generations occur in regular succession. Yet, in the genus *Doliolum* the typical characters by which the Ascidian is separated from the *Salpa* predominate; such are distinctly seen in the absence of the respiratory siphon, in the structure of the respiratory apparatus, and in the metamorphosis.

By their approximation to the *Salpæ*, and by the simpler structure of their branchiæ, however, *Doliolum* seems to me to stand lower than the Compound Ascidians; although, like the higher Ascidians, it is solitary, and, unlike them, it is free.

The Ascidians then, according to their mode of life, may be divided into fixed and free. To the former belong the numerous genera of simple and compound or aggregated Ascidians, to the latter the solitary genus *Doliolum* and the aggregate genus *Pyrosoma*.

Note by the Translator.

Dr. Krohn does not appear to have met with a memoir upon *Doliolum* and *Appendicularia* (*Vexillaria*) published in the 'Philosophical Transactions' for 1851. I have there described and figured *D. denticulatum*, and I am delighted to find that in all essential points, what I have stated is confirmed by one of the most accurate and careful of the German observers.

Dr. Krohn does not seem to have been more successful than myself in making out the ovaries of *D. denticulatum*; but I should hardly be inclined to adopt his supposition, that this species, in opposition to its immediate congeners, is diœcious; the explanation I have suggested (*loc. cit.* p. 601) seems to me still to be the more plausible.

It will be observed that Dr. Krohn considers what I have called the testis to be the *vas deferens*, and *vice versâ*. I feel quite sure, however, that in the specimens I examined the relations of the organ were as I have described and figured them.

From the excellent description of the development of *Doliolum* given in Dr. Krohn's memoir, it seems highly probable that my guess as to the nature of the "shrivelled tubular process," p. 601, is correct, viz. that it is the remains of a pedicle of attachment.

In common with all previous observers, Dr. Krohn appears to have confounded what I have called the "endostyle" with the true "dorsal folds" of Savigny. Recent careful examinations of many species of Ascidians have convinced me that the distinction which I drew between these structures (on *Salpa* and *Pyrosoma*, 'Phil. Trans.' 1851, p. 572) is well founded. The "endostyle" invariably exists at the base of the "dorsal folds" in ordinary Ascidians, and consists essentially of a band of thick, cylindrical, elongated cells, arranged round a common axis. Two similar accessory bands are in the ordinary Ascidians developed upon the folds on each side of the "endostyle."

Dr. Krohn does not seem to have noticed the ciliated sac, or the peculiar manner in which the anterior ciliary bands terminate at this part. I have described similar bands in *Salpa* and *Pyrosoma* (*loc. cit.* § 17–52), and I find that such exist in all Ascidians. The "accessory part of the same apparatus" mentioned by Dr. Krohn is the "tubercule antérieure" of Savigny. It is not, as Dr. Krohn supposes, a mere appendage of the ciliated bands, but it is a very peculiar structure placed in the space between the ciliated bands and the tentacular circlet (in ordinary Ascidians), and is always in more or less close connexion with the ganglion. It is the same organ as the "ciliated sac" of *Salpa, Pyrosoma,* and *Doliolum,* and is, I think, very probably an organ of sense. I have found it varying very remarkably in shape and size in species of *Boltenia, Cynthia, Molgula,* and *Phallusia.*

The existence of a well-developed testis in *Appendicularia* (*Vexillaria*) (*loc. cit.* § 84) appears to me to present an insuperable difficulty to Dr. Krohn's hypothesis, that this creature is an incompletely developed Ascidian; and in addition to this circumstance, there is the absence of a cloaca (the anus opening directly on the dorsal surface (§ 82)), which stamps the form as altogether peculiar.

With regard to the muscular apparatus of the tail of Ascidian larvæ, I may here state as a fact, which I believe to be altogether new, that it is composed of a layer of large, elongated, thick walled cells applied end to end. The cells contain a large clear nucleus with a nucleolus. Their walls present a delicate fibrillation, which is continued from one cell to another, so that it appears at first as if the cells were inclosed within a bundle of fibres; resembling exactly the embryonic muscular fibres of the frog described by Kölliker. The larvæ in which I observed this belonged to a very peculiar small *Cynthia*, in the Collection of the British Museum. Contrary to the usual course, the larvæ had attained a very considerable degree of development in the space between the inner tunic and the outer wall of the branchial sac, and had so become preserved with their parent.

Another point of great interest about the larvæ may be mentioned here. *The integument of the tail and of the body of young larvæ, in which the body contains nothing but a mass of cells, and offers no trace of any organs or apertures, presents clear and unmistakeable signs of the presence of cellulose.* The determination of this point is one of the desiderata left by Löwig and Kölliker (Annales des Sciences, 1846), and it shows, I think, very clearly that the Ascidians do not necessarily get their cellulose, as they suppose, from the *Diatomaceæ* or other ingesta. Do the cells of the tail of the fœtal Ascidian secrete cellulose as the "Primordial-schlauch" in plants secretes it? If so, they must fix carbon; and the physiological distinction between animals and plants will disappear, as the anatomical ones have already disappeared.

In referring to the analogies between the *Salpæ* and *Doliolum*, Dr. Krohn appears to uphold the doctrine of the fundamental difference between the *Salpæ* and other Ascidians. In the memoirs referred to, I have endeavoured to show, on the contrary, that there is but one type of Ascidian structure, and that the variations upon this type pass insensibly into one another. Subsequent investigations, which I hope to make public at no distant period, have to my mind demonstrated the truth of this proposition. The great difficulty I have found among the Ascidians has been, indeed, to discover *any* good anatomical distinctions among the genera.

DESCRIPTION OF PLATE III. B.

Fig. 1. *Doliolum Mülleri*, asexual individual, from the ventral side: *a*, gemmiferous tube or "gemmarium;" *b*, penultimate muscular band with its ends inserted into the gemmarium.

Fig. 2. Larva of *D. Nordmanni*: *c*, larval tegument; *d*, young *Doliolum*; *e*, vesicular appendage; *f*, axis of the tail.

Fig. 3. The same further developed and more magnified. Letters as before.

XIV.—*On the genus* Lepton. By William Clark, Esq.

To the Editors of the Annals of Natural History.

Gentlemen, Exmouth, July 5, 1852.

I have stated in the July 'Annals' for 1852, that the discovery of the animal of the *Lepton convexum* has put it in my power to settle the disputed identity or distinctness between it and *L. nitidum,* and that after due examination I would communicate the result. I redeem my pledge by presenting a short memoir on the genus *Lepton.* Though the *L. squamosum,* the type, has been mentioned by authors, I have thought that it would be desirable to give my account of the animal, with some additions and a few observations on the natural position of the genus.

Lepton, Turton.

Lepton squamosum, auct.

Solen squamosus, Mont.

Animal inhabiting a very flat, subrhomboidal, white, porcellanous, punctured shell; its ground colour is a clear white: the mantle is very large, having the margins sinuated, often puckered into two or three folds at the will of the animal; they extend beyond the shell more than one-third of the vertical measure at its centre, from which spring a row, on each side the middle of the ventral range, of twenty-five rather long, slender, milk-white tentacular pointed filaments; but the mantle thus clothed is only protruded largely beyond the shell, from the middle of the anterior side, throughout the ventral range, to the same level at the posterior end; from these points to the umbones it is never seen, being either closed or not protruded, but its suture or edges are furnished with about forty long, strong, blunt, frosted white, rather close-set cirrhi varying in length; a part of these range at the posterior side of the beaks, above the sessile anal orifice, which occupies a small space without cirrhi, between the termination of the protrusion of the margin and the commencement of the larger filaments on the broader, larger, and posterior side; of that part of the filaments at the anterior side of the beaks, one is thicker, broader at the base, and double the length of the others; this is the last of the larger ones, which at one time I thought was tubular and might be an oviduct, but further examination seemed to disprove this idea. None of the filaments show much motion; the long one only, when the animal advanced a step, made an arcuated contraction, similar to that of the fore-finger *in extenso* when quickly brought down to the palm of the hand; it then resumed the straight position to await another step: all the other cirrhi are either retractile or contractile, separately or *en masse.*

The foot is hyaline azure, with a broad longitudinal medial line of intense snow-white, and a still intenser flake at the anterior end; it is fixed to the centre of the body by a moderately long pedicle; on first protrusion it takes a vertical position, and has a linguiform tapering aspect, but this part almost immediately, after feeling about, ranges itself anteriorly and horizontally; and at the same time, on the other side of the pedicle, a bevelled, attenuated, pointed portion issues, somewhat shorter than the first; this is longitudinally cloven as far as the pedicle, and can form a sort of oval disk, but on the march it is rarely expanded: at the base of the cleft is the byssal gland, which occasionally pours out a glutinous red filamentous matter, that in confinement is copious, and discharged anteriorly, which at first I thought was fæcal matters, and was puzzled to account for such an issue anteally, but the subsequent view of the single sessile posteal anal conduit and the ejection of pellets cleared up the difficulty. This foot is in every respect similar in miniature to that of the *Pectunculus pilosus* and of the *Arcadæ*.

The animal is vivacious, and allowed itself to be examined many times daily; it marched with quickness, but I only once saw it progressing in a vertical position; the usual posture of the shell is to rest on one of the disks, which is frequently changed for the other; the adductors did not appear to allow of a greater opening of the valves than the ordinary extent. The animal, when placed at the bottom of a glass, always crawled up and moored itself by a filament at the side; sometimes, however, it slipped its moorings and floated free on the surface of the water with the umbones downwards, and after an interval refixed itself by spinning a byssal thread.

I cannot speak at present of the branchiæ and palpi, as the animal and shell are in my collection, and are thus preserved to show that the shell, though usually described by conchologists as gaping, can, in consequence of the flexibility of the thin laminar valves, be completely closed. There is no branchial siphon; but there are mantellar folds, which, with the great ventral opening, amply provide for the admission of the water.

The animals of this interesting group exhibit, in the tentacular filaments and curious foot, as well as in the sculpture of their shells, very considerable variation from *Kellia rubra* and *Kellia suborbicularis*; the types of one of the genera of the family in which they have been located by authors, doubtless from the want of knowledge of the animal. Taking into consideration that the Leptons have many of the attributes of the *Arcadæ*, and especially giving due weight to the remarkable similarity between the foot of *Lepton squamosum* and the *Pectunculus pilosus*, I am almost induced to believe that it is in a false position, in connection with the *Kelliadæ*, and that it ought to follow or precede *Galeomma*, which, with me, is an undoubted genus of the *Arcadæ*.

The punctures of this species and of *L. convexum* are in the test; with respect to its congener, the *L. nitidum,* it has been stated that it is smooth and without punctures: this is a mistake, as I can show fifty specimens not only well-marked on the greenish epidermis, but in the substance of the shell.

I have the satisfaction to state, that I have observed another live *L. squamosum,* and also obtained full notes of the animal of one of our great desiderata, the *L. nitidum,* from a most lively animal, which for several days gave me every facility for examination. The *L. squamosum,* just alluded to, was kept thirty-four days in a glass of sea-water, changed daily, and was apparently as vigorous as when first placed in captivity; it thus appears that the Conchiferæ can exist for a long time in pure sea-water, on the animalculæ it contains, though that aliment may not be their sole resource in freedom.

I may observe, that the habitude of crawling and swimming with the foot uppermost in *Lepton,* and in several other minute bivalves, perhaps in all, shows the close alliance of the Acephala with the Gasteropoda, all of which, in their minute condition, have precisely the same peculiar system of dorsal natation. I ought to have mentioned that the liver is light green and mixed up with a flake-white ovary; but from the extreme tenderness of the branchiæ, I cannot speak of them and the palpi with certainty as to form and number.

July 2nd.—As I had just finished the above, a lively specimen of this species was met with, which, on being placed in water, at once unfurled its long and beautiful fringes, and exserted the ample niveous mantle and foot. This is certainly the Prince of British bivalves; the snow-white colour of both animal and shell sheds over this interesting creature the inexpressible charms of purity and elegance. It now lives in the same vase with its pigmy congener, the *L. convexum.*

Lepton nitidum, Turton et auct.

The animal inhabits a light greenish yellow or pure white, subrhomboidal, moderately convex, more or less punctured shell. The mantle is frosted white with the margins plain, but as much proportionately protruded beyond the edge of the shell as in *L. squamosum*; it is in like manner clothed with cirrhal filaments of about the same length, and of pruinose white, but unlike that species, they are rather less developed dorsally than ventrally; each filament at its terminal edge is studded with four or five white points or cilia, so sharp and minute as to require a powerful lens to see them. There is no conspicuous leading process, as in the preceding species, but the mantle, at the same anterior point, forms a visible projection or fold. In this species, and contrary to *L. squamosum*, the longer and broader end is anterior, but the beaks are so central, that there is little difference in the sides; the single sessile anal tube is exactly as in the last species; there is no branchial siphon,—the water enters at the extensive ventral aperture. The foot is almost in every respect similar to that of its congener; it is perhaps larger in proportion, of pale azure hue, marked with intense but irregular flake-white minute blotches; the posterior extremity is as long as the portion anterior to the pedicle; its termination is perfectly aciculate, and like its congener deeply grooved as far as the junction with the body, at which point is the byssal gland, and the superabundant filamentous matter is similarly discharged.

The *L. squamosum* is a lively creature, but this, not one-third of the size, is far more active, creeping up a glass as easily as a Gasteropod; but the posterior portion of the foot is not expanded; perhaps in freedom it is deployed on the march; in confinement both shell and foot are carried laterally. The liver is light green, united to a flake-white ovarium, now, in June, full of ova. Transverse length $\frac{1}{8}$, vertical $\frac{1}{12}$, diameter $\frac{1}{15}$ of an inch. It would appear that this species in every essential is identical with the *L. squamosum*, and it settles the position of the yet undiscovered *L. convexum*. This is the first record of this rare animal that has appeared.

Exmouth, June 20, 1852.

I have this day the pleasure to state, that the problem is solved as to the identity or distinctness of the *Lepton nitidum* and *L. convexum* by the capture of a live specimen of the latter, having the shell sculptured with the rough and intensely marked characteristic punctures of that species. On putting the animal into water it instantly deployed its organs; and for their description I have only to refer to the preceding account of the *L. nitidum*, which in future will take the appellation of a variety of its old associate. The two are so identical, that after ten days' examination I can make no alteration in the minutes, except the having seen the animal march on the disk of the foot, more than once, with the shell in a vertical position; it has all the same habitudes as the *L. squamosum*, and of course differs in no respect from its smoother variety, the late *L. nitidum*. It is now alive, and probably by changing the water daily it will live as long or longer than the *L. squamosum* mentioned above. It is therefore evident that the punctures of this species are very variable, ranging from the most minute granules that scarcely interrupt its smoothness to the coarsest sculpture.

As the specific appellation of *nitidum* is obviously improper, the more significant one of *convexum* ought now to be adopted.

Exmouth, July 18.

Since the above was written I have taken two examples, one this morning, of the smoothest variety of the '*convexum*,' late the '*nitidum*'; both are in the vase with the highly punctured one captured 20th June last, now quite vigorous, in company with the *L. squamosum* alluded to as taken 2nd July; this capture has given me the advantage of a live examination of the two completely opposite conditions of the '*convexum*,' whereas the one above was only referable in comparison with an account of a live '*nitidum*' taken last year. And I can again state that the two varieties are identical.

Lepton Clarkiæ (nova species).

Annals Nat. Hist. New Series, vol. ix. pp. 191 & 293.

The above references give every particular of the shell of this new species, of which it is probable I may detect the animal; but the hinge is so completely identical with that of the *L. convexum*, that it may be presumed its organs will not greatly differ from it.

I am, Gentlemen, your most obedient servant,

William Clark.

BIBLIOGRAPHICAL NOTICES.

A History of Infusorial Animalcules, Living and Fossil. By Andrew Pritchard, M.R.I. 8vo, pp. 704. Whittaker & Co.

A new edition of the only English version of the laborious investigations which have made Prof. Ehrenberg's name famous among micro-naturalists (if we may for the nonce coin a word as good as micro-mammalogists), must be looked upon as a praiseworthy and creditable undertaking.

So far as mere facts are concerned, so many have accumulated during the fourteen years that have elapsed since the publication of the great work, to which we have been indebted for the first impulse to investigation, and for the first guidance in the confused and difficult task, that the gathering them into one place, and making them all accessible to the English reader, is a service of no small merit.

Again, however much Prof. Ehrenberg may condemn them as heretical, it is indubitable that a large body of Fathers of greater or less authority have added their writings to his Canon. Indeed, they have not unfrequently ventured to impugn and protest against the statements of the head of the church microscopical himself.

Mr. Pritchard has with a laudable eclecticism gathered *all* these, wheat and tares, poppy and clover, into one sheaf (a very considerable sheaf too); but thrashing and winnowing is evidently in his view no part of the editorial duty; or to speak without a metaphor, the book has been collected, not edited at all.

We by no means make these remarks in a spirit of detraction. The book is a very useful one, and will be of great service to those who are at work upon the Infusoria. To publish such a book at all involves a great risk to any one who undertakes it, and our sole regret is, that such a risk having been incurred, the opportunity should not have been seized for building an edifice, instead of merely filling a large cart with materials; some of them very rough stones indeed, as for instance the following:—

"It will be sufficient therefore to say, that since the time of their discovery (1676) up to the present period, all that we know of the true spermatozoa of animals is, that they are not distinguishable from Cercaria found in the liver of snails, the animal organization of which has been made out by Bauer, Wagner, and Ehrenberg." (p. 4.)

"28. The power of infusorial organization is instinctively shown by the strong chewing apparatus with teeth which they possess, and their exhibition likewise of a complete mental activity." (p. 7.)

A tap or two with the editorial hammer would, we think, have shown Mr. Pritchard that these two blocks are very much cracked and quite unfit for his purpose. In fact, the former statement is formally repudiated at pp. 61 and 177 of his own work.

"In almost all ages of the world there has been evinced a restless desire within us to pry into the nature or principle of life, and the precise conditions on which it is retained; and notwithstanding that our bodies, its present *abiding-place*, are confessedly frail and perishable, the unravelling of an invisible and immaterial agent has been sought for by a reference to them." (p. 26.)

We quite agree with the author, that those who have been trying "*to unravel an invisible and immaterial agent*" might have been better employed. The occupations of Sisyphus and the Danaïdes were encouraging in comparison.

Mr. Pritchard tells us in the preface that the work has been prepared in conjunction with Mr. Arlidge. There is internal evidence enough indeed, without this assurance, to show that two heads have been employed upon it. It is no business of ours to draw invidious comparisons, but as we have given a specimen of the productions of the one head, we must in justice lay before the reader a more creditable sample, evidently the work of the other.

"It would be but an exercise of the imagination to seek after resemblances between the majority of the Infusoria and higher animals; the resemblances could be but fanciful, existing only in external form. In studying the Infusoria, the mind should be unbiassed by a knowledge of the organization of the higher animals; we ought not to set out with the assumption, that such living atoms must be furnished with the organs of superior existences, and then indulge the imagination by accommodating appearances observed to our preconceived notions; but we should rather endeavour to learn under what simple conditions and contrivances animal life can be manifested and continued." (p. 60.)

No one who regards the modern progress of zoology can fail to agree with the view here expressed; but how does it harmonize with Prof. Ehrenberg's main and fundamental doctrine, that organization has no relation to size, and that the Infusoria have all the organs which characterize the higher animal?

Indeed, while we can conscientiously recommend the present work as a very useful assistant to those who are working for themselves, we must caution our readers against the very unphilosophical subservience to the authority of a name which it too often exhibits. Thus, after a discussion of the polygastric theory of Ehrenberg, we find it said of subsequent observers—

"With Van der Hoeven, all coincide in denying the existence of an inclosing wall to the vesicles, and of an intercommunicating tube between them; and all assert the ever-varying number and disposition, as well as the movements (even rotatory) of these supposed stomachs." And yet we are told further on—

"From the preceding conflicting opinions and observations no satisfactory deduction can be made; Ehrenberg's opinions, however, are entitled to great respect, although the theory of a polygastric structure may not admit of demonstration."

We have every respect for Prof. Ehrenberg, but we are really at a loss to understand why *his* opinions, if they be "incapable of demonstration," are more "entitled to great respect" than those of any one else, especially when these opinions are at variance with those of an unanimous host of at least equally competent observers.

Authoritative assertion in science, it is well to remember, is not evidence; it only affords a presumption, better or worse founded according to the real value of your authority, that evidence may exist. Great authority may be a good ground for a temporary suspension of judgement when opposed to less authority, but it is valueless when opposed to good evidence.

A great authority, whose "opinions are incapable of demonstration," is a sort of scientific balloon, brilliant to look at and much gaped at of the multitude; but containing nothing but gas and sand, and liable to come down with a crash at the touch of the first critical penknife.

A Synopsis of the Family of Naiades. By Isaac Lea. Third edition, greatly enlarged and improved. Philadelphia, 1852. 4to.

By the title of this work we might be led to suppose it would afford the conchologist the means of determining the species of this very interesting family of freshwater bivalve shells, or at least give a reference to the books where the species are figured and described, and the countries they inhabit. Unfortunately the author has not thought this desirable. The work simply consists of a list of 767 species, each followed by the names by which other authors have described it, accompanied by an abbreviation of the name of the author.

Then follows a list of the species of each subgenus, arranged in alphabetical order, under Europe, Asia, Africa, North and South America, and New Holland, as they happen to inhabit.

The author, who has been studying these shells for many years, appears to have set out with the determination to make the 'Synopsis' afford the collectors of these shells as little assistance as possible Thus, he does not mention in which of the works of the various authors cited for the names, the shell under consideration is described or figured, or refer to any general work on the subject in which they are described, nor even to the very numerous species which he has himself described and figured for the first time (more than half the species in the 'Synopsis') in the Transactions of the American Academy, which have been collected together into five quarto volumes, under the title of 'Observations on the genus *Unio*.' He merely adds "Lea" after the name, without making any reference to the volume or page or plate of the 'Transactions' or 'Observations' in which they are figured and described, so that the student has to look out each species through the various volumes, where the shells are arranged without order as they occurred to hand.

In the same manner the names in the "Geographical Distribution of the Species" are not accompanied by a reference to the page in which the species occur in the 'Synopsis.' Their place in the Systematic List can only be found by turning to the "Index of Species," which carefully abstains from referring to the place where the species can be found described in the 'Transactions' or 'Observations,' though this edition of the 'Synopsis' is now printed of the same size as those works, and may be regarded as a sixth volume of the 'Observations.'

We had hoped that as the author became more acquainted with the difficulties of the subject, he would have obliterated the ill-natured observations he had made on Rafinesque, Say, Barnes, Conrad, Deshayes, and other authors, but his dislike appears to have increased with his knowledge, and in every page we have some special pleading why Mr. Lea's name should be adopted, and that of some other author rejected, forgetting that his successors, not having these personal feelings, will examine the question for themselves and do justice to his predecessors and contemporaries.

Mr. Lea informs us in this edition, that he has doubled the number of species in his 'Synopsis' by the new species he has described: if only a tithe of the 300 species which he has described as new prove good, which we venture to doubt, knowing how exceedingly variable these shells are in our European rivers, Mr. Lea's name will be handed down to posterity as an active collector and describer of these mutable shells. Mr. Lea appears to have no other idea of arranging the species, than by taking some leading character, as the general form and kind of surface, and applying it artificially for the divisions of the species of each of the subgenera:—the result is most unsatisfactory and artificial.

If the shells do not afford good sectional characters, we believe it would have been preferable to have arranged the species in each subgenus geographically, dividing the numerous American species according to the two sides of the continent they inhabited, and subdividing them according to the great river-system to which they belonged; at any rate it would have been putting to the test the geographical characters of the species, and this arrangement can only be made by an American acquainted with the branches and creeks of the different rivers.

Mr. Lea uses this test for the European species, and reduces all the *Anodons* to a single species, but believes that a very little stream in America affords at least one, and often many, distinct species of these animals!—J. E. G.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

December 10, 1850.—Prof. Owen, V.P., F.R.S., in the Chair.

Observations on the destructive species of Dipterous Insects known in Africa under the names of the Tsetse, Zimb, and Tsaltsalya, and on their supposed connexion with the Fourth Plague of Egypt. By J. O. Westwood, F.L.S., Pres. Ent. Soc. etc.

The species of insects which attack the larger of our domestic quadrupeds may be divided into two chief classes; first, those which do so in order to obtain a supply of food for their own support; and second, those which do so with the object of depositing their eggs in such a position, that the larvæ, when hatched from them, will be certain of finding a proper supply of food derived from some part of the animal, either external or internal.

The insects composing the first of these two classes require for the performance of their dreaded functions an organization of the parts of the mouth especially fitting them to pierce the skins and hides of the quadrupeds upon the blood of which they subsist, and we accordingly find that it is precisely these insects which have the mouth-organs most fully developed in the different families to which they respectively belong. The *Stomoxys calcitrans*, and especially the different species of *Tabanus*, are pre-eminent in this respect; and the formidable array of lancets in the mouth of one of the latter insects is not to be met with elsewhere among the whole of the flies composing the order Diptera, to which they belong. The effects of the attacks of these insects upon the horse are perceived by the drops of blood which flow from the orifices caused by their bites, and sometimes these wounds are so numerous, that the beasts "are all in a gore of blood." A still smaller species, named by Linnæus the *Culex equinus*, also infests the horse in infinite numbers, running under the mane and amongst the hair, and piercing the skin to suck their blood. This insect, although given by Linnæus as a *Culex*, appears from his description to belong to the genus *Simulium*, to which genus also belongs an insect of fearful note, which attacks the horned cattle in Servia and the Bannat, penetrating the generative organs, nose, ears, &c. of these animals, and by its poisonous bite destroying them in a few hours. A species of the same genus of minute *Tipulidæ* is common in marshy districts in England, and I have often experienced its attacks, which have resulted in the raising of a tumour on the part of the flesh which has been attacked, attended by a considerable amount of local inflammation; and hence we may readily believe the well-authenticated effects produced upon the cattle above described. There are various other insects which attack the horse and ox, such as the *Hippoboscæ*, various species of ticks, *Anthomyiæ*, &c.; and if these do not, from their smaller size, cause a discharge of blood like the large *Tabanidæ*, it is certain that the irritation which they produce not only by their presence upon the skin, but also by the sharpness of their bite, must be very irritating to the quadrupeds which they infest.

The insects which do not themselves feed upon our cattle, but simply infest them for the purpose of depositing their eggs in some convenient place or other upon their bodies, are in no instance that I recollect provided with an increased development of the mouth organs; on the contrary, the *Œstridæ* are either entirely destitute of a mouth, or have only very small rudiments of some of the ordinary parts of the mouth, so as to be entirely unfitted for biting or wounding cattle. The effects however which some of these species produce are as annoying as those caused by the bites of the *Tabani*. The female fly of the common horse bot, *Œstrus Equi*, it is true, instils no dread into the horse round which she is intently engaged in flying, depositing her eggs here and there in particular spots where the horse is certain to lick the hairs, by which means the eggs are introduced into the mouth and pass into the stomach. So little indeed is the horse affected by the presence of this insect, that I have often stood close to one round which the *Œstrus Equi* has been flying, until the latter has come within reach of my hand, when I have caught it without trouble. Another species, *Œstrus hæmorrhoidalis*, is however much more troublesome; depositing her eggs on the lips of the horse, and producing in her endeavours to effect this such an excessive titillation, as to cause great uneasiness to the horse, which tosses its head about to drive off its enemy, gallops about, and as a last resource takes refuge in some neighbouring water, where the *Œstri* never follow it. The same kind of effect is also produced in rein deer by the *Œstrus Tarandi* *, and in oxen by another species of *Œstrus*, *Œst. Bovis*, respecting which however much difference of opinion has arisen. At certain seasons, the whole terrified herd, with their tails in the air, or turned upon their backs, or stiffly stretched out in the direction of the spine, gallop about the pastures, finding no rest till they also get into the water. This *Œstrus* is asserted by some writers to make a strong humming noise, and hence it has been supposed that the herd of cattle are alarmed at the noise; but this must surely be an incor-

* At the present time (April 1851) some of the rein deer in the Gardens of the Society, which were imported last autumn from Lapland, are infected to a remarkable extent with the tumours of this species; there must, I think, be from fifty to a hundred tumours on one of these animals.

rect conjecture, as the *Œstri*, if they make any hum at all, are far outstripped in this respect by many other insects which instil no dread into oxen. Neither are they alarmed in consequence of being subjected to the same kind of attack upon so sensitive a part as the lips, as is the case with the horses attacked by *Œstrus hæmorrhoidalis*. It is however asserted by some writers, that the dread is produced by the pain inflicted by the *Œstrus* in depositing her eggs, her ovipositor being represented as constructed like an auger or gimlet, only having several longer points it can wound with more effect. When it is stated, however, that the female *Œstrus Bovis* does not occupy more than a few seconds in depositing each egg, we may fairly doubt whether, with her long, fleshy, tubular ovipositor, she has been able to pierce the hide of an ox; or whether, as Mr. Bracy Clark suggests, she only makes use of this long instrument to thrust the egg down to the surface of the skin, which she does not pierce, but only glues its eggs to it, the young larvæ when hatched burrowing into the flesh. If this be the case, the act of oviposition must be unattended with pain, as in the case of the deposition of the eggs of *Œstrus Equi*, and we must search for the cause of the alarm of the herd, either in an instinctive knowledge that a certain insect flying around them is the parent of a grub which at a future time will be a torment to them, or in the attacks of some other insect; and I confess that I am inclined to consider that Virgil's beautiful description of the annoyance caused by

> " Myriads of insects fluttering in the gloom,
> (*Œstrus* in Greece, *Asilus* named at Rome,)
> Fierce and of cruel hum "—

has a *Tabanus* rather than an *Œstrus* for its origin.

The larva of the *Œstrus Equi* resides beneath the skin of the back of the ox, causing large tumours, and having the extremity of its body constantly placed at the orifice of the wound, where it was introduced as an egg, or introduced itself as a grub, the openings of its respiratory apparatus being placed at that part of the body.

These introductory remarks on the different modes in which insects attack our horses and oxen, and the different effects which they produce, will enable us the better to estimate the effects produced by an insect, or several species of insects, of tropical Africa upon the horses of travellers who have lately returned from that part of the world, where their enterprising researches have been rewarded by the discovery of the great central lake Tchad. Captain Frank Vardon, a gentleman who has travelled far in the interior of Africa, has placed in my hands some fragments of Dipterous insects which attacked his horses, causing the death of one of them. The following is an extract from his note to me in reply to my inquiry as to the mode of its attack:—

"33 Oxford Terrace, Hyde Park, May 1850.

"DEAR SIR,—I had always heard that the fly of South Africa so destructive to cattle was a large gad-fly, the size of a bee or hornet. This is quite erroneous: it is not very much larger than the common house-fly, but a longer and more 'rakish'-looking insect, and easily distinguished by the transverse black bars on its body.

"I fancy it is not met with south of the Tropic of Capricorn. It is usually found on hills, plains being free from it. I have ridden up a hill and found the Sētsé increasing at every step, till at last forty or fifty would be on my horse at once. The specimens you saw cost me one of the best in my stud. He was stung by some ten or a dozen of them, and died in twenty days. I myself have been bitten by the Sētsé; you would almost fancy it was a flea biting you. Some parts of South Africa are, I should say, rendered inaccessible by the presence of this pest; I mean of course to a man who travels in the usual way, with his oxen and horses.

"How far the Sētsé extends in the interior is of course as yet unknown, but I have certain information as to its being 200 miles north of the 'Great Lake' recently discovered by my friends, Messrs. Livingston, Oswell and Murray.

"Yours faithfully,

"FRANK VARDON."

"*J. O. Westwood, Esq.*"

The various specimens forwarded to me by Captain Vardon have enabled me to determine that the insect is a new species of Wiedemann's genus *Glossina*, which may be thus characterized:—

GLOSSINA MORSITANS, Westw.

Luteo-albida, thoracis dorso subcastaneo, griseo subtomentoso, vittis quatuor longitudinalibus in medio interruptis nigris, scutelli apice punctis duobus parvis fuscis; abdomine pallide lutescenti, segmento basali utrinque macula parva laterali nigra, singulo segmentorum quatuor proximorum ad basin fascia nigricanti, in medio interrupta, notatis; alis parum infumatis.

Long. corp. lin. 5; expans. alar. lin. $8\frac{1}{2}$.

The head is of a dirty buff colour, narrower than the thorax, with large eyes; the epistoma is paler coloured and clothed with whitish hairs; the proboscis is rather longer than the height of the head; it consists of a slender, horny seta or compound bristle, chestnut-coloured in its chief length, but dilated at the base into a large oval bulbous horny lobe, and upon maceration I was enabled to withdraw from the upper side of the seta (which is consequently grooved), two very delicate styles as long as the proboscis; the sides of this instrument are defended by a pair of elongated, slender setose palpi, as long as the proboscis itself; these are concave on the inside and blackish at the tips, and the setæ with which they are clothed are also black, as well as the branched setæ with which the arista of the antennæ is furnished; the outer surface of the arista itself, under a powerful microscope, is evidently villose. The antennæ are inserted in a depressed obconic space between the eyes, rounded above, and there are two dark spots on the upper part of the epistoma; the two basal joints of the antennæ are dark in front, and the large third joint is dirty buff-coloured. The thorax is chestnut-red, clothed with a very delicate grey tomentosity and finely punctured; it is impressed across the middle of the dorsum, and is marked with four longitudinal broad black bars, abbreviated in front and behind, the two central ones being longest in front, and the two lateral ones longest behind; the two former are united in front by a black streak from the front margin. The scutellum is dirty buff, with two dark dots at its extremity, from which, as well as from various dark dots at the sides, arise long black setæ; the halteres are nearly white. The wings are slightly stained with dusky; the veins black, except at the base of the wing, where they are dirty-buff. The legs are dirty-buff, with the outside of the thighs stained with dark brown. The last two joints of the tarsi are black, with large pulvilli. The abdomen is flat, oval in outline, and dirty fulvous buff in colour, clothed above with numerous minute black setæ, which are greatly elongated at the base of the abdomen and the extremity and sides of each segment; the first segment is marked at each side close to the anterior angle with a round black spot, and each of the four following segments has a broad basal fascia of dark brown, interrupted in the middle. The sides and under surface of the thorax are varied with black patches; the abdomen is pale-coloured beneath, with a large terminal oval plate, down the middle of which runs a pale longitudinal line, preceded by two small oblique oval patches, thickly clothed with minute black setæ.

The peculiarities of the genus *Glossina*, whereby it is at once distinguished from *Stomoxys*, to which it is nearly allied, consist in the dilatation of the extremity of the discoidal cell, the rounded horny bulbous base of the proboscis, which is not angulated at its base, and the long and slender flattened palpi, which together form a sheath protecting the proboscis. Wiedemann's typical species (which has remained unique to the present time), *Glossina longipalpis*, (subsequently described by Robineau Desvoidy under the name of *Nemorhina palpalis*,) is a native of Sierra Leone, where it was collected by Afzelius. M. Macquart, judging from the structure of the mouth, considers it probable that it does not live upon the blood of animals, like *Stomoxys*, but upon the nectar of flowers; the two setæ which are enclosed in the proboscis and compose the sucker being so slender, that it is difficult to conceive that they can pierce the skin, the palpi being also elongated so as to form a protection to it, and thus further indicating its weakness. There is however so great a difference between the structure of the proboscis in these insects and *Stomoxys*, that I do not doubt that they are able to pierce the skin of a horse, the proboscis of *Glossina* being a long, straight, horny, needle-like instrument, and not elbowed, with fleshy lips, as is that of *Stomoxys*. Moreover, the bulbous dilated base of the proboscis must evidently play an important part in the economy of the insect, either by giving additional support to the proboscis when in the act of piercing the skin, or by containing powerful muscles for the action of the enclosed setæ; or, as suggested to me by Prof. Owen, this dilated base may be analogous to the dilated base of the sting of the Scorpion, and like it contain a reservoir of some powerfully poisonous liquid.

The account of the irritating powers of the *Glossina* given by Captain Vardon is, it is true, not so detailed as could have been desired, but we learn sufficient to arrive at the conclusion that its effects are, to a certain extent, exactly like those of the *Tabanidæ*; how far the attacks may be attended with tumours, similar to those produced by the *Simulium*, and whether a tropical climate may not extend the effects of the attack, producing inflammatory action upon animals perhaps never before in those latitudes, are questions which have yet to be answered. One thing however appears to me evident, that the Sētsé is no other than the Zimb of Bruce, (an insect respecting whose real family and even existence so many doubts have been expressed,) or at least that that insect is a larger species of *Glossina*, to whose real habits Bruce has added those of a species of *Œstrus*. With the view of establishing this assertion, as well as of clearing up what I consider the inconsistencies of Bruce's account, I shall beg to introduce his description of the Zimb.

"Nothing was more opposite than the manners and life of the Cushite and of his carrier the shepherd. The mountains of the Cushite and the cities he built afterwards were situated upon a loamy black earth, so that, as soon as the tropical rains began to fall, a wonderful phenomenon deprived him of his cattle. Large swarms of flies appeared wherever that loamy earth was, which made him absolutely dependent in this respect upon the shepherd; but these affected the shepherd also. This insect is called the Zimb * in modern or vulgar Arabic; it has not been described by any naturalist. It is in size very little larger than a bee, of a thicker proportion, and the wings, which are broader than those of a bee, are placed separate, like those of a fly. They are of pure gauze, without colour or spot upon them; the head is large; the upper jaw or lip is sharp, and has at the end of it a strong pointed hair of about a quarter of an inch long; the lower jaw has two of these pointed hairs, and this pencil of hairs, when joined together, makes a resistance to the finger nearly equal to that of a strong hog's bristle; its legs are serrated on the inside, and the whole covered with brown hair or down. As soon as this plague appears and its buzzing is heard, all the cattle forsake their food and run wildly about the plain till they die, worn out with fatigue, fright and hunger. No remedy remains but to leave the black earth and to hasten down to the plains of Atbara, and there they remain whilst the rains last, this cruel enemy never daring to pursue them farther.

"What enables the shepherd to perform the long and toilsome journeys across Africa is the camel, emphatically called by the Arabs the ship of the desert. Though his size is immense, like his strength, and his body covered with a thick skin defended with strong hair, yet still is he not capable to sustain the violent punctures the fly makes with his pointed proboscis. He must lose no time in removing to the sands of Atbara, for when once attacked by this fly, his body, head and legs swell out into large bosses, which break and putrefy to the certain destruction of the creature. Even the elephant and rhinoceros, who, by reason of their enormous bulk and the vast quantity of food and water they daily need, cannot shift to desert and dry places as the season may require, are obliged to roll themselves in

* "See Appendix. It is the same name as Zebul in Hebrew.—E."

mud or mire, which when dry coats them over like armour, and enables them to stand their ground against this winged assassin; yet I have found some of these tubercles upon almost every elephant and rhinoceros that I have seen, and *attribute them to this cause.* All the inhabitants of the sea-coast of Melinda, down to Cape Gardefan, Saba, and the south coast of the Red Sea, are obliged to put themselves in motion and change their habitation to the next sand in the beginning of the rainy season, to prevent all their stock of cattle from being destroyed.

"Of all those that have written upon these countries, the prophet Isaiah alone has given an account of this animal and the manner of its operation (Isaiah, vii. 18, 19): 'And it shall come to pass in that day, that the Lord shall hiss for the fly that is in the uttermost part of the rivers of Egypt .... and they shall come, and shall rest all of them in the desolate valleys, and in the holes of the rocks, and upon all thorns, and upon all bushes.'" (Travels, ii. pp. 314–317.)

"*Tsaltsalya, or Fly.*—We are obliged with the greatest surprise to acknowledge that those huge animals, the elephant, the rhinoceros, the lion and the tiger, inhabiting the same woods, are still vastly this fly's inferiors; and that the appearance of this small insect, nay, his very sound, though he is not seen, occasions more trepidation, movement and disorder, both in the human and brute creation, than whole herds of these monstrous animals collected together, though their number was in a tenfold proportion greater than it really is. Providence from the beginning it would seem had fixed its habitation to one species of soil, being a black fat earth, extraordinarily fruitful.

"We cannot read the history of the plagues which God brought upon Pharaoh by the hands of Moses, without stopping a moment to consider a singularity, a very principal one, which attended the plague of the fly. The land of Goshen, the possession of the Israelites, was a land of promise which was not tilled or sown, because it was not overflowed by the Nile. But the land overflowed by the Nile was the black earth of the Valley of Egypt, and it was here that God confined the flies.—I have magnified him about twice the natural size.—He has no sting, though he seems to me to be rather of the bee kind; but his motion is more rapid and sudden than that of the bee, and resembles that of the gad-fly in England. There is something particular in the sound or buzzing of this insect. It is a jarring noise, together with a humming, which induces me to believe that it proceeds, at least in part, from a vibration made with the three hairs at his snout.

"The Chaldee Version is content with calling this animal simply Zebub, which signifies the fly in general as we express it in English. The Arabs call it Arob in their translation, which has the same general signification. The Ethiopic translation calls it Tsal tsalya, which is the true name of this particular fly in Geez, and was the same in Hebrew. The Greeks have called this species of fly Cynomyia, which signifies the dog-fly; in imitation of which, those I suppose of the church of Alexandria that, after the coming of Frumentius, were correcting the Greek copy and making it conformable to the Septuagint, have called this fly Tsal tsalya Kelb, in answer to the word Cynomyia. Salal in the Hebrew signifies 'to buzz' or 'to hum,' and as it were alludes to the noise with which the animal terrifies the cattle; and Tsal tsalya seems to come from this by only doubling the radicals: t'Tsalalou *, in Amharic, signifies 'to pierce with violence.'"—*Appendix*, vii. 284 *et seq.*

From this account we learn that it is the sound of this insect which produces a great amount of trepidation in the cattle of Abyssinia. This accords with Bracy Clark's ideas of *Œstrus Bovis*. Bruce's description of the position of the wings clearly indicates a Dipterous insect, and his figure shows a bee-like insect, with a long straight porrected proboscis exactly like that of *Glossina*. Bruce adds, that the insect punctures the thick skin of the camel with its proboscis, the parts attacked breaking out into large bosses, which are also occasionally found upon the rhinoceros and elephant. It will be observed however that Bruce merely supposed these tumours to arise from the attack of the Zimb.

I think we have sufficient grounds for believing that Bruce has here jumbled together the notion of the buzzing of the *Œstrus* instilling dread into a herd of cattle, his knowledge of the piercing powers of the proboscis of the Sĕtsé, and his knowledge of the tumours caused by the presence of the larvæ of *Œstri* under the skin of the camel †, rhinoceros and elephant. The College of Surgeons possesses a specimen of the larva of the *Œstrus* of the rhinoceros, and the camel is also subject to the attacks of a species of the same genus; whilst I consider that Bruce's figure is made up from memory, taking the statement of its resemblance to a bee and its possession of a proboscis together ‡. No instance, in fact, is known of a species which attacks these animals with its proboscis, forming tumours upon their backs such as are described by Bruce, which agree on the whole with the tumours caused by the larvæ of *Œstrus Bovis*; and we have already seen that no *Œstrus* is capable of inflicting a wound with the organs of the mouth, of which in fact all the known species are destitute, whilst the boring powers of their ovipositors are very questionable.

The accounts given by Mr. R. Gordon Cumming of the destructive powers of the Tsetse fully confirm the opinion here advanced, and prove that although "its *bite* is certain death to oxen and horses," it causes no dorsal tumours like an *Œstrus*. "This hunter's scourge," he says, "is similar to a fly in Scotland called *Kleg* §, but a little smaller; they are very quick and active, and storm a horse like a

* "The name of this fly is undoubtedly derived from a word signifying 'to buzz' in Hebrew and Ethiopic.

† Pliny was aware of the attacks of *Œstri* upon the camel, and he informs us that the merchants of Arabia were in the habit of anointing their camels with whale- and fish-oils. (Hist. Mund. lib. xxxii. p. 302, et lib. xi. cap. 16. p. 36. edit. Pancoucke.)

‡ It is evident from the note added by the editor of the 8vo edition, from which the above extracts have been made, that the drawing of the insect was not a *bonâ fide* one made on the spot, but was manufactured at home.

§ *Kleg* is the local name for the *Hæmatopota pluvialis*.

swarm of bees, alighting on him in hundreds and drinking his blood. The animal thus bitten pines away and dies, at periods varying from a week to three months, according to the extent to which he has been bitten." . . . . "The next day one of my steeds died of the 'Tsetse.' The head and body of the poor animal swelled up in a most distressing manner before he died; his eyes were so swollen that he could not see, and in darkness he neighed for his comrades who stood feeding beside him *."

The Marquis di Spineto, in a memoir published "On the Zimb of Bruce as connected with the Hieroglyphics of Egypt†," endeavoured to ascertain the characters of this insect, and came to the conclusion that it belongs to the order Diptera, notwithstanding Bruce says that it very much resembles the Bee genus, and that it has "several of the properties of the *Bombylius*, the *Tabanus*, the *Œstrus*, and the *Hippobosca*, without belonging to any of them. In some of its generic and even specific characters it is like the *Bombylius* and *Œstrus*, in others like the *Hippobosca* and the *Muscidæ*, in a few like the *Tabanus* and the Dog-fly, whilst in the aggregate it differs from every one of these insects." The Marquis points out the various relationships which the insect, as described by Bruce, presents to these different genera, considering that the porrected hairs or bristles forming the mouth "perform the office of suckers, simply because it does not lay its eggs in the flesh of animals; for according to the account which Bruce gives of the evils attending the attacks of this fly, the bosses which are produced swell, break and putrefy, but never exhibit any larvæ or maggots," thus differing from the habits of the *Œstri*; to which however he adds, by some curious misconception, that "*the larvæ of the* Œstrus *live in wood, which does not seem to be the case with the Zimb.*"

The Marquis however identifies the Zimb with the Κυνόμυια or 'Dog-fly' of the Greeks, the 'Tsal tsalya Kelb' of the Alexandrian Church, the 'Af an ouhor' of the ancient Egyptians, the 'Arob' or 'Oreb' of Exodus viii. 21, and the 'Œstrus' of Aristotle; and considers that it is the precise species of fly which caused the fourth of the plagues of Egypt ‡. As such, he also regards it as the insect represented on the Egyptian monuments at the head of the cartouches which enclose the hieroglyphical titles of the Pharaohs, and as a symbol of Lower Egypt (where only the insect occurs), the preceding figure being intended for a sceptre, in contradiction to the opinion of M. Champollion, who regards the figure of the insect as that of a bee; and consequently the signification of the two symbols as that of "King of an obedient people." I can by no means however agree with this opinion of the Marquis Spineto, since an examination of various Egyptian monuments in the British Museum and elsewhere

* Five Years of a Hunter's Life in the Far Interior of South Africa, ii. pp. 220, 227.

† Lond. and Edinb. Phil. Mag. 1834, vol. iv. p. 170.

‡ In the Article "Musquitoe" (Brit. Cyclop. Nat. Hist. iii. 299), I have suggested various reasons for supposing that the fourth plague of Egypt was caused by some species of *Culicidæ*, which, although not disproved, are certainly weakened by the knowledge now obtained of the real habits of the *Tsetse* or *Zimb*.

(in all of which the insect is represented under precisely the same form) has convinced me that it is intended to represent a Hymenopterous insect, and not one of the Diptera. It is in fact more like the figure of a common Wasp than any other ordinary insect; the appendages of the head, which are obliquely porrected, are evidently intended for antennæ, and not for a bipartite proboscis; the wings, it is true, are only represented as two in number, but as the two on each side of the body in the Hymenoptera are hooked together, they would, by common observers, be regarded as but one; while the contracted form of the base of the abdomen is precisely that of some of the *Vespidæ* figured in the great French work upon Egypt. The *Polistes* represented in pl. 8. fig. 2 ♂. of that work indeed might almost be considered as the identical species intended to be represented on the monuments.

Mr. S. Birch indeed informs me that there is a coloured representation of this hieroglyphic figure on one of the Egyptian monuments in the British Museum, and that the banded colours of the abdomen leave no doubt that it is intended for a Wasp. Moreover the Egyptian name of this insect was the same as that of Upper Egypt, whilst the preceding figure was intended for a reed as emblematical of Lower Egypt, and consequently the two figures indicated the power of the monarch over both these parts of the empire.

To render this article more complete, I have added descriptions of two more tropical African species of *Glossina*, from the Collection of the Rev. F. W. Hope, together with that of another remarkable hitherto undescribed genus allied to *Glossina*, but distinguished by the very singular recurved proboscis and long styliferous abdomen, also from tropical Africa.

GLOSSINA TACHINOIDES, Westw.

Cinerea, faciei striga longitudinali media fulva, epistomate argenteo-sericeo, thoracis dorso brunneo-maculato, scutello griseo maculis duabus brunneis punctisque duobus minutis apicalibus nigris, abdominis dorso carneo-griseo segmento singulo maculis duabus maximis fuscis, pedibus luteo-albidis, tarsis supra nigris.

Long. corp. lin. 4; expans. alar. lin. $8\frac{1}{2}$.

Hab. in Africa occidentali tropicali. (Mus. D. Hope.)

This species is smaller than the preceding and differently coloured. The terminal joint of the antennæ is more lunate in form and dusky coloured in front; the palpi are dusky coloured at the tip and clothed with black hairs. The upper surface of the thorax is ash-coloured, divided across the middle by an impressed line; the anterior half is marked on each side towards the fore angles with an oval brown spot, extending laterally and backwards into a lunate line, enclosing a smaller oval spot on each side towards the hinder angles: in the middle are two slender abbreviated brown lines, and two minute spots resting upon the transverse impressed line over which they are extended and dilated into a pair of somewhat larger spots in the middle of the upper surface of the thorax, each with a slender transverse line extending from it to the sides of the thorax, where it meets a curved lateral brown line enclosing a fainter oval spot, the hind extremity of each of which nearly joins, at the hinder angles of the back of the thorax, a straight line running forwards into the disk, where it vanishes. The upper side of the abdomen may be described as of a brown colour, with the lateral and posterior edges and an ill-defined longitudinal central band of fleshy ash: it is thickly clothed with minute black hairs on the disk, and with long ones at the base and sides. The wings and their veins are coloured as in *Gl. morsitans.*

Glossina Tabaniformis, Westw.

Griseo-fusca epistomate sericeo, thorace fusco-maculato, abdomine fusco-rufescenti apice sensim obfuscato, pedibus fusco-luteis tibiis tarsisque nigro lineatis alis fusco infumatis.

Long. corp. lin. 6; expans. alar. lin. 13½.

Hab. apud littus aureum Africæ tropicalis occidentalis. (Mus. D. Hope.)

This species is very much larger than either of the preceding. The head is comparatively much smaller and the wings much larger; the front of the head is dusky; it, as well as the basal joints of the antennæ, is rather thickly clothed with black hairs; the arista of the antennæ is luteous, with a dark line behind, and the branding setæ with which it is furnished are black; the palpi are thickly clothed externally with short black setæ; the thorax is dark greyish brown, also very thickly clothed with short black setæ and long curved lateral bristles; the back of the thorax is marked with a dark central longitudinal line, having a less distinct one on each side of it, between which and each side are two large brown spots, one behind the other; the scutellum is paler, and marked with two ill-defined dusky spots; the wings are stained brown; the legs are dirty luteous buff; the tibiæ marked with one, and the tarsi with three very delicate longitudinal black lines; the tibiæ are compressed, and the black line occupies the superior compressed ridge.

Tribe Myopariæ, Macquart, Hist. Nat. Ins. Dipt. ii. 29.

Genus Stylomyia, Westw. (*Stylogaster,* Wlk. nec Macq.)

Corpus subelongatum capite thorace parum latiori, facie antice dimidio supero carinato, dimidio infero valde concavo. Antennæ porrectæ articulo basali minimo, 2do obconico, 3tio subovali præcedentis longitudine, vel præcedenti multo longiori compresso parum curvato, arista versus apicem marginis superi inserta, porrecta. Haustellum capite et thorace conjunctim triplo longius, porrectum, in medio geniculatum, dimidio basali parum deflexo et ad ejus apicem crassiori, dimidio apicali valde incurvato. Thorax brevis quadratus. Abdomen supra subconvexum parum curvatum, apice pone segmentum 5um in stylum elongatum (longitudine quinque articulorum præcedentium æqualem), deflexum valde angustum, contracto, hujus styli apice supero in uno sexu, oblique truncato; seta elongata supra hirsuta, lobo breviori compresso filamentisque duobus *elongatis simplicibus in cavitate truncata insidentibus. Alæ breves cellula 1ma postica clausa pediculata et postice dilatata, vena obliqua cellulam postice contiguam claudente subobsoleta; cellula anali brevissima vix pone pseudalulam extensa vena brevissima transversa clausa. Pedes elongati gracillimi, calcaribus duobus tibiarum parum elongatis, tibiis posticis difformibus, unguibus pulvillisque minutissimis.*

This genus is very close to the American genus *Stylogaster*, but especially differs from the description given thereof by M. Macquart, in the very minute condition of the anal cell of the wings. The form of the head and the unequal division of the haustellum, as represented in M. Macquart's pl. 13. fig. 15, are also characters at variance with those of the insects of which I have composed the present genus. The anal cell is of small size in *Stachynia*, Mcq. (*Dalmannia*, Rob. D.), but it is still more minute in *Stylomyia*. The long slender legs and minute claws and pulvilli are also unlike those of all the other *Myopariæ*.

Stylomyia Leonum, Westw.

Rufo-fulva, facie argenteo-sericea antennis rufo-fulvis arista nigra, vertice subplano macula ovali nigra ocellos postice includente, haustello nigro basi subtus parum pallidiori, thorace scutello abdomineque rufo-fulvis stylo concolori fascia lata fere apicali nigra, pedibus fulvis tarsis apice fuscis, tibiis duabus posticis dimidio basali fusco, apicali albido; tarsis nigris.

Long. corp. lin., stylo excluso, 4; expans. alar. lin. 6.

Hab. in Sierra Leona, Africæ. (In Mus. D. Hope.)

The facets of the middle portion of the inner margin of the eyes are rather larger than the posterior ones. The wings are but slightly tinged with grey, and the veins are blackish. The extremity of the anal style with its filaments are fulvous coloured. The two posterior tibiæ are very slender at the base; the apical half is dilated on the upper edge, the under edge not being quite straight.—*Note.* All the details are taken from the species figured.

Stylomyia confusa, Westw. *Fulva, facie argentea, vertice omnino nigro; antennis fulvis articulo 3tio antennarum longitudinem 2di vix superanti, ovali-conico, arista nigra; tuberculo antennifero pallide fulvo, haustello nigro basi fulvo; thorace supra nigro marginibus lateralibus angulisque anticis distincte et irregulariter luteis setis longis nigris. Scutello fusco setis duabus longis terminalibus nigris, pedibus quatuor anticis omnino luteo-albidis tibiis apice obscuris, femoribus duobus posticis fascia angusta ante alteraque pone medium fuscis; tibiis dimidio basali fusco fascia lata media alba, tertia parte apicali fusco, tarsis fuscis; abdomine fulvo segmentis 2do—5to margine postico tenui obscuro; styli dimidio basali fulvo-rufo; apicali nigro, genitalibus exsertis fulvo-rufis; corpore subtus fulvo-albido. Præcedenti e tertia parte minor.*

Hab. ——? (In Mus. Brit.)

Although in general form and proportion of its parts, especially of the terminal style of its abdomen, the specimen of this species in the British Museum agrees exactly with *St. Leonum*, yet the short third joint of the antennæ, and the extraordinarily enlarged size of the middle facets of the inner margin of the eyes, might indicate it to be the opposite sex of the preceding. The second segment of the abdomen is furnished on each side with a small fascicle of elongated black hairs.

This species is introduced by Mr. F. Walker into his 'List of the Dipterous Insects in the Collection of the British Museum' (part iii. p. 680), under the name of *Stylogaster stylatus*; but it appears to me that it neither accords with Macquart's generic characters of *Stylogaster*, nor with the concise Fabrician specific description of *Conops stylata* (Syst. Antl. 177), nor yet with Wiedemann's more detailed observations, especially with reference to the sexual difference in the form of the antennæ (Auss. Eur. Zw. Ins. ii. 245).

MISCELLANEOUS.

Observations on the Circulation of the Blood in the Arachnida. By M. Emile Blanchard.

Until very lately the circulatory apparatus of the Arachnida remained nearly unknown. It was supposed, indeed, that the pulmonary Arachnida would resemble the Crustacea in their mode of circulation, whilst the tracheary Arachnida, on the other hand, would resemble insects; but observations on this subject are still almost entirely wanting, and all the peculiarities belonging to the type remained unknown. The question, however, made a great step, as far as regards the *Scorpionidæ*, in consequence of the researches of Mr. Newport; and in a memoir published three years since, I described the course of the principal arteries in the *Araneidæ*, in which they had not as yet been traced. Notwithstanding the appearance of these works, many points remained to be cleared up. A new examination of this circulatory apparatus has recently led me to ascertain its details in a tolerably complete manner. I had made my previous researches on species found in France, which are of very small size; but, during last autumn, a very lively specimen of a *Mygale* of the largest dimensions (*M. Blondii*), which inhabits South America, having been received at the museum, I have derived considerable assistance from it, in the investigation which I have long been pursuing, on the anatomy and physiology of the Arachnida. I injected this *Mygale*, introducing the injection by the heart, and succeeded by this means in following, and isolating by dissection, all the arteries distributed to every organ, even to their most delicate ramifications.

In this short abstract of my labours, I abstain from describing the course of these numerous arteries in detail, as the description will appear shortly in my work entitled 'L'Organisation du Règne Animal.' I content myself here with indicating the general result; a result which does not apply only to the species which has served me in a special manner in my researches, but equally to all the *Araneidæ*, as I have since convinced myself.

In these Articulata, the heart, usually divided into five chambers, offers four pairs of auriculo-ventricular orifices; the aorta, which springs from the anterior chamber, penetrates into the thorax and furnishes two arteries on each side, the branches of which are distributed to the posterior *diverticula* of the stomach and to the thoracic muscles. Beyond this the aorta divides into two great trunks, which above give off the arteries of the first *diverticula* of the stomach and of all the muscles of the anterior portion of the thorax. The ophthalmic arteries spring from the inner part of each of these trunks. Below, they are prolonged to form the arteries of the mandibles (*antennes pinces*), and about their median portion they furnish a voluminous artery which divides immediately to form the arteries of the legs and of the ventral portion of the abdomen. All these vessels present a number of branches and ramifications not inferior to those which are generally seen in vertebrated animals. Besides these, each of the chambers of the heart furnishes a large artery on each side, the branches of which are distributed to the liver and intestines.

For the return of the blood the circulatory apparatus is much less perfect; in general there only exist canals, the walls of which are incapable of being isolated by dissection. Nevertheless, the legs and the mandibles (*antennes pinces*) are penetrated by a very distinctly limited venous canal; but in the thorax the principal passages are merely circumscribed by the bundles of muscles. On the other hand, in the liver, we observe, at various points and principally on the sides, vestiges of membranous walls.

All the venous blood collected from the different parts of the body is conducted into the lower region of the abdomen, where it is introduced into the respiratory organs, by means of two large pulmonary canals formed by a delicate membrane; arrived at the organs of respiration, the nutritive fluid soon passes into the pulmono-cardiac vessels, which are equal in number to the auriculo-ventricular orifices of the heart, into which they empty themselves. These vessels, of a very delicate consistency, are always adherent to the inner walls of the abdominal teguments.

Thus the circulation of the blood in the Arachnida is executed by means of an arterial system of the most complete description; and a venous system, which, although no doubt very imperfect when compared with that of the Vertebrata, offers, nevertheless, in the regularity of its course and the well-circumscribed limits of most of its passages, a degree of complication of which naturalists hitherto could have formed no idea.—*Comptes Rendus,* March 15, 1852, p. 402.

ON THE DISTRIBUTION OF COLUBER NATRIX.

Referring to Mr. Gray's article in the June Number of the 'Annals of Natural History,' on the distribution of the *Coluber natrix,* I beg to state that it is a mistake to suppose that this reptile is not found in Norfolk. I have seen specimens from two localities in East Norfolk, and I have heard of them in West Norfolk. I have also heard of them at Fritton in East Suffolk, where I am informed that they are frequently observed in summer to swim across a lake from a quarter to half a mile in breadth *.—JOHN HENRY GURNEY.

Easton, Norfolk, July 5, 1852.

Uses of the Stillingia sebifera, *or Tallow Tree, with a notice of the* Pe-la, *an Insect-wax of China* †. By J. D. MACGOWAN, M.D.

The botanical characters of this member of the Euphorbiaceæ are too well known to require description; but hitherto no accurate account has been published of its varied uses, and although it has become a common tree in some parts of India and America, its value is appreciated only in China, where alone its products are properly elaborated. In the American Encyclopædia it is stated that this tree is almost naturalized in the maritime parts of South Carolina, and that its capsules and seeds are crushed together and boiled, the fatty matter being skimmed as it rises, hardening when cool.

Dr. Roxburgh in his excellent 'Flora Indica,' says:—"It is now very common about Calcutta, where, in the course of a few years, it has become one of the most common trees. It is in flower and fruit most parts of the year. In Bengal, it is considered only an ornamental tree; the sebaceous produce of its seeds is not sufficient in quantity, nor its qualities so valuable, as to render it an object worthy of cultivation. It is only in very cold weather that this substance becomes firm; at all other times it is in a thick brownish fluid state, and soon becomes rancid; such is my opinion of the famous vegetable tallow of China."

Dr. Roxburgh was evidently misled in his experiments by pursuing a course similar to that which is described in the 'Encyclopædia Americana' (and in many other works), or he would have formed a very different opinion of this curious material.

Analytical chemistry shows animal tallow to consist of two proximate principles—*stearine* and *elaine*. Now what renders the fruit of this tree peculiarly interesting is the fact that both these principles exist in it separately, in nearly a pure state. By the above-named process, stearine and elaine are obtained in a *mixed* state, and consequently the mass presents the appearance described by Dr. Roxburgh.

Nor is the tree prized merely for the stearine and elaine it yields, though these products constitute its chief value: its leaves are employed as a black dye; its wood being hard and durable may be easily used for printing-blocks and various other articles; and finally, the refuse of the nut is employed as fuel and manure.

The *Stillingia sebifera* is chiefly cultivated in the provinces of Kiangsi, Kougnam, and Chehkiang. In one district, near Haugchan, the inhabitants defray all their taxes with its produce. It grows alike on low alluvial plains and on granite hills, on the rich mould at the

* Two other friends have made the same correction of Mr. F. Edwards's observations.—J. E. GRAY.

† Drawn up for the Agricultural and Horticultural Society of India.

margin of canals, and on the sandy sea-beach. The sandy estuary of Haugchan yields little else; some of the trees at this place are known to be several hundred years old, and though prostrated, still send forth branches and bear fruit. Some are made to fall over rivulets, forming convenient bridges. They are seldom planted where anything else can be conveniently cultivated—in detached places, in corners about houses, roads, canals, and fields. Grafting is performed at the close of March, or early in April, when the trees are about three inches in diameter, and also when they attain their growth. The 'Fragrant Herbal' recommends for trial the practice of an old gardener, who, instead of grafting, preferred breaking the small branches and twigs, taking care not to tear or wound the bark.

In mid-winter, when the nuts are ripe, they are cut off with their twigs, by a sharp crescentic knife, attached to the extremity of a long pole, which is held in the hands, and pushed upwards against the twigs, removing at the same time such as are fruitless. The capsules are gently pounded in a mortar to loosen the seeds from their shells, from which they are separated by sifting. To facilitate the separation of the white sebaceous matter enveloping the seeds, they are strained in tubs, having convex, open wicker bottoms placed over caldrons of boiling water. When thoroughly heated they are reduced to a mash in the mortar, and thence transferred to bamboo sieves, kept at an uniform temperature over hot ashes. A single operation does not suffice to deprive them of all their tallow, and the steaming and sifting is therefore repeated. The article thus procured becomes a solid mass on falling through the sieve, and to purify it, it is melted and formed into cakes for the press. These receive their form from bamboo hoops a foot in diameter and three inches deep, which are laid on the ground over a little straw. On being filled with the hot liquid the ends of the straw beneath are drawn up and spread over the top, and when of sufficient consistence are placed with their rings in the press. This apparatus, which is of the rudest description, and constructed of two large beams placed horizontally so as to form a trough, is capable of containing about fifty of the rings with their sebaceous cakes; at one end it is closed, and at the other adapted for receiving wedges, which are successively driven into it by ponderous sledge-hammers, wielded by athletic men. The tallow oozes in a melted state into a receptacle below where it cools; it is again melted and poured into tubs, smeared with mud to prevent its adhering. It is now marketable, in masses about 80 pounds each —hard, brittle, white, opake, without taste, and without the odour of animal tallow; under high pressure it scarcely stains bibulous paper; it melts at 104° Fahrenheit. It may be regarded as nearly pure stearine; the slight difference is doubtless owing to the admixture of oil expressed from the seed in the process just described. The seeds yield about eight per cent. of this vegetable stearine, which sells for about five cents per pound.

The process for pressing the oil, which is carried on at the same time, remains to be noticed: it is contained in the *kernel* of the nut, the sebaceous matter which lies *between* the *shell* and *husk* having been separated in the manner described. The kernel and the husk covering it are ground between two stones, which are heated to prevent clogging from the sebaceous matter still adhering. The mass is then placed in a winnowing machine, precisely like those in common use in other countries. The chaff being separated exposes the white oleaginous kernels, which after being steamed are placed in a mill to be mashed. This machine is formed of a circular stone groove, twelve feet in diameter, three inches deep and about as many wide, into which a thick solid stone wheel, eight feet in diameter, tapering at the edge, is made to revolve perpendicularly by an ox harnessed to the outer end of its axle, the inner turning on a pivot in the centre of the machine. Under this ponderous weight the seeds are reduced to a mealy state; they are then steamed in the tubs, formed into cakes, and pressed by wedges in the manner above described, the process of mashing, steaming, and pressing being repeated with the kernels likewise. The kernels yield above thirty per cent. of oil, and it sells for a little more than three cents per pound. It is called *Tsing-yu,* and answers well for lamps, though inferior for this purpose to some other vegetable oils in use. It is also employed for various purposes in the arts, and has a place in the Chinese Pharmacopœia, because of its quality of changing gray hair black, and other imaginary virtues. The husk which envelopes the kernels, and the shell which incloses them with their sebaceous covering, are used to feed the furnaces, scarcely any other fuel being needed for this purpose. The residuary tallow cakes are also employed for fuel, as a small quantity of it remains ignited a whole day. It is in great demand for chafing dishes in the cold weather. And finally, the cakes which remain after the oil has been pressed out are much valued as a manure, particularly for tobacco fields, the soil of which is rapidly impoverished by the Virginia weed. Artificial illumination is generally procured in China by vegetable oils, but candles are also employed by those who can afford it, and for lanterns. In religious ceremonies no other material is used. As no one ventures out after dark without a lantern, and as the gods cannot be acceptably worshiped without candles, the quantity consumed is very great. With an unimportant exception, the candles are also made of what I beg to designate as *vegetable stearine*. When the candles, which are made by dipping, are of the required diameter, they receive a final dip into a mixture of the same material and *insect-wax,* by which their consistency is preserved in the hottest weather. They are generally coloured red, which is done by throwing a minute quantity of alkanet root (*Anchusa tinctoria*), brought from Shangtung, into the mixture, which forms the coating of the candle: verdigris is sometimes employed to dye them green. The wicks are made of rush, coiled round a stem of coarse grass, the lower part of which is slit to receive the *pin* of the candlestick, which is more economical than if put into a socket. Tested in the mode recommended by Count Rumford, these candles compare favourably with those made from spermaceti, but not when the clumsy wick of the Chinese is used. They cost about eight cents per pound.

Prior to the thirteenth century, bees'-wax was employed as a coating for candles; but about that period the white *insect-wax* was discovered, since which time that article has been wholly superseded by the more costly but incomparably superior product of this insect. It has been described by the Abbé Grassier, Sir George Staunton, and others; but these accounts differ so widely among themselves, as well as from that given by native authors, as to render further inquiry desirable.

From the description given by Grassier, entomologists have supposed the insect which yields the *Pe-la,* or white wax, to be a species of *Coccus.* Staunton, on the contrary, describes it as a species of *Cicada* (*Flata limbata*). As described by Chinese writers, however, it is evidently an *apterous* insect; hence the inference, either that there are two distinct species that produce white wax, or that the insect Staunton saw was falsely represented as the elaborator of this beautiful material. This, like many other interesting questions in the natural history of this portion of the globe, must remain unsolved, until restrictions on foreign intercourse are greatly relaxed, or wholly removed. In the mean time, native writers may be consulted with advantage; and from the chief of these, the Pun-tsau and Kiunfangpú, two herbals of high authority, the subjoined account has been principally derived. The animal feeds on an evergreen shrub or tree, *Ligustrum lucidum,* which is found throughout central China from the Pacific to Thibet, but the insect chiefly abounds in the province of Sy'Chuen. It is met with also in Yunnan, Hunan, and Hupeh. A small quantity of a superior description is produced in Kinhwa, Chehkiang province. Much attention is paid to the cultivation of this tree; extensive districts of country are covered with it, and it forms an important branch of agricultural industry. In planting, they are arranged like the mulberry in rows about twelve feet apart, and both seeds and cuttings are employed. If the former, they are soaked in water in which unhusked rice has been washed, and their shells pounded off: when propagated by cuttings, branches an inch in diameter are recommended as of the most suitable size. The ground is ploughed semi-annually, and kept perfectly free from weeds. In the third or fourth year they are stocked with the insect. After the wax or insect has been gathered from the young trees, they are cut down, just below the lower branches, about four feet from the ground, and well manured. The branches which sprout the following season are trimmed, and made to grow in nearly a perpendicular direction. The process of cutting the trunk within a short distance of the ground is repeated every four or five years, and as a general rule, they are not stocked until the second year after this operation. Sometimes the husbandman finds a tree which the insects themselves have attained, but the usual practice is to stock them with the nests of the insect, which is effected in spring. These nests are about the size of a "fowl's head," and are removed by cutting off a portion of the branch to which they are attached, leaving an inch each side of the nest. The sticks, with the adhering nests, are soaked in unhusked rice-water for a quarter of an hour, when they may be separated. When the weather is damp or cool, they may be preserved in jars for a week; but if warm, they are to be tied to the branches of the trees, to be stocked without delay, being first folded between leaves. By some, the nests are probed out of their seat in the bark of the tree without removing the branches. At this period they are particularly exposed to the attacks of birds, and require watching. In a few days after being tied to the tree, the nests swell, and innumerable white insects, the size of "*nits*," emerge, and spread themselves on the branches of the tree; but soon with one accord they descend towards the ground, where, if they find any grass, they take up their quarters. To prevent this, the ground beneath is kept quite bare, care being taken also that their implacable enemies, the ants, have no access to the tree.

Finding no congenial resting-place below, they re-ascend and fix themselves to the lower surface of the leaves, where they remain several days, whence they repair to the branches, perforating the bark to feed on the fluid within. From nits they attain the size and appearance of "*pediculus hominis*." Having compared it to this, the most familiar to them of all insects, our authors deem further description superfluous. Early in June they give to the trees the appearance of being covered with hoar frost, being *changed into wax*; soon after this they are scraped off, being previously sprinkled with water. If the gathering be deferred till August, they adhere too firmly to be easily removed. Those which are suffered to remain to stock trees the ensuing season, secrete a purplish envelope about the month of August, which at first is no larger than a grain of rice; but as incubation proceeds, it expands, and becomes as large as a fowl's head, which is in spring, when the nests are transferred to other trees, one or more to each, according to their size and vigour, in the manner already described.

On being scraped from the trees, the crude material is freed from its impurities, probably the integuments of the insect, by spreading it on a strainer covering a cylindrical vessel which is placed in a caldron of boiling water; the wax is received into the former vessel, and on congealing is ready for the market. The Pe-la or white wax in its chemical properties is analogous to purified bees'-wax, and also spermaceti, but differs from both, being in my opinion an article perfectly *sui generis*. It is purely white, transparent, shining, not unctuous to the touch, inodorous, insipid, crumbles into a dry inadhesive powder between the teeth, with a fibrous texture, resembling fibrous calc-spar; it melts at 100° Fahr., is insoluble in water, dissolves in heated essential oils, and is scarcely affected by boiling alcohol, the acids, or alkalies.

The aid of analytical chemistry is needed for the proper elucidation of this most beautiful material. There can be no doubt it would prove altogether superior in the arts to purified bees'-wax. On extraordinary occasions the Chinese employ it for candles and tapers. It has been supposed to be identical with the white lac of Madras; but as the Indian article has been found useless in the manufacture of candles*, it cannot be the same; it far excels also the vegetable wax (*Myrica cerifera*) of the United States.

* Dr. Pearson's Philosophical Transactions, vol. xxi.

Is this substance a secretion? There are Chinese who regard it as such, some representing it to be the saliva and others the excrement of the insect. European writers take nearly the same view, but the best authorities expressly say that this opinion is incorrect, and that the animal is changed into wax. I am inclined to believe that the insect undergoes what may be styled a ceraceous degeneration, its whole body being permeated by the peculiar produce in the same manner as the *Coccus cacti* is by *carmine*.

Its cost at Ningpo varies from 22 to 33 cents per pound.

The annual produce of this humble creature in China cannot be far from 400,000 pounds, worth more than $100,000.—*Silliman's American Journal*, July 1851.

Ningpo, August 1850.

NYMPHÆA ALBA VAR. MAJOR.

Botanic Gardens, Regent's Park, July 21, 1852.

Dear Sir,—A white Water Lily, found growing somewhere not far from London, has been brought to me as a new species. I have doubts about its being any more than a large variety of the *Nymphæa alba*, but I inclose you a description of it, which, if you think it worth while to draw the attention of botanists towards it at this season, you will oblige me by inserting in the 'Annals and Mag. of Nat. Hist.'

It was brought to me quite fresh by Mr. Rich. About a month ago the flowers were imperfect and small, some having five sepals to the calyx, and being more or less irregular; but a perfect one brought on the 17th was at least 7 inches in diameter, and Mr. Rich has had larger.

I remain, dear Sir, yours truly,

Wm. Francis, Esq. J. De C. Sowerby.

Nymphæa alba var.? *major*.

Flower large, all its parts more elongated than in the ordinary form of *N. alba*. The disk of the stigma very concave; the appendages of the radii cylindrical, three times as long as wide. Petaloid stamens broad-lanceolate, attenuated towards the apex, much longer than the next row of stamens. Anther-cells diverging at the base. Petals numerous, rather pointed, the innermost longer than the stamens. Sepals of the calyx ovate-elongated. Leaf broad ovate, narrowed towards the point. Ribs or primary veins ten on each side of the central one; on the back of the leaf they are narrow, raised and rigid; the secondary veins also are *raised* and firm. In other points it agrees with the ordinary *N. alba*: they both grow in the same piece of water.

In the common *N. alba* the disk of the stigma is nearly flat; the appendages to its radii are ovate, only one and a half times as long as wide. The petaloid stamens are ovate-lanceolate, the same length as the next stamens, with the anther-cells parallel. The inner petals are shorter than the stamens, ovate and obtuse. The sepals oval, pointed. The leaves broad oval, not narrowed towards the emarginate apex; the primary veins nine on each side the central one; on the back of the leaf convex, soft; secondary veins *concave* on both sides.—J. De C. S.

ON THE STRUCTURE OF THE BELEMNITE.

To the Editors of the Annals of Natural History.

Gentlemen,—When a disputant affirms a statement 'most emphatically,' it may be suspected that the emphasis is added to supply the want of inherent truth. This is the case with Dr. Mantell when he so affirms that the "phragmocone is common to numerous genera of Cephalopods,"—a statement which is made to appear true only by attaching to the term 'phragmocone' a meaning peculiar to the asserter. A 'conical chambered siphunculated shell' is no doubt common to numerous genera of Cephalopods: before Owen's anatomy of the *Nautilus, Belemnites,* and *Spirula,* it was deemed to characterize all that section of the class which Cuvier grouped together under the wide Linnæan term of *Nautilus,* and with which the "*Siphonifera*" of Férussac and D'Orbigny is synonymous. The term 'phragmocone' was first proposed by Professor Owen, and applied by him to a particular modification of the 'conical chambered siphunculated shell'; to that viz. in which the cone is short and straight, the chambers very shallow, and rapidly enlarging, uniformly concave towards the outlet, with the siphuncle marginal and ventral, and the whole invested by a partly horny, partly calcareous layer continuous with the sheath protecting the more advanced parts of the Belemnite (Phil. Trans. 1844, pp. 68, 69). This modification of the 'conical chambered siphunculated shell' is common to all the subgenera into which the '*Belemnites*' of Cuvier have since been divided, and it is 'peculiar' to them.

The most variable and therefore least important part of their complex shell is the 'dart,' 'guard,' or 'osselet'; its different forms and proportions afford, indeed, the characters of most of the species, and in the *Bel. brevissima,* Duv., *e. g.,* it is reduced to the size of the similarly solid calcareous terminal mucro of the shell of *Beloptera, Sepia,* &c., to which, according to Cuvier, Buckland, and other eminent naturalists, it is answerable. So much, therefore, for Dr. Mantell's other affirmation that the part which he chooses to call 'osselet' is the essential part or character of the Belemnite. I shall not trespass on your space by any notice of Dr. Mantell's views of the value of Professor Owen's researches on the extinct Cephalopods possessing the 'phragmacone,' or of my own opinion of the influence of the Professor's works in general on the progress of Comparative Anatomy: and I limit myself to a single sample of the nature of the discoveries to which Dr. Mantell vaunts his peculiar claims. The part, *e. g.,* which he calls the capsule or sheath is the part so called by Buckland, together with other parts subsequently pointed out by Owen. The author of the 6th Bridgewater Treatise (p. 372) describes—"A conical thin horny *sheath,* or cup, commencing from the base of the hollow cone of the fibro-calcareous sheath, and enlarging rapidly as it extends outwards to a considerable distance. This horny cup formed the anterior chamber of the Belemnite, and contained the ink-bag and some of the viscera." Owen subsequently traced a similarly organized membrane continued backwards from the margin of the alveolus, where Buckland's 'capsule' commences, "to line the alveolar cavity of the spathose guard," and to cover the exterior surface of the guard itself; the first description of which latter structure we find in the following words of his memoir, 'Phil. Trans.' 1844, p. 69:—"The exterior surface of the spathose guard of the *Belemnites* of the Oxford clay, though smoother than in some other species, is minutely granular, and occasionally presents faint traces of vascular impressions, proving it to have been invested by an organized membrane of the living Cephalopods." With his usual cautious exactitude he forbears to extend to this investing organized membrane the term 'capsule,' which his predecessor had correctly restricted to that part which, so far as it truly performs the function of a capsule, commences, as Dr. Buckland describes, where the fibro-calcareous sheath terminates. Every fact has its value; but this varies indefinitely, and does not become greater, when, by an abuse of terms, a small particular is laid claim to by a self-asserted discoverer.

I am, Gentlemen, your obedient servant,

THE QUARTERLY REVIEWER.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1852.

Chiswick.—June 1. Clear and fine. 2. Cloudy: fine: rain. 3. Cloudy. 4. Overcast: fine: clear. 5. Very fine: slight rain. 6. Rain: clear at night. 7. Constant rain. 8. Thick whitish haze: low fog in the evening: heavy rain. 9. Excessively heavy rain throughout. 10. Rain: cloudy: clear. 11. Overcast. 12. Slight rain: overcast. 13. Fine: rain at night. 14. Showery. 15. Fine: showery: clear. 16. Rain: uniformly overcast. 17. Cloudy throughout. 18. Rain: showery: heavy rain. 19. Heavy clouds: clear and fine. 20. Overcast: rain. 21. Rain: cloudy. 22—24. Fine. 25. Uniformly overcast: fine: rain at night. 26. Rain: heavy showers. 27. Overcast: heavy showers. 28. Fine: densely overcast. 29. Overcast: cloudy: clear. 30. Fine: rather windy: clear at night.—More rain fell on the 7th, 8th, and 9th, than on any three consecutive days for at least twenty-six years near London.

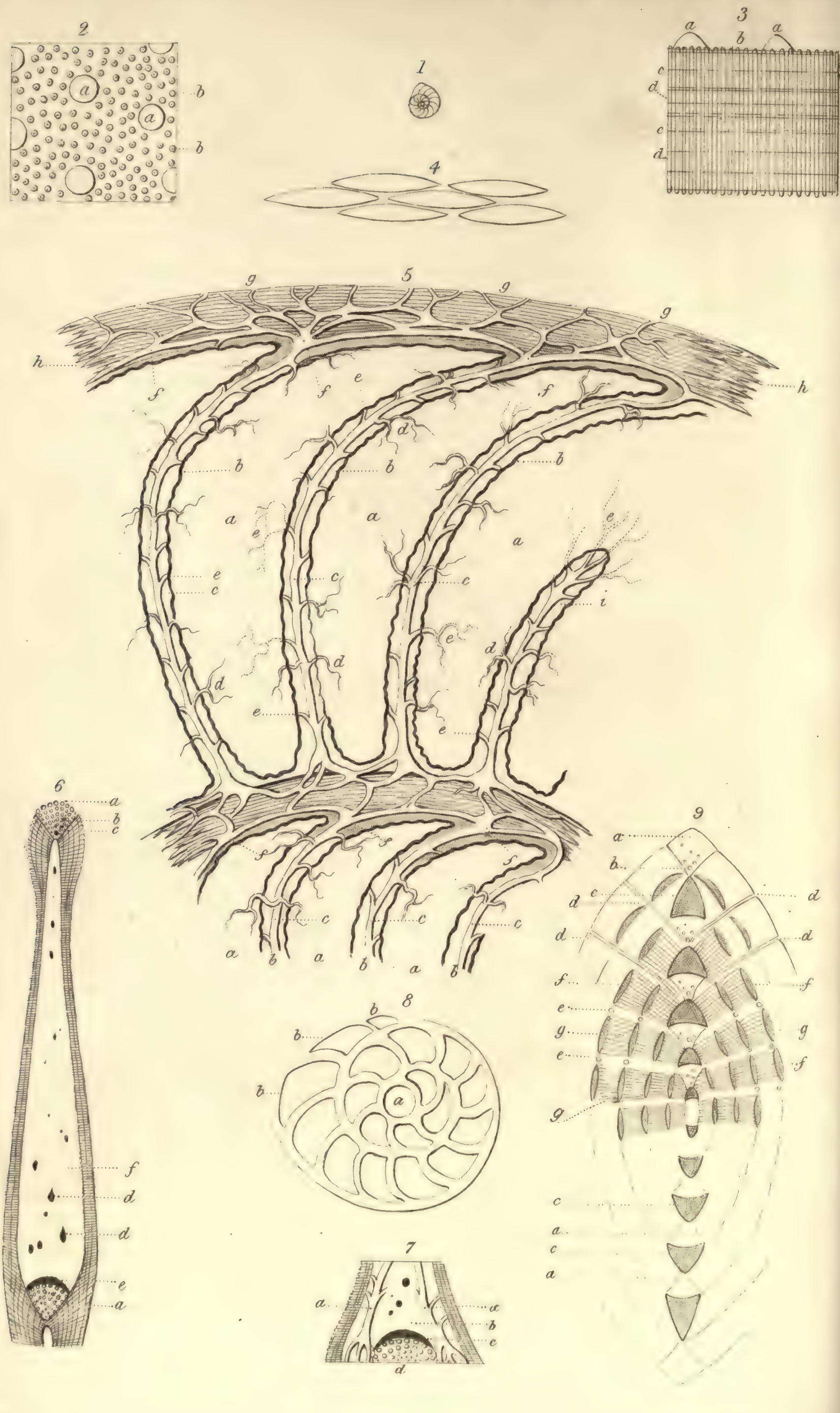
Mean temperature of the month	58°·01
Mean temperature of June 1851	59 ·21
Mean temperature of June for the last twenty-six years ...	60 ·61
Average amount of rain in June	1·77 inch.

Boston.—June 1. Fine. 2. Fine: rain P.M. 3. Cloudy: rain A.M. 4. Fine rain A.M. 5. Fine. 6. Rain: rain A.M. 7, 8. Cloudy. 9. Cloudy: rain A.M: 10, 11. Cloudy: rain A.M. and P.M. 12. Cloudy: rain A.M. 13. Cloudy: rain P.M. 14, 15. Cloudy: rain A.M. and P.M. 16. Rain: rain A.M. and P.M. 17. Fine. rain A.M. and P.M. 18, 19. Cloudy: rain A.M. 20. Cloudy: rain P.M. 21. Rain: rain A.M. 22. Cloudy: rain A.M. and P.M. 23—25. Fine. 26. Cloudy: rain A.M.: 27. Cloudy. 28. Cloudy: rain P.M. 29, 30. Cloudy.

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

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

Days of Month.	Barometer.					Thermometer.					Wind.			Rain.		
	Chiswick.		Boston.	Orkney, Sandwick.		Chiswick.		Boston.	Orkney, Sandwick.		Chiswick.	Boston.	Orkney, Sandwick.	Chiswick.	Boston.	Orkney, Sandwick.
1852. June.	Max.	Min.	8¾ a.m.	9¼ a.m.	8½ p.m.	Max.	Min.	8¾ a.m.	9¼ a.m.	8½ p.m.	1 p.m.					
1.	29·889	29·849	29·40	29·64	29·65	66	48	52·5	47	46	w.	w.	e.	·07	....	·16
○ 2.	29·866	29·791	29·35	29·63	29·63	63	50	60	57	48½	sw.	s.	e.	·09	....	·18
3.	29·838	29·709	29·16	29·54	29·46	65	41	62	51	49½	sw.	ssw.	se.	·03	·40	·48
4.	29·901	29·716	29·26	29·66	29·78	70	43	57·5	54	54	sw.	ssw.	se.	·02	·01	·12
5.	29·970	29·873	29·46	29·87	29·96	69	54	57·5	56	57	s.	e.	se.	·03	....	....
6.	29·839	29·678	29·27	29·96	29·94	71	52	61·5	56	51	sw.	se.	ese.	·03	·32	....
7.	29·579	29·539	29·13	29·96	30·01	62	51	67	55½	55	se.	e.	ese.	·41	....	....
8.	29·617	29·580	29·13	30·01	29·98	69	51	66	60	55½	sw.	calm	e.	·45	....	....
☾ 9.	29·570	29·518	29·10	29·91	29·77	61	51	59	54	50	sw.	n.	n.	1·48	·12	....
10.	29·548	29·539	29·05	29·64	29·57	59	42	51	50	49½	nw.	n.	n.	·18	·15	·04
11.	29·598	29·490	28·96	29·54	29·59	57	40	49·5	53½	51	w.	wnw.	nnw.	·01	·35	....
12.	29·738	29·589	29·17	29·64	29·63	61	42	47·5	53	50	nw.	n.	w.	·02	·13	....
13.	29·719	29·476	29·20	29·52	29·40	65	48	46·5	53½	52	w.	wnw.	ese.	·28	....	....
14.	29·374	29·214	28·73	29·33	29·42	67	46	60	54	53	w.	wnw.	e.	·13	·12	·07
15.	29·570	29·477	28·99	29·52	29·56	67	44	60	55½	53	w.	w.	ese.	·16	·35	....
16.	29·415	29·384	28·94	29·50	29·41	68	50	57·5	58	55	sw.	se.	e.	·20	·12	....
● 17.	29·490	29·437	29·00	29·41	29·50	67	50	60	59	55	s.	s.	ese.	·09	·07	....
18.	29·576	29·538	29·08	29·61	29·70	66	52	63	60	56	s.	s.	e.	·30	·13	....
19.	29·750	29·578	29·14	29·76	29·80	69	49	67	63	56	sw.	s.	e.	·12	·09	....
20.	29·780	29·577	29·30	29·69	29·58	69	56	61	59	55	s.	s.	w.	·05	·36	....
21.	29·622	29·541	29·12	29·48	29·46	68	46	65	63	56	sw.	ssw.	ese.	·02	·09	·07
22.	29·745	29·628	29·14	29·26	29·28	68	51	62	58½	53	sw.	ssw.	sse.	....	·14	·09
23.	29·849	29·717	29·23	29·36	29·53	72	47	59	57	53	sw.	ssw.	sw.	....	....	·65
☽ 24.	30·075	29·986	29·46	29·70	29·82	76	44	63	57½	58	w.	w.	se.	·01	....	·22
25.	30·048	29·904	29·54	29·85	29·75	74	57	61	60	55½	s.	s.	se.	·32	....	·04
26.	29·814	29·708	29·25	29·62	29·62	71	52	63·5	61	56	sw.	ssw.	se.	·12	....	·02
27.	29·824	29·760	29·30	29·67	29·65	71	51	66	60	56½	sw.	ssw.	ese.	·04	·17	·22
28.	29·786	29·761	29·24	29·56	29·59	68	56	63	62	56	sw.	s.	w.	·03	....	·03
29.	29·787	29·715	29·23	29·52	29·33	67	53	67	62	59	sw.	sw.	ese.	....	·27	....
30.	29·937	29·844	29·20	29·28	29·41	71	47	64	58½	56½	sw.	w.	w.	....	....	·66
Mean.	29·737	29·637	29·18	29·621	29·622	67·23	48·80	60·0	56·95	53·71				4·69	3·39	3·05



H.I.C. del. *J.De C. Sowerby sc.t*

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XV.—*On the Form and Structure of the Shell of* Operculina Arabica. By H. J. Carter, Esq., Assistant Surgeon, Bombay Establishment.

[With a Plate.]

The interest which attaches to the forms and structure of Foraminifera is naturally very great, for no one can have seen their beautiful little shells and the extensive tracts in the Nummulitic series, which are almost entirely composed of their remains, without wishing to know something of the animals by which they were constructed.

Fortunately many are now living to help us out in this respect, and although for the most part very small, yet, here and there are found some sufficiently large, as will hereafter be seen, to afford us almost all the information we could expect to obtain, were the fossil species even living, in their largest forms.

In the month of June 1847, I communicated a paper to the Bombay Branch of the Royal Asiatic Society, containing, among other observations, a summary up to that time of all that was known of the structure of Foraminifera; and by way of introduction, as well as for the purpose of rendering this paper more complete and more useful, I will here insert the latter, adding what has been done since, and then a description of the form and structure of the shell of *Operculina Arabica*, which will, I think, elucidate all that has hitherto been stated of, and leave little to be added to, the general structure of Foraminiferous shells, both recent and fossil.

"For ten years after D'Orbigny gave his description of the animal of Foraminifera, no one appears to have taken much trouble to question its accuracy, until Dujardin took up the subject in 1835, while residing at Toulon (where he had ample opportunities of testing the truth of D'Orbigny's imaginary discovery), and after having carried on his researches most perseveringly for some time, at length came to the conclusion, communicated to the Académie Royale des Sciences of Paris in the month of June of the year mentioned, that the Foraminifera were not Mollusca, nor did they belong to any of the established classes.

"In describing their organization, Dujardin stated that all their chambers were occupied by a red or orange coloured animal matter, highly contractile, and possessed of the consistence of mucus; that this was susceptible of extending itself into threads which were filled with irregular granulations, but without the presence of any organs. On carefully observing these animals in their living state, he had seen, with a high magnifying power, in *Miliola* a soft mass projecting from its aperture (analogous to the substance of the interior) which slowly underwent a change of form, and from which a tuft of minute filaments radiated from a common centre of attachment; these filaments prolonged themselves in ramifications to five times the diameter of the specimen (*Miliola*) from which they proceeded, and at length became of such extreme tenuity, as to be followed only by changing the direction of the rays of light. Further, he observed in these filaments a movement of *reptation*, by which the animal advanced from 5 to 6 millimetres per hour. The filaments appeared to be composed of a primitive animal matter, which extended itself forward in the manner of roots; hence the name *Rhizopoda* which Dujardin proposed for these animals. In *Miliola* and *Gromia* these filaments came from their aperture; in *Crestellaria* from the last chamber, and in *Vorticialia* from different pores of the disk.

"As to their manner of reproduction, Dujardin had noticed during the previous year, that in *Troncatulina*, the animal matter was grouped together in certain cases in globular masses, as the green matter of *Zygnema*.

"Finally, in concluding his communication he states, 'We see that it is impossible to keep these animals among the microscopic Cephalopoda: what rank shall be assigned to them?'*

"The discovery then of the animal of Foraminifera appears to be due to Dujardin.

"In November 1835, he exhibited at Paris several living specimens of *Vorticialia* and his genus *Gromia*†, and during that winter continued his researches into their organization with a

* Acad. Roy. des Sc. séance Juin 22, 1835.
† *Ibid.* séance Nov. 15, 1835.

view to establishing the relation that might exist between them and Infusoria.

"In comparing them with Infusoria, he states, in a note addressed to the Académie Royale des Sciences of Paris *, 'I have always been guided by an idea suggested by Bory St. Vincent, who, after having seen the living *Rhizopoda*, was struck with the great analogy which existed between the filamentous prolongations of these animals and the expansions of the *Amœba* or *Proteus*, and directed my attention to the point.'

"Lastly, Dujardin exhibited before the Acad. Roy. des Sc. at Paris in 1836 † some animalcules, called by Ehrenberg *Arcella aculeata*, but which Dujardin regarded as freshwater Foraminifera, and through these he imagined the series to be continued from the *Amœba* to *Miliola*,—that is, through *Difflugia*, a species of *Amœba*, to *Arcella*, from the latter to *Gromia*, and from *Gromia* to *Crestellaria*, and thence to *Miliola*.

"After Dujardin, Ehrenberg took up the subject, and the result of his researches is as opposed to D'Orbigny's description as it is confirmatory of Dujardin's observations.

"In a memoir read at the Royal Academy of Sciences at Berlin in 1838 ‡, Ehrenberg stated that the Foraminiferous shells were inhabited by elegant little bodies which played an important part in nature, and the fossilized remains of which might frequently be found to number more than a million in a cubic inch of chalk; also, that after a series of observations made on recent species both living and dead in the Red Sea and elsewhere, he had come to the conclusion that their place in the animal kingdom should be among the Bryozoa.

"In the month of October 1839 §, Ehrenberg also exhibited living specimens of these animals to the Academy at Berlin, [two] which were taken at Cuxhaven, and in January 1840 he exhibited ten other species of these animals ||, at the same time communicating the following observations on their organization :—

"'The first and largest cell of these animals, sometimes also the second, and occasionally as far back as the fourth, contain only the transparent part of the animal; beyond this, the cells are filled with two large organs differently coloured. One and the principal is an alimentary canal, thick, gray, greenish, which, like the whole of the body, is articulated; this extends itself from chamber to chamber, and its divisions are united by an

* Séance Fev. 1, 1836. † Séance Juin 11, 1836.

‡ *Ibid.* séance de 16 Janvier 1840. L'Institut, No. 350, Sept. 1840, p. 309.

§ Acad. Roy. des Sc. Berlin, séance de 16 Janvier 1840. Vide l'Institut, No. 350, Sept. 1840, p. 309.

|| *Ibid.* [and Taylor's Scientific Memoirs, vol. iii. p. 342.]

œsophagus or siphon. When the shell is removed by acid, the siliceous carapaces of Infusoria which the animal has swallowed may be observed (in *Nonionina* and *Geoponus*) as far back even as the last articulation of the alimentary canal. The structure of this canal is not polygastric but simple; expanded in the articulations, and possessed of a single aperture which is situated anteriorly. In *Nonionina* the articulations are distinct and connected by one siphon; in *Geoponus* they are multiple, and each set connected by its proper siphon.'

"Independently of the alimentary canal, a horny brown yellowish mass is seen in every articulation of the spire, the first excepted: this, which is granular, Ehrenberg considers to be the ovary.

"In searching for a purely negative character, Ehrenberg states that it consists in the want of pulsatory vessels; that while he has always recognized pulsations in the Mollusca and the smallest aggregated or compound Ascidia, he could never do so in *Nonionina* and *Geoponus*, the two species of Polythalamia (Foraminifera) which he more particularly examined*."—*Journ. Bombay Br. As. Soc.* vol. iii. pt. 1. p. 158.

This is all that had been discovered up to the time of my compiling this paper. I had seen the filamentous prolongations myself, and, on dissolving off the shell of a species of *Robulina* (D'Orbigny), had found a brown mass occupying the chambers (as it then appeared to me) in loops, in the largest or last formed ones, and diminishing posteriorly; it was also constricted at each end of the loop by the narrow aperture in the septum, and thus beaded, as it were, posteriorly, where there were no longer any loops, but a simple dilatation of the substance of each chamber. I will not now vouch for the complete accuracy of these observations, for they were made on board ship, with a simple lens and under considerable disadvantages; and other people have not since described the internal substance of the chambers as occurring in loops, nor have I since seen it in this form myself.

About the time I wrote this paper, MM. Joly and Leymerie were engaged in the microscopical examination of Nummulites, and the results of their investigations were made known through the 'Comptes Rendus' on the 24th Oct. 1847. Meanwhile too, Dr. Carpenter examined the fossilized remains of Foraminifera generally, and his communication on the subject was read before the Geological Society of London, 2nd May 1849, together with some extracts from Mr. Williamson's description of the animal and shell of *Polystomella crispa* (Trans. Microscop. Soc. vol. ii.

* Acad. Roy. des Sc. Berlin, séance de 16 Janvier 1840, and Scientific Memoirs, Parts X. and XI.

p. 159), which I shall here insert, with Dr. Carpenter's remarks, as the whole appears in the 'Quart. Journ. Geol. Soc.' vol. vi. pt. 1. p. 28, for I have not Mr. Williamson's paper to refer to:—

"Of the contained animal itself, which he obtained by dissolving away the calcareous matter of the shell with dilute acid, Mr. Williamson says, that it consisted 'of a very thin external membrane filled with gelatinous matter.' 'No trace of minute internal organization, such as a specially located intestinal canal, or ovaries, could be detected by Mr. Williamson; nor was he able in any instance 'to discover with certainty the presence of any foreign bodies in their interior.' The several segments are described by him as connected by a series of prolongations, which pass through the septa near their inner margins. The segments at first formed have only single connecting necks; but the number of these soon increases, and the outer segments are connected by ten or more such necks, which pass through as many distinct orifices in the septa. If all these orifices were brought together on the central plane, so as to coalesce into one, they would exactly correspond with the single perforations in the septa of Nummulites. The animal of *Polystomella* is considered by Mr. Williamson to derive its nutriment from pseudopodia, which are projected through numerous minute apertures over the whole surface of the shell. He has not clearly traced these pseudopodia, however, into connection with the segments occupying the interior whorls, which, like those of Nummulites, are invested by those of later formation; but he mentions (as Ehrenberg had done) that near the umbilicus they are projected in fasciculi; and he states that the surface of the central calcareous nucleus (which is formed by a thickening of the walls of the smallest cells) is pitted by small but deep depressions, which may be designed to facilitate the exit of the pseudopodia from the innermost convolutions. Mr. Williamson goes on to point out, that to these pseudopodia must be attributed the deposition of new matter upon that portion of the central nucleus which is not covered by the investing whorls; and in this view he is in accordance with M. D'Orbigny, who, in his recent work, 'Sur les Foraminifères Fossiles du Bassin Tertiaire de Vienne,' fully recognizes the power of the pseudopodia to secrete the calcareous covering. I may remark, that I cannot see how the investing layers covering the disk of *Nummulites complanata*, and the other species of the same group, can be formed in any other way; since in these the chambers are only marginal, the segments of the animal not extending over the disk; and we have no reason to believe in the existence of any external mantle, spreading over the whole surface, whereby these investing layers could be formed."

We now come to the structure of the shells, to which, of all others, both in description and illustrations, Dr. Carpenter appears to me to have contributed most.

MM. Joly and Leymerie seem to have gone no further, than to have shown, that in fossil Nummulites exist hemispherical granulations or little circular depressions, corresponding to granulations both on the external and internal surface of the shell, and that these are nothing more than perforations with which the shell was pierced during the existence of the animal. Also, that there existed a semilunar hole in each septum arching over the margin of the preceding whorl, and that the rest of the partition was imperforate. (Mém. sur les Nummulites, Sect. B. p. 20.)

Dr. Carpenter, however, whose investigations were carried on independently of those of MM. Joly and Leymerie, has gone much further than this, and therefore it will be as well to give a short summary of all that he has observed.

Commencing with the septa, he states (*loc. cit.*) that each consists of two layers, by which every chamber has its own proper wall, and that the intervening portion, which he terms the "*interseptal space*," "must have been vacant in the recent shell, unless occupied by the soft parts of the animal itself;"—"that each septum is perforated by an aperture, close to its junction with the margin of the preceding whorl" (as he believes was first observed by D'Orbigny, and figured first by Mr. Sowerby); and, "that these perforations pass through *both* layers of each septum, so as to establish a free communication between one chamber and another." That this case is different, however, "with regard to certain more minute apertures, which may be seen by a careful examination, under a sufficient magnifying power, to exist on the surface of every septum, though not consistent either in number or position;" "they penetrate that layer only of the septum on whose surface they open," "and establish a communication between each chamber and the adjoining interseptal spaces." "Other apertures of the same kind may be generally traced, on careful examination, in the walls of the chambers that form the surface of the whorl; and these too appear to communicate with the interseptal spaces by channels burrowed into those walls."

"Thus the cavity of each chamber communicates with that of the one before and behind it in the same whorl, by the large aperture first mentioned, which frequently appears as if made up by the coalescence of a number of smaller perforations (fig. 7 *b*), suggesting the idea that the animal substance which originally passed through it was not a single large canal, but was composed of a bundle of minute tubes or threads. This idea is confirmed by the circumstance, that the outer margin of the included whorl (fig. 7 *c*) frequently presents a series of furrows, corresponding to the notches at the inner edge of the septum (*b*). Each cavity also communicates freely with the interseptal spaces on either side by the smaller apertures and passages last described; and from this space, as we shall presently see, there was a free passage to the external surface of the shell.

"The texture of the shell itself differs remarkably from that of any of the Mollusca with which I am acquainted, approaching that which I have described in the common Crab (Reports of the British Association, 1847, p. 129). It is everywhere perforated by a series of tubes of extreme minuteness which pass directly from one surface to another, their openings being plainly visible on each (fig. 16). The diameter of these tubes is about 1–7500th of an inch, and their distance from each other about 1–15,000th. In a thin vertical section of the shell (fig. 15) they are seen to run parallel to each other, and to be free from sinuosities or interruptions. The whole of this portion of the shell, therefore, is minutely porous. The structure in question can be seldom clearly distinguished in those Nummulites which have had their texture altered by calcareous or siliceous infiltration; but as the appearances which these present correspond closely with those exhibited by specimens of *N. lævigata* which have been subjected to the same change, I have no doubt that the tubular structure in question is common to the whole group."

"All the Nummulites which I have examined present a remarkable departure from this structure in that portion of the shell which forms the margin of each whorl. Here, instead of an assemblage of minute, closely-set, parallel tubuli, we have a much coarser arrangement, the solid substance being perforated with a smaller number of tubes of two or three times the diameter of those last mentioned, which pass in a radiating manner from the inner to the outer surface. Some indications of this difference are seen in fig. 4; but it is much more clearly displayed at *b*, *b*, fig. 15, which represents a portion of a very thin section taken in the same direction, and viewed by transmitted light. The openings of these tubes on the outer margin of the whorl are not readily discernible, partly in consequence of the somewhat oblique direction of the orifices, and partly through these being usually covered with a calcareous incrustation. When this has been removed by the application of dilute acid they are easily seen when properly looked for, as was first pointed out to me by Mr. J. Morris."

Lastly, Dr. Carpenter has observed, in addition to the tubes which run from the punctations on the surface into the chambers of the Nummulite, another "series of perforations of considerable size, which pass directly downwards from the exterior, through the superposed investing layers of the successive whorls, however numerous, until they reach the floor and chambers of the central plane, which they do *not* penetrate." These, he feels satisfied, "always terminate *over the septa,* and actually pass into the *interseptal* spaces."

Now let us see how far these statements are confirmed by the structure of the shells of *Operculina Arabica,* which were obtained in the following way:—

While medical officer on the survey of the south-east coast of Arabia, I observed that Foraminifera were frequently brought up on the grease of the ship's sounding-lead, and after this I obtained the loan of a lead which I used to cast for this particular purpose myself. They were found to be most numerous in about 10 to 20 fathoms of water, rather in sandy than in muddy bottoms, scanty in deep water, and never (by the lead) among rocks and coral-ground. In one bed passed over, which was several miles in diameter, in about 20 fathoms of water, and about six miles off shore, the grease of the sounding-lead came up covered with them at each throw; they were the largest living specimens I have ever seen, and principally consisted of the genus *Operculina* (D'Orbig.), *Discorbis* (Lam.). Most measured from 2 to 3–12ths of an inch in horizontal diameter, and one or two 3–10ths. Some contained animals, and others were empty; the latter were readily distinguished from the former by their pearly whiteness; while those which contained animals were invariably covered with a thin greenish cuticle like the deciduous epidermis of shells generally.

The following is a description of this *Operculina,* which, as it is most probably a new species, I have designated by the specific name of "*Arabica.*"

Operculina Arabica (H. J. C.).

Description. Free, equilateral, oval or discoidal, thin, flat or wavy; formed of one spire increasing gradually, not embracing; regular, equally apparent on both sides; consisting of 3–4 whorls, contiguous, enlarged on the outer border. Chambers numerous, 1–75, narrow, apparent on both sides, increasing gradually in length and breadth from a semitransparent, prominent, central cell; radiating, reflected in their outer third to a point, particularly in the last-formed whorl; divided by semitransparent septa, and covered externally with a green substance like the epidermis of shells generally.

Intercameral communications numerous in the septa of the last-formed whorl, the largest long, narrow and crescentic, arching over the margin of the preceding whorl.

Dimensions.—1–6th of an inch in horizontal, and 1–96th in vertical diameter; widest part of last whorl 1–24th of an inch (Pl. IV. fig. 1).

Observations.—This description is chiefly taken from one of the largest and most regularly formed shells I possess. They are by no means always plane, but, on the contrary, frequently wavy, like Nummulites; and the chambers sometimes increase in size more rapidly than at others, causing the shell to assume a more or less elongated or oval form; the chambers are also sometimes broader, sometimes narrower; and occasionally a septum only extends part of the way out towards the margin of the whorl, when it suddenly bends backwards to meet the preceding one, or it may stop short altogether, and then the chamber behind and before it coalesce at their outer parts. Irregularities of this kind in the formation of the chambers of Foraminifera are not at all uncommon, and apparently so usual in *Nummulites lævigata,* that they would seem to constitute a character. The imperfectly developed chamber extending from the margin of the foregoing whorl outwards instead of in the opposite direction, seems to point out the course in which the chambers are formed; and if each chamber is to be regarded only as the full development of a single animal, the imperfect one must be considered as an abortion, and those which have coalesced as a monstrosity. Most frequently there is here and there a large opening in the shell, over one or more of the chambers, which leads into the latter; they are more or less round, larger or smaller, and the smoothness of their margin would seem to indicate that they had been formed by the animal itself, if not by some other animal.

Microscopic Examination.—The chambers of the shell, after the green cuticular substance has been removed, are found to be covered externally with large and small papillæ; the former 1–2150th, the latter 1–8600th of an inch in diameter (fig. 2). The former also are about twice their own breadth apart, and the latter occupy the intervals between them; both are confined to the areæ over the chambers; they do not appear over the septa nor on the margin of the shell. The large papillæ appear to be imperforate, while the small ones appear to present each a puncture in the centre. The septal spaces, as well as the central cell, are semitransparent, and the former have a single, beaded line of semitransparent papillæ along their course.

The internal surface of the chambers merely presents the small papillæ with their puncta; there are no large papillæ on it, and their cavities are otherwise complete, with the exception of the channels of intercameral communication, and some minute vascular apertures which will be presently mentioned.

The septa (fig. 5 *b, b*) occupy, transversely, about 1–6th of the breadth of the chambers, and each septum incloses within its walls two calcareous tubes or vessels, one on each side, some little distance below the contiguous surface of the shell (fig. 7 *a, a*); these we shall call *interseptal vessels*. They are irregular both in their size and course, though generally about 1–1900th of an inch in diameter, in the last-formed septa of a shell having the dimensions of the one described, and diminish in calibre backwards or towards the first-formed whorls. Each vessel commences in the centre of an intricate network of smaller ones, spread over its own side of the margin of the preceding whorl, and under the layers of the shell (*f, f, f*); these networks, which are joined together, we shall call the *marginal plexus*. In its course each interseptal vessel gives off two sets of *ramusculi*, and the marginal plexus one set. Of those coming from the interseptal vessel, one set terminates on the surface of the shell, particularly about the borders of the septum (*d, d*); the other goes into the walls of the shell, and through the septum, to open probably on the inner surface of the chamber (*e, e, e*); while the set from the marginal plexus opens on the margin (*g, g, g*). As this vascular system appears to extend throughout every part of the shell, and must be for the circulation of some fluid, we will call it the *interseptal circulation*. It would have been more proper to have commenced with the *ramusculi*, as we shall see hereafter that they appear to absorb the fluid which is subsequently transmitted into the larger vessels, but at this period of our description it would not have been so intelligible.

We have now to examine the internal structure of the shell, and commencing with that part forming the walls of the chambers, we observe, that it is pierced by innumerable tubes, which pass directly downwards from the small papillæ on the external, to the small papillæ on the internal, surface of the chambers (fig. 3 *d, d*). I could see no tubes passing down from the large papillæ, which I have before stated to appear imperforate, like those over the septal spaces. These tubes are about 1–9000th of an inch in diameter, and about the same distance apart; they are vertical over the centre of the area of the chamber, and slope outwards at its boundaries, but do not pass through or extend over the margin of the shell, neither over the septal spaces, nor over the central cell; hence the semitransparency of the two latter, and the fringy, beaded appearance which the tubes present at these parts, particularly around the central cell, where they assume the form of rays.

Besides these tubes, a vertical section of the shell presents a series of horizontal lines 7–8 or more in number, parallel to each other, but not equidistant (fig. 3 *c, c*); these appear to be the lines of contact of the layers of which the shell is composed.

Lastly we come to the margin, which exhibits a very curious and interesting structure. It is almost entirely composed of calcareous *spicula,* arranged parallel to, but overlapping each other (fig. 4). These spicula are 1–237th inch long, and 1–900th of an inch broad, transparent, apparently hollow, and pointed at each extremity; they appear to be straight, although from their position one would be inclined to think that they must be a little curved. When a transverse section is made of the margin, we observe that it consists of upwards of 100 of these spicula, which form a triangular bundle or cord (fig. 6 *a*), the apex of which is directed inwards or towards the chambers, and the base (*a*) outwards to form the free, rounded margin of the shell; while its sides are overlapped by an extension of the walls of the chambers, which open as it were to receive it. Its base presents a regularly wavy outline (when viewed in the transverse section) from the longitudinal arrangement of the spicula, which do not appear to be covered by a layer of the shell; and parallel to its sides run the papillary tubes of the chambers (*b*), becoming more vertical as they increase in distance from this position; while towards its apex appear the divided large vessels of the marginal plexus (*c*). In the transverse section also, when reduced to a thin layer, transparent intervals appear in the form of zigzag lines radiating from the apex to the circumference of the cord, which would seem to indicate that the spicula were arranged in it in more or less horizontal planes, dipping towards the apex.

It will naturally now be asked, how this spicular cord (fig. 5 *h, h*), which commences with the first cell, terminates; but I regret that there is not a single specimen in my possession to afford the information. This arises probably from the extreme thinness of the last-formed chamber; for with the two or three preceding ones, it is almost always broken or absent. All I can state in connection with this is, that there are always more or less vessels of the marginal plexus cut through or broken in a transverse section or fracture of the spicular cord, and frequently a large one close to its apex, which, after the shell has been filled with a solution of carmine and then laid in pure water, purges it almost completely from the colouring matter with which it had been filled;—a broken interseptal vessel will also do this. Hence it is not impossible, that a natural opening of the kind may exist at the termination of the spicular cord, for this purpose; but, then, it has nothing to do with the spicular cord itself, of the natural termination and uses of which I am equally ignorant. It should here also be mentioned, that when a thoroughly empty shell, which may be known by its pearly whiteness, is gently laid on the surface of a solution of carmine, so as to float there, the latter is seen, first to colour the margin, then the interseptal vessels become filled, and lastly the *walls* of the chambers; none of the semitransparent parts of the shell become coloured. This will take place sometimes in a few hours, but with some shells it requires a day or two for its completion. By keeping one side of the shell dry the air is enabled to pass out of it, while the solution enters the depending side, and in this way the whole of the hollow structure of the shell becomes coloured. When the shell is washed and dried in this state, the carmine is seen to be chiefly in the interseptal vessels, and this is perhaps the best way of tracing out the terminations, or rather origins, of the *ramusculi.* On the other hand, when the shell is placed in pure water and watched with a magnifying glass, a stream of carmine particles will be seen slowly issuing from the vessels of the marginal plexus, at the broken end of the spicular cord, or from any other part of the large whorls, where an interseptal vessel may have been broken; and after a time, according with that which the shell has taken to imbibe the colouring matter, it will become perfectly white again. Whether this be owing to the watery distension of the gummy fluid suspending the carmine, or a natural consequence of the structure of the shell itself, further observation must determine. The fact of the carmine accumulating at the orifices of the *ramusculi,* as it would in a filter, seems also, with what has just been stated, to point out the course of circulation in them; and if we may be allowed to carry out the analogy still further, which is now seen to exist so strikingly between Foraminifera and Porifera, we might compare the interseptal circulation in the former to the aqueous circulation in the latter, and thence might infer, that the water entered by the *ramusculi* or small pores, and came out by the larger ones, gathered together into one vessel, opening in its natural state at the end of the spicular cord; but, until a perfect specimen be obtained to determine this, all must of course remain conjectural.

Growth.—From what I have stated respecting the existence of a substance, resembling the cuticle of shells, over the external surface of *Operculina Arabica,* and the presence of innumerable puncta, which appear to be connected by tubular communications with the chambers beneath, it is not unreasonable to infer, that by this arrangement successive additions may be made to the external surface of the shell, and the laminated structure, which it presents on a vertical section, thus formed; while the addition of chambers would appear to commence from the opening in the septum close to the preceding whorl, and an interseptal vessel, arising as before described from its marginal plexus, to extend outwards, on either side, *pari passu* with the chambers to the circumference, which it may fall short of or not, as already stated. Again, it would appear that this addition does not take place singly, but that there are always two or more chambers (fig. 8 *b, b, b*) in process of formation, the last being the smallest, and that, one after another, they gradually reach the margin. I have come to this opinion, not from the recent specimens of *Operculina* in my possession, in which, as before stated, all the last-formed chambers are broken, but from having observed the ochraceous casts of microscopic nautiloid species of Foraminifera which have been fossilized, to present this form, when dissolved out from their matrix.

Analogy to Porifera.—When Dujardin, guided by the suggestion of Bory St. Vincent, was struck with the analogy which exists between the filamentous prolongations of Foraminifera and those of the *Amœba* or *Proteus,* he could have little thought, that however nearly the latter might be allied to the Sponges, the former would be found so similar to them in their compact structures. Who, indeed, looking at the nautiloid form of a foraminiferous shell and an amorphous piece of sponge, would say, that they bore the least resemblance to each other? Yet they are, as we have seen, most intimately allied, both in their fleshy and their compact structures. It must be now generally allowed, that the rhizopodous nature of Foraminifera is identical with that of the *Amœba* or *Proteus,* and through the latter with the sponge-cell; and in addition to this, we have the former, at least the genus *Operculina,* still more nearly allying Foraminifera to the Sponges, by possessing a spicular structure, if not a circulating system also, like that of sponges. It is curious too, that without any reference to the use of the pores in these two orders of animals, they should have received names of the same signification, as if the intimate relationship which is now found to exist between them was instinctively anticipated, before it was proved by demonstration. The genus of Porifera to which *Operculina* comes nearest is, of course, the calci-sponges, that called *Grantia,* after their distinguished discoverer Dr. Grant; and of this genus, it would seem to approach nearest to the tubular species, which have but one vent.

Structure of the Shell of Operculina compared with Nummulites.—It will be very gratifying to those whose investigations of the structure of Nummulites must have been attended with so much labour, difficulty and doubt, to see, how satisfactory the examination of a recent foraminiferous shell, so nearly allied to *Nummulites* as that of *Operculina,* confirms and elucidates their observations. The vertical tubes passing from the surface of the shell to the interior of the chambers (see Dr. Carpenter's illustrations, fig. 15, *loc. cit.*); the intercameral communication (*id.* fig. 7 *b*); the linear markings or grooves immediately under the latter (*id.* fig. 7 *c*), which appear to have been produced by the previous existence of a spicular cord in this position; and the radiating lines (*id.* fig. 15 *b, b*), caused by the arrangement of the spicula in horizontal layers inclined towards the apex of the cord, with the sloping papillary tubes on each side of it.—The "minute apertures" (*id.* fig. 7 *a*), which only penetrate *one* layer of the septum, and others which open on the internal surface of the walls, are probably the orifices of the *ramusculi* of the interseptal vessels which go in this direction.—And the "perforations of considerable size, which pass directly downwards from the exterior through the superposed investing layers of the successive whorls" "until they reach the floor of the chambers of the central plane which they do not penetrate" (*id.* fig. 8 *a*);—the vertical interseptal vessels, or an enlargement and union into one tube of the *ramusculi,* which pass upwards and downwards from the horizontal interseptal vessels as seen in *Operculina.*

The latter, that is, the union of the vertical with the horizontal interseptal vessels, I have been able to make out in some specimens of *Nummulites acuta,* Sow. (Geol. Trans. 2nd Ser. vol. v. pl. 24. fig. 15), which have had their cavities thoroughly infiltrated with ochraceous oxide of iron; as well as everything else mentioned by Dr. Carpenter; and with the exception of the spicula themselves, everything that I have seen in *Operculina.* MM. Joly and Leymerie seem to me to have described one thing and to have figured another. They describe the papillary tubes, and seem, from the distance between them, to figure the orifices of the vertical interseptal vessels (pl. 11. *op. cit.*), which Dr. Carpenter has particularly described.

The columns represented by Sowerby in *Lycophrys ephippium* (Geol. Trans. *loc. cit.* fig. 15), and to which Dr. Carpenter has alluded (*loc. cit.* p. 26), appear, to me, to be made up of the papillary tubes which descend from chamber to chamber (fig. 9 *g, g*), and which in purely calcareous fossils are filled with a white opake matter, but in those infiltrated with oxide of iron, with ochraceous matter; while the intervening parts are composed of the septal substance, through which the interseptal vessels pass to the surface and margin in *Orbitoides* as well as in *Nummulites.*

The same system of circulation would also appear to be carried on in *Orbitolites,* where the mass is made up of spheroid or ovoidal cells: for if the nearly flat Indian species, which has a papillary eminence in the centre of the convex side, be rubbed down, the latter presents a ramification of transparent substance like that filling the septal spaces of *Nummulites* and *Orbitoides*; which, radiating upwards and outwards from this eminence, passes into the general structure of the shell.

The transitionary forms of the chambers in *Operculina,* through *Nummulites* and *Orbitoides* to *Orbitolites,* would, when viewed in a vertical section, appear to be thus:—In *Operculina* there is a single plane of spear-head shaped chambers; in *Nummulites* a central plane of conical chambers with layers of compressed ones above and below it; in *Orbitoides,* a central plane of quadrangular chambers with numerous layers of compressed ones above and below it; and in *Orbitolites,* a mass of circular or ovoidal cells more or less definitely arranged. Hence, if these be their respective peculiarities, *Orbitoides Mantelli* will, from Dr. Carpenter's illustration (fig. 31, *loc. cit.*), belong to the latter, and would therefore be now more properly named *Orbitolites Mantelli.*

One other observation I would here make with reference to geology, viz. the natural union which now seems to be pointed out between the Chalk and the Nummulitic series, by the great prevalence of the same class of animal remains in each—that is to say, the abundance of flints which indicate the previous existence of *siliceous sponges* in the former, and the myriads of Foraminifera which are closely allied to the *calci-sponges* in the latter.

Bombay, May 12, 1852.

EXPLANATION OF PLATE IV.

Fig. 1. *Operculina Arabica,* natural size.
Fig. 2. Large and small papillæ on the external surface of the shell, highly magnified.
Fig. 3. Vertical section of the shell over the chambers, highly magnified, showing:—*a, a,* large papillæ; *b, b,* small ditto; *c, c,* horizontal lines indicative of the layers of the shell; *d, d,* vertical tubes.
Fig. 4. Spicula *in situ,* highly magnified.
Fig. 5. Diagram of horizontal section of three large chambers of the shell, showing the interseptal vascular system and spicular cord: *a, a, a,* chambers; *b, b, b,* septa; *c, c, c,* interseptal vessels; *d, d, d, ramusculi* coming to the surface of the shell; *e, e, e, e,* ditto, going to the walls of the shell, &c. through the septa, the dotted lines indicating those branching out into the former; *f, f, f,* marginal plexus; *g, g, g, ramusculi* of margin; *h, h,* spicular cord; *i,* half-formed septum with termination of interseptal vessel.
Fig. 6. Diagram of vertical section of the shell to show the form of the spicular cord: *a,* margin or free surface of spicular cord; *b,* vertical

or papillary tubes, here sloping outwards on each side the cord; *c*, truncated vessels of the marginal plexus; *d*, *d*, small channels of intercameral communication; *e*, grand semilunar or crescentic channel of ditto; *f*, septum.

Fig. 7. Diagram of vertical section to show the situation of the interseptal vessels: *a*, *a*, interseptal vessels; *b*, septum; *c*, grand channel of intercameral communication; *d*, part of spicular cord.

Fig. 8. Enlarged view of first-formed chambers of *Operculina Arabica*: *a*, central cell or chamber; *b*, *b*, *b*, probable forms of last chambers in process of development.

Fig. 9. Diagram of vertical section of *Nummulites acuta*, Sow.: *a*, spicular cord?; *b*, truncated vessels of marginal plexus; *c*, *c*, chambers of central plane; *d*, *d*, vertical interseptal vessels (the "perforations," &c. of Dr. Carpenter); *e*, *e*, horizontal interseptal vessels; *f*, *f*, *f*, chambers on each side the central plane; *g*, *g*, *g*, vertical tubes.

XVI.—*On some genera of the* Icacinaceæ. By John Miers, Esq., F.R.S., F.L.S.

[Continued from p. 119.]

Emmotum.

This neglected genus was proposed by Desvaux in 1825 upon a plant from Guiana. By Endlicher it was referred to *Leretia* of the 'Flora Fluminensis,' with which it neither accords in the appearance of the leaf nor the mode of its inflorescence: Hamilton's character as given in his 'Prodromus,' notwithstanding its brevity, is sufficiently well marked to show that it does not differ from *Pogopetalum*, founded by Mr. Bentham in 1840; indeed the *Emmotum fagifolium*, Desv., corresponds with *Pogopetalum acutum*, Benth., both from Guiana, so as to leave no doubt of their identity: according therefore to the austere rule of science, the latter name must give way to the former. Mr. Bentham in establishing his genus recorded two species, and has since described two others, and I have now to add a fifth. All the species, which are from Guiana and intertropical Brazil, seem to form good-sized trees, with very thick coriaceous leaves of a peculiar appearance; their inflorescence is in axillary crowded fascicles of rather small flowers, which are distinguished by having petals densely beset on their inner face with long red silky hairs arising from an elevated costal nervure. Their chief peculiarity, however, consists in the unusual structure and singular mode of dehiscence of their anthers, which are formed of two opposite, unilocular, valveless, and separate cells, the pollen being discharged extrorsely through a fissure arising from the secession of the dorsal margin of each boat-shaped cell from the very fleshy connective, features that have hitherto escaped observation. *Emmotum* offers also another peculiarity in its ovarium with three radiate cells, placed excentrically on the somewhat gibbous and anterior side of the ovarium. These points of structure are so different from the development met with in other genera of the *Icacinaceæ,* as naturally to lead to the suspicion that *Emmotum* may not belong to this family; but we must remember that in other respects it accords, viz. in its exstipulate alternate leaves, small flowers with a persistent unchanged calyx, petals with valvate æstivation, alternate stamens, simple style, and suspended collateral ovules. I have therefore retained the genus doubtfully, as a separate tribe of the *Icacinaceæ* (*ante,* S. 2. vol. ix. p. 223), until its true place in the system can be ascertained, which will be determined by a knowledge of the structure of the fruit and seed and the form and position of its embryo. The name, I presume, has been derived from ἐν and μοτὸς, *linteum,* on account of the densely intertwined hairs that line the petals, a character that also suggested the name of *Pogopetalum.* These hairs, when examined under the microscope, appear flattened and covered with numerous prominent transparent glandular dots as in *Leretia.* The following is an outline of its generic features:—

Emmotum, Desv. Pogopetalum, *Benth.*—*Flores* perfecti. *Calyx* brevissimus, 5- rarius 4-dentatus, liber, fructifer immutatus. *Petala* 5, rarius 4, lineari-oblonga, carnosula, intus ad carinam longitudinalem pilis rufis sæpius longis et crispatis densissime barbata, æstivatione valvata, mucrone apicali introflexo. *Stamina* 5 vel 4, petalis alterna, iis vix breviora, omnino libera; *filamenta* carnosula dilatata, incurva, apice repente acuta; *antheræ* 2-loculares, *connectivo* crasso, interdum loculis utrinque sejunctis breviores, vel sæpe in mucronem subulatum incurvulum ultra loculos subantrorsim positos producto, imo cordato affixæ, *loculis* membranaceis, cymbæformibus, evalvibus, margine posteriori a connectivo omnino soluto hinc extrorsim dehiscentibus. *Pollen* ovale, longitudinaliter sulcatum. *Ovarium* liberum, oblongum, subgibbum, pilosum, disco hypogyno parvo sistens, 3-loculare, loculis excentrice radiantibus; *ovula* in quoque loculo 2, juxta apicem appensa et subcollateraliter superposita. *Stylus* excentricus, erectus, teres. *Stigma* e dentibus 3 brevissimis erectis minutum. *Drupa* globosa, abortu 1-locularis; cætera ignota.—Frutices Guianenses et Brasilienses *sempervirentes*; folia *alterna, exstipulata, coriacea, integra, nitida, subtus tomentosa*; cymæ *fasciculatæ, axillares, multifloræ*; flores *parvi, aggregati, cum pedicellis brevissimis articulati, bracteati.*

1. *Emmotum orbiculatum.* Pogopetalum orbiculatum, *Benth. Linn. Trans.* xviii. 685. tab. 42;—arbor 2-orgyalis, ramulis cinereo- vel fulvo-tomentosis, foliis ovato-orbiculatis, apice brevissime ac obtusissime acuminatis, coriaceis, nitidis, supra lucidis, rachi tomentoso, nervis parallele incurvo-divaricatis, venis creberrime transversis immersis, subtus cum petiolo crasso profunde canaliculato incano- vel fulvo-tomentosis; ovario hispido, fructu globoso, calyce immutato suffulto.—In Guiana Brasiliæ ad fluv. Padauri, confl. fluv. Nigri.—*Schomburgk.*—(*v. s. in herb. Mus. Brit. et Hook. fructu immaturo, Rio Preto, Prov. Pernambuco.*—Gardner, n. 2941.)

This species is remarkable for the shape of its leaves, which are almost orbicular at the base and summit, are $2\frac{3}{4}$ to $3\frac{1}{4}$ inches long, $2\frac{1}{2}$ inches broad, on a deeply grooved petiole 6 or 7 lines in length; they are thick and coriaceous, very polished above, with a finely shagreened surface, and densely covered beneath with short yellowish tomentum: the simple racemes with a few immature drupes are about $\frac{3}{4}$ inch long.

2. *Emmotum acuminatum.* Pogopetalum acuminatum, *Benth. loc. supr. cit.* 685;—arbor 5-orgyalis, foliis ovatis oblongisve, apice longissime et anguste attenuatis, mucronulatis, coriaceis, fusco-rufulis, supra lucidis et glaberrimis, in costam sulcatis, nervis paucioribus vix prominulis, venis transversis immersis, subtus pallide ferrugineis, glandulis minutis creberrime punctatis, pube rara instructis, petioloque sulcato leviter pubescentibus, demum glabris; racemis geminis, floribus aggregatis griseo-pilosis, petalis ovali-oblongis, intus in carinam pilis longis rufis lanatis, marginibus utrinque glabris; ovario pilis destitutis et e glandulis minutissimis asperis glauco-pruinoso, disco glabro insito; stylo excentrico elongato, stigmate obsolete 3-dentato.—Rio Negro, Brasiliæ (Schomb. 970).

The branchlets are somewhat compressed and angularly striated: it is however distinguished from the other species by the long attenuated summit of the leaves, which are also of a remarkably dark copper or reddish colour when dried; they are about 4 or $4\frac{1}{2}$ inches long, including the suddenly narrow apex of half an inch in length; they are $1\frac{3}{4}$ to $2\frac{1}{2}$ inches broad, on a petiole 5 lines long; the nervures, about seven pairs, are parallel, very divergent, curving, with finely reticulated transverse veins; the upper surface is polished and finely shagreened; beneath they are of a ferruginous hue, dead, almost glabrous, and when viewed under the lens seem covered with minute raised glandular dots: generally two racemes spring out of each axil, from $\frac{1}{2}$ to $\frac{3}{4}$

inch long, which, when younger, appear like a crowded globular axillary fascicle. The anthers in structure resemble those of the following species. The long red hairs that densely spring from the inner keel of the petals under the lens appear marked by large prominent glands in two uneven series, so that they seem almost torulose.

3. *Emmotum fagifolium*, Desv. in Ham. Prodr. Fl. Ind. Occid. p. 29. Pogopetalum acutum, *Benth., Hook. Lond. Journ. Bot.* ii. 377;—ramis angulatis, rufo-tomentosis; foliis oblongis, ovatisve, apice repente lineari-attenuatis, basi rotundatis vel truncatis, valde coriaceis, supra sublucidis, glaberrimis, nervis divaricatis, pubentibus, approximatis, incurvo-parallelis, sulcatis, venis transversis immersis, subtus præsertim in nervis sparse sericeo-pubescentibus, nervis tenuibus subprominulis, petiolo canaliculato tomentoso; racemis geminis, axillaribus, petiolo vix longioribus, floribus aggregatis, aurantiaco- vel cano-tomentosis, petalis lineari-oblongis, intus pilis longis rufis in carinam lanatis, lateribus glabris, filamentis tenuioribus, dilatatis, antheris ovatis, vix mucronulatis, loculis oppositis, complanatis, ovario pilis longis hispido (nec glabro), stylo elongato, gracili.—Guiana Gallica, Desvaux.—*v. s. in herb. Hook.* (Leprieur et Martin).

There can be little doubt that this is the plant described by Desvaux as the "*Bois d'Agouti*," and which is identical with the *Pogopetalum acutum* of Mr. Bentham: the leaves in form much resemble those of the preceding species; they are from $3\frac{3}{4}$ to $6\frac{3}{4}$ inches long, and $2\frac{1}{4}$ to $3\frac{3}{4}$ inches broad, on a slender petiole half an inch in length; the apex is very suddenly acuminated by a linear point, half an inch in length, and often little more than a line in breadth. The flowers are closely aggregated, each being articulated on its short pedicel; the calyx is cupuliform, pubescent, and cleft into five ovate, fleshy and somewhat acute lobes, which are slightly imbricated in æstivation, as in *Platea*; the petals are clothed outside with short gray adpressed hairs, and the prominent internal keel is furnished with a line of very densely-set long red spreading woolly hairs, which are flattened and marked with glandular dots; the stamens are nearly as long as the petals; the filaments are fleshy, compressed and broader at the base, somewhat terete and subulate above, and suddenly bent back at the apex, where the point is affixed to the front of the red fleshy connective, just above its short basal sinus; the anthers are therefore strictly extrorse; the connective is almost terete, somewhat compressed, erect in position, and about one-sixth of the length of the filament; the two anther-cells are distinctly separate, thin, membranaceous, white, flattened, boat-shaped and valveless, fixed one on each side of the connective; they are longer both above and below, so that the anthers are emarginated at the apex and base; they generally open extrorsely by the separation of the posterior margin of the cells from the connective, or they sometimes, though rarely, separate by both margins. The ovarium has been described as being glabrous, but I have constantly found it clothed with long, erect, setaceous, shining, white hairs; the lower part is invested by a glabrous, adnate, cupshaped disk: the style is erect and somewhat bent, glabrous, rather subulate, slender, and of the length of the stamens: there is no apparent stigma, but the apex of the style is hollow and crowned with three very minute teeth: the ovarium contains three radiate, excentric cells, each showing two ovules suspended from near the apex.

4. *Emmotum affine*, n. sp. Pogopetalum affine, *Planch. MSS.*;—foliis ovalibus e basi rotundato gradatim angustioribus apice fossulato et deflexo longe attenuatis, subconvexis, supra nitentibus, costa sulcatis, nervis subprominulis, venis creberrime transversis immersis, subtus ferrugineis, et glauco-pruinosis e pilis brevissimis adpressis sub lente visuris, margine valde reflexo, petiolo subtenui sulcato rufo-glaucescente; racemis axillaribus, floribus aggregatis cano-pilosis, petalis intus in carinam pilis longissimis rufis dense lanatis lateribus glabris: staminibus spec. præced.: ovario piloso, disco glabro insito.—Brasilia.—*v. s. in herb. Hook.* (Sellow.)

This species comes very near *E. acuminatum*; the leaves are very shining above as in that species, and ferruginous beneath, but the hairs that clothe its under surface are so minute as to be seen only under a strong lens; they are somewhat convex above and the margins are very revolute, the attenuated apex being deeply channelled and curved downwards; they are about $4\frac{1}{4}$ inches long and 2 inches wide, with a somewhat slender and almost terete petiole, which is often suddenly deflexed. The inflorescence is axillary in a few of the upper leaves, but is mostly terminal in branching alternate racemes, each about three-quarters of an inch long.

5. *Emmotum nitens*. Pogopetalum nitens, *Benth. loc. citat.*;—ramis striatis; foliis oblongis, acuminatis, coriaceis, supra glaberrimis, pallide glaucis, sub-nitentibus, subconvexis, nervis subprominulis, venis transversis immersis, subtus pube sericea adpressa densa incana aut fulva vestitis, nervis valde prominentibus, margine reflexo, petiolo elongato cano-tomentoso

canaliculato sæpe deflexo; paniculis racemosis, ternis, axillaribus, petiolo sublongioribus, floribus dense aggregatis, griseo-pilosulis, petalis lineari-lanceolatis, acutis, summo patentim reflexis, intus ad carinæ basin apicemque fasciculo pilorum donatis, pilis brevibus albidis; staminibus incurvis crassiusculis, connectivo tereti, imo cordato, in mucronem obtusum incurvum longe protenso, antherarum loculis sejunctis, antice contiguis, subparallelis, margine dorsali dehiscentibus; ovario pilis brevibus micantibus adpressis vestito, disco glabro insito; stylo brevissimo valde excentrico.—Brasilia intertropica.—*v. s. in herb. Hook.—Prov. Goyaz, Minas Geraës et Pernambuco* (Gardn. n. 2941, 3309, 4451); *Rio S. Francisco* (Blanchet, 2889).

In this species the leaves, in the dried state, present a remarkably pallido-glaucous and lurid aspect above, and are covered below with yellow, very short, adpressed and bright tomentum; the upper surface is shining, with prominent nervures, and under a lens appears marked with numerous minute impressed dots, between which are seen still more numerous raised resinous spots; they are generally about 4 inches long and 2 inches broad, on a longer and more slender petiole, about 9 lines in length. One, two or three short branching racemes, about the length of the petioles, crowded with numerous flowers, spring from each axil; the stamens are incurved, about the length of the petals, the anthers being nearly as long as the broad fleshy filaments; the thick, fleshy, almost terete connective is slightly cordate at its base, is somewhat incurved and subulate, and terminates in an obtuse point that much exceeds the length of the anther-cells; this is affixed just in the angle of its sinus in front, to the obtuse apex of the filament, so that the anthers, though at first sight apparently basifixed, are in reality also extrorse in position: the anther-cells are white, of thin texture, linearly boatshaped, quite separate, nearly parallel, and fixed extrorsely upon the sinus of the inner face of the connective, and they discharge their pollen by the secession of the exterior margins from the body of the connective. The pollen is oval, marked by three longitudinal lines. The ovarium is shorter than the stamens, covered with short erect hairs, and seated on a small fleshy glabrous disk; it is 3-celled as in the last-described species; the style is very short, very excentric, hollow at its apex, and terminated by three very minute teeth.

XVII.—*A Catalogue of British Spiders, including remarks on their Structure, Functions, Œconomy, and Systematic Arrangement.* By John Blackwall, F.L.S.

[Continued from vol. ix. p. 471.]

186. *Epëira signata.*

Epëira signata, Blackw. Ann. and Mag. of Nat. Hist. Second Series, vol. vi. p. 341.

This distinctly marked spider was taken at Broadstairs in Kent in the month of September, and occupies a place in Mr. Walker's cabinet. It is an immature male which had to undergo its final change of integument, as indicated by the tumid state of the digital joints of the palpi.

187. *Epëira umbratica.*

Epëira umbratica, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 66; Sund. Vet. Acad. Handl. 1832, p. 238; Hahn, Die Arachn. B. ii. p. 24. tab. 46. fig. 112; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 2; Blackw. Linn. Trans. vol. xix. p. 127; Koch, Die Arachn. B. xi. p. 128. tab. 389. fig. 930, 931.
—— *umbraticola,* Latr. Gen. Crust. et Insect. tom. i. p. 105.
Titulus 9, Lister, Hist. Animal. Angl. De Aran. p. 44. tab. 1. fig. 9.

Epëira umbratica is much more abundant in various parts of England and Wales than it is generally supposed to be, its apparent scarcity being attributable to its nocturnal habits and the care with which it conceals itself during the day.

In June the female constructs, under the exfoliating bark of trees and in crevices in old rails, a subglobose cocoon of white silk of a slightish texture, measuring $\frac{2}{5}$ths of an inch in diameter, in which she deposits about 160 spherical eggs of a yellowish brown colour, agglutinated together in a lenticular mass. On the exterior surface of the cocoon small pieces of bark, wood, and other extraneous materials are distributed, which serve to assimilate it to surrounding objects.

This spider spins a large net, having wide intervals between the radii and the circumvolutions of the elastic spiral line, and preys chiefly on moths.

188. *Epëira solers.*

Epëira solers, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 41.
—— *agalena,* Hahn, Die Arachn. B. ii. p. 29. tab. 47. fig. 115; Blackw. Linn. Trans. vol. xix. p. 126.
Atea sclopetaria, Koch, Die Arachn. B. xi. p. 134. tab. 390. fig. 934, 935; Uebers. des Arachn. Syst. erstes Heft, p. 4.

In a catalogue of spiders, published in the 'Transactions of the Linnæan Society,' vol. xix. p. 113, this species is included under the name of *Epëira agalena*; the mistake originated in copying the appellation from M. Hahn's work, 'Die Arachniden,' where it is connected with a figure and description of *Epëira solers*.

The sexes pair in June, and in that and the succeeding month the female fabricates a subglobose cocoon of yellowish brown silk of a loose texture, about $\frac{1}{2}$ an inch in diameter, and deposits in it 140 or 150 dark brown spherical eggs, agglutinated together in a globular form.

This spider occurs, but not abundantly, in pastures near Llanrwst, spinning among coarse plants and low bushes a net of moderate extent, between the centre of which and a slightly concave cell of white silk, constructed at a short distance from it, a communication is established by means of a strong line; concealed in this retreat, the vibrations of the connecting medium speedily convey intelligence to the watchful owner of the snare that a victim is involved in its meshes.

189. *Epëira similis.*

Epëira similis, Blackw. Ann. and Mag. Nat. Hist. vol. xiii. p. 186.

The first specimen of *Epëira similis* which I had an opportunity of inspecting was an adult male taken at East Lodge, Enfield, and obligingly forwarded to me by Miss Gertrude Buller Elphinstone. I have since received specimens from Hampshire; and a collection of living spiders, transmitted to me in September 1843 from Ellesmere, in Shropshire, by Miss Margaret B. Lewis of Cichle, Anglesey, contained a young male of this species, which, as the digital joints of its palpi were very tumid, had to undergo its final change of integument before it arrived at maturity.

Epëira similis and *Epëira calophylla* are very closely allied; but the males may be distinguished from each other without difficulty by differences in the structure of their palpi and palpal organs.

190. *Epëira calophylla.*

Epëira calophylla, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 70; Latr. Gen. Crust. et Insect. tom. i. p. 108; Sund. Vet. Acad. Handl. 1832, p. 252.

Zilla calophylla, Koch, Die Arachn. B. vi. p. 148. tab. 216. fig. 538, 539.

Eucharia atrica, Koch, Die Arachn. B. xii. p. 103. tab. 419. fig. 1030, 1031.

Titulus 10, Lister, Hist. Animal. Angl. De Aran. p. 47. tab. 1. fig. 10.

This common spider, which is widely distributed in Great Britain, frequents shrubs, buildings, and crevices in rocks and walls. It pairs in autumn, and the female constructs a subglobose cocoon of soft pale brown silk of a loose texture, measuring ½ an inch in diameter, in which she deposits 80 or 90 spherical eggs of a brown colour, slightly cemented together in a subglobose mass. The cocoon is attached to walls and the inferior surface of stones by a thin covering of whitish web. I have observed that the female changes her integument five times before she arrives at maturity, once in the cocoon, and four times after quitting it.

In December 1842 and March 1843 I procured several cocoons of *Epëira calophylla* comprising larvæ of two distinct species of insects belonging to the family *Ichneumonidæ,* which fed upon the ova contained in the cocoons and increased rapidly in size; on being converted into pupæ, the females were observed to have the ovipositor turned over the posterior extremity of the abdomen. In the spring of 1843 both sexes of each species, in the imago or perfect state, issued from the cocoons, which I had placed in closed phials. These insects are very dissimilar in size and colour, and the eggs deposited by each in a single cocoon differ in number inversely as the dimensions of the females which produce them; occasionally I have noticed the larvæ of both species in the same cocoon, but I have never detected them in the cocoons of any other spider, however favourable the circumstances might be as regards time, condition, and locality under which they were examined.

Epëira calophylla usually employs a radius as a medium of communication between its net and a small tubular cell of white silk which constitutes its retreat, instead of spinning a separate line for that purpose; and this peculiar appropriation, whether the radius be in the plane of the net or whether it be withdrawn from that plane, as is frequently the case, imparts an unfinished appearance to the snare, as it prevents the spider from giving a spiral form to the elastic line on which the viscid globules are disposed, though this is sometimes attempted with a greater or less degree of success. No sooner does the spider arrive at one of the radii adjacent to that in connexion with its cell than it returns, traversing the framework of the snare till it arrives at the adjacent radius on the opposite side, when it retraces its steps, and thus, oscillating between the two, spins a number of curved, viscid lines or arcs of circles diminishing in length from the circumference of the net towards the centre. Lister was well acquainted with this peculiarity, so common in the snare of *Epëira calophylla,* but has fallen into the error of supposing that it occurs invariably. See his 'Tractatus de Araneis,' p. 48.

Sometimes this species places its net in situations not entirely surrounded by objects to which it can immediately proceed to attach boundary-lines. In such cases its operations are deserving of attention. After connecting several radii with the most accessible points, it fixes a filament to that extremity of one of them which is furthest from the centre of its net: along this radius the spider proceeds, drawing out the filament from the spinners and guiding it with the claws of a posterior leg, till the point of union with one of the adjacent radii is attained; upon this radius it steps, and passing to its other extremity there makes fast the filament, by this simple process connecting with marginal lines distant objects between which no direct communication previously existed.

Epëira calophylla presents a striking example of the insufficiency of the characters employed by M. Koch in distributing the *Araneidea* into genera and families: though connected with the *Epëiridæ* by the closest relations of affinity, yet he has placed it in his genus *Eucharia,* which he includes in the family *Theridiidæ* (Uebers. des Arachn. Syst. erstes Heft, p. 7).

191. *Epëira cucurbitina.*

Epëira cucurbitina, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 76; Latr. Gen. Crust. et Insect. tom. i. p. 107; Sund. Vet. Acad. Handl. 1832, p. 245.

Miranda cucurbitina, Koch, Die Arachn. B. v. p. 53. tab. 159. fig. 371, 372.

Titulus 5, Lister, Hist. Animal. Angl. De Aran. p. 34. t. 1. fig. 5.

In well-wooded districts this species is not uncommon. The sexes pair in June, and the female attaches to the stems or leaves of shrubs, in the vicinity of her snare, a subglobose cocoon of bright yellow silk of a loose texture, measuring ⅔rds of an inch in diameter, which usually contains 150 or 160 spherical eggs of a yellow colour, cemented together in a subglobose mass, and enveloped in fine, soft, yellow silk.

Arachnologists affirm that the small net spun by *Epëira cucurbitina* is always placed horizontally; but this is a mistake, as I have frequently seen it in an inclined position.

192. *Epëira ornata.*

Epëira ornata, Blackw. Ann. and Mag. of Nat. Hist. Second Series, vol. vi. p. 342.

A specimen of this showy *Epëira* is in Mr. Walker's cabinet. It was taken in April 1848, but in what locality is not stated.

193. *Epëira fusca.*

Epëira fusca, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 84; Blackw. Linn. Trans. vol. xix. p. 127.
—— *Menardi,* Latr. Gen. Crust. et Insect. tom. i. p. 108.
Meta fusca, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 7; Die Arachn. B. viii. p. 118. tab. 285. fig. 685–687.

Caves, cellars, overhanging banks and other obscure places constitute the principal haunts of *Epëira fusca* in North Wales. In autumn the female fabricates a large oviform cocoon of white silk of so delicate a texture that the eggs, connected together by silken lines in a globular mass $\frac{1}{4}$th of an inch in diameter, may be seen distinctly within it. Its transverse axis measures about $\frac{11}{10}$ths, and its conjugate axis $\frac{8}{10}$ths of an inch, and it is attached by numerous lines, generally forming a short pedicle at one extremity, to the walls or roofs of the places it inhabits. The eggs, which are yellow and spherical, are between 400 and 500 in number.

In transferring this species and *Epëira antriada,* included in the genus *Meta* (Uebers. des Arachn. Syst. erstes Heft, p. 6), from the *Epëiridæ* to the *Theridiidæ,* and thus widely separating them from a species so closely allied as *Epëira inclinata,* which is suffered to remain in the former family, M. Koch appears to have lost sight of those principles of affinity and analogy which afford the only safe guide in the classification of natural objects.

194. *Epëira antriada.*

Epëira antriada, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 83; Blackw. Linn. Trans. vol. xix. p. 128.
Meta muraria, Koch, Die Arachn. B. viii. p. 125. tab. 288. fig. 693, 694.

Obscure damp situations are generally resorted to by this spider, which is plentiful in many parts of England and Wales. It spins an extensive net with an open circular space at the centre, which it usually occupies when watching for its prey; from this station it drops quickly to the ground on being disturbed, regaining it when the danger is past by means of a line drawn from the spinners in its descent, and previously attached to the circumvolution of the unadhesive line bounding the central aperture. Like *Tetragnatha extensa,* it has the habit of extending the first and second pairs of legs in a line with the body.

Immature individuals of the species *Epëira antriada, Epëira inclinata, Epëira cucurbitina* and *Epëira diadema,* and adults of the species *Linyphia minuta* and *Linyphia tenuis,* are frequently infested by the *Polysphincta carbonaria* of Gravenhorst, which feeds upon their fluids and ultimately occasions their death. Since the publication of my account of this parasite in the 'Annals and Magazine of Natural History,' vol. xi. p. 1, I have observed that the colour of the larva, after its final change of integument, becomes dark brown streaked and spotted with white, particularly on the sides, and that a series of dorsal prolegs is developed on the segments of its body comprised between the third and tenth, both inclusive. These dorsal prolegs are short, and, with the exception of that on the tenth segment, are more or less bifid at the summit; on their extremities are disposed numerous fine curved processes or claws, with which the larva, when about to fabricate its cocoon, attaches itself to the lines spun by its victim. Only two instances are noticed by Messrs. Kirby and Spence in their 'Introduction to Entomology,' sixth edition, vol. ii. pp. 227, 228, of the larvæ of insects having prolegs situated on their backs.

195. *Epëira celata.*

Epëira celata, Blackw. Linn. Trans. vol. xviii. p. 668.

M. Walckenaer has disposed of *Epëira celata* as a synonym of *Epëira fusca* (Hist. Nat. des Insect. Apt. t. iv. p. 471); but it differs materially from that species in size, structure, colour and œconomy, and has a much closer affinity with *Epëira antriada*. It inhabits damp caverns and hollow banks in Denbighshire and Caernarvonshire, to the sides of which the female, in the month of May, attaches a subglobose cocoon of whitish silk of a loose texture, measuring about $\frac{1}{2}$ an inch in diameter; in it she deposits between 200 and 300 spherical eggs of a yellow colour, agglutinated together in a lenticular form.

196. *Epëira inclinata.*

Epëira inclinata, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 82; Sund. Vet. Acad. Handl. 1832, p. 250.

Zilla reticulata, Koch, Die Arachn. B. vi. p. 142. tab. 214. fig. 532, 533.

Titulus 1, Lister, Hist. Animal. Angl. De Aran. p. 24. tab. 1. fig. 1.

Epëira inclinata abounds in many parts of Great Britain, but seems to prefer districts which are well-wooded. It spins in the intervals between the branches of trees and shrubs a net similar in design to that constructed by *Epëira antriada*, and like that species drops quickly, on being disturbed, from its station in the circular aperture at the centre of its snare, drawing from the spinners in its descent a line which enables it speedily to regain its former position.

In autumn the female attaches to the under side of stones, fragments of rock, and lichens growing on old trees, several globular cocoons of whitish silk of a loose texture, measuring, on an average, $\frac{3}{8}$ths of an inch in diameter; each contains from 80 to 140 spherical eggs of a pale yellow colour, cemented together in a globular mass.

I captured an adult female of this species in August 1842, which was entirely destitute of the left intermediate eye of the posterior row, and the right intermediate eye of the same row had not half of the usual size; and in another adult female, received from the Rev. Hamlet Clark in the autumn of the same year, the right intermediate eye of the posterior row had not one-eighth of the natural size, being merely rudimentary.

197. *Epëira diadema.*

Epëira diadema, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 29; Latr. Gen. Crust. et Insect. tom. i. p. 106; Sund. Vet. Acad. Handl. 1832, p. 235; Hahn, Die Arachn. B. ii. p. 22. tab. 45. fig. 110; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 2; Die Arachn. B. xi. p. 103. tab. 384. fig. 910.

—— *lutea*, Koch, Die Arachn. B. v. p. 62. tab. 161. fig. 378; Uebers. des Arachn. Syst. erstes Heft, p. 3; Die Arachn. B. xi. p. 123. tab. 388. fig. 926, 927.

Titulus 2, Lister, Hist. Animal. Angl. De Aran. p. 28. tab. 1. fig. 2.

This spider is plentiful in Great Britain, constructing an extensive net, without any circular opening at the centre, among gorse, heath and bushes. Its tarsi, like those of *Epëira quadrata*, *Epëira apoclisa*, and other species belonging to the same genus, are supplied with several small, curved, pectinated claws at their extremity, in addition to the three larger ones common to them all. There is, besides, a strong, moveable spine, inserted near the termination of the tarsus of each posterior leg, on the under side, which curves a little upwards at its extremity, and presents a slight irregularity of outline at its superior surface when examined under the microscope. These spines, which have been denominated *sustentacula* (Transactions of the Linnæan Society, vol. xviii. p. 224 *note**), subserve an important purpose: by the contraction of their flexor muscles they are drawn towards the foot, and are thus brought in direct opposition to the claws, by which means the spider is enabled to hold with a firm grasp such lines as it has occasion to draw from the spinners with the feet of the hind legs, and such also as it designs to attach itself to. As the *Epëiræ*, when occupying a position at the centre of their snares, are supported chiefly by the *sustentacula* and a line connecting the spinners with their station, the reason why their heads are always directed downwards on such occasions is apparent.

Epëira diadema and some of its congeners envelope their prey in a sheet of web by the following curious process. Causing the victim to rotate by the action of the third pair of legs and the palpi, the first pair of legs also being frequently employed in a similar manner, they extend the spinners laterally, and applying to them alternately the *sustentaculum* of each posterior leg, they seize and draw out numerous fine lines in the form of a fillet, which they attach to their revolving prey, and thus involve it in a dense covering of silk from one extremity to the other. By means of this stratagem they are capable of overcoming formidable and powerful insects, such as wasps, bees, and even large beetles.

In October the female of this species attaches to the inferior surface of stones a subglobose cocoon of yellow silk of a loose texture, measuring $\frac{2}{3}$rds of an inch in diameter, in which she deposits between 700 and 800 spherical eggs of a yellow colour, agglutinated together in a lenticular form. Withered leaves and bits of dry fern are frequently distributed on the exterior surface of the cocoon. After deserting this nidus, the young spin a few lines on which they group themselves into a compact mass, somewhat resembling the granulated fruit of the *Rubi*.

XVIII.—*Contributions to British Palæontology:—Some new Lower Palæozoic Mollusca.* By F. M'Coy, Professor of Geology and Mineralogy in Queen's College, Belfast.

Sanguinolites decipiens (M'Coy).

Desc. Elongate-oblong, dorsal and ventral margins subparallel; beak incurved, small, depressed, about one-fifth the length from the anterior end; hinge-line long, not elevated (the inflected edges forming a nearly horizontal posterior lunette extending its entire length); cardinal angle about 115°; anterior end rounded, narrowed by an elongate, elliptic lunette; a strong sigmoidally contorted diagonal ridge extends from the beak to the respiratory angle; posterior slope steeply inclined; posterior end slightly oblique, subtruncate, rounded; ventral margin with a wide, rather deep sinus in the middle, from which a wide concavity extends nearly to the beak, and from the diagonal ridge to the anterior end, which is convex anterior to the beaks; surface marked with sharp concentric wrinkles from the anterior lunette to the diagonal ridge. Length 8 lines; in proportion to the length, greatest width (from beak to opposite margin) $\frac{48}{100}$; length of anterior end $\frac{20}{100}$, from the beak to end of hinge-line $\frac{65}{100}$; greatest depth of one valve (about middle of diagonal ridge) $\frac{25}{100}$.

I have seen numerous specimens of this species from the Upper Ludlow rocks, usually confounded with the so-called *Cypricardia cymbiformis* (Sow.), which it strongly resembles at first sight, although the anterior end is considerably longer. That fossil, however, has simple erect dorsal margins, and belongs to the genus *Orthonotus*, while the distinctly inflected dorsal edges forming the elongate, concave, posterior lunette show the present species to belong to the genus *Sanguinolites*.

Not uncommon in the Upper Ludlow rock of Benson Knot, Kendal, Westmoreland; and in the micaceous grits of Llechelawdd Myddfai, near Llandovery, S. Wales; greenish schists of Balmae shore, Kirkcudbright.

(*Col.* University of Cambridge.)

Capulus ? *Euomphaloides* (M'Coy).

Desc. Depressed, spirally inrolled, whorls rounded; spire depressed, of one and a half turns; surface apparently smooth, or faintly marked by broadly undulated wrinkles of growth (indicating the waving of the right lip). Diameter 1 inch, proportional diameter of body-whorl $\frac{50}{100}$, height $\frac{57}{100}$.

This curious species is so much depressed, that were it not for the small size of the spire and the undulation of the lip, as revealed by the flexuous lines of growth, it might be taken for a *Euomphalus*. I at one time thought it might be desirable to form a particular genus for those palæozoic species, such as the *Nerita Haliotis* (Sow.), *Pileopsis neritoides* (Phill.), &c., having the form of *Nerita*, but an undulating lip and lines of growth; on examining carefully the recent *Pileopsis intortus* and allied species, I found so gradual a passage from them to the ordinary cap-shaped forms, that I prefer leaving them altogether for the present. None of my specimens of that type of shells show the mouth clearly, so that it is possible they may want the inner lip, in which case the genus would be a very good one, and only found I believe in the older rocks.

Rare in the Lower Ludlow limestone at Green quarry, Leintwardine, Shropshire.

(*Col.* University of Cambridge.)

Pleurotomaria crenulata (M'Coy).

Desc. Obtusely trochiform, length and width nearly equal; apical angle 85°; spire of four obtusely rounded whorls, most convex below the middle; band broad, depressed, bounded by two delicate prominent keels, the upper edge being a little below the middle of the whorl; a space equal to the band in width is visible below it on the turns of the spire; base flattened, gently convex, slightly umbilicate; surface with close, sharp, irregular, interrupted striæ, slightly arched backwards from the spire to the suture, and in the opposite direction beneath it; the oblique striæ faintly crenulated by very minute spiral striæ, the band with coarse, irregular, backward arched lines only. Length 6 lines, proportional width $\frac{86}{100}$, length of body-whorl $\frac{50}{100}$.

This bears some slight resemblance to the *Turbo carinatus* (Sow.) of the Upper Ludlow, but is generically distinct by its striæ arched backwards to the band; its spire is also shorter, and there are no spiral ridges on the base.

In the Upper Ludlow rock of Brigsteer, Kendal, Westmoreland.

(*Col.* University of Cambridge.)

Murchisonia cancellatula (M'Coy).

Desc. Conic; apical angle about 50°; spire of four whorls, obtusely angulated a little below the middle; the part above the keel oblique, slightly convex near the sutures, slightly concave near the keel; portions below the keel convex; body whorl of moderate size; base apparently imperforate (but imperfectly seen); mouth obscurely rhomboidal, a little wider than high. Length 1 inch 2 lines, proportional width $\frac{87}{100}$, height of body-whorl $\frac{45}{100}$; entire surface above and below the keel reticulated by nearly equal spiral and backward curved, oblique, transverse sulci, eight or nine in one line.

Mr. Salter, on a casual examination of some of our specimens of this species, supposed them to belong to his *Murchisonia scalaris* (Geol. Journ. vol. v. t. 1. fig. 2), which he there says is a common Bala species, recognized by its elongate shape, &c., and imperfect specimens of the exterior of which he says show the fine striæ curving back to the keel; but as the carinated species I have seen from Bala are quite different from the present, and agree with the above figure in the elongate form, so different from the present shell, which also has strong spiral striæ, not said to exist in the *M. scalaris*, nor in the Bala forms which I have seen, I conceive this to be a perfectly distinct species.

In the Upper Bala rock of Allt yr Anker, Meifod, Montgomeryshire; abundant in the sandstone of Mullock quarry, Dalquorhan, near Girvan, Ayrshire.

(*Col.* University of Cambridge.)

Murchisonia gyrogonia (M'Coy).

Desc. Acutely conical; apical angle 45°; spire of three and a half whorls, very strongly angulated in the middle by the projection of an acute carina, the upper and under sides of the volution being flat and steeply inclined; sutural angle 70° to 75°; body-whorl rounded below, with an additional fine keel about halfway between the principal one and the anterior end, which is almost hid by the suture on the spiral whorls; surface (when preserved) marked with sharp striæ, which, on the upper part of the whorl, extend from the suture obliquely backwards to the keel, curving in the opposite direction below the keel. Length $4\frac{1}{2}$ lines, proportional length of last whorl $\frac{55}{100}$, width $\frac{70}{100}$.

This is most allied to the *Murchisonia perangulata* (Hall) of the Bird's-eye limestone of the New York series, but is distinguished by the shortness of the spire in proportion to the body-whorl, and by the additional keel below the band on the last turn. It is also closely allied to the *M. pulchra* (M'Coy, Sil. Foss. Irel. t. 1. fig. 19), but is on comparison found to be distinct by the fewer, longer, and more produced whorls of the spire.

Very abundant in the fine sandy schists of Ysputty Evan, N. Wales; also in the calcareous strata W. of Llanfechan, Montgomeryshire.

(*Col.* University of Cambridge.)

Murchisonia simplex (M'Coy).

Desc. Acutely conical; apical angle 55°; spire of about four or five whorls, angulated in the middle by the projection of an obtuse thick keel, another keel a little smaller between the suture and the keel above, and a third nearer the suture below on each turn; surface marked with fine striæ of growth, arched back to the keel at a moderate angle above, and nearly vertical below; base imperforate. Width of small specimens 6 lines, length of last turn 5 lines (imperfect specimens double this size).

The more elongate form and imperforate base distinguish this species from some of the "Trenton limestone" varieties of the *Pleurotomaria umbilicata* (Hall); and the same characters and the absence of the spiral striæ on the base distinguish it from the *Euomphalus triporcatus* (M'Coy).

I should have supposed the *M. scalaris* (Sow. and Salt.), Geol. Journ. vol. v. t. 1. fig. 2, Ayrshire, belonged to this species, but that one, instead of five, keels are indicated in the figure and text.

Limestone of Allt yr Anker, Meifod, Montgomeryshire; also in the sandstone of Dalquorhan, near Girvan, Ayrshire; greenish trappean sandstone of Glenquhaple, Ayrshire.

(*Col.* University of Cambridge.)

Murchisonia torquata (M'Coy).

Desc. Acutely conic; apical angle about 26°; whorls six, having a thickened prominent suture, below which the upper portion of each is slightly concave, becoming very convex in the lower half; band narrow, below the middle on the most convex part of the volutions; striæ sharp, strongest on the thickened edge of the suture, arching obliquely backwards to the band. Length 6 lines, proportional length of last turn $\frac{40}{100}$, width $\frac{50}{100}$.

As neither the collar-like thickening of the upper edge of the suture, nor the greater projection of the lower part of each whorl, are indicated by Mr. Sowerby in his figure or description (in the Sil. Syst.) of the *P. Corallii,* I suppose the present species to be distinct.

Common in the Upper Ludlow of Spital and Benson Knot, Kendal, Westmoreland; tilestone of Storm Hill, Llandeilo, Caermarthenshire.

(*Col.* University of Cambridge.)

Euomphalus lyratus (M'Coy).

Desc. Spire only slightly elevated, of two very convex turns, each with three narrow spiral ridges, one at the upper suture, one considerably above the middle of the body-whorl and corresponding to the lower suture on the spire, and the third halfway between these two; surface crossed by slightly oblique, thin, cord-like ridges, nearly twice their thickness apart. Diameter about 6 lines, proportional height about $\frac{50}{100}$.

Only one imperfect specimen has occurred of this obviously distinct species, not allowing of the characters of the base or spire being completely ascertained.

Rare in the Bala schists at Llansaintfraid, Glyn Ceiriog, Denbighshire.

Euomphalus triporcatus (M'Coy).

Desc. Obtusely conic; apical angle about 95°; spire of about three or four flattened whorls, each bearing three nearly equal and equidistant, thick, obtuse carinæ, one of which is at the suture, which it renders canaliculate, one in the middle, and one forming the circumference of the basal whorl, and partially concealed by the suture in the spiral whorls; base convex, with three smaller spiral carinæ and a minute umbilicus; surface crossed by sharp, scaly, delicate, transverse striæ. Width 1 inch, proportional length about $\frac{75}{100}$, length of last whorl $\frac{42}{100}$.

Col. Portlock has, I think, figured this species (Geol. Rep. t. 30. fig. 3) as the *E. subsulcatus* of Hisinger, which has double the number of spiral keels on the upper surface. I should have referred those specimens to the *E. cornu-arietis* (His.), but that seems to have four large ridges to each whorl, and no indication is given in the figure or description of the spiral carinæ on the base. It much resembles some of the varieties of the *Pleurotomaria umbilicata* (Hall) from the Bird's-eye limestone of New York, but is certainly distinguished by its smaller umbilicus, and the three additional spiral keels on the base; those latter are generally best seen in the concavity left when the upper whorls of a specimen are broken away (described from internal casts).

Common in the Bala slates of Cyrn-y-Brain, Wrexham, Denbighshire; and in the schists of Golden grove, Llandeilo, Caermarthenshire.

(*Col.* University of Cambridge.)

Maclureia macromphala (M'Coy).

Desc. Discoid, sinistral, usually elliptical, of about three and a half rapidly enlarging whorls; spire depressed below the level of the outer turn, which bears an obscure, obtusely rounded angulation, bounding the slightly oblique upper plane of the shell; circumference obtusely rounded; under side having the middle of the whorls obtusely angulated, thus defining a wide, shallow umbilicus. Diameter 10 lines, proportional diameter of last whorl $\frac{50}{100}$, height of last whorl $\frac{50}{100}$, diameter of umbilicus $\frac{85}{100}$. Surface crossed by minute, thread-like lines of growth, extending obliquely backwards from the suture, and then crossing almost directly into the umbilicus.

This little species is easily distinguished from the *M. magna* by its very wide umbilicus (resembling that of the carboniferous *Euomphalus pentangulatus*), and by the more rapidly enlarging whorls, which also separate it from the imperfectly known *M. matutina* and *M. sordida* (Hall), from the calciferous sandstone of New York.

In the concretionary and schistose limestone of Craig Head near Girvan, Ayrshire.

(*Col.* University of Cambridge.)

Eccyliomphalus Scoticus (M'Coy).

Desc. Discoid, flat, of one and a half gradually enlarging, widely separated, spiral whorls; back obtusely subcarinate, rounded, lower side rounded, upper side with a flat space, bounded on each side by one obscure keel, the outer one most distinct; surface crossed by rather distant sharp lines of growth, each pair with four or five much finer intermediate striæ. Diameter 1 inch 5 lines, proportional diameter of last whorl $\frac{38}{100}$, height $\frac{32}{100}$.

This species is more regularly involute than the *E. Bucklandi* (Portk.), and has the principal keel on the upper side nearer to the beak. There are three or four of the larger striæ in the space of 1 line about the middle of the under side of last whorl.

Not uncommon in the schistose Chazey limestone of Knockdollian quarry, three miles from Ballintrae; also in the calcareous schists of Mullock quarry, Dalquorhan, near Girvan, Ayrshire. (*Col.* University of Cambridge.)

XIX.—*On some of the Animals of the* Chemnitziæ *which have not been described.* By William Clark, Esq.

To the Editors of the Annals of Natural History.

Gentlemen, Exmouth, July 20, 1852.

I beg to present, agreeably to a notice in the 'Annals,' N. S. vol. x. pp. 22 and 77, an account of several animals of the *Chemnitziæ* that have not occurred to naturalists or been very slightly alluded to. My former papers and this will contain descriptions of about twenty species, a number more than fourfold greater than has yet been recorded, and most of which I have this summer re-examined: I propose to follow up the accounts of those that have just been met with by a few short additions and corrections to the several species enumerated in the 'Annals,' N. S. vol. vi. p. 451, vol. vii. p. 380, and vol. viii. p. 108.

Before I enter on the descriptive matter, it will be proper to say a word or two in explanation of some of the organs of this very singular genus, which, in my method, includes the *Odostomiæ* and *Eulimellæ*, and a few of the species of *Aclis*.

With respect to the organs of the animal, I will first mention the peculiar anterior process styled by most authors the mentum, which I think ought to be considered the muzzle or rostrum, as it is a continuation of the neck, over which a bridge is thrown, formed of the eyes and tentacula; and close under them, but on the upper part of the base, or hinder portion of the rostrum, is the proboscidal orifice, from which, though a circumstance of the rarest occurrence, I have in three species seen the evolution of that organ, in the *Chem. pallida, C. acuta* and *C. plicata*; the animals kept it exserted from half a minute to three minutes. Mr. Alder's figure in the 'Annals,' N. S. vol. vii. p. 464, from a sketch of M. Lovén, gives a very good representation of it; the remaining or terminal portion of the rostrum appears to be mute, and is more or less of its length attached to the animal's foot; in other words, it is less free than the muzzle of the *Rissoæ*, of which I consider it the representative and remnant, and which it will be seen has entirely vanished in *Eulima*. Though authors speak of a mentum in that genus, I can find none; they have, I think, mistaken for it the upper margin or flap of the foot, which in front is divided by a narrow groove: this separation is more or less apparent in most, if not in all, spiral Gasteropoda; it has however little resemblance to the rostrum of the *Chemnitziæ*, which is a long, narrow, thick, distinct, and otherwise variable organ, proceeding from the neck as its continuation, and has much the aspect of a mute rissoidean muzzle; whilst the margins of the foot of the *Eulimæ* and other Gasteropoda, and they are generally present in the *Chemnitziæ*, are to assist flexibility on the march, in the same manner as the digitations of the feet of all animals assist progression. Lovén, who has described the mentum in his genus *Turbonilla*, our *Chemnitzia*, has not, though he has described the animal of *Eulima*, mentioned the presence of a mentum or rostrum in that genus.

The point of issue of the proboscis, from the upper part of the rostrum, is more advanced and visible in *Chem. plicata* than in any other species I have yet examined; it was from this animal that it continued evolved more than three minutes, affording me a sight that falls to the lot of few malacologists. I believe I speak within compass, when I state that I have examined more than a thousand live *Chemnitziæ* of twenty species, yet, except on the three occasions alluded to, I never witnessed its exsertion.

All the *Chemnitziæ* have a semitubular fold more or less developed in the mantle, which, though it issues at the upper angle of the aperture, close to the debouchure of the rejectamental orifice, appears more like a branchial one than for fæcal functions. In the *true C. acuta* it is largely exserted and *very* conspicuous. Can this fold be analogous to the process I have described at the same point in many of the *Rissoæ*? Can it have the double, though apparently incompatible, duties of depuration, and to supply the animal, when the operculum on certain exigencies is required to be nearly closed, with the branchial fluid? Can all the Gasteropoda, at the upper angle of the aperture on the right side, have branchial conduits independent of the reception of the water into the respiratory vault, under the lax mantle, by the protrusion of the neck and head of the animal?

The presence of a proboscis brings this genus very near to the *Canaliferæ*; but the *Eulimæ* are still nearer, as they have no head or rostrum, and the proboscis issues nearly at the fork between the tentacula, as in the Muricidal families. This statement renders it necessary to cancel that part of one of my papers wherein I doubt the evolution of a strict proboscis, but after what I have seen that question is set at rest.

The rostrum varies greatly in the proportions of its arcuations, scissions, and points of attachment to the foot; in the *Chem. unidentata* it is plain and truncate, in *C. acuta* it forms an open subcircular channel with a cochleariform termination, and in *Chem. conoidea* it is cloven nearly to the base, simulating a second pair of tentacula.

I have omitted to remark that the orifice of the rostrum is not precisely in the position of the proboscidal fissure of the *Muricidæ*; it is not quite so low in the fork, though exactly under the tentacula at the point of the invasion of the neck, and its continuation, the rostrum, by those organs; this position is proved by the proboscis when evolved lying upon the rostrum, and by its breadth equalling that of the neck, a point I formerly doubted, and entirely hiding that organ from view. This leads me to say, that for the fourth time, a few days since, I witnessed the emission of the proboscis from a specimen of one of the slender varieties of *Chem. acuta*: I had an excellent view, as the animal exserted and withdrew it several times, which was not the case before; it was not quite so slender at the point, nor so much arcuated as in Mr. Alder's figure; its orifice was perfectly seen.

From the above remarks and the descriptions that follow, together with those recorded in former papers, which comprise animals of the genera *Chemnitzia, Odostomia*, and *Eulimella* of modern authors, I submit to naturalists the propriety of merging the two latter in *Chemnitzia*, an appellation that fortunately has no other significancy than that of compliment to a laborious author in this branch of natural history. The similarity of the organs of the animals of the three genera, so far from affording essential generic characters, does not suffice without the assistance of the shell for specific distinction. Surely the *Chem. rufa* and *C. elegantissima* should not be separated from the smoother *Chem. Scillæ* and *C. acicula*, merely because the one is smooth and the other ribbed: if so, to be consistent, it would be necessary to separate the smooth *Chem. pallida* from the ribbed *Chem. decussata* and *interstincta*. As to the spiral fold, all the *Chemnitziæ* have it, though in many it does not come into the limits of visibility; but is that a reason to separate precisely congeneric animals? The tooth or fold, according to the species, is as often absent from view in the aperture as present, and it is curious that this condition is not unfrequently seen in the *same species*. I would ask then, are the inhabitants of such shells to be consigned to *Chemnitzia* or *Odostomia*? *Chemnitzia*, even including the *Odostomiæ* and *Eulimellæ*, is not so abundant in species as to supply an excuse for dividing them, to assist arrangement into genera that have names, but no distinct generic qualities. I think that in the most numerous tribes, judicious grouping would be more scientific than the formation of effete genera.

It is necessary to offer a remark which is applicable to all the Mollusca, especially to the minute ones, and peculiarly so to the *Chemnitziæ*. Great care must be taken to distinguish between *bonâ fide* specialties and those apparent ones brought on by an uneasy condition of the animal, which ought always to be described on the undisturbed march, when all the organs are naturally deployed, as at rest they are contracted; and violent exertion, which often arises when the animal in creeping arrives at the level of the water in the glass in which it is confined, or meets with an impediment, has the effect of producing unnatural forms: for example, the foot is often made to appear deeply emarginate or hollowed out by the excessive protrusion of the auricles, and the termination of the rostrum is in like manner distorted by the right and left points being exserted beyond nature; but all these forced positions vanish on the deliberate march. A neglect of these maxims has occasionally led me into errors, which will be noticed under their respective heads; I will not call them trifling, as perhaps on such, the distinctness of a particular species might hinge.

Chemnitzia acicula.

Eulima acicula, Philippi.
Eulimella acicula, auct.
Eulimella affinis, nonnull.

The animal inhabits a smooth, bluish white, subhyaline shell of eight flat volutions, and has the reflexed apex, the constant characteristic of the *Chemnitziæ*. The mantle is even with the shell, with the exception of the small fold I have alluded to above; the body does not nearly equal half the entire length of the shell. The general colour of the animal throughout is subpellucid frosted white, mixed with minute snowy flakes. The head or rostrum, called by some naturalists the mentum, is, when fully extended, rather long, very broad, square in front, slightly emarginate in the centre, and on the march is always in advance of the foot, as is usual with the muzzle of the *Rissoæ*; it is grooved the whole length, and the groove is continued towards the neck, just separating the tentacula at their basal centre; at its upper surface, close to the base, is the orifice of the proboscis. The tentacula diverge to almost right angles, and resemble short, broad, minute leaves, each with an opake white stripe or stamen through the centre; they bevel to a fine edge, and with their large flexible margins can, like all the *Chemnitziæ*, simulate the ear-shaped folds characteristic of those organs, which in this species are conspicuous, but the proteiform tips are only slightly developed. The eyes are very black, not quite close to each other, and immersed a little posterior to the internal bases of the tentacula. The foot is rather long, extending to two volutions, very thin, in front bluntly auricled, terminating, when in full march, in an acute point, and carries, on a simple lobe at the junction of the foot with the body, a pyriform light corneous operculum marked with arcuated oblique striæ of growth. The animal is free, creeps with rapidity, and dwells in muddy ground mixed with shelly spoil in 14 fathoms water, off Teignmouth, Devon. Malacologists will perceive that the organs of this animal are in every respect generically the same as those of *Chemnitzia rufa* and *Ch. elegantissima*. This species has never before been observed alive.

I have examined several live specimens of that variety of the present species termed by authors *Eulimella affinis*, and I find that the animal of the two is identical; the only difference is in the shell, which in the '*affinis*' is more taper, and has the whorls more rounded and better defined by the divisional lines.

Chemnitzia clavula.

Eulimella clavula, Brit. Moll.

The animal inhabits a pearly white, but not glossy shell, of five rather rounded volutions, including the moderately reflexed apex; the body is about half the entire length of the shell, with a narrowish, elongated, oval aperture, quite free from angularity. The animal is clear frosted white. Rostrum very narrow, rounded at the end, not bilobed nor grooved, and carried just before the foot; neck greatly protruded, on the march showing an open canal formed of two parallel longitudinal lines. Mantle even, no fold visible. Tentacula short, broad, swelling out behind like a minute wide leaf; the auriform folding nearly disappears on the march; they are not divergent; indeed, I may say, they are borne so close and straight as almost to hide the rostrum and proboscidal fissure; they may be termed small, short, triangular, and terminate each with two white inflations, that is, one completely apical, the other close below it quite lateral, subsemicircular, and as if soldered to the external sides of the points. I do not recollect having before observed this tentacular peculiarity. The eyes are at the internal bases, not very close together. The foot is a very deceptive organ, from its quality of exhibiting different appearances; it is very little concave in front, and has long tentacular auricles; the margins are thin, often reflexed upwards towards the shell, and it posteally assumes a form varying from the needle point to an obtuse termination, carrying on a simple lobular eminence of the main foot, at its junction with the body, a minute delicate pearl-coloured obliquely striated operculum. The animal is very active and free. Taken with the *Chem. acicula* in the same locality. The animal of this species has hitherto escaped observation.

I stated in the 7th vol. of the 'Annals,' N. S. p. 391, that I considered the *Ch. clavula* a variety of *Ch. acicula*, and confidently predicted no animal would ever be discovered of such variety which would exhibit decided specialties. I believe this error has originated from having had varieties of the *Ch. acicula* sent me for examination instead of the true '*clavula*.' I apprehend this must have been the case, as no one with the true shells can confound the two. Whether I am right or wrong in this conjecture, the acquisition of eight living examples of the *Ch. clavula* proves, that as regards both the shell and animal it is very distinct from *Ch. acicula*.

Chemnitzia scalaris, Philippi.

Chemnitzia rufescens, auct.

Animal subhyaline white, sometimes of a pale red muddy brown, aspersed with minute opake snow-white points, inhabiting a white plicated shell of seven or eight volutions, with transverse striæ between the ribs, having the body marked with two or three narrow spiral light reddish brown bands, and two on the penultimate volution; the apex is intensely reflexed on its next neighbour. Mantle even, except emitting a small cloven fold at the upper angle of the aperture. Rostrum deeply notched in front, with the segments gently arcuated. The tentacula are moderately long, strong, and divergent, and exhibit the usual folding auriform phases of their margins, but the varying inflations of the tips are less developed than in many other species; the eyes are black, not very close together, and fixed at the internal bases of the tentacula, which do not entirely coalesce, being divided by a distinct groove, that is the continuation of one on the rostrum from the point where the cleft terminates. The foot is short, very slightly auricled, and on the march does not extend much beyond the body volution, posteally declining to an obtuse termination, at a little distance from which is the almost simple upper lobe carrying the usual pyriform elliptically striated operculum.

Habitat: shelly mud, in 10 fathoms water, six miles from the shore, off Teignmouth, Devon.

This animal has scarcely been observed, and the only observation as to colour does not quite accord with the live specimens I have examined. I am now inclined to think, contrary to my opinion in the 'Annals,' N. S. vol. vii. p. 387, that there are two varieties of this species: the one scalar, or with turreted subangular volutions, which is considered the type, under the title of *Chemnitzia scalaris*; the other, with rounded volutions, has the specific appellation of *C. rufescens*. I have taken both alive, and could detect no difference in the animals, except in colour; the *C. scalaris* being sometimes subhyaline frosted white, at others pale red-brown, and the same variations attend the so-called *C. rufescens*. I may be in error as to the identity of the two, but that is my present impression.

Aug. 10th.—I this day took at the same haul two shells, one of which proved the typical *C. scalaris*, the second was the form termed by authors *C. rufescens*; they were both put in a vase, and being lively, I again saw that their organs were identical.

Chemnitzia fenestrata, auct.

Animal inhabiting a longitudinally plicated and spirally ridged white shell of eight rather flat volutions which bevel from their bases to the sutural lines; the apex has the usual reflexion of the tribe. The general colour of the external organs is a subhyaline frosted white, the internal posterior volutions are a deep red-brown. Mantle even with the aperture, except a small shoot at the upper angle. Rostrum slender, long, flat, barely hollowed at its termination. The tentacula are comparatively long, slender, and fold after the characteristic manner of the race, and have the white inflated tips; they are united at the bases, on which, close together, are imbedded at the internal angles the conspicuous black eyes. The foot in slow march is short, broad and obtuse, but when the pace is accelerated it attenuates and extends to the bottom of the second basal volution; anteriorly it forms a concave sweep, ending on the right and left in very slight auricular points, and posteriorly in a moderate lanceolate shape, carrying on a simple lobe, close to its junction with the body, a light, corneous, pyriform, obliquely striated operculum. This elegant little creature is very vivacious, and free from shyness.

Habitat: muddy ground, in 10 fathoms water, six or seven miles from the land, off Exmouth.

It is one of the unrecorded species.

Chemnitzia obliqua, Alder.

Odostomia diaphana, nonnull.

The animal inhabits a very pale yellow-white smooth shell of four rather tumid volutions, besides the apical reflexion, which is less than usual, the divisional lines are by no means oblique, and the body exceeds the length of the spire; its colour is a brilliant frosted subhyaline white. The mantle is even, except a conspicuous tubular fold at the upper angle of the aperture. The rostrum is short and cloven in the centre almost to the eyes; each segment forms an arcuation to each side equal to an angle of 40°. The tentacula are strong, rather long, without much auriform folding, subrotund and taper, terminating with minute circular snow-white spots or inflations on the tips; the eyes are close together at the internal basal angles; the great peculiarity attached to the tentacula is, that instead of a moderate divergence on each side the rostrum, they form large arcuations and are carried at right angles with the axis of the shell. Foot thin, rather concave in front, slightly auricled, long and broad, and when fully extended reaches beyond the body whorl, terminating in a distinct bifurcation, which is very apparent in slow march, but on a quicker pace being attained, the fork in some measure decreases in consequence of the greater extension of the foot; on a small simple lobe, close to the junction of the foot with the body, is fixed an elongated, narrow, corneous, delicate light yellow operculum with close-set oblique striæ of growth.

Taken at Exmouth from a shelly bottom, six miles from shore, in 12 fathoms water. It has hitherto escaped the researches of authors.

I have thought the "*obliqua*," if unconnected with the *Ch. Warrenii* (the *C. decorata* of authors), a doubtful species, but the above description removes all doubts of its not being in *esse*.

Chemnitzia insculpta, Montagu.

The animal occupies an ivory-white shell of five moderately rounded volutions, with well-marked but not oblique sutural lines; the three lower whorls at the basal portions have very fine distant either concentrically circular or spiral striæ. The colour is opake frosted white, with a rather large patch of dull claret-red on the neck. The mantle has the usual fold at the upper angle of the aperture. The rostrum is short, cloven to the eyes, with the segments arcuating as in *C. obliqua*. The tentacula coalesce at their bases, and are very broad and short, which condition may, in some measure, be owing to the margins not being folded in the auriform fashion on the march; they terminate in very small white slightly inflated tips; the eyes are close together at the internal bases. The foot appeared short and broad as the animal moved in slow march, but perhaps, if the pace had been accelerated, it might have been somewhat extended; in front it is gently concave with blunt auricles, close under which it becomes a little constricted, and terminates in a deep regular emargination carrying on a plain lobe a remarkably thin, light, horn-coloured, narrow, subelongated, obliquely striated operculum.

It inhabits six miles from shore at Exmouth, in a shelly bottom of 14 fathoms water. It has not been examined before.

Chemnitzia Warrenii, Brit. Moll.

Chemnitzia decorata, nonnull.

Animal inhabiting a white subturreted shell of four compressed volutions, with oblique sutures; the basal part of the body whorl being finely, superficially, and irregularly spirally striated. The mantle is even with the shell, but has the power of relaxing itself so as to produce a small conduit at the upper angle of the aperture. The rostrum is short, cloven as far as the eyes, having the segments curved to the right and left; the tentacula are short, triangular, bevelled, not broad, attenuating to a fine point, and armed with small white inflated tips; they are carried in front of the head with an angular divergence of about 75°; the eyes are close together at the internal united bases. The foot is short, concave in front, slightly auricled, posteally terminating obtusely with a light, horny, thin, obliquely striated operculum, seated on a simple lobe that is scarce distinct from the upper part of the foot near its junction with the body.

Habitat as in the two preceding species. This animal is now noticed for the first time.

Chemnitzia interstincta, Mont. et auct.; Annals, N. S. vi. 458.

Animal inhabiting a closely plicated white shell of five and a half flattish volutions, the body not being half the length of the shell; the apex is less reflexed than usual; the aperture has generally a visible tooth, and there are one or two rows of crenæ or lattice-work on the base, between the ribs, of the three lower volutions. The general colour of the animal, as regards the portion contained in the body whorl, is a frosted rather opake white. The mantle is even with the shell, scarcely showing a fold at the upper angle of the aperture. The rostrum is very slender, not cloven, but truncate at the end, and as usual on the march precedes the foot. The tentacula are rather long, slender, not particularly divergent, and have but narrow margins for the auriform folds; they are taper, bevelled, and terminate in prominent white tips; the eyes are not very close together at the internal bases. Foot short, narrowish, rarely extending when fully deployed much beyond the body volution, truncate in front or very little concave, with short auricles, and a little contracted below them, carrying on a simple upper lobe, at the junction of the foot with the body, a thin, pear-shaped, light, corneous, obliquely striated operculum; the foot has a rather obtuse though lanceolate termination.

I have reproduced this species, already described by me in the 'Annals,' partly with the view of correcting some slight errors, but principally to place it in immediate view for comparison with its tumid variety, and with the next species, the *Chemnitzia indistincta*, and its variety that has been named *Ch. clathrata*, all of which have been strangely jumbled together; but very large series of both species and their varieties have, I think, enabled me to unravel various misapprehensions. With respect to the shell of the present species, it has only one well-marked tumid variety, which, as regards the animal, differs in no respect from its chief, as the posterior volutions of both, in the shell, are of a dark lead-colour; but the variety is invariably of larger size; the whorls, though the same in number, are more tumid, and the body volution is more than half the whole length of the shell; there is rarely on the body and next turn more than one well-pronounced row of crenæ, and a tooth is always visible in the aperture. I have a fine series of more than twenty examples of the variety, and 100 of the type, all of which have been examined alive.

It is difficult to say whether Montagu's figure represents the shell with the flat or tumid volutions, but as far as the indifferent engraving will allow one to judge, I should guess it to be the tumid variety. I believe, however, all collectors consider the flatter shell the type, it being by far the most abundant. As I find the animals of both absolutely identical, I cannot hesitate to consider the differences of figure as of mere varietal value. The true *Ch. interstincta* has usually a fold in the aperture, but it is not uncommon without it, and these exceptions are multiplied in most collections by an admixture of some half-grown typical *indistincta* and the variety '*clathrata*,' which are invariably without the tooth; it never exceeds $5\frac{1}{2}$ volutions.

The type is very common in the coralline district, but the tumid variety is oftener met with in shelly mud.

Chemnitzia indistincta, Mont. et auct.

Chemnitzia clathrata, Brit. Moll.

The animal inhabits a white subopake shell of six or seven, sometimes eight, rounded volutions, with close-set waved longitudinal plicæ that have 3–5 rows of short lines forming a lattice-work between the ribs, sometimes on them, at the bases of the three or four last whorls; the body is not near half the length of the entire shell; the aperture is always destitute of a tooth. The animal in the body volution is pale yellowish subhyaline white, aspersed with minute snow flakes, but the posterior volutions are dark lead-colour, visible through the shell. When the neck is greatly protruded, two parallel longitudinal lines are seen forming an open canal, perhaps for branchial purposes. The rostrum is long, rather narrow, and just rounded at the termination. The tentacula are very short, united at the bases, with their thin margins unfurled on the march, which gives them, instead of the usual auriform figure, a very large, subtriangular, broad, leafy aspect; they terminate in large inflated white tips, and are often delicately powdered with a pale, thin, cloud-like suffusion of excessively minute lemon-coloured points; the eyes are very black, distinct, and close together at the internal bases. The foot is large, thin, subhyaline, either truncate or concave in front, dependent on the will of the animal, with very large auricles, which in progression are used as feelers; the margins of the foot are often reflexed, as if to embrace the sides of the shell; it is long, and when fully extended reaches to the third basal volution, and ends in a needle point; sometimes on each side there is a row of small flake-white spots; it carries on a simple upper lobe, scarcely distinguishable from the mass of the foot, a light corneous, thin, obliquely striated pyriform operculum.

The animal marches with rapidity, and is far more active than the *Ch. interstincta*. It inhabits, with the variety '*clathrata*,' a peculiar district of shelly mud, between the laminarian and coralline zones in 10 fathoms water, off Teignmouth.

That this is Montagu's *Turbo indistinctus* is scarcely doubtful; he says that his examples have six volutions, and no fold in the aperture—that is the number of the ordinary run of specimens; but both the type and variety, when very fine, have $6\frac{1}{2}$ to 8 turns, as our magnificent series will show.

There can be no doubt of the *Ch. indistincta* being distinct from the *Ch. interstincta*; we, in our first accounts, thought otherwise; but the greater number of volutions, the invariable absence of a tooth, the much more diffused lattice-work of the former, and the specific differences of the animals, afford decisive marks of distinction.

We have examined more than twenty live specimens of the typical species, in comparison, often in the same vase, with forty of the variety '*clathrata*,' which only differs from the type, as regards the animal, in having the posterior volutions pale pink, that gives the shell the appearance of being of a still paler pink hue, but in fresh shells the colour is a dull pearly white; this difference in the animals is probably dependent on food: another variation, perhaps the effect of the same cause, is, that the contour of the variety is somewhat less slender than the type; but the similar number of the volutions, the character of the lattice-work, and of the want of the tooth in the aperture of both, together with the identity of the animals, forbid the differences I have noticed to be considered of more value than of mere and not uncommon variations.

Chemnitzia pallida, Mont. et auct.

C. eulimoides, Ann. Nat. Hist. N. S. vol. vi. p. 452; vol. vii. p. 389.
C. rissoides, Ann. Nat. Hist. N. S. vol. vi. p. 455.
Odostomia notata, O. albella, O. dubia, O. alba, O. nitida, O. rissoides, O. eulimoides, O. glabrata? auct. variorum.

There is nothing to add to the description in the 'Annals' of the above species, of which several are now alive before me; I have only to observe, that having examined the animals of the annexed so-called species, I am bound to add them to the synonymy of *Chemnitzia pallida*; one, as the papers referred to above will show, of the most variable species as regards the shell; but the animals of all these spurious articles have the unvarying distinguishing character of *C. pallida*, which is absent from all the other *Chemnitziæ* that can in any way be confounded with this group,—I mean the liberal, though irregular aspersion of many of their organs with minute sulphur-yellow or gold-coloured spots and points; and above all, the organs of their animals are similar. This species is an inhabitant of all the zones, and receives that impress as to form and size which results from the incidents of the respective localities; these causes have doubtless led to the formation of the pseudo-species, which I think only in some cases can claim even the distinction of varieties.

Chemnitzia acuta, mihi, Ann. Nat. Hist. N. S. vol. vi. p. 452.

Odostomia acuta, auct.
O. conspicua, Alder?
O. turrita, nonnull.
O. striolata, Alder?

Animal inhabiting a glossy shell of 5–6 rounded volutions of a more or less pale livid red, pinkish, or pearly hue; the apex is greatly reflexed, and the aperture furnished with a conspicuous tooth. The ground colour of the animal is a sordid white, mixed with clouded pale yellow, red, or brown patches and points, which are irregularly distributed on many of the organs; the tissue of the skin is smooth, rarely frosted or breaking into a mottled flaky aspect. The mantle is even, except that at the upper angle of the aperture, there is a very evident folded tubular canal, which I have alluded to in the preliminary observations on the genus. I will only add, Mr. Lowe writes, "pallio ecanaliculato;" M. Lovén says, "processus pallii dexter canaliculatus;" from which it may be inferred that the canal is sometimes present, at others not, or not visible. The rostrum is slender, deeply channelled, or hollowed out its whole length, having a cochleariform termination, and at the upper surface of its base emits the proboscis. The tentacula are moderately long, divergent, subtriangular, bevelled, with the margins only slightly folded, and the tips are less white and inflated than usual; the eyes are rather close at the internal angles. Foot short, opake white, often aspersed on both surfaces with the varying hues I have spoken of above, deeply hollowed out in front, forming with the angles long auricles, which, when drawn together by the animal, have the appearance of a second pair of tentacula; its posteal termination, at the will of the animal, assumes the varying phases of the pointed and obtuse forms, carrying at the junction of the foot with the body, on a simple eminence, a pyriform red-brown or yellowish obliquely striated operculum.

There being some inaccuracies in my account of the *Ch. acuta* in the 'Annals' referred to above, I have reproduced it, as it is an important species embracing several others of doubtful parentage, and some varieties, which latter produce the three following distinct forms. The slender subcylindrical variety passes in all collections for the coralline zone *Ch. plicata*; this is an error: an examination of the animal shows it to be a *Ch. acuta,* differing materially in its organs from the true '*plicata,*' which is essentially a littoral animal, rarely, if ever, found beyond that limit: I have hundreds of examples taken alive. The next form is that of the common livid flesh or pearl-coloured glossy shell of 5–6 volutions, with a cone of broader basal dimensions; this is the type, and though usually smooth in the aperture, is sometimes furnished with transverse crenæ in the throat; I have four which were examined alive in comparison with the smooth ones, and they are, both in shell and animal, identical; it is difficult to account for the occasional presence of distinct crenæ in the same species. The third form is of the larger size of 6–8 volutions with white shells; these are smooth, though sometimes furnished with striæ in the throat of the aperture; I have several of each, which are so exactly represented by the figure of Mr. Alder's *O. conspicua* in the 'British Mollusca,' that I am induced to consider that species as a large crenated *Ch. acuta*; and it is not improbable that the *O. striolata* of the same author, like the *Ch. turrita,* of which I have spoken largely in the 'Annals,' N. S. vol. vii. p. 392, may be a striated *Ch. acuta,* which are all more or less furnished with spiral striæ on the volutions. I must observe, that the crenated examples of *Ch. acuta* must not be confounded with any variety of *Ch. conoidea,* as the animals of the two are very different; and as regards the shell, the cone of the one attenuates suddenly, whilst in the *Ch. conoidea* it diminishes more gradually and tumidly.

The *Ch. acuta* is by far the most abundant *Chemnitzia* of the South Devon coasts, and is taken in the coralline and muddy shelly districts. Independent of the three principal varieties, each varies greatly in the contour and colour of its individuals; it is, after the *Ch. pallida,* the most variable of the *Chemnitziæ.*

Chemnitzia unidentata, Mont.; Annals, N. S. vol. vi. p. 453.

I have lately examined many live examples of this species, and have only to request that for "*head proboscidiform*"—"*rostrum truncate in front, not cloven,*" may be substituted.

Chemnitzia conoidea, Annals, N. S. vol. vi. p. 453.

Odostomia conoidea, nonnull.

A splendid series of all sizes of this beautiful species has been examined, and I have little more to observe, except that I find it has a slender and tumid variety.

Chemnitzia plicata, Mont.; Annals, N. S. vol. vi. p. 457.

Two hundred live specimens of this, I believe, strictly littoral animal have occurred; and I beg that the following sentence, "but I believe it also inhabits the laminarian and coralline districts," may be erased.

Chemnitzia rufa, auct.; Annals, N. S. vol. vi. p. 457, & vol. vii. p. 386.

Chemnitzia formosa, nonnull.; and Annals, N. S. vol. vii. p. 387.

I have seen several large specimens in the present month, June 1852; the only correction I offer is for, "The head or muzzle proceeds from the coalescing tentacular membrane, forming a sort of head-veil a little beyond the foot," read "*the rostrum* is long, flat," &c. &c.

Chemnitzia fulvocincta, Annals, N. S. vol. vii. p. 387.

The above reference explains all I know of this species, which, with most authors, is a synonym of *Ch. rufa.*

Chemnitzia spiralis, Mont.; Annals, N. S. vol. vi. p. 457.

Odostomia spiralis, nonnull.

I have no additional observations to make on this species.

Chemnitzia Sandvicensis, Walker, Test. min. rar.; Annals, N. S. vol. vii. p. 388, and vol. viii. p. 110.

Odostomia dolioliformis, nonnull.

I have nothing more to offer on this species.

Chemnitzia decussata, Mont.; Annals, N. S. vol. viii. p. 111.

Odostomia decussata, nonnull.

Chemnitzia elegantissima, Mont.; Annals, N. S. vol. viii. p. 112; Brit. Moll.

I request that the following sentence may be added to the descriptive matter:—The *Ch. elegantissima* is never marked with purple streaks as in *Ch. pusilla,* and the tentacula are carried more in a line with the body than in that species; the shell is also more taper and of a more opake sordid texture, but recent examples must be compared to see the value of this distinction.

Chemnitzia pusilla, Philippi; Annals, N. S. vol. viii. p. 113.

The addendum to the preceding species will apply to this; I have only to observe, that the constant variations in colour, contour, and texture of the shells have been verified by the examination of near twenty live individuals of this species.

Chemnitzia Gulsonæ, Annals, N. S. vol. vi. p. 459, and vol. viii. p. 108.

I have searched in vain for a second example of this rare animal; I am anxious to review it; however, I do not despair of again meeting with it.

The only other British *Chemnitziæ* which I have not seen alive are the *Ch. Barleei, Ch. excavata, Ch. Scillæ* (*Ch. nivosa,* which is the *Ch. cylindrica* (juv.), and *Ch. truncatula* of authors). Though in a former paper I have included the *Aclis unica* amongst the *Chemnitziæ,* it may possibly turn out to be of a different type:—this observation is made without further knowledge on this point; I know pretty nearly its habitat from having found recent shells, but with the animal so collapsed as not to emit the organs. I will make no remark on the *Aclis ascaris* and *A. nitidissima,* as the animals still elude our researches.

I have now stated all that I know, agreeably to my views, of this difficult and interesting genus, and corrected some popular errors as well as those of observation, and particularly many of my own; for however greatly our *amour propre* may suffer by such admissions, there is absolutely no other alternative but to submit to them, which, if omitted, or not made at the proper moment, would leave us pretty much in the same position as the Chancellor of the Exchequer's regiment of conscience-money payers, which curious public fact, illustrative of one of the mysterious operations of the human mind, if properly pondered on, will suggest to us all, in respect of the present and the hereafter, many salutary, important, and high considerations.

I am, Gentlemen, your most obedient servant,

William Clark.

XX.—*On the Sloughing of the Spider-Crab* (Maia Squinado). By P. H. Gosse, A.L.S.

An opportunity having just occurred to me of witnessing the sloughing of a large Crab, I put down the principal points that I observed, hoping that they may throw light upon a subject that has always appeared so full of difficulty; namely, the manner in which the limbs are withdrawn from the exuviæ.

As I was out this morning searching for algæ and zoophytes at low water, in the little cove of Hele near this town, I looked into a crevice that formed a small tide-pool beneath a huge overhanging rock. In the remotest corner crouched a Spider-Crab (*Maia Squinado*), face outwards, as is the custom with crabs in such circumstances. On pulling it out, I was astonished and delighted to observe how completely the carapace and the limbs were covered with parasitical zoophytes and algæ. A delicate *Ceramium* was conspicuous among the latter, and the former consisted of *Antennulariæ* and *Plumulariæ* in great profusion, and in the highest possible condition; many of them loaded with ovigerous vesicles.

While in the act of securing the crab in my collecting-basket, esteeming it only on account of the zoophytes it carried, I felt the body fall away from the carapace, which hung for an instant by the frontal part and then gently detached itself, with a feeling to my fingers as if it had been *torn* away. On looking at the crab I saw the new carapace perfectly formed and coloured, with no marks of injury where the slough had parted from it. The whole of the limbs and the under parts still remained invested with the old skin.

My collecting-jar was not large enough to receive the animal, which I was therefore compelled to bring home dry in the basket. But I immediately covered it with sea-water on my arrival, after it had been exposed about three-quarters of an hour. It was very inert and seemed exhausted. My attention was taken up with one of the zoophytes, which was new to me, and I did not look again at the crab for about a quarter of an hour. It was then in the very act of sloughing the remainder of its exuviæ. The whole of the limbs, the abdominal segments, the sternum, with all the members of the mouth, came off entire, being connected by the common integuments.

When I looked at it, the first thing that struck me was the pulling of the legs out of their sheaths. The posterior ones were freed first; the anterior pairs were about half out, and the animal pulled first at one, then at another, until they were quite drawn out, as if from boots. *The joints, as they came out, were a great deal larger than the cases from which they proceeded.* It was evident that in this instance, neither were the shells split to afford a lateral passage for the limbs, nor were the limbs reduced to tenuity by emaciation. It seemed to me that the parts, which had an almost jelly-like softness when extruded, were compressed as they were drawn through the narrow orifices by the fluids being forced back, these returning through their vessels, and distending the liberated portion of the limb, as it was freed.

The enlargement of the whole animal was as immediate and imperceptible in its progress as that of a caterpillar in the act of moulting. I measured some of the dimensions soon after the completion of the process, and found them as follows:—

	In the slough.	In the crab.
Length of the carapace to the tip of frontal spines ...	$3\frac{7}{8}$ in.	$4\frac{5}{8}$ in.
Width of the carapace at the lateral spines	$3\frac{3}{16}$ „	$3\frac{7}{8}$ „
Diameter of thigh of first true leg	$\frac{5}{12}$ „	$\frac{6}{12}$ „

The claws of the anterior feet, and the black horny points of the ambulatory feet, were increased in size more than proportionally, as were the abdominal foot-processes.

The whole of the branchiæ were represented in the most beautiful order in the exuviæ, with the crescentic *flabellum* laid over each series perfectly *in situ.* They were enveloped in an ample and most delicate mucous membrane, which was attached to the margin of the crust all round, and was evidently the lining membrane of the branchial cavities. The coats of the stomach, with its minute teeth, were also there in the form of a membranous bag, attached to the mouth by the lining of the œsophagus. The coats of the antennæ and of the eyes remained attached to the carapace; and the glassy corneæ of the latter were not reversed.

On opening a joint of one of the legs of the exuviæ, I found the thin shelly plates that afford attachment to the muscles still *in situ.*

I was struck with the beautifully regular though minute serrature of the opposing edges of the claws in the renewed animal, the teeth closing accurately into the intervals of the opposite series when appressed. Scarcely a trace of any such structure could be discerned in the slough; the teeth having been probably worn smooth by use.

I did not see any of the struggling that is sometimes spoken of; it seemed to be a very easy and simple matter. The new integuments were perfected, though soft, before the old were thrown off, and the immediate cause of the separation of the crust appears to me, the sudden growth of the animal within, forcing asunder the upper and lower crusts at the posterior margin: then the pulling out of the limbs presents no more difficulty than what depends on the enfeebled condition of the muscular energy.

The great claws of the common crab and of the lobster, of course, suggest a more difficult operation. But the congruity seen in the operations of nature makes it unlikely that one mode of procedure would obtain in these and another in a species so affined as the Spider-Crab. Hence, I presume that even these members, bulky as they are, are drawn through their narrow joints, not by being *emaciated,* but simply by being *softened,* and by their fluids being displaced *in detail.*

Ilfracombe, Devon, August 14, 1852.

BIBLIOGRAPHICAL NOTICES.

Plantæ Javanicæ Rariores, descriptæ Iconibusque illustratæ, quas in Insula Java, annis 1802–18, *legit et investigavit* THOMAS HORSFIELD, M.D.; *e siccis Descriptiones et Characteres plurimarum elaboravit* JOANNES J. BENNETT; *Observationes Structuram et Affinitates præsertim respicientes passim adjecit* ROBERTUS BROWN. Fol. Lond. Part 4, 1852.

WE are glad to announce the publication of the fourth and concluding part of this valuable work, the earlier parts of which are noticed in the second and fourteenth volumes of our 'Annals.'

The acknowledgements there made to Dr. Horsfield for his eminent services in science, and to the Hon. Court of Directors for their liberal patronage of them, render it unnecessary for us to say more than that the 'Plantæ Javanicæ Rariores' will ever be considered a record *ære perennius* of the merits of the one (associated as he here is with his friends Mr. Brown and Mr. Bennett, to whom the present work owes its existence), and, among other splendid publications equally due to the liberality of the East India Company, of the munificent character of the other.

To this concluding part Dr. Horsfield has added a very valuable map of Java, on which the routes in his different journeys are traced, a geographical preface illustrating the map, and a very interesting postscript, in which he gives a rapid sketch of his excursions, with observations, especially on the volcanos of the island.

Dr. Horsfield's labours in Java began and ended under the protection of the Dutch Government, to the officers of which he gratefully acknowledges his obligations. His first visit to Java was in 1800, as a surgeon on board a vessel from Philadelphia, and it was during this voyage that he was so struck with the beauty of the island, that he felt an irresistible desire to study its productions. In the next year he therefore returned to Java, and entered the Dutch service, receiving the appointment of surgeon in the Colonial Army. His first Report to the Batavian Society of Arts and Sciences led to a more liberal appointment, which enabled him to extend his researches. From 1800 to 1811 Java was in the possession of Holland, and it was restored in 1816. It was in the five intervening years that Dr. Horsfield enjoyed the patronage of Sir Stamford Raffles, and formed that friendship which ever after constituted the pride and charm of his life. It was through the influence of this eminent man that his labours were made known to Sir Joseph Banks: and a collection of plants sent to him in 1814 was the occasion of the first communication from Mr. Brown, who eventually, on Dr. Horsfield's arrival in England in 1819, examined and arranged the herbarium, containing 2196 species. The present work is the joint production of that great botanist, and of his friend and associate Mr. Bennett, and must be considered the most important contribution to our botanical knowledge that has been made in this country of late years.

We copy Dr. Horsfield's closing passage of his postscript:—

"I have the pleasing duty," he says, "to acknowledge the ability and assiduity with which Mr. Bennett has performed the task he has undertaken. The minuteness of detail and extent of research with which he has elaborated the articles he has contributed, elucidate clearly and satisfactorily the characters and habits of the subjects as well as the history of their discovery, and the labours bestowed on their investigation by preceding botanists. Mr. Brown has, agreeably to his original intention, contributed his remarks on the affinity and structure of the subjects described; he has also afforded many valuable suggestions in the progress of the work, and the whole has received his examination and revisal. I embrace with pleasure the opportunity now afforded me of publicly expressing my great obligations to Mr. Brown. The examination and arrangement of my herbarium, the laborious duties connected with the superintendence of the figures contained in this work, the preparation of the illustrative details, and the time devoted to the description of the subjects, are by no means the only marks of friendship which I have received from that distinguished botanist, who, ever since my arrival in England, has afforded to me his advice and assistance in my researches connected with natural history, and on many other important occasions."

Of the plants contained in the concluding part, five in number, nearly all are remarkable for such singularities of structure as to render the determination of their affinities a task of considerable difficulty; and the elaboration of the whole part is due to Mr. Brown. The plant least removed from ordinary forms is *Actinophora fragrans*, a genus indicated in Dr. Wallich's list and there referred to *Buttneriaceæ*; with respect to which Mr. Brown observes, that "it certainly does not belong to *Buttneriaceæ* as I originally defined it, but this may equally be said of several genera included in that order, and which, like *Actinophora*, are more obviously referable to *Tiliaceæ*; at the same time, as I observed in proposing the separation of *Buttneriaceæ*, these two families gradually pass into each other." The more remarkable characters of *Actinophora* are its "enlarged subfoliaceous spreading calyx, accompanying a crustaceous evalvular monospermous pericarpium."

The two succeeding articles are dedicated to a new species of *Sarcostigma* (*S. Horsfieldii*, R. Br.), and *Iodes ovalis* of Blume; two genera referred by Mr. Brown to the natural family of *Phytocreneæ* of Arnott. He discusses the question of the value of their floral envelopes, and comes to the conclusion that they are properly to be regarded as calyx and corolla. He notices also the views of different anthors as to their affinity, and gives a synopsis of the characters of the family *Phytocreneæ* and of the genera belonging to it, viz. *Phytocrene*, Wall., *Sarcostigma*, Wight and Arn., *Iodes*, Blume, *Nansiatum*, Buch. Ham., and *Miquelia*, Meisn. (including *Jenkinsia*, Griff.). As a genus "Phytocreneis affine," he enumerates also *Pyrenacantha*, Hook., properly united by M. Planchon with *Adelanthus* of Endlicher. While removing *Sarcostigma* from *Hernandiaceæ* in which Messrs. Wight and Arnott had placed it, Mr. Brown incidentally observes that the two genera, *Hernandia* and *Inocarpus*, of which that family has been composed, do not appear to be very nearly related to each other.

The fourth species figured in this part is *Cardiopteris lobata*, Wall. List, which is identified with *Cardiopteris Javanica* of Blume. After tracing some curious points in the botanical history of the genus, Mr. Brown proceeds to notice the more remarkable peculiarities of its structure, and discusses the questions of its hermaphroditism, the position of the micropyle of its seed, and the singular arrangement of its perfect and imperfect stigmata. In illustration of the latter point we quote his description of the pistillum. "The external structure of the pistillum is very singular. In an early stage of the flower, immediately before or even at the time of expansion, there are apparently two stigmata: of these the more obvious is capitate, undivided, fleshy, but not papillose, and is supported on a distinct style; the second is quite sessile, much shorter in this stage than the capitate branch, and having its upper or inner surface distinctly stigmatic or papillose. In the next stage, the latter, which I regard as the efficient stigma, gradually enlarges, becoming longer than the capitate organ, which in my opinion is an imperfect stigma, and as in this stage the ovarium though enlarged has not perceptibly increased in diameter, this capitate stigma has the appearance of being lateral. The perfect stigma, which continues to lengthen, its upper surface becoming more evidently hispid or papillose, not unfrequently remains crowning the samara even when ripe, but frequently also it is then deciduous, while the imperfect capitate stigma, which has undergone no change either in size or surface, more generally remains after the real stigma has fallen." With respect to the affinities of this curious genus, Mr. Brown does not regard any of the approximations hitherto made as satisfactory; and although aware of several important objections to the view, is "inclined to consider *Cardiopteris* as an isolated genus or family to be placed at no great distance from *Phytocreneæ*, chiefly through *Iodes*."

The concluding article contains a monograph of the genus *Bennettia*, established by Mr. Brown in Dr. Wallich's List in 1847, and recently published by M. Tulasne under the name of *Cremostachys*. Mr. Brown regards *Bennettia* as bearing "the same relation to *Antidesma* (for *Antidesmeæ* contains at present no other well-established genus) that the polypetalous bear to the apetalous genera of *Euphorbiaceæ*." In the present case he states that "the presence of petals may even be regarded as of more than ordinary importance, their usual form in the male flower being necessarily connected with the æstivation of stamina." This remarkable peculiarity is thus described in the species figured, *Bennettia Javanica*, R. Br.:—"Stamina decem distincta. Filamenta brevissima, latiuscula, sepalis et petalis opposita. Antheræ biloculares, loculis connectivo lato distinctis longitudinaliter dehiscentibus; omnes cucullis petalorum semi-inclusæ, ita ut duæ petalo singulo oppositæ esse videantur (exterior interiorque), sed dum exterior ad filamentum petalo oppositum pertinet, interior e loculis respondentibus filamentorum duorum petalis alternantium formata est." Mr. Brown adds, that "the affinity between *Euphor-*

biaceæ and *Antidesmeæ* is rendered more obvious by the addition to the latter of *Bennettia* ; but the structure of ovarium and the monospermous drupaceous pericarpium readily distinguish them. *Iodes* and *Sarcostigma* also agree with *Bennettia* in several important points, particularly in their unisexual minute flowers, ovarium with two pendulous ovula, monospermous drupa, and in most respects in the structure of seed ; they differ in habit, being twining or scandent shrubs without stipules, in their monopetalous persistent inner perianthium or corolla, in æstivation and reduced number of stamina, in structure of antheræ, and in the embryo being inverted, not transverse." The number of species of *Bennettia* described is seven, "chiefly distinguishable by minute, but," as Mr. Brown believes, "constant differences in their male flowers and in the form of their fruits." With the exception of the Javanese species, they are all from Tavoy, Singapore, and Pulo-Penang, where the genus was first discovered by Jack, who referred it, with doubt however, to *Limonia*. In treating of this genus Mr. Brown incidentally refers to the principle which he laid down in 1810, when proposing and characterizing the family of *Combretaceæ,* which he placed among Polypetalæ "non solum propter petalorum in pluribus existentiam, sed quia vera natura partium affinitatesque ordinum, ex contemplatione generum in quibus structura magis evoluta, quam ex iis in quibus aliqua pars suppressa, tutius erui queant ;" a principle in conformity with which he in 1814 also "placed among Polypetalæ *Euphorbiaceæ,* a family to which the same reasoning is still more strikingly applicable."

Preparing for Publication.

An Elementary Introduction to the Study of Palæontology ; with numerous Figures Illustrative of Structural Details. By F. M'Coy, Professor of Geology and Mineralogy, Queen's College, Belfast.

Also, by the same Author,

A Manual of the Genera of British Fossils ; comprising Systematic Descriptions of all the Classes, Orders, Families, and Genera of Fossil Animals, found in the Strata of the British Isles ; to be completed in four or five Parts, forming one volume, 8vo, of about 500 pages, with nearly 1000 Wood Engravings.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

Feb. 18th, 1851.—W. Yarrell, Esq., Vice-President, in the Chair.

Read "A Catalogue of Recent Land and Freshwater *Mollusca* found in the neighbourhood of Nottingham." By Edward Joseph Lowe, Esq., F.R.A.S. &c.

Water Shells (*Univalves*).

Neritina fluviatilis. Abundant in the river Trent near Beeston and near Nottingham, and in the river Soar near Thrumpton.

Paludina achatina. Common at Thrumpton in the river Soar, in the river Trent below Nottingham, and in the Lenton Canal.

Bithinia tentaculata. Swarms in a stagnant ditch near Lenton Priory, common in most ditches at Lenton, in a clear brook at Beeston and another at Attenborough, in the river Trent and tributaries to that river near Beeston and Sawley, and also under the Seven Arches in Nottingham Meadows.

B. ventricosa. Only found in a narrow ditch near the railway at Lenton, where it is tolerably abundant, and under the Seven Arches in Nottingham Meadows.

Valvata piscinalis. Abundant in brooks at Beeston, Lenton, and Bulwell, and in the river Trent near Beeston.

V. cristata. In rare numbers in a brook on Bulwell Bogs.

Succinea putris. Rather abundant at Thrumpton.

S. Pfeifferi. Common at Sawley and near Highfield House, and found between Beeston and Attenborough.

Limneus auricularius. Abundant in the Musco-Sic dike near Highfield House; found at Lenton, Beeston, Attenborough, and Sawley.

L. pereger. Very abundant at Lenton, Beeston, Attenborough, Sawley, Bulwell, Thrumpton, Highfield House, and Nottingham Meadows.

L. stagnalis. Abundant in a dike at Lenton, a dike at Attenborough, a mill-dam at Bulwell, a backwater at Sawley (called the 'Old Trent'), and in few numbers in the river Trent near Beeston, and a stagnant ditch between Beeston and Attenborough.

L. palustris. Abundant on moist mud at Sawley and near the railway at Thrumpton, and very large in a stagnant ditch between Beeston and Attenborough.

L. truncatulus. Rare in a ditch at Lenton and under the Seven Arches in the Nottingham Meadows.

Ancylus fluviatilis. Tolerably abundant in clear dikes at Highfield House, Attenborough, Bulwell and Oxton, and at the mouth of a well at Newstead Abbey.

Valletia lacustris. Tolerably abundant in a small ditch at Lenton near the railway, and under the Seven Arches in Nottingham Meadows.

Physa fontinalis. Abundant in dikes at Lenton and Attenborough, the canal at Lenton and a pond at Wollaton, and in small numbers in the Musco-Sic brook near Beeston.

P. acuta (of Sowerby). Abundant in the river Trent at Beeston and Attenborough, rare in a brook on Oxton Bogs, in the canal at Lenton, and in a ditch between Beeston and Attenborough.

Aplexus hypnorum. Abundant in a dike at Beeston and rare in a ditch near the Beeston railway station.

Segmentina lineata. Rare in a brook on Oxton Bogs.

Planorbis corneus. Very abundant in brooks at Lenton, Beeston, Bulwell, Sawley, Attenborough, &c.

P. carinatus. Very abundant in brooks at Lenton, Beeston, Bulwell, and Attenborough, in the river Trent at Beeston, and under the Seven Arches in Nottingham Meadows.

P. marginatus. Abundant in dikes at Beeston, and of large size in a stagnant ditch between Beeston and Attenborough.

P. vortex. Very abundant in the river Trent, and in dikes at Beeston, Lenton and Attenborough, and under the Seven Arches in Nottingham Meadows.

P. spirorbis. Abundant in the river Trent at Beeston, and in dikes at Beeston, Lenton, and Attenborough.

P. albus. In few numbers in the river Trent near Beeston.

P. contortus. Not common on the bogs at Bulwell, and rare in a ditch at Lenton.

P. imbricatus. Not common on dead leaves in the lake at Highfield House.

P. nitidus. Rare in the lake at Highfield House and in a pond at Wollaton.

(*Bivalves.*)

Cyclas rivicola. Rather abundant in the river Trent near Beeston and in the river Soar at Thrumpton.

C. cornea. Very common in the river Trent near Beeston, and in brooks at Lenton, Beeston, Attenborough, Bulwell, and Highfield House, and under the Seven Arches in Nottingham Meadows.

C. lacustris. Very abundant in a brook at Beeston and another at Highfield House.

Pisidium amnicum. Abundant in the river Trent at Beeston, in a ditch near Beeston railway station, and in a brook at Beeston.

Anodon cygneus. Abundant in the lake at Highfield House, in the Old Trent at Sawley, and in mill-dams at Bulwell.

A. cellensis. Abundant in the lake at Highfield House and in the river Trent near Beeston.

A. anatinus. Abundant in the lake at Highfield House, a stream and canal at Lenton, and the rivers Trent and Soar.

A. avonensis. Rare in the river Trent near Beeston.

A. anatinus, var. (very ventricose). In the lake at Highfield House.

Unio pictorum. Common in the lake at Highfield House, the river Trent at Beeston and Sawley, and the river Soar at Thrumpton.

U. tumidus. Not uncommon in the river Trent near Beeston, and rare in the lake at Highfield House.

U. ovalis. Found in the lake at Highfield House and in the river Trent at Beeston.

U. Deshayesii (if a var.). Not common in the river Trent near Beeston.

Dreissena polymorpha. Very common and large in the lake at Highfield House, common in the canal at Lenton (where it is small), the river Soar at Thrumpton, and a pond at Wollaton, and in few numbers in the river Trent near Beeston.

LAND SHELLS.

Helix aspersa. Very common at Beeston and around Nottingham.

H. hortensis. Rare at Bulwell.

H. nemoralis. Very abundant in most hedges.

H. hybrida (if a var.). Rare at Highfield House.

H. arbustorum. Rare at Thrumpton, Sawley, and Highfield House.

H. pulchella. Tolerably abundant at Highfield House, rare at Beeston and Oxton.

H. fulva. Not uncommon at the foot of a hill at Thrumpton, rare at Highfield House, Oxton, and Stanton-on-the-Wolds.

H. hispida. Common at Nottingham Castle, Beeston, Bulwell, Sawley, Oxton, Highfield House, Thrumpton, Stanton-on-the-Wolds, &c.

H. concinna. Tolerably abundant at Highfield House, and found at Stanton-on-the-Wolds.

H. depilata. Found in small numbers at Stanton-on-the-Wolds.

H. sericea. Rare at Bulwell, Oxton, and Stanton-on-the-Wolds.

H. virgata. Rare at Stanton-on-the-Wolds and at Highfield House.

H. ericetorum. Abundant at Stanton-on-the-Wolds.

H. rotundata. Very common at Highfield House and Nottingham Castle, and found at Bulwell.

H. alliaria. Not abundant at Sawley and Thrumpton.

H. cellaria. Abundant at Nottingham Castle, Sawley, and Highfield House.

H. aculeata. Rather rare under decayed leaves at Highfield House and Stanton-on-the-Wolds.

H. caperata. Very abundant at Stanton-on-the-Wolds in one field, but not found elsewhere.

H. crystallina. Not abundant at Highfield House, Bulwell, and Oxton.

H. granulata. Rare on Bulwell Forest.

H. lucida. Not common at Bulwell, Oxton, Highfield House, and Stanton-on-the-Wolds.

H. nitidula. Rare at Bulwell and Oxton.

H. pura. Rare at Oxton.

H. pygmæa. Rare at Highfield House and Stanton-on-the-Wolds.

Vitrina pellucida. Common at Oxton both on the warren and on the bogs, less abundant at Highfield House, Beeston, Bulwell, and Stanton-on-the-Wolds.

Carychium minimum. Tolerably abundant under leaves at Highfield House, Bulwell, Beeston, and Stanton-on-the-Wolds.

Bulimus obscurus. Abundant at Nottingham Castle and Highfield House.

B. lubricus. Common at Highfield House, Sawley, and Thrumpton, and found at Bulwell, Oxton, and Stanton-on-the-Wolds.

Azeca tridens. Rare at Highfield House.

Pupa umbilicata. Very abundant at Nottingham Castle and at Highfield House.

Clausilia nigricans. Exceedingly common at Thrumpton, Bulwell, and Highfield House.

The following Mollusca are to be found associated together in the same localities.

A dike running at the foot of Beeston and passing behind the lake at Highfield House contains, where it passes through Mr. Barker's field, the following shells: *Planorbis corneus, P. marginatus, P. carinatus, P. vortex, P. spirorbis, Limneus pereger,* and *Aplexus hypnorum.* The dike is choked with weeds and filth from the village, and warm water from a neighbouring mill here runs into it; *P. corneus* is found much larger in this warm dike than elsewhere in this neighbourhood. 200 yards lower down the dike contains (where it runs through the Rev. J. Wolley's fields), besides the above Planorbis tribe, *Cyclas lacustris, Limneus auricularius, L. pereger, Pisidium pulchellum,* and *Valvata cristata.* A few hundred yards beyond this the water becomes free of weeds and clear, and the whole tribe of *Planorbis* are left behind. From Broadgate, all through the Highfield House estate, the dike only contains *Limneus pereger,* and in one or two places *Ancylus fluviatilis,* and on the moist mud on its banks *Succinea Pfeifferi* and *Limneus truncatulus.* The Musco-Sic brook branches out from it at Broadgate and joins it again at the east extremity of the Highfield House estate; this brook at first contains *Planorbis marginatus, P. vortex, P. carinatus, P. corneus, Bithinia tentaculata* (very large), *Valvata piscinalis, Limneus pereger, Cyclas cornea, Pisidium pulchellum,* and *Limneus auricularius.*

A very clear brook at Attenborough with Algæ growing in it, contains *Planorbis corneus, P. carinatus, P. marginatus, P. vortex, P. spirorbis, Ancylus fluviatilis, Bithinia tentaculata, Limneus pereger, L. auricularius, L. stagnalis,* and *Physa acuta.*

A similar brook at Lenton near the railway contains *Planorbis corneus, P. vortex, P. spirorbis, P. carinatus, Limneus stagnalis, L. auricularius, L. pereger, Physa acuta, P. fontinalis, Valvata piscinalis, Cyclas cornea,* and *Bithinia tentaculata.*

A small ditch some fifty yards from the last-named locality contains:—*Bithinia ventricosa, B. tentaculata, Limneus truncatulus, L. pereger, Valletia lacustris, Planorbis vortex, P. spirorbis, P. carinatus,* and *P. contortus.*

The lake at Highfield House contains:—*Anodon cygneus, A. cellensis, A. anatinus, A.* var. of *anatinus, Unio pictorum, U. tumidus, Dreissena polymorpha* (very large), *Planorbis nitidus, P. imbricatus,* and *Limneus pereger.*

The river Soar at Thrumpton contains:—*Cyclas rivicola, C. cornea, Unio pictorum, Dreissena polymorpha, Anodon cygneus, A. anatinus, Limneus pereger, L. stagnalis,* and *Paludina achatina.*

The river Trent near Beeston contains:—*Pisidium pulchellum, Anodon anatinus, A. avonensis, A. cygneus, Cyclas cornea, C. rivicola, Bithinia tentaculata, Limneus pereger, L. stagnalis, Physa acuta, Neritina fluviatilis, Planorbis carinatus, P. vortex, P. spirorbis, P. albus, Unio pictorum, U. tumidus, U. ovalis, Limneus palustris, Valvata piscinalis,* and *Dreissena polymorpha.*

Under the Seven Arches in Nottingham Meadows are, *Planorbis carinatus, P. spirorbis, P. vortex, Bithinia ventricosa, B. tentaculata, Valletia lacustris, Cyclas cornea,* and *Limneus pereger.*

In the river Lean at Bulwell there are *Valvata piscinalis, V. cristata, Planorbis carinatus, P. contortus, P. vortex, Bithinia tentaculata, Limneus pereger, Anodon cellensis,* and *Ancylus fluviatilis.*

A moist mud-bank left by the Trent floods at Sawley contains *Limneus truncatulus, L. palustris, L. pereger,* and *Helix alliaria.*

A dry bank near has *Helix nemoralis, H. arbustorum, H. hispida,* and *Bulimus lubricus.*

A cool bank at Thrumpton contains *Helix nemoralis, H. arbustorum,* *H. hispida, H. fulva, Clausilia nigricans, Bulimus lubricus, Succinea Pfeifferi, S. putris, Helix cellaria,* and *H. alliaria.*

A sand-bank in the lane at Highfield House has *Helix nemoralis, H. hispida, H. concinna, H. virgata, H. arbustorum, H. rotundata, H. cellaria, H. pulchella, Bulimus lubricus, B. obscurus, Azeca tridens, Pupa umbilicata,* and *Clausilia nigricans.*

The Nottingham Castle-yard contains *Helix aspersa, H. hispida, H. nemoralis, H. cellaria, H. rotundata, Bulimus lubricus, B. obscurus,* and *Pupa umbilicata.*

Oxton Bog and Warren has *Helix fulva, H. lucida, H. pura, H. pulchella, H. hispida, Bulimus lubricus, Vitrina pellucida, Physa acuta,* and *Segmentina lineata.*

The Hill Farm at Stanton-on-the-Wolds has *Helix hispida, H. sericea, H. depilata, H. concinna, H. fulva, H. aculeata, H. pygmæa, H. caperata, H. ericetorum, H. nemoralis, H. virgata, Bulimus lubricus, Carychium minimum,* and *Vitrina pellucida.*

Read further, a memoir "On the *Aquilaria Agallocha*, Roxb., the Agallochum or Aloë-wood Tree of Commerce." By the late William Roxburgh, M.D., F.L.S. &c. Communicated by the President.

The memoir, which appears to have been written in 1810 or 1811, contains a detailed description of this important tree, as well as much other information in addition to that published in the posthumous 'Flora Indica' of the author. The plants described were sent to the Calcutta Botanic Garden by Mr. Robert Keith Dick, Judge and Magistrate at Silhet; and an extract is given from a letter addressed by that gentleman to Dr. Roxburgh, in which he states that the wood is brought for sale from the country of Kuchar and from the southern parts of the zillah of Silhet, particularly the divisions of Puthureea and Lunglah, where the tree is known by the Bengal name of *Tuggur*. Its extreme height is from sixty to seventy cubits, and the trunk from two to two and a half cubits in diameter. No part of the wood, except that which is used for the extraction of the *Uttur*, is applied to any useful purpose. Few trees contain any of this precious perfume, and such as do, have it very partially distributed in the trunk and branches. The people employed in its collection, however, cut down all the trees indiscriminately, and then search for the *Aggur* by chopping through the whole tree, and removing such portions as are found to contain the oil or have the smell of it. In this state Mr. Dick describes four different kinds, of which the first, called *Ghurkee*, sinks, and sells at from 12 to 16 rupees per seer of 2 lbs.; the second, called *Doim*, produces from 6 to 8 rupees per seer; the third, *Simula*, floats, and is sold at from 3 to 4 rupees; and the fourth, *Choorum*, in small pieces, which also float, at 1 to $1\frac{1}{2}$ rupees per seer. The oil is obtained by bruising the wood in a mortar, and then infusing it in boiling water, when the *Uttur* collects on the surface. Neither root, leaves nor bark yield any *Uttur*. Some trees will produce a maund (80 lbs.) of the four sorts. So far Mr. Dick. Dr. Roxburgh thinks that there is a wonderful agreement between the various but imperfect accounts of the trees said to produce the *Calambac* or *Agallochum* of the ancients and that which he describes. He notices the descriptions given by Lamarck and Cavanilles, which he thinks, as far as they go, agree well with the plant of the Botanic Garden; as do those of Rumphius, making some allowance for the imperfection of his figures. Kæmpfer's figure and description also exactly correspond with young specimens in the Botanic Garden sent from Goalpara by Dr. Buchanan and from Silhet by Mr. Smith; and a description of the fruit by Mr. James Cunningham is quoted as very exact. Dr. Roxburgh gives his reasons for believing that not only the *Ophispermum Sinense* of Loureiro, but also the *Aloëxylum Agallochum* of that author, are both of the same genus, if not the very same species, with the plant from Silhet. There runs indeed so uncommon a coincidence through the whole of these notices as to induce him to believe that they all relate to the same identical object. He concludes by retracting what he had previously said, in his account of *Amyris Agallocha*, as far as relates to its yielding *Calambac*, which he acknowledges to have been founded on erroneous information.

Dr. Roxburgh's memoir was accompanied by some remarks by the late H. T. Colebrooke, Esq., F.L.S., consisting chiefly of references to and extracts from various Oriental authors, in relation to this fragrant wood, the countries in which it is found, the tree from which it is derived, its various kinds, and the processes used in extracting the oil. On the subject of the etymology of the word *Agallochum*, he observes that it is not right to derive it from the Arabic, which on the contrary is confessedly borrowed from the Greek, that is to say, from the *Agallochon* of Dioscorides. Neither is its origin to be sought in the Hebrew *Ahalim* and *Ahaloth*, as proposed by Salmasius, since it is more obvious to deduce it from the language of the country whence the drug was brought; and the Indian name *Aguru*, or with the Sanscrit pleonastic termination *ca*, *Aguruca*, is much nearer to the sound of the Greek term. The Portuguese *Pao de Aquila*, he adds, is an undoubted corruption either of the Arabic *Aghálují* or of the Latin *Agallochum*; and it is by a ludicrous mistake that from this corruption has grown the name of *Lignum Aquilæ*, whence the genus of the plant now receives its botanic appellation.

The paper was accompanied with a coloured drawing of the young plant, and of a flowering branch, together with a detailed analysis of the parts of fructification.

March 4.—N. Wallich, Esq., M.D., Vice-President, in the Chair.

Read "Notes on Bdellium." By B. A. R. Nicholson, Esq., M.D., of the Bombay Army. Communicated by the Secretary.

Dr. Nicholson states that the tree which he identifies as producing the Bdellium of Greek and Roman authors, occurs in the hilly districts of North-western India, where it is known to the natives by the name of Googul. He extracts the account of Bdellium from Ainslie's 'Materia Indica,' and comments on some of the statements therein contained. Thus, for example, Ainslie says that "all of this gum-resin found in India is brought from Arabia, where the tree is called Dowm;" but Dr. Nicholson states that wherever the tree is found in the North-western provinces, the bazaars are supplied with the gum from it; and that he never heard the tree called Dowm in Arabia, although he has been in many parts of that country, where he has seen the Googul. Dr. Ainslie again quotes Sprengel, who erroneously states that Dowm is the Arabic name for *Borassus flabelliformis*, and cites Kæmpfer and Rumphius in proof that Bdellium is procured from that tree; but Dr. Nicholson believes the Arabic name Doom to be exclusively applied to the dividing-stemmed Palm (*Hyphæne Thebaica*, Gærtn.), which is common on the banks of the Nile, in the Thebaid and Upper Egypt, two or three trees of which he has seen growing at Mocha, and a single tree at the west end of the native village opposite to the Portuguese settlement in the Island of Diu in Kattiawar. He has frequently examined this Palm without detecting any gum; and it is well known in India that the Tari, *Borassus flabelliformis*, does not produce gum. Another Palm, *Chamærops humilis*, L., has been also affirmed to produce Bdellium, and Matthiolus is quoted as having witnessed the fact at Naples; but Dr. Nicholson states that he particularly examined this *Chamærops* at Girgenti in Sicily in all stages of its growth, in flower, in fruit, and without either, and never observed anything like gum.

After refuting these erroneous notions as to the origin of the gum, Dr. Nicholson proceeds to state that he met with the Googul plant for the first time in 1832 on the Hills of Balmeer, in the Chotee Thur or Little Desert, on taking and sacking which town large quantities of the gum were found in several of the Banyan houses. The bush is also plentiful about Joolmaghur, thirteen miles south-west from Balmeer; and the author has observed it on the Kulinjur Hills in Parkur, as well as on those of several parts of Kutch and Wangeer. Having been shipwrecked in 1836 on the southern coast of Arabia, about 200 miles east of Cape Furtash, and being carried by the Arabs to the town of Geda, about three miles distant from the coast, he observed that large quantities of the gum Googul, there called Aflatoon, were brought to Geda by the Bedouins from the interior, where he was informed that the tree producing it was very plentiful, and that the gum is annually carried thence to Mocha on camels, and exported from Mocha to Bombay and other places. He subsequently found the Googul bush on the hills of Yemen, and in 1841 on the hills above Wankaneer in Kattiawar. The gum is chiefly used as a frankincense; but the natives of Guzerat, and probably of other provinces where the tree is found, collect and bruise the recent berries and twigs, boiling the juice out in cauldrons, and having mixed it with their chunam (lime), to which it imparts increased tenacity, commence all their dwellings with lime thus mixed, it is said from a religious motive. The gum is found most abundantly after the rains, when it is collected in pieces as it exudes from the tree, and is often very dirty from the careless way in which it is gathered, being mixed with the bark and twigs, and sometimes even with the subjacent soil. The harder and nearly transparent drops are picked out by the Banyan merchant, and fetch a higher price than the rest.

The author states that he is indebted to the late Dr. Charles Lush, F.L.S., Superintendent of the Honourable East India Company's Botanical Gardens at Darpoorie, who in 1842, from the sketches and specimens then in the author's possession, identified the plant as the *Amyris Kataf* of Forskåhl, and assisted in identifying the gum with the Bdellium of the ancients. He believes that if at all known to Roxburgh, it must be under the names of *Amyris nana* or of *Boswellia.*

The paper concluded with a description of the plant, and with some remarks on the geological character of the localities in which it is found; and was accompanied by a sketch of a branch, and by specimens of the gum in its pure and mixed states.

May 6.—R. Brown, Esq., President, in the Chair.

Read some "Notes on the Leaf of *Guarea grandifolia,* Dec." By R. C. Alexander, Esq., M.D., F.L.S., as follows:—

In the enclosed specimens of a *Guarea* from Jamaica, the *G. grandifolia,* Dec., it will be seen that the lower leaflets have fallen off, while younger ones are being developed at the extremity of the same petiole. At the time of flowering, the number of leaflets varies from a single pair to eight or ten pairs; but as these fall off in the course of a few months, the petiole elongates, and at each successive rainy season, of which there are two in the year, throws out from the end a fresh foliage of several pairs. The lower and older part of the petiole in the meantime remaining attached to the stem, becomes completely ligneous and round, and acquires a rind distinct from the wood, and covered with lenticelles and a resemblance to pith in the centre;—takes on, in short, the character of a branch, from which it is only to be distinguished by the axillary inflorescence, the absence of buds in the axillæ of the leaflets, and the analogy with the closely-allied genus *Trichilia,* in which the same phænomenon is seen in leaves deciduous after the second development. In *Guarea,* at least in this species of it, the leaf seems to be continuous with the branch, without articulation, and to have no definite term of life, hanging on till overtopped and killed by other leaves. Its usual length at that period is from a yard to four and a half feet.

In Adrien de Jussieu's Memoir on the *Meliaceæ* are the following remarks:—

"The resemblance of the leaflets borne on the same petiole to leaves borne on the same branch becomes more striking still in certain genera, as *Guarea,* where the extremity of the petiole, after a series of leaflets perfectly developed, presents some which are not yet so, and which appear to belong to another shoot. It would be interesting to ascertain what becomes of them, a thing that I have not been able to do, having had none but dried specimens to examine."

This shrub usually grows at the base of large timber trees, such as the *Eriodendron anfractuosum,* in the pasture districts of St. Ann's parish, establishing itself between their elevated buttress-like roots, and with its leaves hanging down to the grass, forms natural arbours, or rather stables, in which the cattle repose during the heat of the day. The negroes use them to wattle the walls of their huts, and call the bush "Alligator Tree," probably from the two Spanish words "*a ligar*," to tie with. Where it stands free, it attains the size of a full-grown apple-tree; but it invariably, I believe, grows within shelter of some other and larger one.

Except this genus and *Trichilia*, I found no other in Jamaica that had the character of leaf above described.

The President exhibited numerous specimens of recent and fossil *Cycadeæ*. Among these was a fine specimen of a new species (*Cycadites Saxbyanus*, R. Br.) found in the Isle of Wight by Mr. Saxby of Bonchurch. The President remarked that all the specimens of *Cycadites* hitherto found in the Isle of Wight agreed in having an elliptical outline, unaccompanied with any inequality in the woody ellipsis, and also in having a bud in the axilla of each leaf; in these respects differing from the *Cycadites* of the Isle of Portland and from all the recent species of *Cycadeæ* with which we are acquainted, which have a circular outline and only scattered buds.

ROYAL SOCIETY.

March 4, 1852.—A paper was read, entitled, "On the Anatomy of *Doris*." By Albany Hancock, Esq., and Dennis Embleton, M.D., Lecturer on Anatomy and Physiology in the Newcastle-on-Tyne College of Medicine, in connection with the University of Durham. Communicated by Professor E. Forbes, F.R.S.

The authors have proposed to themselves to describe the anatomy of the three genera typical of the three groups of the Nudibranchiate Mollusca. An account of the structure of *Eolis* has already appeared in the 'Annals of Natural History.'

A detailed description is given of the anatomy of *Doris*, the following species of which have been examined, and are referred to in the paper: *D. tuberculata*, Auct., *D. tuberculata*, Verany, *D. Johnstoni*, *D. tomentosa*, *D. repanda*, *D. coccinea*, *D. verrucosa*, *D. pilosa*, *D. bilamellata*, *D. aspera*, and *D. depressa*; but *D. tuberculata* of English authors has been taken as the type of the genus, and the standard of comparison for the rest.

Digestive System.—The mouth in all the species is a powerful muscular organ, provided with a prehensile tongue beset with siliceous spines, which when the tongue is fully developed, are arranged in a median and two lateral series. Certain species possess, besides, a prehensile spinous collar on the buccal lip, occasionally associated with a rudimentary horny jaw. The mode of development of the lingual spines is shown to be the same as that of the teeth of the Vertebrata.

The œsophagus varies in length; in some it is dilated at the top, forming a crop; in others it is simply enlarged previously to entering the liver mass. *The stomach* is of two forms; one, as in *D. tuberculata*, is very large, receiving the œsophagus behind, and giving off the intestine in front, and lying in advance of the liver; the other is received within the mass of the liver, and is very small. *The liver* in all is bulky, mostly bilobed, and variously coloured, and pours its secretion by one or more very wide ducts into the cardiac end of the stomach. A small laminated pouch—a rudimentary *pancreas,* is attached in some species to the cardiac, in others to the pyloric end of the stomach. The *intestine* is short, of nearly the same calibre throughout, rather sinuous in its course, and terminates in a nipple-formed anus in the centre of the branchial circle.

The Reproductive Organs are male, female and hermaphrodite. *The male organs* consist of penis and testis; the latter is connected with the former and with the oviduct. *The female organs* are, ovarium, oviduct, and mucus-gland. The ovarium is spread over the surface of the liver in the form of a branched duct with terminal ampullæ. The oviduct terminates in the mucus-gland. *The androgynous apparatus* is a tube or vagina opening from the exterior into the oviduct, having one or two diverticular spermathecæ communicating with it in its course. On the right margin of the body near the front is a common opening, to which converge the three parts of the reproductive organs. The spermatozoa are developed within large and fusiform spermatophora, and are observed in the spermathecæ, oviduct and ovary.

Organs of Circulation and Respiration.—The circulatory organs are, a systemic heart, arteries, lacunæ and veins. The existence of true capillaries in the liver-mass seems probable. A second heart—a ventricle, having a portal character, is also described. The systemic heart lies immediately beneath the dorsal skin, in front of the respiratory crown, and comprises an auricle and ventricle enclosed within a pericardium. In the systemic circle the blood is returned to the heart without having passed through the special respiratory organ. It is that blood only which is returned from the liver-mass that circulates through the branchiæ.

The authors conclude from their observations, that in the Mollusks there is a triple circulation: first, the systemic, in which the blood propelled along the arteries to the viscera and foot is returned, with the exception of that from the liver-mass, to the heart through the skin; there it becomes partially aërated, the skin being provided with vibratile cilia, and otherwise adapted as an instrument of respiration; second, the portal, in which venous blood from the system is driven by a special heart to the renal and hepatic organs, and probably to the ovarium, where it escapes, doubly venous, with the rest of the blood which has been supplied to these organs from the aorta, and which is therefore only singly venous, to the branchiæ; third, the branchial circulation, in which flows only the more deteriorated blood brought by the hepatic vein, but in which also that blood undergoes the highest degree of purification capable of being effected in the economy, namely in the special organ of respiration. This triple circulation has not yet, as far as the authors are aware, been described as existing in the Molluscan Subkingdom. From the fact of the blood in *Doris* being returned to the heart in a state of partial aëration, it is clear, they say, that this animal is, in this respect, on a par with the higher Crustaceans; and from the blood arriving at the heart in the same condition, according to the researches of Garner and Milne-Edwards, in *Ostrea* and *Pinna*, the great *Triton* of the Mediterranean, *Haliotis, Patella* and *Helix*, it can scarcely be doubted that this arrangement will be found throughout the Mollusca.

From a consideration of the facts cited in the paper, it may be deduced that the skin or mantle is in the Mollusca the fundamental organ of respiration, and that a portion of that envelope becomes evolved into a speciality as we trace upwards the development of the respiratory powers.

Upon the dorsal aspect of the liver-mass is a branched cavity, that of the *renal organ*, lined with a spongy tissue, and opening externally at the small orifice near the anus.

Organs of Innervation.—These are in two divisions, one corresponding to the cerebro-spinal division, the other to the sympathetic or ganglionic system of the Vertebrata. The existence of the latter, it is stated, is now for the first time fully established. The centres of the first system are seven pairs and a half of ganglia. Of the seven pairs, five are supra-œsophageal, two, infra-œsophageal: the single ganglion belongs to the right side and has been named *visceral*. There are three nervous collars around the œsophagus, one of which connects the infra- with the supra-œsophageal. The total number of pairs of nerves from the œsophageal centres is twenty-one, and there are also four single nerves.

The sympathetic system exists, and is more or less demonstrable, in the skin, the buccal mass, and on all the internal organs. It consists of a vast number of minute distinct ganglia, varying in size and form, the largest quite visible to the naked eye, of a bright orange colour, like the ganglia around the œsophagus, and interconnected by numerous delicate, white nervous filaments, arranged in more or less open plexuses. This beautiful system is connected with both sets of œsophageal ganglia.

The authors having found the sympathetic nervous system in several species of *Doris*, in *Eolis papillosa*, and in *Arion ater*, believe it to exist in all the more highly organized Mollusca.

The supra-œsophageal nervous centres in the Mollusca are in some instances so concentrated as to have led to the idea that they form only one mass; in others the ganglia are more or less distinct, and separated from each other. *Doris* has been taken as the representative of one class, *Aplysia* of the other, and on a comparison of both the supra- and infra-œsophageal ganglia of these with each other, there has been found a close correspondence between them, with the exception of the visceral ganglion. The single one in *Doris* is represented in *Aplysia* by a pair of ganglia, situated in the posterior part of the body near the root of the branchiæ. The supra-œsophageal ganglia in the Lamellibranchiata appear homologous with those of *Doris*.

Having determined the existence of a true sympathetic or organic nervous system in *Doris*, the authors feel themselves more in a position to trace a parallelism between the œsophageal nervous centres of these Mollusca and the cerebro-spinal system of the Vertebrata, and accordingly they find there is a strict analogy between them, even to the individual pairs of ganglia of which they respectively consist, the general result being that the whole of the ganglia, grouped around the œsophagus in these Mollusca, answers to the encephalon, and a small portion of the enrachidion, of the Vertebrata.

Organs of the Senses.—The auditory capsules are microscopic, composed of two concentric vesicles, the inner enclosing numerous, oval, nucleated otolithes. *The eyes* are minute black dots, beneath the skin, attached by a pedicle to a small ganglion. They are made up of a cup of pigment, receiving from behind the nerve, and lodging in front a lens, having in advance of it a cornea, the whole enclosed by a fine capsule. The authors believe they have shown the dorsal tentacles to be the *olfactory organs.*

The organs of touch are, the general surface of the skin, but more particularly the oral tentacles or veil. *Taste* is most probably located in the lips and channel of the mouth, the tongue being a prehensile organ, and ill-adapted as the seat of such a function.

In conclusion, the authors comment on the high organization of the *Doridæ,* and express their belief that the genus, as at present understood, will require to be broken up into several groups.

BOTANICAL SOCIETY OF EDINBURGH.

July 8, 1852.—Dr. Seller, President, in the Chair.

The following papers were read:—

1. "On the presence of Fluorine in the stems of Gramineæ, Equisetaceæ, and other Plants, with some observations on the sources from which vegetables derive this element," by George Wilson, M.D.

The author commenced by stating, that the earliest observer of the presence of fluorine in plants was Will of Giessen, who found traces of it in barley, the straw and grain of which were analysed together. The author reported to the Botanical Society, some four years ago, the results of his earlier researches into the distribution of this element throughout the vegetable kingdom, which were not very numerous or very encouraging. One reason of this was the small extent to which fluorine occurs in plants; another, and practically as serious a reason, was the difficulty of separating and recognising fluorine when accompanied by silica. The presence of this body in a plant, besides greatly complicating the investigation, rendered the employment of platina vessels essential, and thus limited the amount of material which could be subjected to examination, besides making it difficult or impossible to observe the progress of an analysis.

The author then stated, that, in the course of some recent investigations into the presence of fluorine in siliceous rocks, he had succeeded in devising a process which was also applicable to plants, and could be carried on in the ordinary glass vessels of the laboratory. The process in the case of plants was as follows:—The plant under examination was burned to ashes as completely as possible. The ashes were then mixed in the cold with oil of vitriol, so as to secure the decomposition of the salts of volatile acids present. The mixture was then transferred to a retort, or flask, provided with a bent tube dipping into water, and the liquid raised to the boiling-point, when fluorine, if present, was evolved in combination with the silicon of the silica, as the gaseous fluoride of silicon, which dissolved in the water with separation of some gelatinous silica. The resulting solution was neutralized with ammonia and evaporated to complete dryness, when the whole of the silicon passed into the condition of insoluble silica, and water dissolved the fluoride of ammonium. The solution of this fluoride could then be dried up and moistened with sulphuric acid, when hydrofluoric acid was evolved, which might be made permanently to record its presence by causing it to etch glass in the usual way. The author has in the meanwhile applied this process almost solely to the stems and trunks of plants, especially to those containing silica, reserving for subsequent investigation their other organs, especially their seeds and fruits. The following were the results obtained :—

Table of Plants examined for Fluorine. The numbers represent grains of ashes, except in the case of Tabasheer and Wood Opal. The blanks imply that the weight was not known :—

Ashes in grains.	Name of plant.	
200	*Equisetum limosum*	Distinct etching.
	Bambusa arundinacea	Ditto.
	Charcoal (derived chiefly from Oak, and to a smaller extent from Birch)	Ditto.
	Coal	Ditto.
	Barley straw	Ditto.
	Hay (Ryegrass)	Ditto.
35	*Equisetum variegatum*	Faint etching.
19	——— *hyemale*	Ditto.
255	——— *palustre*	Ditto.
	Dactylis cæspitosa	Ditto.
99	*Elymus arenarius*	Ditto.
495	*Saccharum officinarum*	Ditto.
1040	African Teak	Ditto.
	Smilax latifolia	No etching.
	Rosmarinus officinalis	Ditto.
235	*Bambusa Nepalensis*	Ditto.
	Polypodium vulgare	Ditto.
537	Tree Fern	Ditto.
24	*Phalaris arundinacea*	Ditto.
240	Malacca Cane	Ditto.
50	Cocoa-nut shell	Ditto.
127	*Tectona grandis*	Ditto.
80	Tabasheer	Ditto.
1680	Wood Opal	Ditto.

On this table the author remarked, that the siliceous stems which he had found to abound most in fluorine, were exactly those which contained most silica. In particular, deep etchings were procured from the Equisetaceæ and from the Gramineæ, especially the common Bamboo. The last was known to contain silica in such abundance that it collected within the joints in white masses, nearly pure, and had long, under the name of Tabasheer, been an object of interest to natural philosophers. The horse-tails were scarcely less remarkable for the amount of silica contained in their stems, which had led to the employment of one of them (*Equisetum hyemale*) in polishing wood and metals. The African Teak, which like the Bamboo is known sometimes to secrete silica, was also found to contain fluorine, though much less largely than the plants named; whilst the strongly siliceous stems of Barley and Ryegrass also yielded the element in marked quantity. The Sugar-cane, however, gave less striking results than might have been expected, and the same remark applied to the Malacca-cane. Two specimens of silicified wood and one of Tabasheer gave no evidence of the presence of fluorine. So far, however, as the plants named in the preceding table are concerned, the author does not wish it to be inferred from the negative results which are detailed, that the plants in question are totally devoid of fluorine. With larger quantities of their ashes, positive results would, in all probability, be obtained.

The author's general conclusions were as follows:—1st, that fluorine occurs in a large number of plants; 2nd, that it occurs in marked quantity in the siliceous stems of the Gramineæ and Equisetaceæ; 3rd, that the quantity present is in all cases very small; for although exact quantitative results were not obtained, it is well known that a fraction of a grain of fluoride will yield with oil of vitriol a quantity of hydrofluoric acid sufficient to etch glass deeply, so that the proportion of fluorine present, even in the plant-ashes which contain it most abundantly, does not probably amount to more than a fraction per cent. of their weight. The proportion of fluorine appears to be variable, for different specimens of the same plant did not yield concordant results.

In this, however, there is nothing anomalous, for some Bamboos yield *Tabasheer* largely, whilst others are found to contain none. It seems not unlikely that soluble fluorides ascending the siliceous stem of a plant, on their way to the seeds or fruits in which they finally accumulate, may be arrested by the silica, and converted into insoluble fluosilicates (fluorides of silicon and of a metal); and a Bamboo, for example, secreting Tabasheer, may effect this change where one less rich in silica cannot determine it. The slow or quick drying of a stem may also affect the fixation of fluorides in the stems or trunks of plants.

The sources of the fluorine found in plants may be regarded as preeminently two,—1st, simple fluorides, such as that of calcium, which are soluble in water, and through this medium are carried into the tissues of plants; and 2nd, compounds of fluorides with other salts, of which the most important is probably the combination of phosphate of lime with fluoride of calcium. This occurs in the mineral kingdom in apatite and phosphorite, and in the animal kingdom in bones, shells and corals, as well as in blood, milk, and other fluids.

A recent discovery of the author, communicated to the Royal Society of Edinburgh, has shown that fluorides are much more widely distributed than is generally imagined, and that the trap rocks near Edinburgh, and in the neighbourhood of the Clyde, as well as the granites of Aberdeenshire, and the ashes of coal, contain fluorides, so that the soils resulting from the disintegration of those rocks cannot fail to possess fluorides also. All plants accordingly may be expected to exhibit evidence of their presence in the following portions of their tissues or fluids :—

1. In the ascending sap, simple fluorides.

2. In the descending sap, in association with the albuminous vegetable principles, and in the seeds or fruits, in a similar state of association, fluorides along with phosphates.

3. In the stems, especially when siliceous and hardened, fluorides in combination with silica. The investigation is still in progress.

2. "On the presence of Iodine in various Plants, with some remarks on its general distribution," by Mr. Stevenson Macadam.

The present paper owes its origin to some observations lately made by M. Chatin of Paris, and communicated by him to the French Academy of Sciences.

Chatin is of opinion, that in the atmosphere, in rain-water, and in soils there is an appreciable amount of iodine ; that the quantity of this element present in one district differs from that in another ; and that the relative amount of iodine in any one locality determines to a great extent the presence or absence of certain diseases. For instance, in the district of country which he classifies under the general title of the "Paris zone," the quantity of iodine present in the atmosphere, in the rain-water, and in the soil is comparatively great, and to this he ascribes the absence of goitre and cretinism ; whereas in the zone corresponding to that of the "alpine valleys," the amount of iodine has diminished to one-tenth of that found in the "Paris zone," and to this scarcity of the element he attributes the prevalence of goitre and cretinism, which in that zone are endemic. Considering that the subject was one of great importance, more especially if the conclusions arrived at by Chatin (in reference to the functions fulfilled by iodine in preventing the occurrence of the diseases referred to) could be legitimately deduced from the experiments which he performed, the author has this summer undertaken a series of analyses in reference to the general distribution of iodine. Mr. Macadam's researches have as yet been mostly directed to the atmosphere and to rain-water, and he considered that a notice of the results obtained might be interesting to the Society, alike from the intimate connexion which exists between the plant and the atmosphere, and from the fact, that he has been led to seek, and to detect, the presence of iodine in a department of the vegetable kingdom in which it has not hitherto been observed.

Chatin has not published a detailed account of the processes adopted by him ; but from the manner in which he speaks of the good effects produced by the addition of potash to substances under examination, which, to use his words, "arrested the complete decomposition of the iodine compounds whilst the waters were evaporating," and by the addition of carbonate of potash and carbonate of soda, which "rendered the iodine present in soils much more easily extracted," the author was led to believe that the fixed alkalies had been largely employed by him. Accordingly, in the first experiments, the alkalies were used in their caustic condition, for the purpose of fixing any free iodine, and retaining any compound of iodine which might be encountered.

Mr. Macadam commenced with an examination of the atmosphere. By the arrangement he employed, the air was made to traverse,—1st, a tube containing slips of paper, which had been previously dipped in a solution of starch; and 2nd, a double-necked gas bottle, containing about 3 oz. of a dilute solution of caustic soda. A continuous stream of air was drawn through the arrangement for some hours. This experiment was conducted in the morning, and in the afternoon a stream of air was for several hours drawn through the same arrangement, caustic potash being substituted for the caustic soda. The starch-papers did not exhibit the slightest coloration, even when moistened with distilled water. The solutions of potash and soda, however, on being treated with starch and nitric acid, at once exhibited the rose colour characteristic of the presence of iodine in small quantity. So far the experiments seemed to lead to the desired conclusion; but when portions of the original alkaline solutions, which had not been subjected to a current of air, were carefully tested, it was found that iodine was present in them, in quantity to all appearance as great as it was in those portions which had been used in the experiments.

Wishing to trace back the iodine to its source, samples of the carbonate of potash, carbonate of soda and lime, which had been employed in the preparation of the caustic solutions, were analysed, and in all three iodine was present in perceptible quantity. Desirous of making certain that the reagents used in the investigations were as pure as other commercial substances of the same kind, various specimens were procured from different sources, and in every sample which was subjected to examination the presence of iodine was detected. So far then as the determination of iodine in the atmosphere is concerned, the experiments were of no value. The alkalies through which the air had been drawn undoubtedly contained iodine originally, and therefore no certain conclusion could be drawn as to the probability of their being more highly iodized by contact with the atmosphere. To the presence of iodine in *potashes*, or, to use words more strictly botanical, in the *ashes of forest timber*, further reference will be made in a subsequent part of this paper.

In the next experiment the alkalies were dispensed with, the air being drawn through—

1. A tube with slips of starched paper, kept somewhat damp.
2. A gas-bottle immersed in a freezing mixture; and
3. A gas-bottle containing a solution of nitrate of silver.

A continuous current was kept up for fully five hours, commencing at mid-day. At the conclusion of this experiment, the papers were not altered in the slightest degree; the gas-bottle (2) contained about a quarter of an ounce of liquid, and the nitrate of silver (3) had not been perceptibly changed. The condensed liquid was neutral to test-papers; a drop of starch was added to it, and subsequently nitrite of potash and hydrochloric acid, which together form a most delicate means of detecting iodine; the result was negative. The nitrate of silver solution was cautiously evaporated to one half-ounce; sulphuretted hydrogen added to precipitate the silver, and liberate as hydriodic acid any iodine which might be present; the liquid raised in temperature, carefully avoiding ebullition, and filtered. The filtrate, on the addition of starch, nitrite of potash and hydrochloric acid, did not exhibit the slightest trace of iodine. Mr. Macadam therefore concluded, that in the large volume of air which he had drawn through the arrangement, there had not been an appreciable amount of iodine.

The experiments as yet referred to were made at different heights on Arthur's Seat, and their negative results led to arrangements being made for a trial on a scale much more extensive. Through the kindness of the proprietor of Kinneil Iron Works, the author was enabled to proceed to Borrowstowness, and attach his apparatus to the receiver from which the air under great pressure is forced into the blast-furnaces. By means of a stop-cock fixed in the receiver and a long flexible tube, the air was conducted to the following arrangement:—

1. A wide tube containing slips of paper dipped in starch.
2. A condensing worm, surrounded by a freezing mixture and attached to a receiver.
3. A tall jar containing chips of pumice-stone and a few iron filings, with sufficient water to cover them.
4. A similar jar with pumice-stone, scrapings of clean lead and a solution of acetate of lead.
5. A condensing worm immersed in a freezing mixture and attached to a receiver.

The air, under a pressure of 3 lbs. on the square inch, was allowed to traverse the arrangement for fully four hours, when the apparatus was taken asunder, and the contents of the vessels being placed in stoppered bottles, the whole was brought to Edinburgh for examination. The slips of paper (1) were not sensibly altered in tint, and did not betray the slightest indications of even a rose colour when moistened with distilled water. The condensers (2 and 5) contained each a very small quantity of liquid, which, on being tested, did not show a trace of iodine. The small quantity of liquid in the condensers may be accounted for by the comparatively high temperature possessed by the air rushing through so quickly as it did. The contents of the jar (3) were thrown on a filter, and washed with cold water. To the filtrate was added half an ounce of a solution of carbonate of potash, and the whole evaporated to a quarter of an ounce; no iodine was present. The carbonate of potash used in this trial was prepared by calcining cream of tartar, and was so far free from iodine, that none could be detected in 2 oz. of the solution, of which half an ounce was employed. There was therefore no likelihood of iodine being added in the alkali used, even though the analysis of the contents of the jar had shown its presence. The jar (4) with the lead solution was treated in the same manner as described in a former part of this paper, when referring to the employment of silver, and the result was also negative. Notwithstanding the large scale on which this experiment was conducted, a volume of air of not less than 4000 cubic feet having been forced through the arrangement, Mr. Macadam has been unable to verify the results of Chatin, yet he feels disinclined to pronounce those results unwarranted, and has therefore resolved to make another trial on a still larger scale. It is proposed to fit up an apparatus of a stronger and more durable nature, and to allow a volume of air of not less than 100,000 cubic feet to pass through.

Whilst the experiments on the atmosphere were proceeding, Mr. Macadam was also examining large quantities of the rain-water which fell in Edinburgh for the last two months. For this purpose, he added to 3 gallons of the water some ounces of a solution of acetate of lead. On standing twenty-four hours, a precipitate had fallen to the bottom, from which the liquid was drawn off. The precipitate was treated as formerly described, and no iodine was detected. As the iodide of lead is slightly soluble in water, and as it might be present in the liquid which had been removed from the precipitate, the whole was evaporated to 1 oz., and afterwards tested for iodine, but none was present. A second experiment was tried with a similar volume of rain-water, viz. 3 gallons, substituting nitrate of silver for the acetate of lead; a precipitate was observed after standing for twenty-four hours, but neither it nor the liquid contained a trace of iodine. Another experiment, made with 3 gallons of rain-water, which had been collected at Unst in the Shetlands, and to which acetate of lead was added, gave the same negative results.

Mr. Macadam is well aware, that, consequent on the evaporation of water from the surface of the ocean, portions of the salts contained in it are carried up and disseminated through the atmosphere, ready to be rained down upon inland places, and that in this way iodine, most probably as iodide of sodium, will be present in the air. Accordingly at first he was confident that he should succeed in verifying Chatin's observations in a district so near the sea as that around Edinburgh, and more especially in the water obtained from Unst, which had fallen in the immediate vicinity of the ocean; but when we consider what a very small per-centage of iodine is present in the water of the ocean, many gallons being required to give even a faint indication, equal to that exhibited by $\frac{1}{500,000}$th of a grain of an alkaline iodide, and if, further, we suppose that when the water rises in vapour from the sea, it carries up the salts in the same proportions as they exist in sea-water, it is evident that it would be requisite to evaporate some hundred gallons of rain-water, before even a minute trace of iodine could be obtained.

At a former part of this paper reference was made to the presence of iodine in the potashes of commerce. The samples first tested were those usually to be purchased in Edinburgh, but subsequently genuine and authenticated specimens of both crude and refined potashes were procured from Glasgow. It is to Canada and the United States that we owe our supplies of these materials. As imported into this country, they are contaminated with many foreign ingredients, and amongst the rest the author has detected iodine. The most ready means for separating and recognising this substance is to heat a considerable quantity of the salt with a minimum of water. On cooling the solution, the greater portion of the carbonate of potash, as well as the impurities, falls to the bottom of the vessel, whilst the iodide of potassium remains dissolved in the water. When testing for the iodine in the potashes, this solution was evaporated to dryness, treated with alcohol, boiled and filtered. The filtrate, on being evaporated to dryness, left a residue, which on resolution in water acted distinctly with the starch-test for iodine.

The presence of this element in potashes leads the author to believe that iodine will be found more generally distributed in the vegetable kingdom than it has formerly been supposed to be. The potashes from the States and from Canada are principally the dried lixivium of the ashes of forest-trees ; but whilst by much the greater portion is so, the parties in charge are not very scrupulous about what plants they employ, and occasionally everything which comes in the way, and which will burn, is added to the pile. It may therefore be objected to the statement, that forest-trees contain iodine, that the iodine found in the ashes may be derived from the succulent herbs and shrubs, and not from the trees themselves ; but this objection will be at once removed when it is stated, that in the lixivium of charcoal the author has obtained very distinct traces of iodine. Now the charcoal sold and used in this country is principally oak, with a little birch, elm and ash.

The amount of iodine in forest-trees must be comparatively small. When experimenting with the potashes, one is apt to forget the small bulk into which a large quantity of timber falls when the organic matter is expelled, and the saline ingredients are alone left. So far as can be estimated from the present qualitative experiments, the relative quantity of iodine in forest-trees is much less than that in succulent plants growing in marshy places.

In conclusion, it was mentioned that the presence of iodine in some freshwater plants was now generally recognised, and that the author is at present engaged in testing the various plants growing in the lochs in the neighbourhood of Edinburgh. The method employed in their analysis is to dry the plants, and burn them cautiously ; indeed the *burning* should be rather termed *charring* ; the ashes are reduced to fine powder, digested in water and filtered ; the clear liquid evaporated, and subsequently treated like the potashes. In every case the process used for the liberation of iodine is that suggested by Dr. Price, viz. nitrite of potash and hydrochloric acid ; and in many cases where no indications of iodine could be obtained by the ordinary methods, good results were procured with Dr. Price's process.

In the following plants, hitherto not known to contain iodine, Mr. Macadam has detected that element :—

Myosotis palustris	Duddingstone Loch.
Mentha sativa	Ditto.

Menyanthes trifoliata	Duddingstone Loch.
Equisetum limosum	Ditto.
Ranunculus aquatilis......	Dunsappie Loch.
Potamogeton densus	Ditto.
Chara vulgaris	Ditto.

The author has also confirmed the presence of iodine in the following plants, in which it had been previously found by other observers; the specimens, however, are from different localities:—

Iris pseud-acorus	Duddingstone.
Phragmites communis	Ditto.
And in the ashes of coal.	

As having some connexion with the subject treated of, the author intimated that he had obtained distinct indications of the presence of bromine in the crude potashes. It is unfortunate that our tests for bromine are so much inferior in delicacy to those of iodine, that it is necessary to operate upon very large quantities before the tests are distinct. There is no doubt that from its presence in trees, it will be found in greater abundance in the more succulent plants; but the few trials yet made have been unsuccessful in determining its presence in any but the crude Canadian and American potashes.

The experiments (excepting those pursued in the open air) were conducted in the laboratory of Dr. George Wilson, to whom the author feels deeply indebted for the kind manner in which he has afforded him every assistance in his power during the whole course of the investigation.

3. Dr. Balfour read the following letter by Mr. Richard Fryer to Dr. Pappe of Cape Town, relative to a case of poisoning by the bulbs of *Homeria collina*, specimens of which were exhibited to the meeting:—

"On perusing your 'Flora Capensis Medica,' the circumstance stated at page 26 of the poisonous effects of the bulb of the 'Cape Tulip,' brought to my recollection a dreadful accident which occurred in Hantam, in this district, many years ago, and, as I was called upon at the time in a judicial way to examine some of the bodies and take evidence upon the causes of death, I can vouch for the accuracy of what I shall here relate. It appears that one of the shepherds of a farmer residing there, brought home in the evening a bundle of bulbs, which the Dutch call 'Mutjes'; that towards dusk these were put under the ashes to roast, and when the other servants assembled in the kitchen they were taken out and eaten amongst them; the party consisting of three hottentots, two women, and one male slave. About half an hour after they had partaken of them they were all seized with dreadful nausea, followed shortly afterwards by severe vomiting, and a speedy prostration of strength. The farmer being called, ascertained immediately, from some of the bulbs still unconsumed, that they had been eating the '*Homeria collina*,' of the yellow sort 'Wilde Dagga.' Sweet oil, milk, and everything thought good were immediately administered, but before midnight the three hottentots and one woman had died in excruciating agonies. The male slave recovered, but for a year afterwards he looked like a skeleton, and the surviving woman ascribed her safety to only having eaten one bulb."

MISCELLANEOUS.

Notice of the Occurrence, on the Durham Coast, of Diphyllidia lineata. By ALBANY HANCOCK, Esq.

IN the early part of last year, the Rev. G. C. Abbes brought to me a small mollusk which he had obtained from the boats at Whitburn. On examination, this creature proved to be *Diphyllidia lineata*, a most interesting addition to the marine fauna, not only of the district, but of England. It has occurred only once before in the British seas; in September 1849, a single specimen having been dredged off Shetland by Mr. Barlee. These two, the only British examples, are much smaller than those obtained in the Mediterranean, and are more attenuated in form. Thinking, therefore, that our specimen might possibly be a distinct species, I was induced to examine its internal structure; and Mr. Alder having kindly supplied individuals of the true *D. lineata*, a strict comparison was instituted, which has resulted in determining that the two forms are identical.—*Trans. of Tyneside Naturalists' Field Club*, vol. ii. p. 128.

IRISH MOLLUSCA.

To the Editors of the Annals of Natural History.

Windsor Lodge, Monkstown, co. Dublin,
August 5, 1852.

GENTLEMEN,—The following Mollusca are the results of three days' dredging in Birterbuy Bay, co. Galway. The first day I was accompanied by my friend Dr. Battersby of Torquay, who being pressed for time had to return to Dublin sooner than he expected, leaving me to pursue the conchological research in that delightful locality.

July 21.—*Gastrochæna modiolina*; the scarcer variety found in cases composed of broken shells, &c.
Pandora obtusa.
Lyonsia norvegica.
Thracia pubescens; one valve.
Psammobia tellinella.
—— *vespertina.*
Cardium fasciatum.
—— *nodosum.*
Circe minima, of the most beautiful marking.
Lepton squamosum.
Arca tetragona.
Modiola tulipa.
Lima Loscombii.
Dentalium Tarentinum.
Chiton Asellus; very large.
Trochus Montagui.
Odostomia eulimoides.
Mangelia gracilis; dead.
—— *purpurea*; dead.
—— *striolata.*
—— *septangularis.*
Cylichna conulus.
—— *cylindracea*; dead.
—— *truncata*; dead.

July 22.—Some of the shells found on the 21st, as also *Thracia convexa*; dead.
Thracia pubescens.
Solen pellucidus.
Cardium pygmæum.
Lucina spinifera.
—— *flexuosa.*

July 23.—Many of the species obtained the first day, together with *Lima subauriculata.*
Chiton lævis.
Natica Montagui.
Mangelia teres.
—— *purpurea.*
Bulla Cranchii; very fine.

All the above shells were procured alive, except those specified as otherwise, and some of them are new to that locality.

I remain, yours most truly obliged,
W. W. WALPOLE.

On the Irritability of the Leaves of Drosera rotundifolia. By Dr. MILDE.

Towards the end of June I placed on the middle of a strongly vegetating leaf of a plant of *Drosera rotundifolia* which I had had for a short time in a cup of moss in my room, four small flies of about the size of a pin's head. The insects remained nearly motionless upon it, and their efforts to escape from the sticky matter were ineffectual. After about five minutes I again looked at the leaf, when to my astonishment I saw that the glandular hairs of the anterior margin of the leaf, which had been previously extended horizontally, had turned back towards the surface of the leaf and partially covered the flies. I had no time until the following day to observe the leaf again carefully, when I found that the anterior margin and the sides of the leaf had turned over towards its middle and thus completely enveloped the flies. It was only after the lapse of five days that the margins of the leaf and hairs had returned to their places, so as to leave the dead flies lying free on the surface.—*Bot. Zeitung*, x. 540.

EMBRYOGENY OF ORCHIS, GESNERIA, AND OTHER PHANEROGAMIA.

Dr. Cobbold laid before the Edinburgh Physiological Society a brief account of some investigations into the embryogeny of *Orchis, Gesneria,* and other Phanerogamia. These observations, together with a preliminary account of the labours and opinions of Schleiden, Amici, Brown, Geraud, Griffith, Hofmeister, Meyen, Mirbel, Mohl, Dickie, and about forty others, formed the subject of an essay, written in the summer of 1849. Dr. Sanderson, who at the same time investigated this subject, has since published in the 'Annals of Natural History,' an admirable memoir on the embryogeny of *Hippuris vulgaris,* the facts there recorded being strikingly confirmed by what the author of this paper observed as occurring in the above genera. From a review of the whole matter, the following conclusions are to be drawn:—

1st. That, prior to impregnation, the ovule always contains an embryo-sac.

2nd. That the embryo-sac is commonly formed at the apex of the nucleus.

3rd. That in the interior of the embryo-sac there exists a fluid, more or less granular.

4th. That the sac frequently protrudes beyond the exostome (ovule tube,—Griffith).

5th. That in the interior of the sac, prior to impregnation, one or more cytoblasts, or embryonic vesicles, are formed.

6th. That their formation takes place by the aggregation of molecules (Amici, Meyen).

7th. That the cytoblasts, or embryonic vesicles, also contain a fluid more or less granular (globulo-cellular cambium,—Mirbel).

8th. That the pollen is always necessary for fertilization (apparent exception given by Smith).

9th. That the pollen, when applied to the stigma, sends out one or more tubes (prolongations of the intine), which contain granular matter (fovilla).

10th. That in most cases the union of the pollen-tube with the apex of the embryonic sac constitutes the very act of impregnation.

11th. That the result of this union is the formation of an embryo.

12th. That this formation takes place, either by the metamorphosis of one of the pre-existing germinal or embryonic vesicles under the dynamic influence of the fovilla (acting catalytically ?) ; or, as is more probable, by the union of the contents of the pollen-tube with that of a germinal vesicle, similar to what occurs in the conjugation of Confervæ. When two or more vesicles exist, as in *Orchis*, one only becomes fertilized, the remainder abortive.—*Proc. Edinb. Phys. Soc.*

METEOROLOGICAL OBSERVATIONS FOR JULY 1852.

Chiswick.—July 1. Fine: cloudy: slightly overcast. 2. Cloudy and fine. 3, 4. Very fine. 5. Excessively hot: thermometer higher in the shade than it has been for at least twenty-six years: lightning at night. 6. Very hot. 7. Cloudless: hot and dry. 8. Dry haze: sultry: clear at night. 9. Very hot. 10. Very fine. 11. Hot and clear. 12. Sultry. 13. Fine: lightning, with distant thunder at night. 14. Overcast: thunder: very hot: lightning, with rain at night. 15. Cloudy and fine: clear. 16. Slight haze: very hot: excessively heavy and constant rain at night. 17. Rain: cloudy and warm: clear at night. 18. Very fine: heavy clouds: clear. 19. Very fine. 20. Overcast. 21. Light clouds: very fine: clear. 22—24. Very fine. 25. Overcast: thunder: rain. 26. Cloudy and fine: clear. 27. Slight haze: very fine. 28—30. Very fine. 31. Heavy dew: very fine: cloudy.

Mean temperature of the month	67°·37
Mean temperature of July 1851	60 ·71
Mean temperature of July for the last twenty-six years	63 ·40
Average amount of rain in July	2·37 inches.

Boston.—July 1, 2. Fine. 3. Cloudy. 4. Fine: thermometer 84° at 5 P.M. 5. Fine: therm. 91° at 2 P.M. 6. Fine: therm. 86° at 3 P.M. 7. Fine: therm. 81° at 3 P.M. 8. Fine. 9. Fine: therm. 89° at 2 P.M. 10, 11. Fine. 12. Cloudy. 13. Fine. 14. Cloudy. 15. Cloudy: rain, with thunder and lightning early A.M. 16. Fine: rain, with thunder and lightning P.M.: therm. 86°. 17. Cloudy: therm. 86° 3 P.M. 18. Fine. 19—22. Cloudy. 23. Fine. 24. Cloudy. 25. Fine: rain P.M. 26. Cloudy: rain A.M. and P.M. 27, 28. Fine. 29. Cloudy. 30. Fine. 31. Cloudy.

Sandwick Manse, Orkney.—July 1. Bright: cloudy. 2. Rain: cloudy. 3. Bright: cloudy: fine. 4. Cloudy: clear: fine. 5. Bright: clear: cloudy: thunder and lightning. 6. Rain: cloudy: fine. 7. Hazy: fine. 8. Bright: fine: fog. 9. Hazy: showers: thunder and lightning. 10. Bright: cloudy. 11. Bright: clear: fine. 12. Bright: fine: cloudy: fine. 13, 14. Bright: fine: clear: fine. 15. Bright: fine: cloudy: fine. 16. Hazy: fine: clear: fine. 17. Cloudy: rain. 18. Bright: cloudy: clear: fine. 19. Hazy: cloudy: clear: fine. 20. Bright: cloudy: rain: fine. 21. Rain: cloudy: fine. 22. Bright: hazy: fine. 23. Bright: fine: cloudy: fine. 24. Drops: fine: cloudy: fine. 25, 26. Cloudy: damp. 27. Damp. 28. Cloudy: fine: cloudy: damp. 29. Fog. 30. Rain: fog. 31. Damp: cloudy: damp.—This month has been remarkably fine and warm.

Mean temperature of July for twenty-five previous years	54 ·79
Mean temperature of this month	61°·36
Average quantity of rain in July for six years	2·71 inches.

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

Days of Month.	Barometer.					Thermometer.					Wind.			Rain.		
	Chiswick.		Boston.	Orkney, Sandwick.		Chiswick.		Boston.	Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Orkney, Sandwick.	Chiswick.	Boston.	Orkney, Sandwick.
1852. July.	Max.	Min.	8¾ a.m.	9¼ a.m.	8½ p.m.	Max.	Min.	8¾ a.m.	9¼ a.m.	8½ p.m.						
○ 1.	30·107	29·995	29·45	29·60	29·71	72	52	62·5	58	54½	sw.	w.	s.	......	......	·60
2.	30·131	30·099	29·53	29·46	29·65	73	50	63	52½	54	sw.	sw.	w.	......	......	·25
3.	30·158	30·117	29·60	29·87	29·88	80	51	72·5	55	58	s.	sw.	ese.	......	......	·01
4.	30·077	29·943	29·53	29·88	29·85	94	57	69	68½	65	s.	s.	se.	......	......	·10
5.	29·912	29·819	29·37	29·83	29·91	97	60	73	69½	62	s.	se.	......	......	......	......
6.	29·866	29·808	29·30	29·94	30·04	90	61	74	59½	60	e.	se.	......	......	......	·19
7.	30·006	29·914	29·42	30·03	30·06	90	49	70	59½	60	e.	e.	......	......	......	......
8.	30·026	30·016	29·50	30·06	30·03	87	51	67·5	63	60	e.	e.	se.	......	......	......
☾ 9.	30·020	29·995	29·44	29·88	29·88	92	54	74·5	65½	57	e.	e.	w.	......	......	......
10.	30·117	30·034	29·47	29·99	30·11	87	53	71	57	56	ne.	n.	wsw.	......	......	·30
11.	30·127	30·070	29·63	30·17	30·17	81	57	67	59	57½	se.	ne.	......	......	......	......
12.	30·100	30·049	29·59	30·09	30·09	79	56	71	62	63	e.	ne.	e.	......	......	......
13.	30·060	30·026	29·57	30·07	30·02	81	59	69	70	63	e.	ne.	se.	......	......	......
14.	29·993	29·923	29·47	29·07	29·95	81	60	70	68	60	e.	e.	se.	·20	......	......
15.	29·939	29·898	29·35	29·88	29·90	87	53	70	67	62	s.	sse.	s.	......	·30	......
16.	29·916	29·747	29·35	29·87	29·87	87	62	68·5	68	62	e.	calm	se.	1·60	......	......
● 17.	29·811	29·738	29·20	29·81	29·72	73	52	72·5	65	61½	sw.	s.	se.	·01	·34	......
18.	29·890	29·820	29·26	29·71	29·81	79	50	70	66	61½	w.	w.	......	......	......	·15
19.	30·003	29·945	29·37	29·81	29·84	77	56	71	66	61	sw.	ssw.	se.	......	......	......
20.	30·034	29·973	29·46	29·87	29·85	74	54	69	67½	59	sw.	ssw.	w.	·01	......	......
21.	29·973	29·942	29·40	29·83	29·79	77	51	66	66½	60	sw.	w.	sw.	......	......	·42
22.	30·128	29·971	29·47	29·83	30·00	78	44	68·5	61	58	w.	w.	w.	......	......	......
23.	30·138	30·052	29·62	30·05	29·95	79	52	63	61½	60½	e.	ene.	sse.	......	......	......
☽ 24.	29·951	29·842	29·47	29·89	29·86	78	57	73	66	61½	e.	se.	sse.	......	......	......
25.	29·733	29·656	29·26	29·80	29·89	74	58	73·5	64	61	w.	e.	nw.	·36	·03	·14
26.	29·708	29·640	29·14	30·05	30·14	77	59	70	59½	57	sw.	ne.	n.	·10	......	·06
27.	29·993	29·862	29·38	30·20	30·20	79	52	70·5	58	57½	e.	ene.	n.	......	·13	·08
28.	30·064	30·025	29·52	30·12	30·12	77	49	66	62	59½	ne.	ne.	w.	......	......	......
29.	30·054	30·034	29·54	30·09	30·10	74	47	67·5	62	60	ne.	nne.	w.	......	......	......
30.	30·070	30·038	29·56	30·06	30·04	76	46	66	65	59	w.	nw.	w.	......	......	·18
○ 31.	30·072	30·038	29·50	29·97	29·93	81	54	70	62	60	w.	calm	......	......	......	·10
Mean.	30·005	29·936	29·44	29·896	29·947	81·00	53·74	69·3	63·03	59·70				2·28	0·80	2·58

THE ANNALS

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XXI.—*Observations on the Nidification of* Gasterosteus aculeatus *and* Gasterosteus spinachia. By Albany Hancock *.

It is only within the last few years that naturalists have clearly determined that some species of fish make nests for the reception of their spawn; though Aristotle was actually acquainted with the fact about twenty-two centuries ago.

Five or six kinds are now ascertained to nidify; and of these, two belong to the genus *Gasterosteus*,—one, *G. aculeatus*, the Three-spined Stickleback; the other, *G. spinachia*, the Fifteen-spined Stickleback. The former is a well-known, active, and pugnacious little fish, inhabiting almost every pool and rivulet in the kingdom; the latter is much rarer, and is a denizen of the sea.

Mr. Jonathan Couch states, in his interesting work entitled 'Illustrations of Instinct,' that the first detailed notice of the nest-building of the Three-spined Stickleback occurs in a little magazine, 'The Youth's Instructor,' for the year 1834. This notice is from the pen of Mr. T. Crookenden, a gentleman unknown as a naturalist; but who has given a very faithful account, so far as it goes, of the nidification of this species. It contains all that is at present known on the subject, and its accuracy can be verified by any one who will take the trouble to look into almost any pool of water during the summer months,—the breeding season of the Stickleback. At this time, these fish will be observed near to the margins, busily engaged in building and guarding their nests; and shoals of the fry may be seen, in different stages of development, swimming about in all directions. But if we wish to study, to advantage, the nidification of this

* Read before the Tyneside Naturalists' Field Club, August 11, 1852.

species, a few specimens should be placed in confinement about May or June; and then all their movements can be narrowly watched and accurately observed. Care must be taken, however, that they be left unmolested, and that their new abode resemble, as much as possible, their usual haunts. I have lately had an opportunity of noticing the habits of this fish, during the breeding season, under the above favourable conditions.

We have, for some time past, kept a glass trough filled with aquatic plants and animals; the bottom of this vessel is covered with mud, and the rock-work, piled up in the centre, is overgrown with a delicate hair-like Conferva; a few floating plants spread over the surface of the water, and innumerable *Entomostraca* and other small Crustaceans, as well as various animalcules, swarm in all parts; the minute, but deadly, poison-armed *Hydra* also prevails where food is so plentiful; and a solitary individual of the great water beetle, *Dytiscus marginatus*, rambles over its watery domain, lord and master of all. Several of the freshwater Mollusca also people the trough, which on the whole has much the appearance of a miniature pond. Into this new home were put four or five sticklebacks last May; and they, at once, made themselves perfectly at ease. One, without the least hesitation, took possession of a certain spot, which it guarded with the greatest pertinacity, attacking vigorously any of its companions that might happen to approach the chosen locality. The beetle too, which sometimes came slowly paddling by, was pounced upon and unceremoniously tumbled over; but secure within his scaly armour, as the knights of old, he little heeded the onslaught of his naked assailant; so overpowering all opposition he scrambled onward in his undeviating path.

This fish was rather small, had the throat of a bright red colour, and the eyes of a brilliant bluish green. At first, all the others were pale; but, in the course of a few days, one of them gradually assumed the rich hues of that just described, and soon afterwards it also became attached to a spot, taking up its abode in one of the corners of the trough. On examining attentively the two selected localities, a nest was found in each, composed of a collection of delicate vegetable fibres, resting on the bottom of the trough, and matted into an irregularly circular mass, somewhat depressed, and upwards of an inch in diameter; the top being covered over with the same materials, and having, in the centre, a large hole. The fishes scarcely ever strayed from their nests, but were constantly on guard, defending or repairing them; they were perpetually prying into the hole at the top and thrusting their heads right into it. On one occasion, one of them entered by this hole, and slowly forced itself right through the side of the nest: as it gradually moved onward, its body had a peculiar, lateral, vibratile motion. They would frequently seize hold of the nest and give it a violent tug, shaking and tearing loose the vegetable matter of which it was composed; at other times they would carry to it, in their mouths, fine Conferva-stems, and press them with considerable force into the walls of the nest, or thrust them into the hole, which, by this means, was sometimes partially concealed. Occasionally, each was observed hovering over its nest, with the head close to the orifice, the body being inclined upwards, at an angle of about 45°, fanning it with the pectoral fins, aided by a lateral motion of the tail. This curious manœuvre was apparently for the purpose, so to speak, of ventilating the spawn, which could be distinctly seen through the orifice at the top; at least, by this means, a current of water was made to set in towards the nest, as was rendered perfectly evident by the agitation of particles of matter attached to it. This fanning or ventilating process was repeated, at short intervals, during the day, and every day until the spawn was hatched, to accomplish which took between two and three weeks.

Only one nest contained spawn; the other was torn in pieces, and the materials scattered about, in the hope that we might have the pleasure of seeing it reconstructed. In this we were not disappointed; the fish immediately began to form a new nest in exactly the same spot, and by the following day it was more than half completed. It took a mouthful at a time, and was at some pains in adjusting each load, spreading the materials out, and pressing them down with its mouth; it then drew its body slowly over the whole, vibrating, all the time, in the same peculiar manner as when it forced its way through the nest, as before stated*.

On the 13th of June the hole at the top of the fruitful nest was found to be much enlarged, so that the entire mass of spawn was exposed to view; and, on looking attentively, a few of the newly hatched fry were seen flitting about the walls of the nest. The assiduity of the parent was now greatly increased; it never left the spot; by night it rested either on the nest or by its side, and during day nothing was allowed to approach. It fiercely seized a quill that was passed down towards the object of its solicitude, with such vigour that the shock of attack was distinctly felt by the hand. Combats with its companions became more frequent; but its ire was chiefly directed against its neighbour, which, like itself, was engaged in parental duties. This having also a nest to defend never shrank from the conflict,

* It is probable that it is the male fish which builds and guards the nest; and, if so, it might, perhaps, be shedding the milt when dragging its body over and through the nest in the manner described.

and the encounters were therefore fierce and prolonged; but, nevertheless, conducted with all due caution, and apparently with much science, as the gentlemen of the ring would express it. The sparring was very wary, and generally lasted a few seconds before the combatants closed. The attack was usually commenced by one quietly creeping up, watching its opportunity; on this, the other, acting on the defensive, would turn its broad side to the enemy and raising the ventral spine wait to receive the onslaught; the assailant, intimidated by this formidable demonstration, would then slowly retreat, and in its turn had in the same manner to defend itself. After thus advancing and retreating for a few times, one, taking advantage of an unguarded moment, would rush in upon its opponent and butt at it with its head, apparently endeavouring to bite; the other, rallying, returned the compliment, and after dashing at each other in this way two or three times, with extraordinary rapidity, the round would terminate, and each fish retreat to its nest to recommence its more immediate nidimental duties.

The fry were, at first, so minute and transparent that they could scarcely be discerned as they lay partially concealed amid the meshes of the nest: every now and then a slight fluttering motion betrayed their position, otherwise it was almost impossible to distinguish them. As I was closely watching their motions, at this time, one of the newly hatched fishlings, with intrepidity beyond its experience, ventured to pass the limits of its cradle: in an instant the watchful parent was there, and with gaping mouth seized the little wanderer, which immediately disappeared, the jaws having closed upon it. Seeing this, I at once gave up the fry for lost, deeming that here was an instance of instinct at fault, and that all the affectionate solicitude of the parent was to end in its devouring its offspring. In this I was mistaken: the old fish, quietly returning, dropped the straggler into its nest lively and uninjured. During the whole of this day none of the fry were permitted to ramble beyond the precincts of their fold; when any attempted to do so—and many did attempt—they were invariably brought back in the mouth of the parent: none escaped its vigilant eye, and it was amusing to see with what a hurried, fluttering motion the little things dropped almost perpendicularly down into the nest, so soon as they were released from the jaws of the parent.

It was three days before all the eggs were hatched, and the attention of the parent, during all this time, was unremitting. On the second day I marked its manœuvres for five minutes, and found that, in this short period, it ventilated the nest eight times, warded off an attack of the neighbouring fish, and brought back to the nest a straggler or two. During this day the spawn was frequently examined by the parent, who would occasionally seize hold of it and give it a good shake; apparently for the purpose of throwing off adherent matter, that the water might freely circulate about the eggs. The parent would then dive, head foremost, into the nest and bring out a mouthful of mud, which it would carry to some little distance and discharge with a puff.

The third day was passed much in the same manner, only as the eggs were now all hatched, the nest was less frequently fanned or ventilated; and the fry, about forty in number, were allowed greater liberty; the strongest being permitted to recreate themselves among the Confervæ that grew on a stone about 2 inches from the nest. On the fourth day the fanning had ceased altogether, and the rambles of the young were less restricted. They were not yet, however, permitted to pass beyond certain limits; when any transgressed these bounds they were immediately seized, as heretofore, and carried back to the nest; into which they were always very glad to escape from the clutches of their ardent parent. Notwithstanding all her vigilance, one contrived, on the fifth day, to escape her eye, and passing the fatal boundary was immediately devoured by the other fish, which now seemed always on the watch, neglecting its own barren nest, being intent only on appropriating to itself the nestlings of its fruitful neighbour. In this act of cannibalism we see the reason for the parent's anxious care and its jealousness of its kind; and it is evident from Mr. Crookenden's account, previously quoted, that they greedily devour each other's spawn. The young fry, however, have other enemies as well as their own species. One day a favourite *Hydra* (*H. fusca*) was observed to be distended in a most extraordinary manner; on examination it was found to have swallowed the head and shoulders of one of the young fish many times larger than itself; and the caudal extremity, which was too much for it, and which was projecting out of its mouth, had been seized upon by another *Hydra*. Thus, it would appear that these low organized, but powerful and voracious animals occasionally regale themselves on the flesh of the *Vertebrata*. This happened when the fry were three or four weeks old.

All the old fish, with the exception of that with the young, were, in consequence of their cannibal propensities, turned out of the trough; and danger being thus removed, the fry were no longer restricted in their rambles, but enjoyed the whole range of their crystal abode. Henceforth the parent's assiduity gradually relaxed, though for days afterwards it was its custom to take the young occasionally into its mouth, and after carrying them a little distance to let them drop out again. I took one of the fry out one day for examination with the microscope; on returning it to the trough, it was in so sickly a state as to be scarcely able to leave the vessel, which was held in the hand. The old fish, perceiving the helpless condition of its offspring, came up to the surface of the water, and seizing hold of the exhausted young one carried it off almost from amidst my fingers, and taking it to some distance puffed it out of its mouth into a tuft of Confervæ. This courageous act of our little fish would seem, in some measure, to give credence to the assertion, so frequently made, that some of the sharks protect their young by receiving them into the mouth on the approach of danger.

Other facts might be related evincing parental attachment; but perhaps enough has been said to satisfy those, who take an interest in such matters, that in this respect the Three-spined Stickleback is scarcely, if at all, inferior to the hen, whose affectionate regard for her offspring has ever been the theme of admiration. Incubation, with the fish, is out of the question; it attends its nest, however, as diligently as any of the feathered tribes, keeping it in constant repair, fanning it with its fins, and removing anything that might obstruct the free action of the water upon the eggs; it defends its young with the same undaunted courage, and though it cannot gather them under spreading wings as the hen gathers her brood, yet all those which stray are brought back to the nest, that they may be under the protection of their ever-vigilant and courageous parent.

The nest of the Fifteen-spined Stickleback (*Gasterosteus spinachia*) was first noticed by Mr. Jonathan Couch on the Cornish coast in 1842. Since then it has been observed two or three times on the coast of Northumberland. It is composed of pendent seaweeds bound together, by a silk-like thread, into pear-shaped or fusiform masses: the spawn is deposited in the centre of the mass. Mr. Couch says, "One of these nests was visited every day for three weeks, and the old fish was found invariably guarding it; it would examine the nest on all sides, and then retire for a short time, but soon return to renew the examination. On several occasions," continues this gentleman, "I laid the eggs bare by removing a portion of the nest, but when this was discovered great exertions were instantly made to recover them. By the mouth of the fish the edges of the opening were again drawn together, and the other portions torn from their attachments and brought over the orifice till the ova were again hid from view. And as great force was sometimes necessary to effect this, the fish would thrust its snout into the nest as far as the eyes, and then jerk backwards till the object was effected. While thus engaged, it would suffer itself to be taken in the hand, but repelled any attack made on the nest, and quitted not its post so long as I remained."

Mr. Richard Howse, who found three or four of these nests in a pool among the rocks at Tynemouth, a year or two ago, informs me that each was attended by a fish, and that they scarcely ever left their nests, but kept hovering about, attentively examining them, and thrusting their projecting muzzles amidst the seaweeds of which they were composed; the fish would occasionally poise themselves close to the nests, and fan them with the pectoral fins in the same manner as the Three-spined species. And, indeed, it is quite evident, from the accounts given by these two gentlemen, that the habits of both species, in all that concerns nidification, perfectly coincide; both guard the nest with the same unwearied perseverance, drive off enemies, make all necessary repairs, fan or ventilate the nest, and keep it in all respects in good order.

It is satisfactory to observe this exact similarity of habits, for Mr. Couch has changed his opinion, apparently upon insufficient grounds, respecting the nest, which he attributed to the Fifteen-spined Stickleback. He now considers it to belong to the common Shanny (*Blennius pholis*), arriving at this conclusion after having examined the young hatched from ova taken out of one of the nests. "Being from the first," says this gentleman, "impressed with the conviction that they were the young of the Fifteen-spined Stickleback, I was much surprised to notice the great difference of their shape from that of their supposed parent, more especially in the parts before the eyes, which, instead of being elongated and slender, were short and round. In consequence of this they were closely examined with glasses, and drawn with the aid of a microscope of low power; and though I failed to detect satisfactorily the ventral fins of that fish (chiefly perhaps from their slender form and transparency), yet, from the declivity of the head, protuberance of the belly, the pectoral fin, and the length of the dorsal and anal fins, which in some specimens were continuous with the caudal, and in others separated by a slight notch, I had no hesitation in referring them to the common Shanny."

Now, the young of the Three-spined Stickleback differ just as widely from the mature fish as the young of the Fifteen-spined species are stated to do; and what is of still more importance, the differences are of exactly the same kind. In the former, as well as in the latter, the parts before the eyes are short and round, and can scarcely be said to project at all in front; the declivity of the head is consequently great; the belly is protuberant, and the dorsal and anal fins are long and continuous with the caudal. The young of the Three-spined Stickleback would therefore appear also to possess, at first, the characters of the Shanny; but as development goes on, the jaws are pushed out, the belly is reduced in comparative size, and the dorsal and anal fins are shortened, and become ultimately separated from the caudal. Thus, in course of time, the young gradually assume the form and characters of the parent. And there can be little doubt that this would have been found to be the case with the young of the Fifteen-spined Stickleback, had Mr. Couch watched their development a little longer. The obtuse form of the head, on which that gentleman places much stress, is the embryonic condition of all fishes; the elongation of the jaws is always an after-development.

In conclusion it may be remarked, that of the three or four other species of fish, described to nidify, one, a native of Demerara, is stated to remain by the side of the nest with as much solicitude as the hen guards her eggs; the same is said respecting another species inhabiting the Black Sea: but in none, so far as I am aware, has parental attachment been observed to equal that evinced by the Three-spined Stickleback. Yet we must not, therefore, conclude that it does not exist to the same extent in others of the finny tribes. The habits of these animals are very little known; and who can say what time may bring to light respecting the œconomy of the inhabitants of the deeper regions of the sea? It is only, as it were, the other day that nothing was known of the nidification of the Three-spined Stickleback,—a resident of almost every pool, river, and rivulet in the kingdom.

XXII.—*A Catalogue of British Spiders, including remarks on their Structure, Functions, Œconomy, and Systematic Arrangement.* By John Blackwall, F.L.S.

[Concluded from p. 189.]

198. *Epëira bicornis.*

Epëira bicornis, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 124; Blackw. Linn. Trans. vol. xix. p. 126; Koch, Die Arachn. B. xi. p. 92. tab. 382. fig. 902, 903.

—— *arbustorum,* Koch, Uebers. des Arachn. Syst. erstes Heft, p. 3.

In the wooded parts of Denbighshire this rare species occurs on the trunks of trees. It pairs in June, and in July the female constructs a subglobose cocoon of light brown silk of a loose texture, about $\frac{1}{3}$rd of an inch in diameter, which includes her eggs.

199. *Epëira conica.*

Epëira conica, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 138; Latr. Gen. Crust. et Insect. tom. i. p. 109; Sund. Vet. Acad. Handl. 1832, p. 248; Hahn, Die Arachn. B. ii. p. 45. tab. 57. fig. 130.
Singa conica, Koch, Uebers. des Arachn. Syst. erstes Heft, p. 6; Die Arachn. B. xi. p. 145. tab. 392. fig. 943–945.
Titulus 4, Lister, Hist. Animal. Angl. De Aran. p. 32. tab. 1. fig. 4.

I have seen immature individuals of this remarkable spider which were captured in Middlesex, and in 1852 I received from Mr. Meade an adult male which was sent to him from that county. Lister states that he has frequently found *Epëira conica* in lofty and umbrageous woods in Cambridgeshire and Yorkshire.

200. *Epëira tubulosa.*

Epëira tubulosa, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 86.
Singa hamata, Koch, Die Arachn. B. iii. p. 42. tab. 88. fig. 197, 198; Uebers. des Arachn. Syst. erstes Heft, p. 6.
—— *melanocephala,* Koch, Die Arachn. B. iii. p. 44. tab. 88. fig. 199.
Titulus 7, Lister, Hist. Animal. Angl. De Aran. p. 40. tab. 1. fig. 7.

According to Lister, *Epëira tubulosa* is sometimes met with in great abundance in moist situations; it is one of the few native species, however, which I have not yet succeeded in obtaining.

Genus TETRAGNATHA, Latr.

201. *Tetragnatha extensa.*

Tetragnatha extensa, Walck. Hist. Nat. des Insect. Apt. t. ii. p. 203; Latr. Gen. Crust. et Insect. tom. i. p. 101; Sund. Vet. Acad. Handl. 1832, p. 256; Hahn, Die Arachn. B. ii. p. 43. tab. 56. fig. 129; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 5.
—— *gibba,* Koch, Uebers. des Arachn. Syst. erstes Heft, p. 5.
Titulus 3, Lister, Hist. Animal. Angl. De Aran. p. 30. tab. 1. fig. 3.

This is the only species belonging to the genus *Tetragnatha* which has been found in Great Britain. It frequents damp localities, constructing among bushes and plants in the vicinity of brooks, ditches and pools a slight net having a circular aperture at the centre. The specific name *extensa* has reference to its habit of extending the first and second pairs of legs forwards and the posterior pair backwards in a line with the body.

In June the female attaches to some object near her snare, a subglobose cocoon, about $\frac{1}{5}$th of an inch in diameter, composed of fine silk of a loose texture, which is either whitish with small tufts of a dull green colour on its exterior surface, or else is of a dull green colour with whitish tufts. The eggs deposited in different cocoons vary greatly in number; but I have never noticed fewer than 60 nor more than 214 in a single set; they are spherical, of a pale yellow colour, and are agglutinated together in a subglobose mass.

Tribe Senoculina.

Family *Dysderidæ*.

Genus Dysdera, Latr.

202. *Dysdera erythrina.*

Dysdera erythrina, Walck. Hist. Nat. des Insect. Apt. t. i. p. 261; Latr. Gen. Crust. et Insect. tom. i. p. 90; Hahn, Die Arachn. B. i. p. 7. tab. 1. fig. 3; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 20; Die Arachn. B. v. p. 76. tab. 165. fig. 389; Blackw. Linn. Trans. vol. xix. p. 128.

Specimens of *Dysdera erythrina* have been taken under stones in the central parts of the city of Manchester; others have been transmitted to me from Cambridge by Professor Potter and Mr. Alfred Bishop, and from Oxford by Mr. W. H. Baxter; and Mr. Walker informs me that he has met with this spider on the south coast, near the seashore.

203. *Dysdera rubicunda.*

Dysdera rubicunda, Koch, Die Arachn. B. v. p. 79. tab. 165. fig. 390, 391; Blackw. Linn. Trans. vol. xix. p. 129.

The only individual of this species which has come under my observation was an adult male, contained in a collection of spiders sent to me from Cambridge by Charles C. Babington, Esq., M.A. M. Walckenaer is certainly mistaken in supposing that *Dysdera rubicunda* is merely a variety of *Dysdera erythrina* (Hist. Nat. des Insect. Apt. t. ii. p. 444), as well-marked differences in the structure of the palpal organs of the males prove to demonstration that they are distinct.

204. *Dysdera Hombergii.*

Dysdera Hombergii, Walck. Hist. Nat. des Insect. Apt. t. i. p. 263; Blackw. Linn. Trans. vol. xix. p. 129; Koch, Die Arachn. B. x. p. 95. tab. 351. fig. 819, 820.
—— *Latreillii,* Blackw. Lond. and Edinb. Phil. Mag. Third Series, vol. i. p. 190.
—— *gracilis,* Wider, Museum Senckenb. B. i. p. 200. taf. 14. fig. 1.
—— *punctata,* Koch, Die Arachn. B. v. p. 84. tab. 167. fig. 395, 396.

Distinguished arachnologists have mistaken *Dysdera Hom-*

bergii, first briefly described by Scopoli (Entomologia Carniolica, p. 403, No. 1119), for the young of *Dysdera erythrina,* from which it differs in colour and organization. Being convinced of its specific distinctness by a careful examination of specimens captured in 1832, in the same year I gave a description of it in the 'London and Edinburgh Philosophical Magazine,' under the appellation of *Dysdera Latreillii*; but the trivial name, of course, is superseded by that originally given to it by Scopoli. The tarsi of this species, unlike those of its congeners, have three claws at their extremity, and are destitute of scopulæ.

Crevices in rocks and walls and the under side of lichens growing on trees are the favourite resorts of *Dysdera Hombergii,* which is plentiful in the wooded districts of Denbighshire, Caernarvonshire and Lancashire; and in the spring of 1849 I received an immature female from Mr. J. Hardy, who took it in Berwickshire. The sexes pair in May, and in the succeeding month the female envelopes herself in an oval cell of white silk of a slight texture, on whose exterior surface are disposed minute pebbles, small pieces of indurated soil, and other heterogeneous materials; in this cell she deposits between 20 and 30 spherical eggs of a pale pink colour, which are not cemented together.

Genus Segestria, Latr.

205. *Segestria perfida.*

Segestria perfida, Walck. Hist. Nat. des Insect. Apt. t. i. p. 267.
—— *florentina,* Hahn, Die Arachn. B. i. p. 5. tab. 1. fig. 1; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 20; Die Arachn. B. v. p. 72. tab. 164. fig. 385, 386.
—— *cellaria,* Latr. Gen. Crust. et Insect. tom. i. p. 88.

The claim of this fine species to a place among our indigenous spiders rests on the authority of Dr. Leach, who has recorded an instance of its capture at Plymouth, in the Supplement to the 4th, 5th and 6th editions of the 'Encyclopædia Britannica,' article Annulosa.

206. *Segestria senoculata.*

Segestria senoculata, Walck. Hist. Nat. des Insect. Apt. t. i. p. 268; Latr. Gen. Crust. et Insect. tom. i. p. 89; Sund. Vet. Acad. Handl. 1831, p. 145; Hahn, Die Arachn. B. i. p. 6. tab. 1. fig. 2; Koch, Uebers. des Arachn. Syst. erstes Heft, p. 21; Die Arachn. B. v. p. 75. tab. 164. fig. 388.
Titulus 24, Lister, Hist. Animal. Angl. De Aran. p. 74. tab. 1. fig. 24.

Segestria senoculata is of frequent occurrence in many parts of England and Wales, and in December 1848 a young individual was transmitted to me from Berwickshire by Mr. J. Hardy.

It spins a long tube, which serves for a domicile, in the crevices of rocks and walls, and under lichens growing on trees. Towards the end of May or the beginning of June the female deposits between 80 and 90 spherical eggs of a yellowish white colour, not agglutinated together, in a lenticular cocoon of white silk of a fine but compact texture, measuring $\frac{1}{4}$th of an inch in diameter, which is inclosed in a silken cell, attached to objects near her retreat, and covered with particles of earth and the refuse of her prey.

This species, when in captivity, does not complete its several changes of integument and arrive at maturity in less than two years, and I have ascertained that its existence sometimes extends through a period of four years. Only three spinning tubes are connected with each intermediate spinner of this spider; they are situated at its extremity and are of large dimensions.

Genus Schœnobates, Blackw.

207. *Schœnobates Walkeri.*

Schœnobates Walkeri, Blackw. Ann. and Mag. of Nat. Hist. Second Series, vol. vi. p. 343.

An adult male of this very interesting spider was captured at Broadstairs in Kent in the month of September, and is in Mr. Walker's cabinet. It is preserved in Canada balsam, and has suffered from compression, circumstances which render an investigation of its structure difficult. After a most careful inspection under the microscope, I could not ascertain that it had more than six eyes; but even should it ultimately be found to possess eight of those organs, it must still, by its other essential characters, constitute a new genus.

Genus Oonops, Templeton.

208. *Oonops pulcher.*

Oonops pulcher, Templeton, Zoological Journal, vol. v. p. 404. pl. 17. fig. 10; Blackw. Linn. Trans. vol. xix. p. 129.
Deletrix exilis, Blackw. Lond. and Edinb. Phil. Mag. Third Series, vol. x. p. 100.
Dysdera pulchra, Walck. Hist. Nat. des Insect. Apt. t. iv. p. 382.

In the 'London and Edinburgh Philosophical Magazine,' I proposed the genus *Deletrix* for the reception of this minute spider, which I described, under the specific name of *exilis,* from immature females whose colours had been injured by captivity. At that time I was not aware that I had been anticipated by Mr. Templeton, whose genus *Oonops,* founded on the organic peculiarities of this species, has the claim of priority.

M. Walckenaer does not admit the validity of the well-defined genus *Oonops* (misprinted *Conops*), but has placed this spider in the genus *Dysdera*. See the synonyma.

Oonops pulcher occupies interstices in rocks and walls, and among lichens growing on trees, in Lancashire, Denbighshire and Caernarvonshire, being abundant in the wooded parts of the last two counties. By the agency of a small scopula, connected with the extremity of each tarsus, it is enabled to move with celerity and security on dry objects having polished perpendicular surfaces. In May the female fabricates near her retreat several contiguous subglobose cocoons of white silk of a delicate but compact texture, measuring about $\frac{1}{16}$th of an inch in diameter, in each of which she usually deposits two spherical pink eggs, not cemented together.

Family *Scytodidæ*.

Genus Scytodes, Latr.

209. *Scytodes thoracica.*

Scytodes thoracica, Walck. Hist. Nat. des Insect. Apt. t. i. p. 270; Latr. Gen. Crust. et Insect. tom. i. p. 99.
—— *tigrina*, Koch, Die Arachn. B. v. p. 87. tab. 167. fig. 398.

Dr. Leach has stated in the Supplement to the 4th, 5th and 6th editions of the 'Encyclopædia Britannica,' article Annulosa, that *Scytodes thoracica* has occurred twice near Dover; but that both individuals were females.

Genus Savignia, Blackw.

210. *Savignia frontata.*

Savignia frontata, Blackw. Lond. and Edinb. Phil. Mag. Third Series, vol. iii. p. 105; Research. in Zool. p. 312. pl. 2. fig. 1, 2.

The male of this small and interesting species was discovered on iron rails at Crumpsall Hall in the autumn of 1832, and has since been met with, at different seasons of the year, in various parts of Lancashire, Yorkshire, Cheshire, Denbighshire and Caernarvonshire. As regards its œconomy, I can merely state that it is active during the day, decidedly aëronautic, making frequent ascents into the atmosphere, and that it can exist for a long period immersed in water. Though the male is far from being uncommon, yet I have not succeeded in capturing a single female.

By the conical protuberance on the anterior part of the cephalo-thorax, the relative length of the legs, the converging maxillæ and semicircular lip, *Savignia frontata* is connected with the spiders belonging to the genera *Walckenaëra* and *Neriëne*.

XXIII.—*On some undescribed Animals of the British* Rissoæ. By William Clark, Esq.

To the Editors of the Annals of Natural History.

Gentlemen, Norfolk Crescent, Bath, Sept. 1852.

It is stated in the 'Annals,' N.S. vol. viii. p. 48, that I had examined some unrecorded animals of the British *Rissoæ,* and when the minutes were reduced I would communicate the result; I now fulfil that engagement; and to show that an account of these minute species is considered a desideratum, I need only quote the learned authors of the 'British Mollusca,' who, speaking of the *Rissoa striatula,* remark, "The animal of this, as of too many other *Rissoæ,* is yet unknown." The following observations were taken in 1851, but in the present summer I have reviewed, at Exmouth, the several species alluded to, and added some new ones; I may therefore speak with increased confidence of their descriptive accuracy as far as regards the external organs, but I apprehend that a correct anatomy of such minute creatures is a vain expectation; we must therefore rely on analogy, for at least the general characters of their interior organization.

It is necessary to mention that the almost microscopic organs of these diminutive species require the aid of good glasses to see their true forms and attributes; the present descriptions are the result of the organs being viewed through Coddington lenses of as high powers as were consistent with distinctness: inferior means give false appearances, and are often the cause of discrepancies between observers of the same animal.

Rissoa striata, Montagu.

Animal inhabiting a white shell of 5–6 rather tumid, semiplicated, spirally striated volutions; it is hyaline white in most parts; an exception is the upper and under surface of the rostrum and buccal fissure, which are of a sordid light red brown. Mantle even with the shell, except that a minute cirrhal filament, very difficult to be seen, issues from it at the upper angle of the aperture, as in the type *R. parva,* in which it is never absent.

The head is a long flat muzzle deeply grooved above and below, with minute lappets on the upper surface near its termination, and on the march is carried a little in advance of the foot: the tentacula are moderately long, divergent, strong but flattened, very little setose; they do not attenuate to points like the type, but are of the same breadth throughout, and of opake snow-white; in progression they are extended considerably beyond the head: the eyes are conspicuously black, and placed on minute scarcely projecting external offsets. The foot is truncate in front, grooved so as to form a labium, and slightly auricled; it is altogether stronger than in *R. parva*, and like it rarely extends to the limit of the body volution, and terminates posteriorly in a moderately pointed lanceolate shape; there is very slight trace of a longitudinal line in the centre of the sole; the operculigerous lobe has the margins laterally so lax and disunited as to form wings, which, on the march, at the will of the animal, continually change their appearance; on it, near the junction of the foot with the body, is the light horny oval operculum of three spires, the two first minute and scarcely traceable; the last enlarges rapidly, and shows distinct striæ of growth. There is no caudal cirrhus on the opercular lobe, which is nearly coextensive with the main foot, and so pointed as to appear like one, and in some specimens is unequally emarginate at the sides.

The animal is not shy, and marches with vivacity; it has been remarked that it is disproportionately small for the shell, and the tentacula very short; I do not think our southern examples confirm this view: it inhabits all the districts. The records of this common species are so scanty, that it may almost be looked on as undescribed.

Rissoa semistriata, Montagu.

The animal occupies a shell of six moderately convex volutions, each partially striated, the middle portions being smooth. Its colour is nearly white, with the palest tinge of yellow. The mantle is even with the shell, except a short minute filament that is protruded by the animal from the portion which lines the upper angle of the aperture, like that I have mentioned in the *Rissoa parva* above, and in the *R. ulvæ*, in the 'Annals,' N.S. vol. vi. p. 33. The head is a short muzzle, not so long as in the type, but similarly grooved in the centre above, and cloven at the extremity and below. The tentacula are flattish, rather long, divergent, frosted, pale yellow or white, with the tips slightly clavate; the eyes are on gently raised prominences at the external bases. The foot is nearly the shape of the type, contracted in the middle, pointed behind, and sometimes emarginate, but it is proportionately longer, larger, and thicker; there is no groove or longitudinal line on the sole; the upper lobe anteally expands into narrow white wings, and terminates behind with three caudal processes, whereof the middle is the longest, and writing of it to Professor Forbes I termed it a bashaw of three tails; it carries the light corneous suboval operculum at some distance from the end of the foot, but the two first turns of the spire are nearly obsolete; the third occupies the greater portion of the plate, and is well marked with oblique lines of growth.

I have lately examined many lively specimens, and can confirm the fact of the operculigerous lobe terminating in three filaments, as well as the presence of the short mantellar process that is produced and retracted, at the will of the animal, from the upper angle of the aperture. What are the functions of this organ is doubtful; it has not the aspect nor is in the position of a reproductive element; it has more the resemblance of a tentacular instrument; but in some *Rissoæ* it acquires an imperfect tubular appearance, as in the *Chemnitziæ*, in which, particularly *Ch. acuta*, it seems to perform the office of the branchial siphon of the *Canaliferæ*. I believe that this appendage has scarcely been noticed by authors; it appears to exist in many of the *Rissoæ*, but if in all is doubtful; it has no connexion with the operculigerous lobe, or its wings or caudal cirrhi, but is a strictly mantellar process. The animal is free, unusually rapid on the march, inhabits all the zones, and has not before been observed.

Rissoa costata, Montagu.

Animal inhabiting an elaborately sculptured, costated, spirally striated, basally ridged pale yellow shell of 5–6 rounded volutions, hyaline white, except the large black eyes and pale red buccal disk. Head a long proboscidiform muzzle finely corrugated in quietude, cloven vertically at the orifice as in *R. parva*, but showing more partially than in that species the corneous jaws and buccal apparatus. The mantle is plain and even. The tentacula are long, flat, not filiform, rather thick at the base, tapering gradually to a rounded extremity; they are not setose: the large eyes are fixed on prominences at the external angles. The foot at rest is short, on the march it extends to the middle of the antepenultimate volution; it is labiated in front, but not auricled, constricted above instead of in the middle, as is more usual in *Rissoa*, and then expands and tapers to a narrowish attenuated rounded termination. The operculigerous lobe dilates into subcircular lateral alæ, bearing close at the junction of the foot with the body, a suboval corneous faintly spiral operculum with the turns rapidly increasing, as in the paucispiral *Littorinæ* and typical *Rissoæ*. It has a distinct caudal cirrhus.

Malacologists, from the curious sculpture and entire flat striated broad margin of the peristome of the shell, have thought that this hitherto unrecorded animal would display singular features; that is not the case; it is a very simple creature, and scarcely differs from the *R. parva*, except in having the tips of the tentacula rather flatter, more rounded, and in the different position of the constriction of the foot. The animal is active, marches up a glass with uncommon rapidity, and displays a freedom beyond the usual habits of the tribe. It is found in all the zones.

Some live examples of this species having occurred, I add to the above account, that the front part of the foot is marked with an intense snow-white flake of the figure of the letter V, visible in consequence of its transparency above and below; I have also to remark, that the anterior terminal line of the foot is unusually deeply incised, so as to form two labia; the lower, or that of the sole, at the centre part, on the march is produced much beyond the upper lip. I have never before seen this feature so extensively developed in any *Rissoa*.

And lastly, I state, that I failed to detect satisfactorily the small pendent process in the mantle at the aperture, which is so conspicuous in *R. parva* and *R. semistriata*; yet it may exist: I had the same difficulty in *R. striata*, but afterwards I saw it in several examples.

Rissoa reticulata, Montagu.

Rissoa Beanii, nonnull.
Rissoa sculpta, nonnull.

The animal occupies a spiral, cancellated, pale yellow or brown shell of 5–6 tumid volutions; its ground colour is yellowish white. Mantle even with the shell, except the filamentary process at the angle of the aperture. Head proboscidiform, furnished with the usual cloven disk and buccal appendages; the rostrum near its termination at the upper surface appears to have attached to it two very small similar shields, one on each side, independent of the terminal minute subcircular flat lobes. The tentacula are compressed, slender, rather long, rounded at the extremities, not setose; the eyes are at the external angles, on short light yellow or orange pedicles. Foot subrotund, scarcely auricled, but grooved in front sufficiently to form a shallow labium, slightly constricted anteriorly, at one-third the length, gently tapering to a rather obtuse lanceolate but not emarginate termination; the operculum is carried on an upper plain moderately alated lobe, at nearly the point of the junction of the foot with the body; it is pyriform, with indistinct rapidly increasing paucispiral gyrations; the terminal part of the lobe, like the *R. semistriata*, is furnished with three blunt, cylindrical, short cirrhi, and occasionally one of the sides of the main foot is emarginate. The branchial plume is composed of 12–15 single, pale yellow, short strands, which are visible when the neck is greatly exserted. The animal is active and freely shows its points. Common in the coralline zone, but rather rare alive.

This is the true *Turbo reticulatus* of Montagu; it is, however, subject to considerable variation of the contour and quality of the cancellations, which have led to the fabrication of some spurious articles.

This species has not before been described. The specific appellation of '*reticulata*' must be substituted for '*Beanii*;'—a complimentary term ought not to take the place of the long-accredited and not doubtful one of the admirable Montagu.

Rissoa punctura, Montagu.

This species has been confounded with the preceding, but having met with many live specimens, it will be seen that Montagu has properly distinguished it. The animal is lively and freely shows its organs, and in this instance I have it in my power to effect a concentrated description; it is in every respect identical with the *R. reticulata*, with the exception of a particular-seated and constant variation of colour; the operculigerous lobe is a very pale muddy reddish brown, but it is marked, on each side close to the junction of the foot with the body, with an irregular rather large dark smoke-coloured stripe, which is invariably wanting in *R. reticulata*.

Though differences of colour are not generally to be received as good specific characters, yet, when we see certain markings in an animal in a particular position, which are always absent in one that resembles it in almost every other point, we are entitled to consider them as fair specific differences; and in this case distinctness is corroborated by a considerable variation in the contour of the two shells, the *R. punctura* being much smaller, with more rounded and less tumid volutions, as well as having the sutures more deeply impressed than in the *R. reticulata*.

Since these observations I have taken many of this and the preceding species, and in the present animal have always found the dark lead-coloured marks on the operculigerous lobe, with the addition under the neck, near the eyes, of a small red dot; but these particulars are absent in the *R. reticulata*, the same parts being pure white. Both inhabit the coralline zone, and at Exmouth the *R. reticulata* is strictly confined to a coralline area, whilst the *R. punctura* occupies the interstitial grounds of that district, in muddy patches, mixed with comminuted shelly spoil. I cannot doubt the distinctness of the two.

Rissoa soluta, Brit. Moll.

The animal occupies a simply elegant minutely spirally striated almost microscopic pale yellow shell of 3–4 rounded volutions. The mantle does not extend beyond the aperture. The colour is hyaline white with a trifling exception. Head proboscidiform, having its terminal pale red disk vertically cloven, in which the buccal organs are distinctly visible. The tentacula are moderately long, rounded at the tips, very pilose, the setæ springing from them horizontally, but only visible with high powers; eyes at the external angles on small scarcely raised pale sulphur-coloured eminences. Foot subtruncate, slightly auricled, labiated or grooved anteally, and long and narrow. Operculigerous lobe small and not much alated; no caudal cirrhus was detected; the light corneous operculum is suborbicular and paucispiral, fixed nearly at the extremity of the foot. The animal is exceedingly vivacious and free, marching up a glass with singular rapidity. It is very abundant alive in the coralline zone, in 14 fathoms water, off Budleigh Salterton, Devon.

Rissoa proxima, Brit. Moll.

The animal inhabits a thin sordid white shell of four rounded, deeply separated, rather oblique volutions, which are, particularly the body one, closely but superficially spirally striated; the caducity of the striæ renders this species very liable to become glabrous from attrition. The general colour of the external organs is a brilliant subhyaline white, but, though aspersed with minute opake snow flakes, the transparency is scarcely impaired. The mantle is even, and does not emit a process from the portion that lines the upper angle of the aperture. The head when quiescent is a short subcylindrical rostrum, quite smooth and rounded at the termination; it is not tunicated, lobed, grooved, nor vertically cloven on the upper part, and on the lower area it forms a disk, which has not a distinct vertical fissure as in *R. parva*, but shows a fine crosial incision, which is the alimentary orifice, and within it are probably the corneous jaws and buccal apparatus, but I could not detect them, perhaps from being of the hyaline colour of the rostrum, which is so pellucid as to allow the intenser white canal or œsophagus leading to the stomach to be seen through the walls.

When the animal is on the march it often suddenly evolves the rostrum to double its usual length, at the same time expanding the termination into a large disk or finely dentated flattened rose, which it throws back on the margin of the upper point of the aperture, and then as quickly withdraws the extension to its usual limits; whether this curious manœuvre is part of the animal œconomy, or of the nature of that which is sometimes seen in the typical *Rissoæ* when disturbed, I cannot determine until more specimens are observed; at present, I think the action peculiar to this species.

The tentacula are flat, strong, rather short, flake-white, smooth, gently attenuating and becoming minutely claviform at the tips, which are each clothed with six comparatively long, intensely aciculate setæ; the eyes are unusually large, black, and fixed on minute demi-semicircular lateral excrescences at the external bases, and are so amalgamated with them as scarcely to present a prominence. The foot is a curious organ, being large, fleshy, anteriorly grooved, so as to form a slight labium, deeply indented in the centre, and produced into large, long, arcuated, pointed auricles; posteally it becomes divided into two long, distinct tails or streamers, nearly coextensive with the shell in its axial admeasurement; close to the bifurcation is a small opercular lobe without a caudal cirrhus, on which is fixed a beautiful white horny suboval operculum of 4–5 spires; the two or three first are small and concentrated, the last suddenly enlarges and closes the aperture, and is marked with delicate oblique striæ of growth. The neck when greatly protruded is blotched at the sides and on the top with a claret-coloured red: these marks and the eyes also, when not exserted, are conspicuous through the tenuity of the shell.

This rare animal, of which I have taken seven live examples, dwells in a muddy-bottomed shelly district of the coralline zone in Exmouth Bay, eight miles from shore, in 15 fathoms water.

This species has occasioned a difference of opinion; some naturalists have thought it distinct, others have considered it the Montaguan *R. vitrea* in a perfect condition, and looked on his shell as a specimen denuded of its striæ by attrition; they say that many of the so-called *R. vitrea* of the cabinets, when placed under the microscope, exhibit traces of the striæ of the '*proxima*': in this fact they are probably correct, because these smooth examples may really be that species; but they are wrong in their conclusions that it is Montagu's shell, as will appear by the discovery of a perfect specimen and lively animal of a species, which, I think, whatever doubts may still exist, must now be considered the "smooth shell" of that author, long known as the *Turbo vitreus*, and which has not the slightest traces of spiral striæ. The present difficulty has arisen from Montagu's description either suiting a worn '*proxima*,' or the shell I propose to regard as the '*vitrea*.' If I had not made the present capture, I should, like others, have judged the two to be different conditions of the same species; but in the next article I think it will appear that even the shells of the '*proxima*' and '*vitrea*' exhibit a slight but constant variation, and that the animals are very distinct.

August 14.—I have just taken another lively example of this species, and I need only remark, that the peculiar gait above mentioned was less apparent than in the animal already described; I therefore am inclined to consider it of that nature which may be observed in the *Rissoæ*, when in creeping they arrive at the level of the water, and commence exserting and retracting with rapidity the buccal apparatus.

In the animal just discovered the curious tails of the foot were well developed, the angle of separation being about that of the fore and middle finger of the hand when placed as far apart as possible. In all the animals I have observed I never met with a similar termination of the main foot.

Rissoa vitrea, Montagu.

The animal occupies a pale yellow essentially smooth shell of 4½ tumid, though less rounded and more taper volutions, with shallower sutures than the *R. proxima*. The general colour of the animal is very pale dirty white. The mantle does not protrude beyond the aperture. The head or rostrum is subcylindrical, double the length of the '*proxima*,' invested with a tunic to near its extremity, grooved above, emarginate at the end, forming two minute, flat, symmetrical, arcuated, terminal lobes, vertically cloven beneath as in *R. parva*; the colour on both surfaces is a moderately suffused pink, through which the buccal apparatus is visible; and when the neck is much exserted it will appear coloured with pale pink hues. The tentacula are flat, much longer than in the '*proxima*,' but not clavate like it at the tips; they have however the same fine sharp setæ at the extremities; the eyes are at the centre of the bases of the tentacula, not raised, nor half the size of those of its congener. The foot is truncate in front, very slightly labiated, with unusually short obtuse auricles; not bifurcated posteriorly, but has an entire somewhat taper and rounded termination not extending beyond the second volution: the operculum is fixed on a simple lobe scarcely distinguishable from the upper part of the foot; it is rather more circular than in the last species, but, though paucispiral, the turns are less distinct, the oblique striæ of increment coarser, and the colour instead of being clear white is a dull yellow. All this is different in the '*proxima*.'

The examples now described are the only two that have occurred of this rare animal; it and the '*proxima*' were placed in the same glass, and being lively I had good opportunities for comparison; the animals are organically different, but I think the '*proxima*' is a greater departure from the rissoidean type than the '*vitrea*'; still it will probably remain with the *Rissoæ*, though some of the specialties are on the verge of generic deviation. In the remarks on these species I fear that conciseness is neglected, but the confusion in which they have long been enveloped must be the apology, as without the present close examination, the doubts of their identity or distinctness would still have remained, and the slight though constant difference of contour in the two would by many be considered accidental.

It may be useful to the shell collector, to the younger student, and as a memorandum of the remaining desiderata of this genus, to offer a few short remarks on all the British *Rissoæ* not enumerated above. The *Rissoa parva,* the type, has been described in the 5th volume of the 'Annals,' N. S. p. 359; I have there mentioned that the *R. rufilabris, R. costulata,* and *R. interrupta* are varieties of the type, to which I believe I may add the *R. labiosa.* The *R. inconspicua* has been spoken of by Mr. Alder in the 'British Mollusca;' I will therefore only say, that having examined the animals of numerous specimens of its varieties, I find no marked variation; they all have the lead-coloured stripes on the alæ and sides of the foot. I have also stated in the 'Annals,' N. S. vol. vi. p. 33, that I thought it a coralline zone variety of *R. parva*; I withdraw that opinion, as I am satisfied of its distinctness. The animal of the elaborately sculptured *R. striatula,* the most elegant of the *Rissoæ,* if it be one, still escapes observation. I have this summer taken some delicate specimens in the coralline district, and yet hope to see the inhabitant.

The *R. lactea* of Michaud I do not know, but from the figure in 'Brit. Moll.' I should have judged it a variety of the *R. reticulata,* one of the large, short, tumid shells, and would have said the same of the *R. abyssicola,* if it had not been considered distinct by Professor Forbes. The *R. crenulata* is the well-known *Turbo cimex,* as the *R. calathus* is the old '*calathiscus*' of authors: neither of the animals are recorded. The *R. Zetlandica* is a well-established northern species, but the inhabitant is unknown. The *R. rubra* is very common alive in certain localities; I have never seen the animal, and can scarcely believe it to be a true *Rissoa,* as the semitestaceous operculum and its apophysis are more like those of a *Chemnitzia.*

An account of the *R. cingilla* has appeared in the 'British Mollusca.' The *R. pulcherrima,* nonnull., is a dwarf, nearly ribless *R. inconspicua,* which is one of the most variable species in form, size and markings. In comparison, care must be taken not to examine what is called an adult *R. pulcherrima* with a young '*inconspicua*' of the same size, but of larger growth, as it may lead to false ideas of distinctness; adult shells, of whatever growth, and in like manner, young shells, must be compared together, as the aperture in the two conditions is very different, there being in the young ones always a subangularity, but in those with completed peristomes it is nearly orbicular. The

R. littorea, Delle Chiaje, is an apocryphal British species; and the so-called *R. eximia* is an undoubted *Chemnitzia* allied to *C. excavata*; I have described the shell, the animal being undiscovered, under the title of *C. Barleei*. The *R. ulvæ* and its varieties have appeared in the 'Annals,' N. S. vol. v. p. 358. I cannot speak of the *R. anatina* and *R. ventrosa*, not having met with them alive. The account of the animal of *R. fulgida* is published in the 'British Mollusca' from my notes; it differs much in the proportionate dimensions of its organs, but there is no sufficient generic variation to remove it from this genus. At Exmouth it is abundant on the algæ of the half-tide littoral levels. The *Turbo subumbilicatus* of Montagu is still in obscurity; it is perhaps a variety of one of the species of the estuaries, and if it could be identified, its position would probably be in this genus. I mention the *Jeffreysia diaphana* and *J. opalina*, because they have recently been styled *Rissoæ*; they appear from several characters to form the passage to the *Chemnitziæ*. I think I have now named every *Rissoa*.

I conclude this still imperfect monograph by calling on the naturalists of this branch of science to make it more complete, by searching in their respective localities after the animals which continue to elude our view; as without the inhabitants of shells, the essential part of this portion of nature is hidden from us. Conchology as a science is little better than the toy of the shell-fancier; we can only admit that these persistent forms, independent of the animal, are useful as objects of comparison with some of the antediluvian relics of our globe, as they prove that nature, at least a part of it, existed in the palæontozoic epochs as at the present time.

I am, Gentlemen, your most obedient servant,

William Clark.

XXIV.—*On keeping Marine Animals and Plants alive in unchanged Sea-water.* By P. H. Gosse, A.L.S.

To the Editors of the Annals of Natural History.

Gentlemen,

In a recent Number of 'Chambers' Edinburgh Journal' (July 1852) a paper has just been pointed out to me, on maintaining the balance between animal and vegetable life in an aquarium. Mr. Warington, whose experiments are there alluded to, has succeeded in keeping living plants and animals together in fresh water, and announces that he is "attempting a similar arrangement with a confined portion of sea-water, employing some of the green sea-weeds as the vegetable members of the circle, and the common winkle or whelk to represent the *Limneæ*," which in the former case he had found useful in consuming the slime produced by the decay of the vegetable matter.

Priority of publication is universally acknowledged to give a title to whatever honour attaches to a new discovery, and this I shall not dispute with Mr. Warington. I may be permitted to state, however, that I have for some considerable time been pursuing experiments on the same subject.

For several years past I have been paying attention to our native Rotifera, and in the course of this study had kept fresh water in glass vases unchanged from year to year, yet perfectly pure and sweet and fit for the support of animal life, by means of the aquatic plants, such as *Vallisneria, Myriophyllum, Nitella* and *Chara* (but particularly the former two), which were growing in it. Not only did the Infusoria and Rotifera breed and multiply in successive generations in these unchanged vessels, but *Entomostraca, Planariæ, Naïdes* and other Annelides, and *Hydræ,* continued their respective races; and the young of our river fishes were able to maintain life for some weeks in an apparently healthy state, though (perhaps from causes unconnected with the purity of the water) I was not able to preserve these long.

The possibility of similar results being obtained with sea-water had suggested itself to my own mind, as it has to that of Mr. Warington; and the subject of growing the marine Algæ had become a favourite musing, though my residence in London precluded any opportunity of carrying out my project. But in the course of last winter, ill-health drove me to the sea-side, and gave me the opportunity I had been long desiring. My notion was exactly that of Mr. Warington, that as plants in a healthy state are known to give out oxygen under the stimulus of light, and to assimilate carbon, and animals on the other hand consume oxygen and throw off carbonic acid, the balance between the two might be ascertained by experiment, and thus the great circular course of nature, the mutual dependence of organic life, be imitated on a small scale.

My ulterior object in this speculation was twofold. First, I thought that the presence of the more delicate sea-weeds (the Rhodosperms or red families especially, many of which are among the most elegant of plants in colour and form), growing in water of crystalline clearness in a large glass vase, would be a desirable ornament in the parlour or drawing-room; and that the attractions of such an object would be enhanced by the curious and often brilliant-hued animals, such as the rarer shelled Mollusca, the graceful Nudibranchs, and the numerous species of Sea-anemones, that are so seldom seen by any one but the professed naturalist.

But more prominent still was the anticipation that by this plan great facilities would be afforded for the study of marine animals under circumstances not widely diverse from those of nature. If the curious forms that stand on the threshold, so to speak, of animal life, can be kept in a healthy state, under our eye, in vessels where they can be watched from day to day without being disturbed, and that for a sufficiently prolonged period to allow of the development of the various conditions of their existence, it seemed to me that much insight into the functions and habits of these creatures, into their embryology, metamorphoses and other peculiarities, might be gained, which otherwise would either remain in obscurity or be revealed only by the wayward "fortune of the hour."

Nor were these expectations wholly unrealized. My experiments, though not yet entirely successful, and needing much more attention and time to complete them, have yet established the fact, that the balance can be maintained between the plant and the animal for a considerable period at least, without disturbance of the water; while my vivaria have afforded me the means of many interesting researches, the details of which I am preparing for the press.

The first thing to be done was to obtain the Algæ in a growing state. As they have no proper roots, but are in general very closely attached to the solid rock, from which they cannot be torn without injury by laceration, I have always used a hammer and chisel to cut away a small portion of the rock itself, having ready a jar of sea-water into which I dropped the fragment with its living burden, exposing it as little as possible to the air. The red sea-weeds I have found most successful: the *Fuci* and *Laminariæ,* besides being unwieldy and unattractive, discharge so copious a quantity of mucus as to thicken and vitiate the water. The *Ulvæ* and *Enteromorphæ* on the other hand are apt to lose their colour, take the appearance of wet silver-paper, or colourless membrane, and presently decay and slough from their attachments. The species that I have found most capable of being preserved in a living state are *Chondrus crispus,* the *Delesseriæ,* and *Iridea edulis.* The last-named is the very best of all, and next to it is *Delesseria sanguinea,* for maintaining the purity of the water, while the colours and forms of these render them very beautiful objects in a vase of clear water, particularly when the light (as from a window) is transmitted through their expanded fronds. Many of my friends, both scientific and unscientific, who have seen my vases of growing Algæ at various times during the present year, both at Torquay and at this place, have expressed strong admiration of the beautiful and novel exhibition.

I have not as yet been able to preserve the water to an indefinite period. Sometimes the experiment has quite failed, the plants decaying and the animals dying almost immediately; but more commonly, the whole have been preserved in health for several weeks. The following notes from my journal give the particulars of the most successful of my efforts.

On the 3rd of May I put into a deep cylindrical glass jar (a confectioner's show-glass) 10 inches deep by $5\frac{1}{2}$ inches wide, about three pints of sea-water, and some marine plants and animals.

On the 28th of June following, I examined the contents of the jar as carefully as was practicable without emptying it, or needlessly disturbing them. It had remained uncovered on the tables in my study, or sometimes in the window, ever since, a little water only having once been added merely to supply the loss by evaporation. The water was perfectly clear and pure. A slight floccose yellow deposition had accumulated on the sides of the jar, but there was very little sediment on the bottom. I had taken no note of the plants or animals when I had put them in; but as none of them had died, and none had been either abstracted or added, the following enumeration gives the original as well as then present contents.

There were at this time in the jar the following Algæ all in a growing state, and attached to the original fragments of rock :—

Two tufts of *Delesseria sanguinea,* each with numerous leaves.
Two of *Rhodymenia jubata,* one small, the other a large tuft.
A small *Ptilota plumosa,* growing with one of the last-named.
A *Chondrus crispus,* with
An *Ulva latissima,* growing parasitically on one of its fronds.

These seven plants had supplied for eight weeks the requisite oxygen for the following animals, which were at this time all alive and healthy :—

Anthea cereus.
Actinia bellis, a large specimen.
—— *bellis,* a half-grown one.
—— *anguicoma,* large.
—— *anguicoma,* small.
—— *nivea* (MS.).
—— *rosea* (MS.).
—— *rosea,* a small specimen.
—— *mesembryanthemum,* young.
—— *mesembryanthemum,* young, another variety.

Crisia denticulata, a large tuft.
Coryne —— ?, young.
Pedicellina Belgica, two numerous colonies.
Membranipora pilosa.
Doris (*bilineata* ?).
Polycera 4-lineata, very small.
Phyllodoce lamelligera, about 11 inches long.
A coil of small *Annelides.*
Several *Serpulæ.*
Acaridæ.
Entomostraca.
Infusoria.
Grantia nivea. And other smaller zoophytes and sponges which I could not identify.

Soon after this examination I went on a journey, and did not return till the 7th of July. The weather had set in very hot: whether this, combined with the closeness of the room, had had any effect I do not know; but on my return I found the water beginning to be offensive, a sort of scum forming on the surface, and the animals evidently dying. Some were already dead, but most of the others recovered on being removed to fresh sea-water. This result, though it put an end to my experiment at that time, I do not regard as conclusive against the hypothesis; for of course animals are liable to death under any circumstances, and the corrupting body of one of these in so limited a volume of water would soon prove fatal to others, even though there might be no lack of oxygen for respiration. It is possible that one of the large *Actiniæ* may have casually died during my absence, the timely removal of which might have averted the consequences to the others; but this is only conjecture. Perhaps there was too large an amount of animal life in proportion to the vegetable; but the maintenance of all these in health and activity for nearly nine weeks seems hardly to agree with such a supposition.

I have always found one of the most unpleasant phænomena in the experiments to be the appearance, in the course of a few weeks, of greenish or yellowish matter about the sides of the jar, hindering their transparency. This I have reason to think is the early state of Confervoid plants, for filaments of green Confervæ soon begin to shoot from this accumulation, and would probably choke up the water in time. Mr. Warington's suggestion of employing the phytophagous Mollusca to get rid of the accumulating vegetable matter, had not occurred to me; it is ingenious, and might perhaps obviate this inconvenience. I had myself observed that the presence of some of the *Trochi* seemed to be helpful in keeping the water pure, but I did not know how to account for it.

Should these experiments be perfected, what would hinder our keeping collections of marine animals for observation and study, even in London and other inland cities? Such a degree of success as I have attained would admit of so desirable a consummation, for even in London no great difficulty would be experienced in having a jar of sea-water brought up once in a couple of months. I hope to see the lovely marine Algæ too, that hitherto have been almost unknown except pressed between the leaves of a book, growing in their native health and beauty, and waving their delicate translucent fronds, on the tables of our drawing-rooms and on the shelves of our conservatories.

I remain, Gentlemen, your obedient servant,

P. H. Gosse.

Ilfracombe, Sept. 10, 1852.

XXV.—*Notes on the genus* Cyclostoma; *and Characters of some new species from India, Borneo, and Natal.* By W. H. Benson, Esq.

1. *Cyclostoma Nilagiricum,* nobis, n. s.

Testa umbilicata, depresso-turbinata, solida, liris spiralibus 8–9 majoribus, quibusdam parvis obsoletis inæquidistantibus interjectis munita, castanea, ad periphæriam albido-articulata, infra fascia latissima saturatiore, superne strigis radiatis angustis undatis albidis frequentioribus, subtus rarioribus ornata; spira ad apicem exsertiuscula, obtusata; anfractibus 5, convexiusculis, ultimo ad periphæriam subfuniculato-carinato, superne angulato, circa suturam late planato, subtus circa periomphalum excavatum lævigatum compresso, umbilico mediocri profundo, subcylindrico; apertura obliqua, pyriformi-rotundata, aurantiaca, fauce cærulescente, peristomate expanso, incrassato, reflexiusculo, aurantiaco, breviter adnato, prope umbilicum leviter sinuato, superne angulato, producto, intus sulco intrante impresso.

Diam. major 43–45, minor 34–36, axis 22–24 mill.

Hab. ad latus occidentale Montium "Nilgherries" teste Jerdon.

This shell was at first supposed to be *C. Indicum* of Deshayes, but proved to be widely different. It is allied to *C. Jerdoni,* nobis, and to *C. Ceylanicum,* Pfeiffer. *Cyclostoma Indicum* is placed by the last-mentioned author between *C. validum* and *C. linguiferum,* being provided with a linguiform process to the lip, near the umbilicus, of which feature, however, no notice is taken by Deshayes either in his specific character or in his extended description. The remark in vol. viii. of the 'Annals,'

p. 193, that *C. Indicum* extended its range to the Nilgherries, requires to be expunged, having reference to the present species, while *C. Indicum* is not at present known to extend beyond the vicinity of Bombay.

The young of *C. Nilagiricum* preserves its distinctness from *C. Jerdoni* in the same condition by its sculpture, colour, the depression of the spire, the broad flattening observable above the shoulder of the whorl, the angulation of the shoulder, the excavation of the periomphalum, its compressed angulated edge, and by the blue colour of the interior, which is bordered with chestnut in the young, but gradually gives place to the orange of the peristome in the adult example of *C. Nilagiricum,* while the whole of the interior is white in both states of *C. Jerdoni.* The spiral striæ are not very conspicuous on the underside of *C. Nilagiricum,* and are entirely discontinued at a short distance from the periphery, the region of the umbilicus being smooth. In most of the allied species the umbilicus and its neighbourhood are pale, but in this species the dark chestnut ground colour of the shell extends over the whole exterior surface where not broken by flecks or streaks of whitish. Dr. T. Jerdon procured it from the forest on the western edge of the Nilgherries, while *C. Jerdoni* was found by him to inhabit the north-east face of the same mountain group.

2. *Cyclostoma Malayanum,* nobis, n. s.

Testa depresso-turbinata, lævigata, spiraliter exilissime obsolete striata, supra castanea, albido undulatim strigata, interdum plurifasciata, subtus albida, castaneo anguste fasciata, infra periphæriam fascia latiuscula saturata, albido sparse articulata, ornata; spira exsertiuscula, apice acutiuscula; anfractibus quinque subconvexis, ultimo rotundato, subtus convexo; apertura vix obliqua, magna, circulari, albida; peristomate duplicato, leviter adnato, externo plane expanso, superne arcuato, labio angusto; umbilico mediocri, pervio, subpérspectivo.

Diam. major 43, minor 32, axis 29 mill.

Hab. in montibus vallibusque Insularum Penang et Lancavi, necnon in Peninsula Malayana. Teste Dr. T. Cantor.

This shell, collected by Dr. Cantor, is one of the group which contains *C. Pearsoni, Siamense, Tuba,* &c. The peculiarly flattened double peristome will at once serve to distinguish it from any of the allied species. The colouring also is of a particularly sober character.

3. *Cyclostoma Anostoma,* nobis, n. s.

Testa perforata, turrita, tenui, exiliter striata, pallide castanea, apice acutiuscula albida; anfractibus septem convexis, ultimo antice breviter ascendente, basi rotundato; apertura ampla, vix obliqua, leviter sursum spectante, subcirculari, fauce castanea, margine rufo; peristomate duplicato, tenui, interno continuo, subito expanso, externo plane dilatato, præcipue ad partem columellarem, vix reflexiusculo.

Axis 23, diam. anfr. penult. 10, diam. apert. extern. 9, alt. apert. 7½ mill.

Hab. in Insula Borneo.

In form much resembling *C. altum* of the Philippines, but shorter and more rapidly tapering from the base to the summit, differing also in tenuity, in the pale apex, the absence of a funiculate keel at the base, the more convex whorls, and the more coarsely striate ultimate volution. The penultimate whorl is not broader than the last, as it is in *C. altum*; at the same place where the channel occurs on the inner lip in that shell there appears a very slight indentation. The summit and succeeding whorl are white, as in *C. Guildingianum*, Pfeiffer. Two slightly impressed lines traverse the last whorl spirally in the only specimen received through Dr. Bacon. They appear to be accidental, and have therefore been omitted in the specific description.

4. *Cyclostoma quadrifilosum*, nobis, n. s.

Testa umbilicata, globoso-turbinata, sub epidermide hispida, et crebro oblique lamellata, nitida, spiraliter 4-lirata, interstitiis striis minutissimis spiralibus, alias obliquas decussantibus, munitis, castanea, superne strigis pallidis distantibus ornata; sutura impressa; spira conica acutiuscula; anfractibus 5 convexis, ultimo liris 4 filiformibus instructo, prima supera, secunda ad periphæriam, tertia inferiori, quarta basali; umbilico angusto pervio; apertura vix obliqua, subcirculari, fauce castanea; peristomate duplicato, interiori ad dextram recto, vix porrecto, ad sinistram expanso, sinuato, intus leviter incrassato, albido, exteriori expansiusculo, nigrescente, antice superne prorsum arcuato.

Diam. major 6, minor 5, axis 5 mill.

Hab. in Insula Borneo.

The fourth filiform carina, which is present in both specimens received (the other three being situated as in *C.* 3-*liratum*, Pfr.), the lamelliform epidermis, the spiral striæ, the duplication of the peristome, and the other characters of the aperture, seem to justify the distinction of this species from *C.* 3-*liratum*, which inhabits the same island, but which I only know from Pfeiffer's description. *C.* 4-*filosum* is a little smaller than that species. The outer lip is separated from the internal peristome by a slight sulcus. The two upper threads are continued on the penultimate whorl, as in 3-*liratum*.

5. *Cyclostoma Wahlbergi*, nobis, n. s.

Testa mediocriter umbilicata, depresso-turbinata, scabre et acute radiato-striata, luteo-glauca, epidermide fusca; spira vix elevata, acutiuscula; anfractibus 4 convexis, ultimo rotundato; apertura ampla, alta, rotundata, peristomate acuto; umbilico aperto, profundo.

Diam. major 14, minor 11, axis 7 mill.

This is probably the species which Wahlberg got at Natal, and which, by some misconception, was attributed to the fauna of South Africa, by Krauss, as *C. translucidum*, a South American shell possessed of a calcareous operculum; whereas that of the present species is thin and horny. The example described was collected at Natal, with *Bulimus Kraussi*, and transmitted to Mr. S. Stevens with other specimens of a smaller size.

Cyclostoma Phænotopicum, Benson, Annals, vol. viii. p. 190.

The following characters require to be added to the previous description of the shell, of which I have received an adult specimen from Darjiling:—

Peristomate verticali, integro, expansiusculo, subreflexo, superne duplicato, lamella exteriori ibidem subangulata.

Diam. major 13, minor 10, axis $5\frac{1}{2}$ mill.

Besides the figure of *C. spiraculum*, Sowerby, No. 272 of the 'Thesaurus,' which is *Pterocyclos hispidus* (*Spiraculum hispidum* of Pearson), Sowerby added No. 273, a figure of a small shell, also from India, which he referred to the same species. It was, however, destitute of the spiracle and with a different aperture, and was so clearly distinct that it has been referred by several authors to other species. In the 'Conchylien Cabinet' Pfeiffer assigned it, at first, with a mark of doubt, as well as *C. Papua*, Quoy, to *C. helicinum*, Chemnitz; although he afterwards saw reason to distinguish *C. helicinum* from *C. Papua*, which he now refers, together with *C. Distomella*, Sowerby (a very different shell?), to *C. Hebraicum*, Lesson. Gray also attributes fig. 273 of the 'Thesaurus,' with a mark of doubt, to *C. Papua*. A glance at the figure, Conch. Cab. pl. 28. f. 14–15, would at once dispose of this reference; while I have no hesitation in referring the stray form in the 'Thesaurus' to an uncoated specimen of *C. Phænotopicum*, with which its size, form, zigzag markings, and conformation of the mouth exactly agree.

Cyclostoma constrictum, Benson, Annals, vol. viii. p. 188.

Another specimen of this shell from Darjiling confirms an additional character for this species, tending still further to show its relation to the more Westerly Himalayan species, *C. strangulatum*, which was alluded to in my former remarks. The following character should be added:—"Callo suturali retroverso, pone constrictionem posito (ut in *C. strangulato*)."

Cyclostoma funiculatum, Benson, Journ. Asiat. Soc. 1838.

Specimens received of the young of *C. funiculatum*, in different stages of growth, show very different forms, which might cause the shell to be assigned to other species, or even to a different genus, if unaccompanied by the thin horny operculum. In the young state, with $5\frac{1}{2}$ whorls, the shell is pale horn colour, with a slight rufous tint, the periphery of the last whorl is angular, the base slightly convex, nearly planate, the mouth oblong-quadrate, the right and left lip nearly parallel, and forming a right angle, somewhat rounded, with the horizontal base. In this state, moreover, the shell is perforate. In the next stage, with six whorls, the shell has become thicker and more opake, the epidermis reddish olive, the periphery of the last whorl more acutely angular, the base concave, while the umbilicus is filled up, the mouth is elliptical, and the square base of the aperture has given place to an angular inferior termination. In the adult the aperture is rounded, the peristome reflected and thickened with an orange enamel, and the periphery of the last whorl is rounded, and has a funiculate border round the impervious rimation. The adult *C. funiculatum* is figured in plate 31 B. of the 'Thesaurus,' f. 316–7.

Cyclostoma Aurora, Benson, Annals, vol. viii. p. 186.

The shell described was an uncoated and worn specimen. The following addition will represent the species when perfect:—"Carinarum interstitiis striis elevatiusculis spiralibus obductis, rubente, supra strigis castaneis fulguratis, subtus fasciis pluribus, mediana latiori, variegata; epidermide tenui fugace obtecta. Operculo ut in *C. Involvulo*."

The specimens which have enabled me to make the above corrections were collected for me, at Darjiling, by Mr. Robert Trotter, of the Bengal Civil Service, together with some new forms of *Helix*, and a new *Clausilia*, the third species which has been found in Northern India, where the genus is confined to the mountain ranges, and appears to have been debarred, by the intervention of the Gangetic plain, from penetrating to the mountains of Central or Southern India, whereas in ultra Gangetic India the continuous mountain ranges have enabled species to descend to a low latitude in the Malayan Peninsula.

XXVI.—*Observations on the Natural History of the Water-Snail and Fish kept in a confined and limited portion of Water.* By ROBERT WARINGTON, Esq.

To the Editors of the Annals of Natural History.

GENTLEMEN,

The accompanying observations were thrown together with the intention of laying them before the Members of the Natural History Section of the British Association at their late Meeting in Belfast, but from sudden and unexpected business engagements I was prevented from attending, and thus, most unwillingly, obliged to forego the pleasure I had anticipated of discussing the details of the subject with so many of our leading practical naturalists as are generally assembled on such occasions. My time also was so much occupied as to prevent my copying them, in a readable form, before the Sections closed: should you, however, consider them worthy of a place in your valuable Journal, their insertion will much oblige.

Yours very truly,

ROBERT WARINGTON.

Apothecaries' Hall, Sept. 10, 1852.

MY object in bringing the accompanying observations before the public is to endeavour to direct, more in detail than I have hitherto been able to do, the attention of naturalists, and those who take a delight and pleasure in the study of Nature's wonderful and glorious works, to a very simple means of easily investigating the habits and œconomy of all those numerous classes of animal and vegetable life that are capable of being brought within the limited precincts of the small water-cases I have elsewhere described*. And when I state that these observations have been made by one most ignorant on the subject of natural history, and a perfect tyro in this field of research, as the details of this communication will fully demonstrate; when I mention also that they have been made at leisure intervals of very short duration, snatched as an amusement and as opportunities occurred from the weightier matters of professional business;—I hope that it may encourage others to follow in the same most interesting course of investigation, when, aided by a little perseverance, they may ensure for themselves an abundant reward. The matured naturalist I am sure will agree with me in the argument, that if such observations can be made by those unacquainted with the subject, and without trouble or inconve-

* Quarterly Journal of the Chemical Society, vol. iii. p. 52; and Garden Companion for January 1852.

nience, it does offer a means of research which should develope some most interesting and important results, and that the same principle is capable of being extended to a much larger scale; a demonstration of which I believe will be very speedily exhibited. As regards the growth of the plants employed in these miniature ponds, I have already briefly treated in the 'Garden Companion' for January last, and shall therefore confine myself in the present communication to the two other members of the circle; and first—

The Water-Snail. This important element in all the cases where the removal of the decaying vegetable matter, or the growth of Confervæ, is necessary, to enable the generality of fish to live healthily, as must arise in most stagnant waters and ponds, offers to our consideration some very interesting phænomena. In commencing my experiments in the early part of 1849, I had employed the *Limnea stagnalis* for this purpose, but was soon obliged to substitute some less voracious inhabitant for my small domain, for I found that as it grew in size its appetite increased to an enormous extent, and the plants were punished most severely, the leaves of the *Vallisneria spiralis* being bitten quite through; and if the snails were in too large a number, the whole of the vegetation was rapidly removed; other varieties of the *Limnea* were consequently introduced at an early period, namely *L. auricularia* and *L. glutinosa,* as also *Physa fontinalis, Bithinia tentaculata, Planorbis corneus* and *P. carinata.* These last two varieties have been found highly serviceable, as from the cornuated formation of their shell and small mouth, the fish cannot so readily get them out to feed upon. With the *L. auricularia* and *L. glutinosa* this is easily effected in consequence of the large aperture of their shell; and if the fish fails in his endeavours by a sudden attack to shake the snail out, he will attempt to suck it from its retreat, as is the case with the gold-fish; with the minnow (*Leuciscus Phoxinus*), however, it is different, as the smallness of its size renders this manœuvre impossible, unless the snail be very minute; it has recourse therefore to another and quite as efficient a means of obtaining its object, and I have seen these beautiful little fellows seize on their prey and shake it, as a terrier dog would a rat, between a piece of the rock-work and the glass, until they have broken its thin and delicate shell to pieces, and having effected this to their satisfaction, quietly consume their victim.

It will be seen from these facts, that the snails will require to be renewed at intervals, particularly as I have previously shown that the increase of the snail by its eggs, which are deposited in very large quantities, is entirely prevented from the fish consuming them the instant they exhibit signs of locomotion.

These water-snails have the extraordinary power of moving along the surface of the water with great rapidity with their shells downward, the foot being attached as it were to the atmospheric air. The *Planorbis* also can fix itself, without any apparent means of attachment, by its side to the flat surface of the glass, and will remain thus for several days.

In watching the movements of the *Limneæ*, I was for some time under the impression that they had a power of swimming or sustaining themselves in the water, as they would rise from the bottom of the pond, a portion of the rock-work, or a leaf of the plants, and float for a considerable period, nearly out of their shells, without any apparent attachment, and by the contortions and gyrations of their body and shell, move some little distance, in a horizontal direction, from the point which they had left. On more carefully watching this phænomenon, however, I found they were attached by a thread or web, which was so transparent as to be altogether invisible, and which they could elongate in a similar way to the spider; they also possessed the power of returning upon this thread by gathering it up as it were, and thus drawing themselves back to the point which they had quitted. These facts were clearly proved in the following manner:—A *Limnea stagnalis* had glided its way along a young and short leaf of the *Vallisneria* which terminated below the surface of the water, and having reached the extremity launched itself off from it; after moving about with a sort of swimming or rolling motion in a horizontal direction for some time it lowered itself gradually, and in effecting this the long flexible leaf of the *Vallisneria* was bent with an undulating motion, corresponding exactly with every movement of the snail, clearly showing that it had a firm attachment to the extremity of the leaf. On another occasion a *L. glutinosa* gradually rose from the surface of a piece of submersed rock, and when at the distance of about 3 or 4 inches from it stayed its progress, floating about in a circumscribed horizontal direction for some time; at last it rose suddenly and rapidly to the surface, evidently from the rupture of its thread of attachment. The most convincing proof, however, of this fact that I can perhaps adduce, and one that I have often repeated with all the before-mentioned *Limneæ*, is that when the snail has been some inches distant from the supposed point of attachment, a rod or stick has been carefully introduced, and slowly drawn on one side between them in a horizontal direction, and by this means the snail can be made to undulate to and fro, obeying exactly the movement of the rod: this requires to be done very gently, as, if too much force is used, the web is broken, and the snail rises rapidly to the surface.

The next subject of interest which I wish to call attention to is—

The Stickleback, *Gasterosteus leiurus*. This most beautiful little creature has afforded a subject for much interesting observation for some time past, and I fear that what I have to offer will prove very much a repetition of what has already been published on the subject. As however the proceedings and observations of those who dare not rank themselves in the class of naturalists, sometimes from their want of knowledge cause circumstances to arise which would not otherwise occur, so in the present case my failures through my own ignorance may develope some new points in the œconomy of these small fry. Mr. Edwards of Shoreditch, whose London garden pond has afforded much interesting matter to many microscopists, informs me, in a note dated August 27, 1852, that it is about fourteen years since he first noticed the fact of the stickleback building a nest, guarding the spawn and defending the young ones: no publication, however, of these observations seems to have taken place. Since this period, the facts have been published by M. Coste in France in 1847, and quite lately by Mr. Kinahan*, in a paper laid before the Dublin Natural History Society.

My observations in the miniature ponds commenced in May 1851, when, having received from a friend at Mitcham several of these little fish, male and female, the latter being full of spawn, they were introduced to their new abode. A curious scene followed: the male fish immediately took up certain positions, the strongest apparently having the first choice, which they maintained against all intruders, and a species of border warfare was continually maintained across the proscribed boundaries of each, and although at times driven out by a fierce attack from a stronger fish, yet, immediately the battle had ceased, they returned to their previous position, which they defended most vigorously. These battles were at times most desperate, for these puny combatants would fasten tight on each other for several seconds, tumbling over and over, until their strength appeared completely exhausted. If there were more fish present than there were positions for, they fared most grievously, being driven altogether into one corner of the pond, and from which they ventured forth only to be driven back again on all sides, where they were continually exposed to the attacks of their companions.

The day after they had been placed in their new domain, the strongest of the male fish was observed most busily employed gathering small ligneous fibres from different parts of the pond,

* Zoologist for July 1852.

and carrying them in its mouth to one particular spot, where he appeared to force them into the sand and gravel with his nose. Being perfectly unacquainted at the time with the fact of this little creature building a nest, I watched him more attentively. He had selected a spot behind a piece of rock-work, almost hidden from view at the front of the case and towards the room; but on looking down from the top of the water I could perceive that he had already constructed a small hole as round as a ring and with a good broad margin to it, formed of the materials he had been so industriously collecting, and on which he appeared to have placed numerous particles of sand and small pebbles. This spot he guarded with the utmost jealousy, continually starting forth from his position and attacking the other fish with most extraordinary fury. The desperate ferocity with which this fish attacked the others, and the continued turmoil the whole pond was kept in, determined me to do a most absurd act, which I instantly afterwards regretted, and my want of knowledge of the subject at the time had prevented my foreseeing, namely to remove this fish from the pond. I therefore caught it in a small muslin net, and without the slightest trouble, as he attacked the net the instant it was introduced. But what was the consequence? No sooner was he removed from the water than the other fish darted to the spot he had been protecting, pulled forth a mass of eggs which had been deposited there, and which I had not previously seen, tore it to pieces among them, and devoured it before I had time even to shake my prisoner out of his confinement; however, it taught me a fact in natural history, and it may perhaps be novel to others. So ended my experience of 1851.

Now I think it will be evident from what I have stated that these eggs must have been deposited by the female fish, and the nest made around them afterwards; and this I think was also the case with the fish experimented on this year by my friend Mr. Gratton, who had a fine brood of young sticklebacks hatched after fourteen or fifteen days, the nest being formed immediately after the introduction of the fish.

The appearance of the male fish during this spawning period is beautiful beyond description. The eye is of the most splendid green colour, having a perfectly metallic lustre like the green feathers of some species of humming-bird. The throat and belly are of a bright crimson, the back of an ashy green, and the whole fish appears as though it were somewhat translucent and glowed with an internal incandescence: his ferocity during this period is extraordinary. How so small a creature can bear up so long under such a state of apparent excitement appears marvellous. Later in the year the colours slightly change, the back becomes more of a green tint, the throat and belly of a paler red, and all the glowing appearance subsides. The female fish is of a brown colour on the back, the eye also brown and the belly white.

I now pass on to the present year, when I had the pleasure of seeing the nest built from the very commencement and through all its stages. The place selected for the nest was the bare flat top of a piece of oolite where it formed a right angle by resting against the glass partition which separated two of these ponds, in one of which were kept four minnows and two small eels, and in the second the sticklebacks which form the subject of this observation. In this the male fish commenced gradually to deposit and accumulate his materials. I will endeavour to give in detail the exact description of his proceedings while I had the opportunity of watching him, avoiding as much as possible the repetition of his operations; for as each loose fibre or small piece of material was brought singly to the chosen spot, the same routine would be gone through over and over again:—Now he arrives with a large fibre in his mouth, deposits it, rearranges the whole of the materials, already accumulated, with his mouth, removing one fibre to this place and another to that, and departs on his search for more. Now he returns carrying a small piece of gravel, which is carefully placed on part of the fibres as it were to keep them down; he then draws himself slowly over the whole and is off again. Now he brings another fibre, which he dibs in with his snout so as to make it interlace with the others; then he attempts to interlace in the same way the fibrous rootlet of a Lemna which is growing above his head, but which the instant he thinks he has fastened and loosens his hold of, rises again by its expanded lobe to the surface; this fibre appears to be well fitted for his purpose, for he repeats his attempts to fix it among his gleanings over and over again. Now he is busy making a circular hole in the middle of the accumulated materials with his snout; a piece of the fibre is next taken out from the mass, projected from his mouth, watched as it falls very slowly through the water; then, as it proves too light for his purpose, it is again seized, carried to some distance, and projected away, and he is off to rearrange the remainder, carefully tucking in the ends with his snout; he then draws himself slowly across the whole and is off again. Now he catches a sight of the female fish, pursues her with great rapidity, seizes her by the tail and by the lateral spine, but she escapes his grasp and conceals herself behind the rock-work. Again he conveys more material to the nest, and the next journey is again laden with another small piece of gravel; the whole is then slightly shaken, then compressed, and he is off again; thus he conveys without cessation decayed rootlets, gravel, sand, and whatever material he can find that will answer his purpose. But I must observe that their specific gravity is continually tested: thus, having found what appears a suitable fibre, it is carried a little way, then projected to a short distance from his mouth and watched as it falls; if it falls rapidly, it is again seized and carried direct to the nest; if more slowly, it is tried again in the same manner; and if it then proves too light, it is abandoned altogether and another selected. If a piece is found better fitted for his structure than what he has already obtained, it is rapidly conveyed to the spot; much alteration in the arrangement of the materials takes place, so as apparently to dispose of the new prize to the best advantage, and it is only after continued and indefatigable perseverance that he succeeds in rearranging them to his wishes. If there should be any strong fibre which he has a difficulty in causing to remain in the position he requires, a small quantity of sand is brought in his mouth and adroitly placed on the top of it to keep it down; if this does not effect the purpose desired so as to please him, the refractory piece is taken out and rejected altogether. At times he hangs or hovers close over the surface of the nest and throws his whole body into a curious and rapid vibratory motion, by which he causes a rapid current of water to be projected on the materials as though it were to prove their stability; and when this operation is performed, the lighter particles and light mud are as it were fanned or winnowed out by the generated current, and may be seen floating away: this operation will also explain the reason for testing the gravity of the materials before they are used. Another very curious operation is the action of drawing his body slowly over the surface of the materials which form the nest. I believe that at this time he excretes a glutinous matter which acts as a species of cement, and tends to keep the materials together, at the same time that the pressure of his body may render them more compact. Or it may be that the whole surface of the nest is by this action charged with the milt, and thus the impregnation of the eggs more perfectly ensured, as precisely the same motion is employed after the eggs are deposited, and from the appearance of the fish it seems to be attended with pleasurable sensations. These two last-described operations are very frequently repeated.

If during this time any other male fish makes his appearance, he is chased with the utmost ferocity and driven to conceal himself in any cranny which he can find; should, however, another fish be also building, desperate battles ensue whenever they approach each other's position, or chance to meet while collecting their materials.

The whole time occupied in accumulating these materials for the nest was about four hours, during which interval a goodly quantity had been obtained; and a small opening appeared to be carefully constructed near each end of the mass, the use of which will be now explained. All having been apparently arranged for the female fish to spawn, and the operations of fanning out the light particles, the improving their order, the dibbing in the ends, the loading them with additional sand, and the consolidation of them as described fully effected, and the whole reviewed carefully for several days in succession, as it were awaiting the coming of the female, on her appearance the following curious scene ensued. The female fish came out of her hiding-place, her attention being fixed apparently on the nest, when immediately the male became as it were mad with delight; he darted round her in every direction, then to his accumulated materials, slightly adjusted them, fanned them, and then back again in an instant; this was repeated several times; as she did not advance to the nest, he endeavoured to push her in that direction with his snout; this not succeeding, he took her by the tail and by the side spine and tried to pull her to the spot, then back to the nest, and having examined the two small openings alluded to, he thrust his nose in at the lower and gradually drew himself under the whole of the materials, making his exit at the opposite one, as though to prove to her that everything was prepared for her spawning. These manœuvres, however, failed in their purpose; she examined the nest several times; but the appearance of the minnows, &c. moving about on the other side of the glass partition against which the nest had been formed, I believe deterred her from depositing her eggs there, and she afterwards spawned elsewhere. The nest which had cost so much trouble was ultimately abandoned and neglected, and was gradually dispersed by the snails.

There are several other interesting particulars regarding the habits of the several fish, &c., which I have had the opportunity of experimenting with, and which may form the subject of some future memoranda. I would merely remark in conclusion, that I have after many difficulties and failures succeeded in keeping sea-water perfectly clear for upwards of six months, and that I have for the last five weeks had several sea-anemones living in it which at present appear extremely healthy, and the water has not been disturbed for the last fourteen days. My great difficulty in the midst of London has been to obtain materials to work with.

XXVII.—*Description of a new species of Wart Pig from the Camaroons.* By J. E. Gray, Ph.D., V.P.Z.S.

The Zoological Society has recently received, from the Camaroon River in West Africa, a new, and, for the family, a very beautiful species of Pig, which appears to be undescribed. It belongs to the genus *Choiropotamus*, which is characterized by the males being furnished with a large bony protuberance on each side of the face, about middle distance between the end of the nose and the eyes; both sexes have elongated, rapidly attenuated ears, ending in a pencil of long hairs; the tail is thick, long and placed high up the back.

The position of the tail and the lengthened form of the ears at once distinguish these animals from the true Pigs (*Sus*), which always have a slender tail, and small, hairy, rounded ears.

The *Choiropotami* are confined to Africa, while the species of *Sus* have only hitherto been found in the European and Asiatic quarters of the world.

The Camaroon Wart Pig, *Choiropotamus pictus*. Uniform red brown; the face, forehead, ears, and some large blotches on the legs black; the edge of the ears, whiskers, streak over and under the eyes, and a continued, rather crested streak along the middle of the back, pure white.

Hab. The Camaroon River, West Africa. A male.

This is immediately known from the *Choiropotamus larvatus* of South Africa by the brightness of the colour, the latter being black, whitish washed, white on the side of the face, with a large black spot under the eyes. *Sus Koiropotamus* of Desmoulin without the protuberances on the face is the female of this species; the African Hog of Daniel's 'African Scenery,' t. ii., being the adult male.

XXVIII.—*Description of* Sauresia, *a new genus of* Scincidæ *from St. Domingo*. By J. E. Gray, Ph.D., F.R.S., V.P.Z.S.

This genus is described from a specimen brought from St. Domingo by M. Salle intermixed with other reptiles. Though imported by a French collector and bought from Paris, I do not find any description of it in the second part of the Catalogue of Lizards lately published by M. Dumeril and his nephew M. Auguste Dumeril, which contains the species of this family.

It belongs to the well-marked tribe of *Diploglossinæ*, characterized by the hard, minutely striated scales; but it differs from all the genera of that tribe at present known, in having very weak feet with only four rudimentary toes, being in fact the representative of the genus *Seps* in the other tribes, and forming a good passage between *Diploglossus* and *Ophiodes*.

Sauresia. Body and tail cylindrical elongate; limbs four, short, weak, far apart; toes 4·4, anterior toes very short, two middle longest, subequal, interior shorter; hinder very unequal, interior very short, indistinct, second longer, third longest, fourth moderate, far back. Scales rather thick, broad, 6-sided, longitudinally striated. Rostral plates rounded, erect; supra-nasal plates two pair; frontal plates two, anterior broad, 6-sided, posterior elongate, 6-sided; supercilial shields 3·3. Ears open, rounded; nostril lateral; loreal shield 3·3; lower eyelid opake, with a series of erect band-like scales.

Sauresia sepsoides. Gray brown (in spirits), with a broad dark brown streak, edged above by a narrow pale line on the upper part of each side of the body and tail.

Hab. St. Domingo.

XXIX.—*Some Account of a Dredging Expedition on the coast of the Isle of Man during the months of May, June, July and August* 1852. By T. C. Eyton, Esq., F.L.S., F.Z.S.

Having been staying at Douglas, Isle of Man, for a period of nearly four months during the past summer, and having a small yacht, I have been out dredging, chiefly from off Douglas Head to Maughold Head, weather permitting, pretty constantly during that period; it may not therefore be uninteresting to the readers of this Magazine to know what the products have been, more especially to those who may follow me over the same ground. Professor Forbes has investigated the fauna of the sea off the island, but his labours have been confined chiefly to the S.W. coast, while mine, on the contrary, have been on the N.E. side of the island. The beds I have been working upon extend nearly continuously from about a mile and a half off Douglas Head to Maughold Head; the depth varies from 16 to 27 fathoms. The greatest portion of the bottom is covered with Nullipore; on some portions scarcely a live shell is found; other parts, especially off Douglas Head, Laxey Point and Maughold Head, abound in scallops and oysters; the former are chiefly dredged by the fishermen to set the deep sea line with, and furnish an excellent bait for many kinds of fish, especially haddock. The fishermen generally bait their lines with the scallops obtained the first haul, while the dredge is down for another, throwing the shells overboard, which will account to a certain extent for the large number of dead shells on the beds. The following is a list of the fish I observed while on the island:—

The Haddock, *Morrhua Æglefinus*, Cuv. Taken with the long lines: is in best season in the winter and spring.

The Cod, *Morrhua vulgaris,* Cuv. Taken in the same manner as the last.

The Bib, *Morrhua lusca,* Flem. Taken with hand lines in Douglas Bay.

Whiting, *Merlangus vulgaris,* Cuv. Douglas Bay.

Whiting Pollack, *Merlangus Pollachius,* Cuv. Taken with hand lines in Douglas Bay and other places round the island; it is called by the fishermen the Callack.

The Ling, *Lota Molva,* Cuv. Taken with long lines.

Rock-Ling, *Motella vulgaris.* Also taken with the long lines.

The Plaice, *Platessa vulgaris,* Flem. Taken with the long lines and also trawling.

The Flounder, *Platessa Flesus,* Flem. Taken as the last: the left-handed variety is not uncommon.

Dab, *Platessa Limanda,* Flem. Taken as the last.

Band Fluke, *Platessa Limandoides,* Jenyns. This fish is taken trawling on a sand bed between the Calf and the Irish coast, and is called on the island the Sand Sole.

Turbot, *Rhombus maximus,* Cuv. Found of a very large size in the Calf Sound; one was taken while I was on the island 90 lbs. weight, with a long line set at the turn of the tide in the Sound; it is also taken trawling.

Brill, *Rhombus vulgaris,* Cuv. Taken in the same manner as the preceding.

Sole, *Solea vulgaris,* Cuv. Taken trawling.

Cornish Sucker, *Lepadogaster cornubiensis,* Flem. Taken commonly among the rocks in Douglas Bay.

Conger, *Conger vulgaris,* Cuv. Taken with long lines in abundance.

Sand Eel, *Ammodytes Tobianus,* Cuv. Common.

Red Gurnard, *Trigla Cuculus,* Linn.

Grey Gurnard, *Trigla Gurnardus,* Linn. Both of the last are taken with lines commonly.

Armed Bullhead, *Aspidophorus europæus,* Cuv. Taken in a seine set for salmon.

Father-lasher, *Cottus Bubalis,* Euph. Common.

Sea Bream, *Pagellus centrodontus,* Cuv. Common round the island: taken with hand lines.

Mackerel, *Scomber Scomber,* Linn. Common during July and August.

Dory, *Zeus Faber,* Linn. Not uncommon.

Spotted Gunnel, *Murænoides guttata,* Lacép. Common in puddles among the rocks on the coast.

Ballan Wrasse, *Labrus maculatus,* Bloch. Taken commonly with lines; it is called by the fishermen the Bolland.

Red Wrasse, *Labrus carneus.* Taken occasionally with hand lines, but not so common as the last species.

Salmon, *Salmo Salar,* Linn. Taken in nets at the mouth of rivers at Ramsay, Peele and Douglas.

Salmon Trout, *Salmo Trutta.* Taken in the same manner as the last species.

Herring, *Clupea Harengus,* Linn. The Isle of Man is celebrated for its herrings, which appear generally on the Peele side of the island in June; towards August they are chiefly found on the Douglas side, but are not considered such good-eating then as they are when taken on the Peele side. A very large number of fishing smacks, or luggers, as they are called on the island, are employed in the herring trade; I have counted upwards of ninety within sight at one time from the Calf; there are also several carrying-boats employed to take the herrings off for sale to Liverpool and elsewhere.

Skate, *Raia Batis,* Linn. Common.

Sand Ray, *Raia maculata,* Mont. Not uncommon, but not so frequent as the last.

Worm Pipe-fish, *Syngnathus lubriciformis,* Jen. One specimen taken under stones in Douglas Bay.

The following is a list of the Mollusca dredged up:—

Cyprina islandica.
Cardium serratum.
Venus scotica.
—— casina.
—— gallina.
—— ovata.
Tapes Virginea.
Pectunculus Glycimeris.
Pecten maximus.
—— opercularis.
—— varius.
—— Tigrinus.
—— Pusio.
Psammobia ferroensis.
Saxicava rugosa.
Lima Loscombii.
Osteodesma corbuloides.
Mytilus edulis.
Anomia ephippium.
—— striatum.
Ostrea edulis.
Dentalium entalis.
Pileopsis hungarica.
Patella pellucida.
—— vulgata.
Acmæa virginea.
Emarginula reticulata.
Fissurella reticulata.
Trochus tumidus.
—— striatus.
—— ziziphinus.
—— granulatus.
—— magus.
Trophon muricatum.
Strombus pes pelecani.
Cypræa europæa.
Var. diaphana.
Bulla lignaria: only one broken specimen.
Murex erinacea.
Fusus islandicus.
—— antiquus.
Buccinum undatum.
Tornatella fasciata.
Natica monilifera.
Nerita littoralis.
Turritella communis.
Chiton fascicularis.
—— asellus.
—— marmoreus.
—— ruber.
—— albus.
Eolis angulata.
—— arenicola.

The following Crustacea were also captured:—

Inachus doryrhynchus.	Pagurus cuanensis.
—— tenuirostris.	—— levis.
Pisa tetraodon.	Munida Rondeletii.
—— Gibbsii.	Galathea squamifera: on the shore.
Ebalia Pennantii.	Palæmon squilla.
Hyas coarctatus.	Capsella phasma.
Portunus pusillus.	Idotea tricuspidata.
Acheus Cranchii.	Oniscus oceanicus.
Pilumnus hirtellus.	Praniza cærulata.
Pinotheres pisum.	

Besides the above lists, I have specimens of many other animals which I propose to add in another paper, not having been able to name some of them very satisfactorily at present; and also a list of Sponges.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

June 17, 1851.—Robert Brown, Esq., President, in the Chair.

Read a Letter from Thomas Forster, Esq., M.B., F.L.S., dated from Bruges, May 21st, 1851, and addressed to the Secretary, containing some observations "On the present season in relation to the Migration of Birds and other Natural Phænomena."

Dr. Forster commences his letter by referring to a passage in White's 'Natural History of Selborne,' where it is remarked that the Swallow-tribe, and particularly the Martins, must suffer great devastation in the course of their winter migrations, inasmuch as, in certain seasons "the numbers of single birds which return in the spring bear no manner of proportion to those who retire in autumn." Dr. Forster's Journal, now of forty years' standing, shows that this disproportion is greatest in late springs, particularly when accompanied with much wet and windy weather. The present season has been especially remarkable. After a winter the mildest ever remembered in Belgium, the spring was cold and showery, and nearly all the periodical phænomena were later than usual; while many tribes of plants suffered severely from some obscure atmospherical influence, apparently referable to the same class of causes which produce epidemics in the human subject and epizooties among animals. The *Hyacinthus plumosus* died off in most gardens, and also the *Muscari racemosus*. As soon as the flowers showed themselves the stock began to wither and in a few days died away, whole beds going off in the same way. Great numbers of Tulips perished in the ground; the leafing of trees was very late; and the Mulberry had not at the date of the letter shown any signs of budding. The Swallow (*Hirundo rustica*) arrived on the 18th of April, and had become pretty numerous. The Swift (*Hirundo Apus*) came on the 7th of May, in less numbers than usual. Dr. Forster had not yet (on the 21st of May) seen the Sand-Martin (*Hirundo riparia*), which is usually found in April; and even of the Martin (*Hirundo urbica*), usually plentiful at Bruges in the first week of May, the most careful search had not enabled him to detect a single bird. The Nightingale and Black-cap came to their time, but the Grey Wag-tail was not seen until the day of the date of the letter. The remarkable scarcity of flying insects, the usual food of the swallows, caused them to seek for other species, and a naturalist of the neighbourhood had assured Dr. Forster that he saw them hunting for their prey on walls and trunks of trees, like the Creeper, a fact which Dr. Forster considers as tending to support his opinion of the reasoning powers of animals. Up to this time the Cockchafer (*Melolontha vulgaris*), although usually abundant, had not made its appearance; nor had another constant inhabitant of the gardens, *Buprestis nitens*, yet been seen. The large black Cockroach had increased to an alarming extent in many of the old houses and on the premises of the bakers. Some foreign newspapers had erroneously spoken of the weather as fine in Belgium, but there had been only three tolerably fine days since the 21st of March, and the average temperature since the 25th of that month had been 8° Fahr. below the mean.

Read also, a Memoir "On the position of the Raphe in Anatropal Ovules." By Benjamin Clarke, Esq., F.L.S. &c.

Mr. Clarke believes that this character, which has hitherto attracted but partial attention, is a character of much constancy in the several families, and therefore deserving a more complete examination He states the most usual position of the raphe, when each of the carpellary margins bears a single row of anatropal ovules, as in *Pæonia*, to be lateral and turned towards the raphe of the ovules of the opposite row; and the curvature of the ovule has the same direction even in cases where the ovule is not anatropal, as in *Colutea arborescens.* The position of raphe with reference to placenta is less regular where the ovules are more numerous, but in some cases, as in *Gomphocarpus*, it is observed to be always next the placenta, the ovules being pendulous with long funiculi; and in *Cuphea* and *Reaumuria* also next the placenta with the ovules erect.

It is, however, when the anatropal ovule is single that Mr. Clarke believes the position of the raphe affords the most important characters, and he proceeds to consider the various relations which it bears to the placenta under six different heads, as follows:—

1. Ovule pendulous; raphe turned away from the placenta.
2. Ovule pendulous; raphe lateral.
3. Ovule pendulous; raphe next the placenta.
4. Ovule erect; raphe turned away from the placenta.
5. Ovule erect; raphe lateral.
6. Ovule erect; raphe next the placenta.

1. *The pendulous ovule, with the raphe turned away from the placenta*, was first observed by Mr. Brown, and afterwards figured and

described by Dr. Schleiden as "ovulum spuriè pendulum anatropum, raphe aversâ." Mr. Clarke finds it to be of more frequent occurrence than is generally supposed; it is found among Endogenous plants, not only in *Typha* and *Sparganium*, but also in *Chamædorea elegans* (the ovule of which is, however, not completely pendulous); and *Zannichellia* and *Potamogeton* show a decided tendency towards it by the direction to which the ovule curves. He considers it a principal argument in favour of its being frequent at least, if not constant, in Endogenous plants, that it occurs in those groups by means of which the Endogenous and Exogenous divisions approach each other, as in *Aroideæ* and *Piperaceæ*, and in *Ranunculaceæ* and *Alismaceæ*. As Exogenous plants, in which the raphe is averse, he instances,—1. *Ranunculaceæ* (when the ovule is pendulous); 2. *Nelumbium*; 3. *Malpighiaceæ* (in those genera in which the funiculus is next the dorsal rib of the carpel); 4. *Coriaria*; 5. *Rhus Toxicodendron*, and not improbably *Anacardiaceæ* generally; 6. *Euonymus*; 7. *Visnea*; 8. *Pennantia*, which he thinks should perhaps be referred to *Olacineæ*; 9. *Chenopodiaceæ*; 10. *Amaranthaceæ*; 11. *Paronychia capitata* (in the three last cases the ovule is not completely inverted, being campylotropal, but the direction of the curvature is such, that were the inversion complete, the raphe would be averse); 12. *Plumbagineæ*; 13. *Laurineæ*; 14. *Aucuba*; 15. *Calycanthus* (in which the ovule at the base is erect with the raphe next the placenta, and the upper one or two ovules are bent away from the placenta so as to become nearly horizontal, showing a tendency to *raphe aversa*); 16. *Belvisieæ*?; 17. *Dipsacus sylvestris*; 18. *Galenia* and *Tetragonia*; 19. *Fumaria officinalis* (which shows at least a decided tendency to the same structure in having the radicle beneath the horizontal seed and turned to the hilum). Mr. Clarke adds, that he has examined numerous cases where the carpel when single is anterior, and has not yet met with any examples of this character, except in the instances of *Dipsaceæ*, *Tetragoniæ* and *Fumaria*. He notices some remarkable variations in the position of the raphe in the ovules of *Visnea Mocanera*, both when solitary and when there are two; and concludes this section by some observations on the question whether the campylotropal ovule of *Amaranthaceæ*, &c. (in which the embryo subsequently formed is turned towards the placenta) is a character equivalent to the pendulous anatropal ovule with *raphe aversa*. That it is so, he thinks proved by the examples of *Statice* and *Plumbago*, the structure of which he describes and compares with that of *Gomphrena* and *Philoxerus*; and he adduces the instances of *Trianthema* on the one hand, and *Galenia* and *Tetragonia* on the other, as well as certain genera of *Sapindaceæ*, in which the embryo is more or less curved, to show that there is no absolute distinction between anatropal and campylotropal ovules.

2. *The pendulous ovule, with the raphe lateral*, is a character of frequent occurrence; it was particularly noticed and accurately figured in *Cornus* and *Marlea*, in Sir W. Hooker's 'Journal' for May 1850. Mr. Clarke has hitherto observed it in only two instances in which the carpel may be considered as anterior, viz. in

Goniocarpus and *Valeriana*; but it is nearly so in *Trichocladus*, and probably also in *Morina*. He has not yet observed it among Endogenous plants. Of its occurrence among Exogenous plants, he enumerates the following instances:—1. *Malpighia*, and other genera of *Malpighiaceæ*, in which the funiculus (representing the raphe) is constantly lateral; 2. *Suriana*, as figured by Prof. Lindley; 3. *Ilex*; 4. *Halesia*; 5. *Viburnum*; 6. *Acrotriche*; 7. *Myoporum*; 8. *Lonicera* (*sp. loculis uniovulatis*); 9. probably in the 1-seeded fruits of *Oleinæ*; 10. *Thesium*. This section concludes with some observations on the variation from *raphe aversa* to *raphe lateralis*, which sometimes occurs in the same family, as in *Corneæ* and *Malpighiaceæ*, which Mr. Clarke believes to offer an explanation of the variable relation of the ovule to the funiculus, which is common to both *Illecebreæ* and *Chenopodiaceæ*.

3. *The raphe next the placenta* is well known as the most ordinary position in pendulous anatropal ovules, and Mr. Clarke only suggests the inquiry whether solitary ovules having this character ever occur among Endogenous plants.

4. *Of the erect ovule, with the raphe turned away from the placenta*, Mr. Clarke has met with only three instances, two of them occurring in cases where there are two ovules. These are *Penæa fruticulosa* and *Calytrix virgata*, in the latter case less completely averse than in the former. The principal instance, however, is that of *Compositæ*, where the raphe in four or five genera examined was always found to correspond with the anterior angle of the ovary. That the anterior is the fertile carpel in *Compositæ* Mr. Clarke thinks is shown (in addition to the arguments previously adduced by him) by the fact that in *Aster Sibiricum*, he has always found the ovule to arise more or less distinctly from the posterior side of the ovary, and that the same circumstance occurs, although less distinctly, in *Centaurea nigra*. In such *Cichoraceæ* as he has examined, he has found the raphe for the most part or always lateral; but as he regards the carpella of this division of *Compositæ* as being right and left of the axis, he concludes that the position of the ovule might be expected to be different. The position of the raphe in *Berberis vulgaris* is occasionally next the placenta, but more frequently tends to be averse from it.

5. The character of *ovule erect, with the raphe lateral* (first observed by Mr. Bennett in *Rhamneæ*, and by him attributed to a torsion of the funiculus), obtains to a considerable extent among Exogenous families. It occurs regularly in *Stilbe pinastra*, and generally in one-seeded fruits of *Berberis vulgaris*; but in two-seeded fruits of the latter the raphe is removed from the placenta and placed nearer to the dorsal rib of the ovary. In *Vitis*, on the contrary, whether with one- or two-seeded cells, the raphe is always next the placenta. In a species of *Justicia*, with two ovules, placed one above the other and quite erect, the raphe is lateral; but in *Mendozia*, with a similar placentation, it is apparently next the axis. As other instances of lateral raphe with erect ovules Mr. Clarke cites *Elæagnus orientalis*, *Calamus viminalis*, and *Trianthema decandra*, the direction of the cur-

vature in the embryo of the latter being regarded as analogous to the position of the raphe in the two former.

6. The position of the raphe next the placenta is well known to be the ordinary condition in erect anatropal ovules, and on this head the author enters into no details.

Mr. Clarke then proceeds to consider the causes by which these differences in the position of the raphe may be produced.

1. He adopts the opinion (first demonstrated by Mr. Brown) that a single ovule pendulous with *raphe aversa* is the result of an erect ovule pressed or growing downwards from the elongation of the cavity of the ovarium in that direction, while its upper part remains stationary; but suggests that it is only when an erect ovule has the raphe properly next the placenta that it has *raphe aversa*, when it thus becomes pendulous. And looking to their affinities, he thinks it not improbable that all pendulous orthotropal ovules should be referred to the same cause.

2. He believes that a single pendulous ovule with the raphe lateral is an ovule originally extending horizontally from the placenta with the raphe lateral, as in *Ranunculaceæ* and *Cucurbitaceæ*, and subsequently pressed downwards as in the former case.

3. He maintains that a single pendulous ovule with the raphe next the placenta is the only true pendulous ovule, with the exception of pendulous campylotropal and amphitropal ovules with the foramen (and subsequently the radicle of the embryo) turned away from the placenta.

4. He conceives that one or two erect ovules with the raphe turned away or obliquely away from the placenta result from pendulous ovules pressed upwards by the elongation upwards of the cavity of the ovarium; and adduces in support of this opinion the pendulous ovules of *Geissoloma* contrasted with the erect ovules of *Penæa*, the erect ovules of *Calytrix* compared with the pendulous ovules of the neighbouring families, and the pendulous ovules of *Calycereæ* compared with the erect ovules of *Compositæ*, provided further observation should substantiate his belief that in the last-named family the raphe is really turned away from the placenta. Such ovules he would term *spuriè erecta*, in contradistinction to the opposite case to which Sprengel has applied the term *spuriè pendula*.

5. He considers that a single ovule erect with the raphe lateral is a horizontal ovule spontaneously growing or pressed upwards by the corresponding development of the ovary; in proof of which he cites the fact that *Trianthema micrantha* has two seeds in a horizontal position, with the radicle lateral, while *T. decandra* has two erect seeds one above the other, with the radicle also in both cases lateral.

6. He considers one or two erect ovules with the raphe next the placenta (which seems general in Endogenous plants, and is frequent in all the divisions of Exogenous) as for the most part truly erect; although this position may sometimes be derived from horizontal ovules pressed upwards or spontaneously growing erect, the funi-

culus becoming at the same time twisted so as to bring the raphe into relation with the placenta.

Mr. Clarke then proceeds to illustrate the importance of these characters in a systematic point of view, as regards different families usually regarded as nearly related. He states that *Thymeleæ* differ from *Laurineæ* in having the raphe next the placenta, and that the same difference of relation occurs in *Sanguisorbeæ* and *Amygdaleæ*. In all the Urtical Orders with pendulous ovules the raphe is next the placenta, or if campylotropal the direction of the curvature is equivalent, and the radicle of the embryo is turned away from the placenta; while in the Chenopodal Orders with pendulous ovules the radicle is either turned towards the placenta or placed on one side of it. The characters thus indicated may also, he thinks, tend to a more natural distribution of the Orders related to *Rhamneæ*, *Rutaceæ* and *Sapindaceæ*. He refers also to the differences in this respect existing between *Berberis* and *Ranunculaceæ*, *Hedera* and *Cornus*, *Cinchonaceæ* and *Compositæ*. He states that *Erythroxylon* differs from *Malpighiaceæ* in having the raphe next the placenta; and *Selago* in a similar manner from *Myoporum* and *Stenochilus*, in which the raphe is lateral. *Scleranthus* also differs both from *Illecebreæ* and *Tetragoniæ* in having the radicle turned directly away from the placenta.

In conclusion, Mr. Clarke observes that while *raphe aversa* and raphe lateral occur in several instances in the same family and possibly in the same genus (as the vertical and horizontal positions of the seed in *Chenopodium* appear to be equivalent characters), yet *raphe aversa*, or even raphe lateral, and raphe next the placenta are not known to occur in the same family—pendulous ovules only being understood. And also, that as far as his inquiries go, raphe next the placenta in pendulous ovules is unknown in Endogenous plants.

November 4.—R. Brown, Esq., President, in the Chair.

Read a communication from J. Couch, Esq., F.L.S., recording the discovery on the Coast of Cornwall of a species of *Onchidium* allied to *O. Celticum*, Cuv.

These *mollusca* were found by Mr. Couch in great abundance on a confined space of rocks at West Coombe, in Lantivet Bay, between Polperro and Fowey, congregated in small groups about a foot or two from the surface of the sea, where the waves break over them, ascending and descending with the tide so as constantly to maintain nearly the same relative position. When wholly immersed (in an attempt to preserve them alive) in a bottle of sea-water, they did not survive the day.

Read an Extract from a Letter addressed to the President by W. K. Loftus, Esq., the Naturalist attached to the Turco-Persian Boundary Commission, dated at Kerrind, Persia, August 6th, 1851.

In this locality, the neighbourhood of which abounds in plants producing fœtid gums, Mr. Loftus, acting on Mr. Brown's recommendation, had procured several different kinds, of which, and of the plants producing them, he gives some particulars in his letter. Two of these belong to the genus *Dorema*, Don; and a third, derived from a plant, which Mr. Loftus regards as belonging to the tribe *Sileridæ*, is called in Kurdish "beeje." The three gums have the same general properties, and grow on a limestone soil, at the elevation of from 5000 to 7000 feet. Large quantities of gum are also produced by the wild Almond, a species of *Astragalus*, and the *Pistacia vera*, which grow abundantly in the same neighbourhood; and there is, moreover, a kind of thistle, which exudes honey, especially from the bud, on being pierced by a species of *Rhynchophora*. Mr. Loftus proposes to resume his observations, as his party proceeds northward, in the course of the ensuing summer.

November 18.—R. Brown, Esq., President, in the Chair.

Mr. Adam White, F.L.S., exhibited, on the part of J. H. Gilbert, Esq., Ph.D., of Harpenden, near St. Albans, a portion of a wooden cistern lined with lead and perforated with numerous holes by the *Anobium striatum*, in relation to which he entered into a detailed account of the circumstances in which it had occurred. In this case the cistern, which belonged to Mr. Curtis, a brewer of Harpenden, was made from an old fermenting tub, which had become much worm-eaten on the outside. In 1838 it was lined with thin lead (of 5 lbs. to the square foot); but in little more than three years it began to leak, when some small holes were discovered in the lead and were soldered over. In 1842, however, the leakage had increased to such an extent that the leaden lining was removed, and a thicker one (of 18 lbs. to the square foot) was substituted. Five or six years afterwards, however, the leakage again commenced; and in 1850 it had proceeded to such an extent that the cistern was entirely removed to make room for one of iron. On taking out the lining it was clearly ascertained that the perforations from which the leakage arose were the work of an insect, which, after boring through the wood, had made its way also through the leaden lining. A specimen sent by Dr. Gilbert to the British Museum was determined by Mr. White to be the *Anobium striatum*; and similar instances of injury to wooden cisterns lined with lead were referred to as detailed in Mr. Westwood's 'Introduction to the Modern Classification of Insects,' in the 'Zoologist,' and in the 'Proceedings of the Entomological Society.'

Read the commencement of a memoir "On two Genera of Plants from the Cordillera of Chili." By John Miers, Esq., F.R.S., F.L.S. &c.

December 2.—William Yarrell, Esq., Vice-President, in the Chair.

Read the conclusion of Mr. Miers's memoir "On two Genera of Plants from the Cordillera of Chili."

Both these plants were collected by Mr. Miers in his rapid journey over the Cordillera in 1825. The first belongs to the tribe of *Eriogoneæ*, from all the known genera of which it is distinguished by its very slender ramifications, which are in every axil dichotomously divided, the solitary involucre on a lengthened capillary pedicel springing from the middle of each bifurcation, and by the proportion of its floral parts. The author gives his reasons for regarding the floral envelopes in *Polygoneæ* as constituting a calyx and corolla, which, in all described *Eriogoneæ*, have a ternary arrangement with 9 stamina and 3 styles; but the present genus differs in the quaternary disposition of the envelopes, accompanied by 8 stamina and 4 styles. He had at first regarded it as entirely undescribed, the characters of *Oxytheca*, as given by Mr. Nuttall in the 'Journal of the Academy of Natural Sciences of Philadelphia,' 2nd series, vol. i. p. 169, deviating widely from those observed by himself on the Chilean plant; but the examination of a specimen of *Oxytheca* from Mr. Nuttall himself, in Sir W. J. Hooker's Herbarium, has convinced him that, notwithstanding these apparent discrepancies, his plant is referable to the same genus, the characters of which he is compelled to modify as follows:—

OXYTHECA, *Nutt.*

CHAR. GEN. *Involucrum* 3–5-florum, tubulosum, subtetragonum, ad medium 4–5-partitum; laciniis subæqualibus, acutis, longissimè aristatis. *Flores* hermaphroditi cum masculis interdum intermixti, pedicellati, bracteati, subexserti, demùm cernui. *Sepala* 3–4, petaloidea, æqualia, oblonga, unguiculata, valdè imbricata. *Petala* 3–4, sepalis alterna et subsimilia, tenuiora, glabra, imbricata, et cum illis persistentia. *Stamina* 6–8, e summo gynophoro orta, inclusa, 3–4 alterna breviora sepalis opposita; *filamenta* filiformia, apice inflexa; *antheræ* rotundatæ, cordatæ, dorsifixæ. *Ovarium* ovatum, 3–4-gonum, stipitatum, petalis tertio brevius, 1-loculare; *ovulo* basilari, erecto. *Styli* 3–4, breves, erecti, demùm divaricati; *stigmata* capitata. *Achænium* 1-spermum, ovale, 3–4-costatum, sepalis petalisque emarcidis arctè tectum. *Semen* loculum implens; *testa* membranacea. *Embryo* spiralis, antitropus, intra albumen farinaceum inclusus; *cotyledonibus* cochleato-rotundis, foliaceis, accumbentibus; *radiculâ* illis triplò longiore, tereti-subulatâ, hemicyclicâ, apice recto verticem spectante.—Herbæ *suffruticulosæ Californicæ et Chilenses, Andicolæ, sesquipalmares, valdè ramosæ*; ramis *gracilibus, in quâque axillâ 2–3-chotomè divisis*; foliis radicalibus *congestis, lineari-subulatis*, caulinis *bracteiformibus, axillaribus, ternis, basi connatis, hinc breviter vaginantibus*; involucro *longè pedunculato e quâque dichotomiâ orto*; floribus *minutis, sigillatim præcocioribus*; pedicellis *basi* bracteâ *lineari, aristatâ, breviore donatis.*

OXYTHECA SPICULATA, dichotomè ramosa, ramulis gracilibus divaricatis glanduloso-pilosis, foliis radicalibus congestis spathulato-linearibus utrinque pilis eglandulosis asperis, pedunculo axillari capillaceo, involucri dentibus 4 aristâ acuformi longissimâ armatis, floribus 4-meris, staminibus 8, petalis rubentibus apice patentibus.

Hab. in Andium Chilensium descensu Orientali, inter Mendoza et Aconcagua, circa rivulum Stæ Mariæ, altitudine 8000 ped.

The other genus described by Mr. Miers is a nearly aphyllous shrub, with straight, erect, virgate branches, terminating in spines, and belongs to the family of *Bignoniaceæ*, from some of the usual characters of which family it offers, however, a striking deviation, the ovarium being simply bilocular, with a few ovules suspended on the two faces of the dissepiment, and the fruit forming a small oval drupe, containing a single osseous indehiscent nut, which is 1-celled by abortion, and contains only a single pendulous seed entirely filling its cavity, and consequently quite apterous, oval, with a small thick superior radicle and two plano-convex fleshy cotyledons. This was discovered by Mr. Miers on the skirts of the eastern declivity of the Andes, near Mendoza, on the margin of the desert tract called "La Travesia," where it was also found by Dr. Gillies. Its characters are as follows:—

OXYCLADUS, *Miers.*

CHAR. GEN. *Calyx* gamophyllus, 5-dentatus, persistens. *Corolla* gamopetala; tubo cylindrico, calyce 2–3-plovè longiore, vix gibbo; limbo brevi, 5-lobo, subbilabiato, lobis rotundatis; labio inferiore 3-lobo, lobis paululò majoribus, superiore bilobo, in æstivatione imbricativâ semper exteriori. *Stamina* 5, corollæ lobis alterna, quorum 4 didynama, quinta superior brevissima ananthera; 2 inferioribus longioribus faucem attingentibus, 2 lateralibus illis tertio brevioribus; *filamenta* paullò supra basin tubi inserta, filiformia, glabra; *antheræ* rotundatæ, reniformes, cordatæ, 2-lobæ, connectivo dorsali cordiformi adnatæ et huic in medio loborum anticifixæ, lobis ovalibus divaricatis anticè longitudinaliter dehiscentibus. *Ovarium* oblongum, pilosum, glandulâ annulari brevi 5-lobâ glabrâ cinctum, 2-loculare; *ovulis* in quoque loculo circiter 6, supernè per paria collateralia, e dissepimenti nervo longitudinali seriatim appensa. *Fructus* subbaccatus, calyce immutato clausus. *Nux* ovata, acuta, 4-sulcata, apice 4-denticulata, 1-locularis, 1-sperma. *Semen* loculo conforme, latere superiori funiculo brevi appensum; *testa* chartacea, favoso-reticulata; *endopleura* membranacea. *Embryo* exalbuminosus; *radiculâ* superiori, crassâ, apice mamillæformi; *cotyledonibus* illâ triplò longioribus, ovatis, plano-convexis, valdè crassis.—Arbuscula Mendozensis, *vix non aphylla, spinosa, ramosissima, glaberrima*; ramis *nitidis, erectis*; floribus *paucis, aggregatis, parviusculis*; corollâ *cærulescente.*

OXYCLADUS APHYLLUS (v. v.).

Hab. prope Mendoza, ad pedem Orientalem Andium Chilensium. *Vernac.* Ala.

For the reception of this curious genus, Mr. Miers has found it necessary to constitute a new tribe of the Order to which it belongs, which he subdivides as follows:—

BIGNONIACEÆ.

Trib. 1. BIGNONIEÆ. *Capsula* dehiscens, 2-locularis, 2-valvis; *seminibus* numerosis alatis compressis, dissepimento utrinque affixis. *Embryo* cotyledonibus complanatis foliaceis.

Trib. 2. CRESCENTIEÆ. *Fructus* drupaceus, lignosus, 2- vel plurilocularis; *seminibus* numerosis alatis v. compressis. *Embryo* cotyledonibus compressis carnosis.

Trib. 3. OXYCLADEÆ. *Fructus* drupaceus, nucem unicam 1-locularem indehiscentem includens; *semine* solitario suspenso rotundato. *Embryo* radiculâ superiore; cotyledonibus magnis ferè hemisphæricis carnosis.

Figures of both genera with detailed dissections accompanied the paper.

December 16.—R. Brown, Esq., President, in the Chair.

Read a Letter from Mr. Hogg, F.R.S., F.L.S. &c., to the Secretary, recording the capture of two species of Pipe-fish (*Syngnathus*) during the last summer, the one near the mouth of the river Tees, the other in that river near Middlesborough, by the same person, a fisherman of Stockton. The first of these, *Syngnathus Typhle*, L., measured $15\frac{3}{4}$ inches in length, and the formula of its fins, which differs in the descriptions of Donovan and Jenyns, was as follows:—D. 39; C. 10; A. (rubbed off); P. 13? The second, *S. æquoreus*, L., was $17\frac{1}{4}$ inches long; its dorsal fin had thirty-nine rays; and the caudal fin was obsolete, or rather rudimentary, the rays to the number of three (or perhaps four) being inclosed within the skin of the body; the tail was flattened at the extremity.

Read also, a "Note on the Natural History of Shetland." By Adam White, Esq., F.L.S. &c.

In this note, after referring to Dr. Hibbert's researches into the mineral riches of Shetland, to Dr. Fleming's contributions to its zoology, to Mr. Dunn's interesting work on its birds, and Mr. Hewitson's investigation of their eggs, and to the fruitful results of the dredgings of Mr. Barlee, Mr. McAndrew and Professor Forbes, by which so much has been done to increase our knowledge of the living inhabitants of its surrounding seas, Mr. White expresses an opinion that the zoological riches of the coasts of Shetland will be found to equal, if not to surpass, those of the Firths of Forth or of Clyde, and even of the coasts of Dorset, Devon and Cornwall themselves. He refers to the two principal rarities in the flora of these islands (the *Arenaria Norvegica*, Gunner, and *Ajuga pyramidalis*, L.), and concludes by announcing the discovery by himself of a Lapland species of Humble-bee, new to the British fauna, which occurs not uncommonly in his brother's garden at Lerwick, is still more frequent in that of Mr. Bruce of Sandlodge opposite Mousa, and seems even more abundant in Unst. This was immediately recognized by Mr. Frederick Smith as *Bombus arcticus* of Dahlbom; but as a species of *Bombus* had been described by Kirby under the same specific name in the Appendix to Capt. Parry's First Arctic Voyage in 1822, and consequently ten years before the publication of Dahlbom's species, Mr. White proposes to name the latter *Bombus Smithianus*. He adds that, in accordance with Kirby's rule in his 'Monographia Apum Angliæ,' he would have preferred the specific name of *Smithiellus*, as indicating that it was named after a describer and not merely a collector, but he has felt himself compelled to adopt the name of *Smithianus* to prevent the possibility of confusion with another species of the family of *Apidæ* to which the name *Smithella* has been applied.

Read further a memoir "On the Forest-Trees of British Guiana and their Uses in Naval and Civil Architecture." By Sir Robert H. Schomburgk, Ph.D. &c.

This memoir had been read at the meeting of the British Association at York, in October 1844; but as only a simple notice of this reading had appeared in the Reports of the Association, the Secretary (in whose hands Sir Robert Schomburgk had placed it) thought it desirable to read it again before the Linnean Society in order that an abstract might be published in the Society's 'Proceedings.'

The trees are mostly indicated by their colonial names, but to many of them Sir R. Schomburgk has been enabled to add their scientific designation.

Souari, Sewarri or *Sewarra* (Pekea tuberculosa, *Aubl.*). Of large size and very abundant; excellent for ship-building, mill-timber and planks, and may be obtained from 20 to 40 feet long, and from 16 to 20 inches square.

Siruaballi, Sirwaballi, Siverballi. There are four varieties or perhaps species of this tree, which belongs to the family of *Laurineæ.* They are distinguished as black, brown, yellow and white *Siruaballi.* Its spicy smell and bitter taste preserve it from the attacks of worms, either in or out of water, on which account it is in great request for planking colonial crafts.

Dakumballi. Grows on the side of rivers, and is not much used.

Marsiballi or *Accuribroed.* A tall straight tree, but not of large size. Wood hard and strong, but not very durable when exposed to alternations of wet and dry weather, for which reason it is only used in house-framing and inside work. When dried it is frequently used for torches.

Turanira or *Bastard Bully-tree.* Tall, straight, of large size, and abundant on the banks of the Demerara River. Makes good planks and framing-timbers for inside work, but is not durable when exposed to the weather.

Suradani or *Suridani.* Plentiful and of large size; principally in request for planks and timbers of colony crafts. It is of a light red colour.

Kautaballi or *Kutaballi.* Grows chiefly on the sand-hills which form the first elevations on receding from the sea-coast. Very hard, and much used for beams and inside work, but not durable when exposed to the weather.

Cakaralli or *Kukaralli.* Mostly found on rising ground along the banks of rivers, and belongs to the tribe of *Lecythideæ.* Its straightness and large size (from 30 to 40 feet long and from 6 to 14 inches square) would qualify it for masts or spars for colony crafts; but its heaviness militates against this use. It is very durable and chiefly used in house-framing; but as it is said that barnacles do not attack it, it is also employed in wharfs, &c. The bark is easily stripped off, and consists of numerous layers, which the Indians separate by beating with a stick, and the author has counted as many as seventy of these layers in a strip of bark. When separated they have the appearance of thin satin paper; they are dried in the sun, and used as wrappers for cigars.

Simaruba, or *Sumaruppa* (Simarouba amara, *Aubl.*). Grows on hill-sides to the height of 50 feet, branching and somewhat crooked.

The wood resembles white pine, both in colour and quality, and makes good boards for inside work. A decoction of the bark, which is intensely bitter, is considered an excellent remedy in dysentery and other complaints of the bowels, and is much used among the Indians.

Yahou. Grows in valleys in rich soil, and is much used for the staves of casks, &c.

Wallaba (Eperua falcata, *Aubl.*). In great abundance along the banks of rivers, reaching 40 feet in height, and being often 2 feet in diameter. Bark reddish brown, with a thin white sap, enclosing a wood of a deep red colour frequently variegated with whitish streaks. It is hard, heavy and shining, and impregnated with an oily resin, which makes it very durable both in and out of water. It splits very easily, and is consequently generally used for palings, shingles and vat-staves, and also for posts and uprights in framing. The bark, which is somewhat bitter, is a good emetic, which is much used by the Arawak Indians in a decoction.

Curahuri or *Kuruhuru.* Tall and straight. Wood used for framing, boards and planks.

Curana, Samaria, Acuyari, Mara, or *Cedar-Wood* (Icica altissima, *Aubl.*); two varieties, as they are considered by Aublet, one having red wood and the other white. The *Red Cedar* is found only in the interior, growing to 60 or 70 feet and even higher, and from 4 to 5 feet in diameter. It has a strong aromatic smell, and is much in request for inside furnishing, bookcases and shelves, as it is found to preserve books and papers from injury by insects, and is also light, easily worked and not liable to split. Its great height would qualify it for masts, and the Indians prefer its trunk to that of any other tree for preparing their canoes. One of those employed by the author during an expedition into the interior, which was 42 feet long and 5½ feet wide, was hollowed out of a single trunk of this tree, and was found at the end of four years' service, having previously been much used, to be as sound as when bought for the expedition, although it had been in both fresh and salt water, and hauled over land and cataracts in the interval.

Itaballi or *Copai-yé* of the Macusi Indians (Vochy Guianensis, *Aubl.*). From 50 to 60 feet high, and from 2 to 2½ feet in diameter. Wood hard, but not very durable when exposed to the weather; chiefly used for inside work, staves for sugar hogsheads, boat-oars, &c. Flowers of a beautiful yellow, highly odoriferous and very ornamental.

White Siruaballi. A tall tree; wood much lighter than the *brown Siruaballi* previously mentioned, but not so much esteemed.

Curata-yé of the Macusis (Curatella Americana, *L.*). A crooked tree, seldom more than 12 feet high, with crooked and tortuous branches, and a thick rough bark which frequently peels off in large flakes. The crooked branches are much used by the Indians for their canoes, and might serve for military saddles. It grows only in the Savannahs of the interior. The leaves, which are scabrous, are used by the Indians like sand-paper to polish their blow-pipes, bows, war-clubs, &c.; and the blow-pipe being called *Cura*, the tree has thence received the name of *Curatakié*.

Burracurra, Paira, Letter-wood, or *Snakewood* (Piritanera Guianensis, *Aubl.*). This tree, which is very scarce within several hundred miles of the sea-coast, is often from 60 to 70 feet high, and from 2 to 3 in diameter. The bark is of a dark grey, and when wounded exudes a white milk. The outer part of the wood is white and very hard; the heart (which in the largest tree scarcely exceeds 6 or 7 inches in diameter) is of great weight, hardness and solidity, of a beautiful deep red, variegated with black spots of different size and figure, which give rise to its name. It is susceptible of a brilliant polish; but the small size of the mottled part, and its great value even in the colony, limits its use almost entirely to veneering, to picture-frames, to some smaller pieces of furniture, and to walking-sticks. The Indians form it into bows more for ornament than use. At the foot of the Canuku Mountains near the river Rupununi, at the Upper Essequibo, and Corentyn, it is still plentiful; but all these places being several hundred miles from the sea-coast, it is both difficult and expensive to convey it to the colony. There appears to be a variety, the heart of which is not mottled, and this the Indians are said to prefer to the other for their bows.

Wamara. A scarce tree, attaining a great height, but the only part used is the heart, which is dark brown and often streaked. Its hardness and weight cause it to be preferred by the Indians for their war-clubs: it may be had from 6 to 12 inches square, and from 20 to 40 feet long.

Cuppa, Ruyé (Clusia sp.?). A tree of large size, with a hard wood used for inside work.

Curahara or *Kurara*. Plentiful and of large size; and its durability, and not being liable to split, recommend it chiefly for timbers, knees, &c. for schooners. It is also much in request for mill-rollers, mill-timbers and planks of every description.

Yarura, Porreka-yé, or *Paddle-wood* (Aspidosperma excelsum, *Benth.*). The lower part of the trunk juts out in tabular projections, forming cavities or compartments like the *Mora*, which serve the Indians as ready-made planks, principally for the construction of their paddles. The trunk itself has the appearance of being fluted, or as if it consisted of numerous slender trees grown together along their whole length. The author states that he knows only of one other similar instance among the forest-trees of British Guiana; in this latter case the tree produces berries, while the fruit of the Yarura is a follicle containing several suborbiculate winged seeds, attached by a long funiculus. The wood of the Yarura is light, elastic, and not apt to splinter; it might prove useful for gun-carriages, bulwarks of vessels of war, &c.; and might also, on account of its lightness, be employed in floats or paddle-wheels of steam-vessels. It is much in request for rollers in the cotton ginning machines, for which purpose it is superior to any other wood in the colony.

Purple-heart, or *Mariwayana* (Copaifera pubiflora, *Benth.*, and

Cop. bracteata, *Benth.*). Rather scarce in the Coast Region, being found in the mountainous tracts above the Cataracts. There are several varieties or species, but all much alike, possessing great strength and elasticity, and used for furniture, on account both of their colour and durability. Used also for mortar-beds, being superior to any other wood in sustaining the shocks produced by the discharge of artillery. The author was assured by Col. Moody, R.E., that the Black Green-heart and the Purple-heart were the only woods that stood the test as mortar-beds at the Siege of Fort Bourbon, in the Island of Martinique. One variety (*Cop. bracteata*) is very common in the Savannahs near the rivers Rupununi, Takutu and Branco; but this is of small size compared with the others. The natives use the bark taken off entire with the ends sewn together, and strengthened by a slight frame-work for river canoes.

Mapurakuni or *Maipayé.* The bark is used by the Indians for colouring their arrow-points and pottery, as it produces a fine red colour when steeped in water and mixed with Currawéru. It is a large forest-tree.

Burueh, Bully, or *Bullet-tree* (Mimusops sp.). A tree of the largest size, often 6 feet in diameter, and having the trunk destitute of branches nearly to the top. Leaves, branches and trunk producing a whitish milk; fruits the size of a coffee-berry, and when ripe very delicious. Wood extremely solid, heavy, close-grained and durable; dark brown, variegated with small white specks; chiefly used in house-framing, for posts, floors, &c., as the weather has but little influence on it, but also esteemed the most valuable timber for the arms, shafts, &c. of windmills. It squares from 20 to 30 inches, and may be obtained from 30 to 60 feet long. In salt or brackish water it is sure to be attacked by the worms. A tree cut down by the author at Cuyuni, measured 67 feet to the first branches, and thence to the top 49 feet—in all 116 feet.

Payou-yeh (Etaballia Guianensis, *Benth.*). A tree growing only near the Upper Essequibo and very abundantly along the Rupununi and Takutu, the heart of which is highly ornamental, but not more than 6 inches in diameter, and very subject to holes.

Maipurému (Vantanea Guianensis, *Aubl.*). Wood very subject to worms, and not likely to become of much use; but the tree presents a beautiful appearance with its large clusters of pink flowers, and is even more remarkable for its drupaceous fruit, which is furrowed like our peaches and almonds, and is cut in half by the Indians to form ornaments, chiefly for the children.

Camara, Camacusack, Makoripong, or *Ackawai-Nutmeg* (Acrodiclidium Camara, *Schomb.*). Timber most like the *Siruaballis,* aromatic and bitter, and consequently resisting worms and insects. Trunk 40 or 50 feet high, with a circumference of 8 to 10 feet, and apt (like the Yarura and Mora) to form tabular projections at the lower part. Chiefly prized for its aromatic fruit, which is considered one of the most efficacious remedies in colic, diarrhœa and dysentery.

Greenheart, Sipiri (Nectandra Rodiæi, *Schomb.*). The brown Greenheart is one of the most useful timber-trees of the colony, and is found in great abundance within 100 miles of the Coast Region. It grows to the height of about 60 feet, and is generally used for house-frames, wharfs, bridges, piles and planks. Within the last twenty years a large quantity has been imported into Liverpool and Greenock; and it has been even asserted that in strength and durability it is superior to English oak, than which it commands a higher price. In times of scarcity the Indians obtain from its fruit, grated and macerated in water, a fecula which is mixed with the rotten wood of the Wallaba-tree, pounded, sifted and baked into bread, in like manner with the Cassava. In the bark and also in the fruit, Dr. Rodie of Demerara has discovered a substance which forms an excellent substitute for quinine, and to which he has given the name of *bebeerine*. The black greenheart appears to be a mere variety.

Cartan-yeh of the Macusi Indians, *Pao da Rainha* of the Brazilians. Apparently restricted to the Savannahs in the neighbourhood of the rivers Rupununi, Takutu, Branco, &c. The Brazilian name is derived from the red colour of the wood, which resembles that of the Brazil-wood of Pernambuco, to which the same name (Queen's-wood) is applied. It reaches a height of 80 to 100 feet; and being easily worked and of a handsome colour, promises to become of great interest to cabinet-makers. It was used by the author during his sojourn in Pirara for temporary tables, and the large size of its planks induced the military commandant to construct of it a temporary bridge across the river. The leaves are impari-pinnate, the flowers papilionaceous, and the fruit a samara with a prickly capsule, the wing being from 4 to 5 inches in length*.

Sarabadani. Much used for furniture. It grows to a large size, and is chiefly found in swampy soil and along the banks of rivers.

Ducaballi, or *Guiana-Mahogany*, is very scarce, and is almost regarded as superior to mahogany, whence it is chiefly employed for furniture and commands a high price.

Waranana, or *Wild Orange*. A large timber-tree, which grows chiefly along the banks of the rivers Pomeroon, Supinama, &c. Much used for boat-oars and staves for sugar hogsheads. Its fruit resembles an orange, but is not eatable.

Ducaliballi. Grows to a pretty large size, but is not plentiful; the trunk is about 40 feet high, but seldom exceeds 20 inches in diameter. Wood deep red, finer, more equal and more compact than mahogany, and like the Ducaballi much used for furniture. Takes a fine high polish, and resembles or perhaps is identical with the Brazilian Beef-wood.

Haiawaballi, or *Zebra-wood* (Omphalobium Lamberti, *Dec.*). Grows to a large size, but is very scarce. Wood of a light brown with darker stripes, and considered the handsomest furniture-wood of the colony: it is easily worked and makes beautiful bed-posts.

Hubaballi. A light brownish wood, beautifully variegated with black and brown streaks; easily worked, takes a fine high polish,

* From this description of the leaves, flowers and fruit, the tree is probably *Centrolobium robustum*, Mart.—Secr.

and makes beautiful furniture, and cabinet-work of every description. May be had from 6 to 15 inches square and from 20 to 35 feet long. It is by no means scarce, but is much subject to holes, which frequently render it useless.

Simeri, or *Locust-tree* (Hymenæa Courbaril, *L.*). A tree of large size and plentiful throughout Guiana, often attaining from 60 to 80 feet in height and 8 to 9 feet in diameter. Trunk destitute of branches nearly to the top. Wood close-grained, of a fine brown, streaked with veins, and well adapted for mill-timbers, as it does not split or warp. A good deal of it is sent to England to be used as trenails in planking vessels, and in beams and planks for fitting up steam-engines: it has also been found to answer well for the frames, wheels, &c. of spinning machines. The Indians and Negroes are fond of the farinaceous saccharine pulp enveloping the seeds. The gum, which resembles Copal, and produces an excellent spirit-varnish, is found about the roots of the old trees a few inches under the surface of the ground, and occasionally also exuding from the trunk.

Yari-Yari or *Lance-wood* (Duguetia Quitarensis). Is abundant in the interior; but the trees are seldom above 20 feet high clear of the branches, or more than 5 inches in diameter. It is considered by the coach-makers, in consequence of its elasticity and toughness, the best material for chaise or gig shafts.

Black Greenheart is only distinguished from the common Greenheart by the colour of the wood, but is so scarce in proportion to the brown, that not more than one in twenty of the trees cut down are found to belong to this variety. The wood is in great request in the island, being preferred to all others, on account of its well-known durability, for windmill-shafts, spindles and mill-work in general.

Itaka or *Itekitibouraballi* (Machærium Schomburgkii, *Benth.*). Wood much used for furniture: it has streaks of black and brown throughout, the outer part being pale yellow. It is not scarce, but rarely squares to more than 14 inches, and is very subject to heart-shakes. Its purple flowers have the odour of violets.

Ebony, or *Banya*. A large tree of fluted surface and uneven growth, the heart of which (seldom more than 8 to 10 inches square) is alone used: it is black, heavy, hard and strong, and generally used by the Indians for their war-clubs.

Mora (Mora excelsa, *Benth.*). The most majestic tree of the forests of Guiana, towering over all the rest and often reaching the height of 120 feet. It is abundant along the rivers of the Coast Region, and extends as far south as lat. 3° N. The wood is close, cross-grained, and difficult to split: it is considered by the most competent judges to be superior to oak (as it is not subject to dry-rot) and the very best wood that can be procured for ships' timbers. It may be obtained from 10 to 20 inches square, and from 30 to 40 feet long; and its branches having a tendency to grow crooked it affords natural knees, while the trunk may be used for keels, beams and planking. A full account of this useful tree was published by Mr. Bentham in the Society's 'Transactions,' vol. xviii. p. 207.

January 20, 1852.—Robert Brown, Esq., President, in the Chair.

Mr. Yarrell, V.P.L.S., communicated the following particulars of the growth of a Cedar in the garden of E. B. Johns, Esq., at Bishop's Stortford, Herts, and planted by him in the year 1832, when it was turned out of a 32-sized garden-pot. It is growing in a mild brick earth, and its present measurements (December 1851) are as follows:—

	ft.	in.
Height	51	0
Girth at the base	8	6
——— five feet from the ground	6	6
——— ten feet from the ground	6	0
——— fifteen feet from the ground	5	0
Length of branches from the trunk to the points	22	0

Read a "Note on the occurrence of an Eatable *Nostoc* in the Arctic Regions and in the Mountains of Central Asia." By J. D. Hooker, M.D., F.R.S., F.L.S. &c. Accompanied by a communication from the Rev. M. J. Berkeley, F.L.S., on the same subject.

Dr. Hooker states that on the return of Captain Penny's Expedition from the Arctic Regions, Sir W. Hooker received from Mr. Sutherland a small collection of Cryptogamic plants, among which was one, apparently referable to *Nostoc commune*, which he described as being found in great abundance upon the floating and fixed ice in Wellington Channel, occurring in detached masses drifted about by the wind, forming the only vegetable production of any importance over many square leagues, and affording shelter to *Poduræ*, with other *Crustacea* and some insects. In the neighbourhood of their winter quarters on Cornwallis Island, lat. 75° N., long. 95° W., it was so plentiful that it might be taken advantage of as food, and prove a material addition to the resources of the country in cases of extreme want. Mr. Sutherland added that he had eaten handfuls of it on several occasions, without any inconvenience; and although it was generally infested with swarms of the larvæ of flies and gnats, as well as with myriads of very active *Poduræ*, he considered it much more nutritious and agreeable than the "*tripe de roche*," and perhaps not inferior to "Iceland Moss." On showing the plant to Dr. Thomson, he drew the attention of Dr. Hooker to a very similar plant which occurs in great abundance in Western Thibet, floating in large masses on the surface of pools and lakes in soils impregnated with carbonate of soda, and of which heaps are drifted by the winds upon their banks. It occurs as high up as 17,000 feet, and is of a green or pale purple colour; and this too appeared to Dr. Hooker to belong to *Nostoc commune*. Samples of both were forwarded to Mr. Berkeley, whose notes to the following effect were also laid before the Society.

Mr. Berkeley states that he has been unable to find any account of the chemical constituents of *Nostoc*. The chemical condition of such species as he has been enabled to examine, under the influence of iodine and sulphuric acid, seems to vary not only in the different species, but in individual specimens, and even in parts of the same specimen. In some the gelatinous matter and the chains of spores assume a more or less deep tint of violet, indicating that the greater portion consists of cellulose, perhaps in some cases partially changed to dextrine by the action of the sulphuric acid; while in other cases the prevailing tint is yellow-brown, indicating rather bassorin. No purple tint occurs where merely iodine is used, and the change therefore is not due to the presence of amylum. In fresh specimens of *Nostoc commune*, the spores assume a beautiful green tint, which is probably due to the combined tint of the yellow protein contents of the cells and the blue cellulose of which their wall is formed. In the Arctic specimens and in English *Nostoc commune* the bassorin tint prevails, while in specimens from Thibet (probably *Nostoc salsum*, Kütz.), gathered by Dr. Thomson, in pools of water where the soil is covered with an efflorescence of carbonate of soda, cellulose is indicated, but with every intermediate shade. Mr. Berkeley has, however, found that in woody fibres which in bleaching have been exposed to salt water, a deeper purple tint is assumed than when they have been bleached by rain water, so that something may possibly be due to the peculiar place of growth of the Thibetan species. In *Nostoc edule* the yellow-brown tint is stronger than in any other specimen examined; but it is scarcely probable that any very constant chemical characters will be found to prevail in the different species. In either case there would be a very nutritious food, and one from its gelatinous condition probably easily assimilated. The habit of the Arctic species is exactly that of *Nostoc commune*, and Mr. Berkeley would not hesitate to regard it as identical, if there were no other difference than a little increase in the relative size of the threads of spores; but in parts of the fronds the chains are surrounded by a distinct gelatinous envelope, presenting an appearance somewhat similar to that of toad-spawn, which is very visible in a transverse section. At a later period, when the chains are ready to break up at the connecting joints, no trace of this envelope is to be detected, and the plant then exhibits the true characters of *Nostoc*. It appears indeed, from the remarks of Thuret, that when the threads of *Nostoc* are first generated from the large connecting bodies, there is really such an envelope; but this exists in *Nostoc*, as far as is at present known, merely in the infant state; and consequently if the genus *Hormosiphon* is to be retained, the Arctic species must be regarded as belonging to it, for no such appearance has been detected by Mr. Berkeley either in dried or freshly-gathered specimens of *Nostoc commune*. It is possible that more extended observation may show that this character is not of the consequence attributed to it by Kützing; but in the mean time Mr. Berkeley characterizes these specimens as—

Hormosiphon arcticus, foliaceo-plicatus viridis vel fuscescens, filis demùm (gelatinâ diffusâ) liberis.

Fronds foliaceous, variously plicate, sometimes contracted into a little ball. Gelatinous envelope at length effused; connecting cells at first solitary, then three together; threads (which are nearly twice as thick as in *Nostoc commune*) breaking up at the connecting cells, so as to form two new threads, each terminated with a single large cell, the central cell becoming free. Of these threads and of their gelatinous envelope Mr. Berkeley gives figures.

With regard to the Thibetan *Nostoc*, Mr. Berkeley adds that a species of this genus, as is well known, is a native of Tartary and is eaten abundantly in China. There is a box of it, sent by Mr. Tradescant Lay, in the Museum of the Linnean Society; and mention is made of it by M. Montagne in the 'Revue Botanique,' ii. p. 247, as having, in the form of a soup, made part of a dinner given by the Mandarin Huang at Macao, to several members of the French Embassy. The Mandarin described it as a freshwater plant, growing in Tartary in streams and running water, and sold at Canton in small boxes: it is highly esteemed by the Chinese, and not very expensive. At this time M. Montagne regarded the species as *Nostoc cæruleum*, but specimens sent him by Mr. Berkeley proved it to be distinct, and it was afterwards published in the 'Revue Botanique' under the name of *Nostoc edule*, Berk. and Mont., and figured by Kützing in his 'Tabulæ Phytologicæ.' In the last-named author's 'Species Algarum,' it is said to have been gathered by Gaudichaud, who, although a great traveller, was certainly never in Tartary. The Thibetan *Nostoc*, like the Arctic, is probably quite as good as the Tartarian. After some further notes on the chemical changes produced in this plant and in *Nostoc commune* when treated with iodine and sulphuric acid, and a reference to a passage in Kützing's 'Grundzüge der Philosophische Botanik,' where he speaks of these plants as consisting in great measure of gelacin (a substance belonging to the same category as bassorin, and perhaps a modification of it), Mr. Berkeley concludes by stating that a thin slice of gum tragacanth, treated with iodine and sulphuric acid, assumes after a time the same tint as the *Nostoc*. He believes, however, that starch is often present in gum tragacanth, which is not likely to be the case with the *Nostoc*; and thinks we may safely assume the jelly of *Nostoc* to be a state of bassorin, passing into cellulose or dextrine.

February 3.—Robert Brown, Esq., President, in the Chair.

Read a Paper entitled "Further Observations on the genus *Anthophorabia*, Newp." By George Newport, Esq., F.R.S., F.L.S. &c.

The author stated that having had the good fortune, in September last, to rediscover, at Gravesend, the parasite *Anthophorabia*, which, twenty years ago, he found in the nests of *Anthophora*, at Richborough in Kent, and an account of which is given in a former paper ('Proceedings,' March 20, 1849, vol. ii. p. 24), he felt it necessary to offer a few additional observations on this genus; since one of the most remarkable peculiarities of the male sex, the possession of three stemmata on the vertex, and of a single stemmatous eye on each side of the head, instead of the usual compound one of perfect insects, had been repeatedly denied to be a fact; the denial being printed in the 'Proceedings' of the Society for May 1, 1849, vol. ii. p. 37.

At the time the author described this genus it was well known that he possessed only delineations of the insect, which he had made in the year 1831; at which time the insect occurred in great abundance, and as he then expected to have been able to obtain it at pleasure, he neglected to preserve specimens of it. He now showed in the insect itself the stemmatous eyes which he originally stated it to possess, and consequently that the denial which had been given to this fact had been uncalled for. He felt it but right, however, to mention that there were points of minor importance in the description originally given of the genus which admitted of some revision. These referred to the number of joints in the antennæ, the club of which is formed of a plurality of closely united rings, instead of being but a single joint. The tarsi, too, of both sexes, may be regarded either in the way usual with entomologists, as being formed only of *four* joints, or, if anatomically considered, as he had originally described them, as of *five* joints, the terminal joint being short, soft and pad-like, and usually discarded by entomologists as a distinct joint, which, nevertheless, it is.

With respect to the asserted identity of *Anthophorabia* with another parasite, *Melittobia*, described in the 'Proceedings' for May 1, 1849, vol. ii. p. 37, the author showed that this could not be the case, if the latter insect has been described correctly, as the account there given of *Melittobia* differs greatly from the facts exhibited by *Anthophorabia*. The characters of this genus he now proposed to revise as follows:—

Fam. Chalcididæ.

Gen. Anthophorabia, *Newp.*

Fem. Caput latitudine thoracis. *Antennæ* 9-articulatæ, pilosæ; articulo 3tio ad 6tum subæqualibus; reliquis clavam solidam ovalem efformantibus. *Thorax abdomenque* æquales. *Tarsi* (4-?) 5-articulati in utroque sexu; articulo 5to minimo, molli, pulvillo simili, ferè obsoleto.

Mas. Caput magnum. *Oculi* stemmatosi. *Antennæ* 10-articulatæ; articulo 1mo globoso, minutissimo; 2do arcuato, magnoperè dilatato, dimidio anteriore subtùs excavato; 3tio magno; 4to adhuc majore, globoso v. subangulato; 5to 6to 7moque minimis, cyathiformibus; 8vo 9no 10moque auctis, clavam solidam ovalem efformantibus. *Alæ* abbreviatæ.

As the specimens found at Gravesend present some specific characters which were not observed in the insects formerly obtained at Richborough, the author proposed to name those which he now possesses, provisionally, in the event of their proving to be a new species:—

A. fasciata. *Mas.* Fulva, fasciis 5 transversis abdominalibus saturatioribus, antennarum articulis anterioribus oculis prothoracis margine posteriore maculâque subalari utrinque in mesothorace nigrescentibus, pedibus subarcuatis robustis ambulatoriis, trochantere femorumque paris secundi parte terminali subtùs spinulis minutis densè barbatis, tibiis tarsisque omnibus fortiter spinosis.—Long. lin. 1.

Fem. Nigro-ænea nitida, lineis 2 longitudinalibus in mesothorace scutelloque albidis, abdomine ovali elongato acuto fasciis transversis saturatioribus pilis albidis marginatis, oculis rufescentibus, pedibus flavescentibus, femoribus saturatioribus, tibiis rectis elongatis pilosis, tarsis pilosis fortiter spinosis.

Hab. in nidis *Anthophoræ retusæ* apud Gravesend in Comitatu Cantiano.

The author then gave some account of the habits of the males and females, which he had seen emerge from the nymph state, and remarked that out of about one hundred and fifty specimens of perfect insects and nymphs obtained from one bee's nest, he had only found eleven males. Having placed about one hundred females in a small glass tube closed, as he thought, securely with a cork, he was surprised at the end of a fortnight to find that nearly the whole had escaped, by insinuating themselves into slight fissures in the sides of the cork, between this and the glass. From this circumstance he is now disposed to think that the habit of the female is to penetrate into the bee's nest, after this has been closed, and deposit her eggs on the nearly full-grown larva within; as a few weeks after the escape of these females he discovered three individuals in an open cell of *Anthophora* which contained a nearly full-grown larva, and which had remained nearly close to the glass tube from which the *Anthophorabia* had escaped. Two of these individuals now appeared to be in the act of oviposition. He noticed also on the same bee-larva some larvæ of the parasites in different stages of growth; so that he regards the species as an external feeder, like the larva of *Monodontomerus.*

Specimens of the male and female insects were exhibited at the meeting.

ZOOLOGICAL SOCIETY.

Dec. 10, 1850.—Prof. Owen, V.P., F.R.S., in the Chair.

On the Marine Mollusca discovered during the Voyages of the Herald and Pandora, by Capt. Kellett, R.N., and Lieut. Wood, R.N. By Professor Edward Forbes, F.R.S. etc.

Out of 307 species of shells collected by the voyagers, 217 are marine Gasteropoda, 1 is a Cephalopod, and 58 marine bivalves. The genera of which species are most numerous are—*Murex, Purpura, Trochus, Terebra, Strombus, Conus, Columbella, Littorina, Oliva, Cypræa, Natica, Patella, Chiton, Venus,* and *Arca.* Among the more local genera represented in this collection are, *Monoceros, Pseudoliva, Cyrtulus, Saxidomus,* and *Crassatella.* The specimens are usually in very fine preservation. Many of the species are rare or local.

The localities at which they were chiefly collected were the coast of southern California, from San Diego to Magdalena, and the shores of Mazatlan. Unfortunately the precise locality of many of the individual specimens had not been noted at the time, and a quantity of Polynesian shells, mingled with them, have tended to render the value of the collection as illustrative of distribution less exact than it might have been. A few specimens of considerable interest were taken by the 'Herald' at Cape Krusenstern. The new species are all from the American shores. There are no products of deep-sea dredging.

As many of the following new forms are from the coast of Mazatlan, Mr. Cuming, whose experience and advice have been taken, and magnificent collection consulted in drawing up this report, has considered it desirable that some undescribed shells contained in his collection, from that region, should be described at the same time.

TROCHITA SPIRATA, sp. nov.

T. testâ conicâ, fusco-purpureâ, longitudinaliter radiato-sulcatâ, sulcis numerosis, prominentibus, subrugosis; anfractibus 6, *angustis; laminâ internâ spirali, depressâ, magnâ, margine undulato.*

Diam. $2\frac{3}{10}$, alt. $1\frac{4}{10}$ unc.

A very handsome species of this group, allied to *Calyptræa sordida* of Broderip, and differing from the well-known *T. trochiformis* in having very much narrower and more numerous whorls, as well as in its internal colouring. It was procured at Massaniello, in the Gulf of California.

TROCHUS CASTANEUS. Nuttall, MSS.

T. testâ latè-conicâ, crassâ, læte castaneâ, spiraliter flavo-lineatâ, anfractibus 6, *convexiusculis, omnibus spiraliter sulcatis, sulcis numerosis, ultimo lato, basi subangulato, convexo, imperforato, aperturâ subquadratâ, margaritaceâ, suturis impressis. Operculum?*

Alt. $\frac{8}{10}$, lat. $\frac{8}{10}$, long. apert. $\frac{4}{10}$ unc.

The number of sulcations in the second whorl is about six; the cavities are always rich chestnut, the elevations yellowish. The general form is intermediate between that of *ziziphinus* and *alabastrites*. The shell has long been known under Nuttall's manuscript name, but never, so far as I am aware, described. It is from Upper California.

TROCHUS (MONODONTA) GALLINA, sp. nov.

T. testâ obtusè pyramidali, crassâ (adultus ponderosus), spirâ magnâ, anfractibus 5, *glabris, obsoletè obliquè striatis, convexiusculis, albidis, fasciis angustis numerosis purpureis ornatis, anfractu ultimo prope suturam subcanaliculato, basi lateribus rotundatis, umbilico albo, imperforato, impresso, aperturâ subquadratâ, labro externo subpatulo, margine acuto, lævi, nigrescente, labro columellari bidentato, albo, faucibus margaritaceo-albis, operculo circulari, corneo, fusco, spiris numerosissimis, confertis. Testa junior spirâ depressiusculâ.*

Alt. $1\frac{1}{10}$, lat. max. $1\frac{2}{10}$, alt. apert. $0\frac{6}{10}$ unc.

Probably from the Mazatlan coast.

TROCHUS (MONODONTA) AUREO-TINCTUS, sp. nov.

T. testâ obtusè pyramidali, crassâ, spirâ mediocri, anfractibus 4 *vel* 5, *convexiusculis, obtusè angulatis, subcanaliculatis, spiraliter* 1–

2 latè sulcatis, striis spiralibus minutis, longitudinalibus minutissimis sculptis, colore nigro obscurè minutissimèque griseo-lineato, ultimo anfractu basi subplanato 4–5 sulcis profundis spiralibus sculpto, margine obtusè subangulato, umbilico profundè perforato, lætè aurantio, aperturâ subrotundâ, labro externo tenui, nigro marginato, labro columellari albo 1–2-dentato, dentibus inæqualibus munitis, dente inferiore minimo, fauce albo-margaritaceo.

Alt. $0\frac{7}{10}$, lat. max. 1, alt. apert. $0\frac{4}{10}$ unc.

Variat costis obliquis transversis.

With the last

Trochus (Margarita) purpuratus, sp. nov.

T. testâ turbinatâ, spirâ depressâ, prominulâ, anfractibus 5, convexiusculis, nitidis, lævigatis, striis incrementi minutissimis, roseolis fasciis spiralibus læte purpureis cinctis, suturis impressis, basi margine subrotundato, umbilico imperforato, albo, aperturâ subrotundâ, labro externo tenui, labro interno lævi, obsoletè undulato, albo-margaritaceo, faucibus purpureo-margaritaceis.

Alt. $0\frac{4}{12}$, lat. max. $0\frac{5}{12}$, alt. apert. $0\frac{2}{10}$ unc.

A beautiful little species. W. coast of N. America?

Trochus (Margarita) Hillii, sp. nov.

T. testâ latè turbinatâ, heliciformi, spirâ obtusâ, parvâ, depressâ, anfractibus 5 convexiusculis, lævigatis, politis, ad suturas appressis, flaveo-albidis, ultimo anfractu maximo, basi convexo, marginibus rotundatis, centraliter excavato, imperforato, aperturâ obliquè-subrotundâ, labro externo tenui, columellari leviter arcuato, albo; faucibus albo-margaritaceis.

Alt. $0\frac{4}{12}$, lat. max. $0\frac{5}{12}$, alt. apert. $0\frac{3}{12}$ unc.

From the northern shores of the W. coast of N. America?

I have dedicated this species to — Hill, Esq., Master of the 'Herald.'

Natica Pritchardi, sp. nov.

N. testâ subglobosâ, spirâ brevi, anfractibus 5, nitidis, sub lente striatis, flaveolis, fasciis transversis fusco-purpureis, angulato-undulatis flammulatis, in adulto obsoletis seu fascias obscuras spirales simulantibus; aperturâ ovatâ, supernè obsoletè angulatâ, columellâ costâ callosâ albâ spirali in umbilicum obliquè intrante, umbilico supernè perforato; faucibus fasciato-fuscatis. Operculo calcareo, albo, lævi, polito, sulco angustissimo prope margine externo, margine interno recto, crenulato.

Alt. 1 unc.; long. anfr. ult. $\frac{9}{10}$, lat. $\frac{9}{10}$ unc.; long. apert. $\frac{8}{10}$ unc.

Mazatlan. I have dedicated this pretty shell, which reminds us of the Atlantic *intricata*, to my friend Dr. Pritchard, Assistant-Surgeon of H.M.S. Calypso, who assiduously collected on the coast of Mazatlan, where he, as well as the officers of the 'Herald' and 'Pandora,' met with this species in abundance.

Planaxis nigritella, sp. nov.

N. testâ ovato-lanceolatâ, crassiusculâ, fusco-nigridâ, spirâ brevi, acutâ, anfractibus 6, spiraliter sulcatis, interstitiis latis, planis, *sulcis in medio anfractûs ultimi obsoletis, aperturâ ovatâ, patulâ, supernè unidentatâ, labro externo tenui, margine interno obsoletè crenulato, labro columellari, supernè striato, infernè abbreviato, lævi; canali brevissimâ, faucibus atropurpureis.*

Long. $\frac{5}{12}$, lat. $\frac{3}{12}$, long. apert. $\frac{3}{12}$unc.

Straits of Juan del Fuaco. The operculum is preserved in some of the numerous specimens, and has a subspiral nucleus.

Planaxis pigra, sp. nov.

N. testâ ovato-lanceolatâ, crassâ, flaveolâ, spirâ mediocri, acutâ, anfractibus 6, *planatis, lævigatis, aperturâ brevè-ovatâ, patulâ, supernè obsoletè unidentatâ, labris incrassatis, marginibus lævibus, canali brevissimâ, faucibus albis.*

Long. $\frac{4}{12}$, lat. $\frac{2}{12}$, long. apert. $\frac{2}{12}$ unc.

Its surface is invested with a soft yellow epidermis. The operculum is corneous, of subconcentric elements, with a lateral subspiral nucleus.

Pitcairn's Island.

Nassa Cooperi, sp. nov.

N. testâ lanceolatâ, turritâ, crassâ, anfractibus 6, *convexiusculis, spiraliter sulcato-striatis, longitudinaliter* 8-*costatâ; costis distantibus, fortibus, distinctis; anfractu ultimo* $\frac{1}{2}$ *longitudinis testæ æquante, aperturâ ovatâ, canali brevi; labro externo crasso, simplici; labro columellari reflexo, albo; caudâ albâ; anfractibus fuscis, obscurè albo-fasciatis.*

Long. $\frac{8}{12}$ unc., lat. anfr. ult. $\frac{4}{12}$, long. apert. $\frac{3}{12}$.

Marked from the Sandwich Isles. Dedicated to Lieut. Cooper, R.N., of the 'Herald.'

Nassa Woodwardi, sp. nov.

N. testâ lanceolatâ, turritâ, crassâ, albâ, rufo-fasciatâ, anfractibus sex convexiusculis, spiraliter sulcatis, longitudinaliter densè-costatis, spirâ vix longitudinem ultimi anfractûs æquante; aperturâ ovatâ, caudâ brevissimâ; labro columellari reflexâ, albâ; caudâ albâ; fauce striato.

Long. $\frac{5}{12}$ unc.; lat. $\frac{2}{10}$ unc.; long. apert. $\frac{2}{12}$ unc.

With the last. Dedicated to — Woodward, Esq., R.N., Purser to the 'Herald.'

Purpura analoga, sp. nov.

P. testâ turritâ, albidâ, spiraliter latè rufo-fasciatâ; spirâ exsertâ; anfractibus 5 *rotundatis, costis spiralibus* (6 *ad* 8 *in anfractu penultimo*), *quadratis, numerosis cinctis, interstitiis crenulatis, ad suturam obsoletis, labro subdenticulato.*

Long. $1\frac{4}{12}$, lat. $\frac{8}{12}$, long. apert. $\frac{8}{12}$ unc.

This species (from the Californian coast?) bears a striking resemblance to the Atlantic *Purpura lapillus*, and is intermediate between it and the *Purpura decemcostata* of Middendorff, from the Icy Sea at Behring's Straits, the place of which it probably takes on the western shores of North America.

Purpura, nov. sp.? A single specimen, to which I abstain giving a name, since its characters are intermediate between those of *de-*

cemcostata and *Freycinetii* (a Kamtschatka shell); it is probably a variety of the former.

PURPURA FUSCATA, sp. nov.

P. testâ oblongâ, subturritâ, fuscâ; spirâ brevi; anfractibus convexis, costis spiralibus (2 *in anfractu penultimo*) *paucis distantibus subsquamosis cinctis, interstitiis costis obsoletis; aperturâ dilatatâ, columellâ albidâ.*

Long. $1\frac{1}{12}$, lat. $\frac{8}{12}$, long. apert. $\frac{8}{12}$ unc.

A species of the *Lapillus* group. Said to have been taken at the Sandwich Islands.

Among the *Purpuræ* in the collection are *P. planospira*, *P. columellaris*, and *P. Carolensis*, all Galapagos species, and probably collected during the visit to those islands.

FUSUS KELLETII, sp. nov.

F. testâ crassâ, fusiformi, pyramidatâ, anfractibus 9, *spiraliter striatis, angulatis, noduloso-costatis, costis in anfractibus omnibus* 8, *prope suturam obsoletis excavatis appressisque; anfractu ultimo* $\frac{2}{3}$ *testæ occupante; aperturâ elongato-pyriformi, supernè angulato; infernè canali obliquo plus* $\frac{1}{3}$ *aperturæ æquante; labro columellari, reflexo, incrassato, labro externo attenuato, subdenticulato; caudâ incrassatâ, contortâ, reflexâ; colore sordide albido, ore albo.*

Long. $3\frac{1}{2}$ unc.; lat. max. anfr. ult. $1\frac{2}{10}$ unc.; long. apert. $2\frac{3}{4}$ unc.; long. caud. $\frac{9}{10}$.

This remarkable shell was taken on the Californian coast, and is very distinct from any known *Fusus*. In general aspect it closely resembles a *Fasciolaria*, reminding us strongly of the European *Fasciolaria tarentina*, but is greatly larger and has no plaits on the pillar lip. The striæ which wind round the whorls are grouped in twos and threes. They become very strongly marked and assume the character of sulcations on the caudal portion of the body whorl. The ribs are mainly developed a little above the centre on the angulated portion of the body whorl and on the lower halves of the upper whorls, so prominently as to appear like large tubercles.

I have dedicated this unique shell to the eminent conductor of this important expedition.

Fusus Oregonensis was taken on the Californian coast, and *F. salebrosus* on the coast of Mazatlan.

MISCELLANEOUS.

On a Parasite which is developed under exceptional circumstances on the surface of certain alimentary substances and causes them to appear covered with blood. By M. MONTAGNE.

AN extraordinary phænomenon has just passed under my eyes, to which I beg to call the attention of the Academy for a moment. I had already some knowledge of it from two memoirs which have treated of it specially, but had never witnessed it previously. Moreover this phænomenon is so rare, that I am not aware of its having ever been mentioned in this country. I am speaking of the development of a parasite, either animal or vegetable, which under certain circumstances attacks alimentary substances, especially pastry, communicating to them a bright red colour resembling that of arterial blood.

According to the interpretation of several historical facts given by M. Ehrenberg, who has published a very interesting and erudite work upon this production, its appearance in the dark ages must have given rise to fatal errors, by causing the condemnation of unhappy victims to capital punishments, for crimes of which they were totally innocent. It is in fact to this phænomenon that we must refer all those instances of blood found in bread, on consecrated wafers, &c. which the credulity of our fathers attributed to witchcraft or regarded as prodigies of fatal presage.

On the 14th of July last, I was at the Chateau du Parquet, near Rouen, with M. Aug. Le Prévost: every one knows, that for about ten days at that time the temperature had been exceedingly high. The servants, much astonished at what they saw, brought us half a fowl, roasted the previous evening, which was literally covered with a gelatinous layer of a very intense carmine red, and only of a bright rose colour where the layer was thinner. A cut melon also presented some traces of it. Some cooked cauliflower which had been thrown away, and which I did not see, also, according to the people of the house, presented the same appearance. Lastly, three days afterwards, the leg of a fowl was also attacked by the same production.

Examining it with a microscope of middling power lent me by M. Le Prévost, I readily convinced myself that it was the same thing which had been observed by M. Ehrenberg; for a specimen of it, developed upon cooked rice, which had been sent by M. Ehrenberg to Dr. Rayer some years since, had been submitted to my inspection by that gentleman.

Whether it be an animalcule (*Monas prodigiosa*) as M. Ehrenberg thinks, or a fungus (*Zoogalactina imetropha*) as M. Sette considers it, the individuals composing it are so extremely small that their diameter is not more than $\frac{1}{700}$ of a millimetre, and it requires a magnifying power of at least 800 diameters to observe them satisfactorily. This parasite is propagated with great facility when sown under favourable conditions,—in cooked rice for example placed between two plates or in closed vessels. M. P. Col, a chemist of Padua, has employed it in tinging silk various shades of rose colour.—*Comptes Rendus,* xxxv. p. 145.

IRISH MOLLUSCA.

To the Editors of the Annals of Natural History.

Windsor Lodge, Monkstown, co. Dublin,
September 16, 1852.

GENTLEMEN,—Upon my friend Dr. Battersby showing the specimens of *Cylichna* we took in Birterbuy Bay to Mr. Clark of Bath, he pronounced that they were the *Cylichna strigella*, and not the *C. conulus*, as stated in the September Number of the 'Annals.'

I am, Gentlemen, yours most truly obliged,
WILLIAM W. WALPOLE.

Directions for Making and Preserving Microscopical Preparations. By M. Harting of Utrecht.

[The following directions are translated, in a slightly abridged form, from different parts of Harting's work on the Microscope*. They have been selected as likely to prove useful to that now numerous class of students who prosecute original researches with the aid of the microscope. Personal experience enables us to attest the value of some of these hints; and the fact that Prof. Harting's unrivalled cabinet of microscopic preparations, comprising more than 6000 specimens put up with his own hands, is indebted for its completeness and preservation to the methods of manipulation here described, is sufficient evidence of their excellence.—Trans.]

Very few objects can be preserved unaltered when dry, and even when this is possible, as in the case of hairs, fish-scales, and the like, the method is not to be in general recommended. Such objects, when surrounded by air, possess too little transparency to permit a satisfactory definition of their component parts. It is only for preserving the scales of insects and certain *test objects* that the dry method is useful, and even preferable, from the superior distinctness with which it enables the observer to make out the different sorts of lines upon these bodies. The simplest mode of mounting these scales for microscopical examination, is to lay a few of them upon an ordinary glass object-slide, which may be moistened with the breath, if this is found necessary to make the objects adhere to it. A glass covering-plate, of suitable thickness, is then laid upon the object; and finally there is pasted round both slide and cover a piece of paper, having in its centre an opening corresponding to the position of the object.

Different specimens from the organic kingdom would, if simply put up in the dry way, speedily become the prey of vegetable and animal parasites. This is the case, for instance, with sections of organs like the lungs, preserved by inflation and subsequent drying. To prevent this disadvantage, I am in the habit of moistening such preparations with oil of turpentine, which, on evaporating, leaves upon the surface a very delicate varnish-like coating, which suffices for its protection.

Most microscopical objects, however, require to be mounted in some fluid, the nature of which must be varied according to the properties of the substance which it is wished to preserve. The fluids which I employ are the following:—

I. *Saturated Solution of Chloride of Calcium.*

1st, This solution, which must be perfectly free from traces of iron, is of very general utility, and may be employed in all cases in which the substance to be preserved is of moderate firmness or hardness. In this solution all preparations of bones and teeth, sections

* Het Mikroscoop, deszelfs gebruik, geschiedenis en tegenwoordige toestand. Utrecht. 3 vols. 1848–50.

of hairs, feathers, fish-scales, whalebone, &c., are best preserved. It may be also used with advantage for mounting specimens of many minute animalcules provided with a hard integument, such as cheese-mites, the itch-insect, small freshwater crustacea, and the like. It is likewise the best preservative for vegetable preparations, whose cell-walls or vessels have undergone a partial incrustation, and is also very useful for displaying the shells or *loricæ* of the siliceous Bacillariæ and Diatomaceæ.

In using it, one only requires to lay the object on a slide, and to moisten it with a drop of the solution, taking care, at the same time, to remove the air-bubbles which may be formed here and there. Two pieces of paper, corresponding to the thickness of the object, are next pasted to the extremities of the slide, and the whole is then covered with a second glass plate of the same size. If it should now be found that too little fluid has been applied to the object, or that part of it has run off, a drop of the solution may be applied to the edge of the slide, and will find its way between the glasses by capillary attraction. A piece of thin paper may be inserted between the glasses, to promote the flow of the fluid towards the preparation, or to rectify the position of the object when it has become displaced.

For attaching the strips of paper to the glass slides in this and other cases, the best material that can be used is starch paste, with which a little arsenious acid is mixed, in order to prevent the formation of a species of mould which is otherwise apt to gather round the preparations.—Vol. ii. p. 347–350.

Of late I have discovered a fault in this mode of mounting preparations. In many which have been preserved in drops of the chloride of calcium solution, there have formed numerous branches of a species of *Hygrocrocis*, which spread from preparation to preparation, and from box to box, threatening totally to destroy all specimens which have been put up in this way. I have consequently discontinued the practice of mounting specimens in chloride of calcium solution, to which the air still has access; and when I now employ this or any other fluid, am careful to exclude the influence of the atmosphere by touching the edges of the covering-plate with a cement which I have elsewhere described (see p. 314). This procedure has the additional advantage of not requiring the use of a saturated solution: it may be diluted, in proportion to the delicacy of the specimen, with from two to ten parts of water.—Vol. iii. p. 470.

II. *Canada Balsam.*

The method of mounting objects in Canada Balsam is too well known to require description.

III. *Creosote Solution.*

This fluid may be prepared either by distillation with water, or by filtering a saturated solution of creosote in one part of alcohol of s. g. 867, after mixing it with twenty parts of water. It is useful for all preparations of muscle, cellular tissue, tendon, ligament, cartilage, sections of bones and teeth which have been treated with acid, the fibres of the crystalline lens, &c. For the preservation of adipose tissue, of the ultimate nerve-tubes, and of the blood-corpuscles, it is not well adapted. Objects put up in it, after a certain time, usually acquire a brownish-yellow tint.

IV. *Solution of Arsenious Acid.*

To prepare this solution an excess of arsenious acid is boiled with water, which is then filtered and diluted with twice as much water. This fluid is one of the most suitable preservatives for preparations from the animal kingdom; all the tissues mentioned under the last head, and also the adipose tissue, may be kept unaltered in it; and as they acquire no yellow colour, or a far slighter tinge, during their immersion, I have of late years accorded a general preference to the arsenical over the creosote solution.

V. *Solution of Corrosive Sublimate.*

This is prepared by dissolving one part of corrosive muriate of mercury in from 200 to 500 parts of water. The strength of the solution must be varied according to the nature of the object to be preserved; hence it is well, when the required degree of concentration is not ascertained, to put up several preparations with solutions of different strengths. This procedure is especially applicable to blood-corpuscles, which can be preserved unaltered in no other fluid with which I have experimented. Thus the blood-corpuscles of the frog require a fluid containing $\frac{1}{400}$th of corrosive muriate; those of birds a solution of $\frac{1}{300}$th; those of mammalia and man $\frac{1}{200}$th.

These solutions are likewise useful for keeping the elementary parts of the brain, spinal cord, and retina, although all these structures, in whatever fluid they are put up, undergo some alteration. Cartilage, and the fibres of the crystalline lens, keep well in these fluids; but other fibrous tissues lose too much of their transparency when in contact with them. They may be used, however, for preserving muscular fibre, whose cross markings they render more distinct.

For preparations of delicate vegetable tissues, and, in general, of all tender organs in which it is desired to retain the starch globules and chlorophyl unaltered, for freshwater Algæ, Diatomaceæ, Confervæ, Infusoria belonging to the division Rotifera, &c., a solution containing $\frac{1}{400}$th or $\frac{1}{300}$th of corrosive sublimate is the best preservative with which I am acquainted.

VI. *Solution of Carbonate of Potash.*

This may be made of various strengths, with one part of the salt dissolved in from 200 to 500 parts of water, and is the best material for preserving the primitive nerve-tubes. Other fibrous tissues may be kept tolerably well in it, but become more transparent than in the fresh condition. This is sometimes advantageous, as, for example, when we wish to display the respiratory apparatus of insects with the ramifications of the air-tubes.

VII. *Solution of Arsenite of Potass.*

I have, in a few instances, made use of a solution of arsenite of potass in 160 parts of water, to preserve the primitive nerve-tubes. It has been found as effectual as the carbonate of potash solution.

In employing the chloride of calcium solution* and Canada Balsam, it is unnecessary to take measures to prevent the evaporation of the fluid. The first remains always fluid,—chloride of calcium being a deliquescent salt; and as the outer surface of the balsam hardens, the escape of the liquid portion is prevented.

But it is otherwise with the last-mentioned preservative fluids (Nos. III. to VII.). To prevent their evaporation, it is necessary to employ a cement or luting to prevent air from having access to the fluid. Different compositions have been recommended for this purpose; but I have found none more serviceable than that employed by gilders to make gold-leaf adhere to mirror and picture frames. The following is the receipt for the preparation of this so-called gold-ground or gold-size:—

Let twenty-five parts of linseed oil be boiled for three hours with one part of red lead (*menie*) and one-third of a part of umber, and then poured off. Next take white lead and yellow ochre, well pounded and divided, and mix them together in equal proportions. Successive portions of this mixture must be added to the oil, and well rubbed up and mixed with it, till a tolerably thick fluid is formed, which must be once more thoroughly boiled.

If now a preparation has been made, which it is wished to preserve in the chloride of calcium, or any of the five last-mentioned fluids, and if it can, without injury, bear a little pressure, the following manipulation is recommended:—

If the specimen is moistened with water, which during the preliminary examination is frequently the case, all superfluous fluid is in the first place removed with a little roll of bibulous paper, or with a camel-hair pencil, such as I have elsewhere recommended. The fluid at a little distance from the object may be wiped off with a cotton or linen rag, and the surface of the glass there made perfectly dry. A certain quantity of the preservative fluid is then placed upon the specimen, and this is most conveniently effected by using a dropping-flask. The amount of fluid should be such that it should afterwards perfectly fill the space beneath the covering plate; the proper quantity is soon learned by a few trials. Next a (square?) covering-plate, about two millimetres ($\frac{1}{12}$th of an inch) narrower than the object-slide, should be laid under the centre of the latter,—*i. e.* immediately beneath the part which it is destined to cover. A pencil is next dipped in the cement, and a square drawn with it upon the glass around the fluid containing the specimen, so that the cement shall extend from one to two millimetres ($\frac{1}{25}$th to $\frac{1}{12}$th of an inch)

* The author has renounced the practice of putting up preparations in this fluid, and permitting the access of air, for reasons given at p. 312. —Trans.

within the margins of the covering-plate. The latter is now to be placed upon the specimen, and its margins finally covered with the cement. If there is too much fluid beneath, the superfluity finds a channel for escape; an opening then takes place in the cement, below the cover, but is again closed, if care be taken to renew the application of the cement to the edges of the cover, when the superfluous fluid has been removed, or has dried up. In about two days, the outer layer of the luting will have become dry, but the inner layer remains soft for many weeks and even months. This is just what constitutes the excellence of the cement, for it never bursts and permits evaporation; and a great number of preparations which I have put up in this manner are at the present time, after the lapse of several years, quite unaltered. It is, however, of importance that the cement shall occupy a portion of the space between the object-plate and its cover; a mere anointing of the edges of the latter is never sufficient.

If the specimen be one which will not bear pressure without injury, it must be put up in some kind of cell, the depth of which must be regulated by the thickness of the object. The covering-plate must in this case be always smaller in diameter than the space between the outer margins of the cell. First, some preservative solution is placed in the cell, and then the object is laid in it; the upper edges of the cell are then touched with a little of the *gutta-percha luting**. The cell is then completely filled till the fluid even forms a convexity above its margins; if now the cover is applied, the superfluous moisture escapes, and no air remains in the cell. Finally, when the edges are dry, they must be covered with a thick layer of the luting, and with a second a few days afterwards.

The method last described is especially applicable to the preservation of injected specimens in a solution of arsenious acid.—Vol. ii. p. 350–355.

Preparation of Caoutchouc Cells.

In commerce we now obtain caoutchouc plates of different thicknesses. The thinnest measure about one millimetre ($\frac{1}{25}$th of an inch), and out of these plates of any required thickness may be formed, as their surfaces adhere perfectly together, especially if previously slightly heated. In a square piece of suitable thickness an opening may be made by means of scissors, or the centre may be cut out of a disc-shaped piece by means of a hammer and ring-shaped punch. To fasten the caoutchouc ring to the object-slide we use the following luting:—

One part of finely cut gutta-percha is mixed with fifteen parts of oil of turpentine, and dissolved in it by gently heating, and constantly stirring, the mixture. The solution is then poured through a cloth, to separate some impurities which are always to be met with in raw gutta-percha. To the purified solution there is added one part of shell-lac, which, by the aid of gentle heat and constant stirring, must be dissolved in it. The heat is then kept up until a drop of the solu-

* The reader will find the receipt for this composition, and directions for making cells of gutta-percha and caoutchouc, at the end of the present article.—Trans.

tion let fall upon a cold surface becomes nearly hard. The cement is then ready for use. If it is afterwards found requisite to melt it again, a little oil of turpentine should be added before applying the heat.

To attach the caoutchouc ring to the glass, proceed as follows:—Lay the ring upon the table, and above it place the glass object-slide, so that the ring occupies the centre of the slide, and a free margin of glass is left around it. A pencil is now to be dipped in the warm luting, and carried over the portion of the glass through which the ring is seen, care being taken to spread the luting in a thin layer, as the superfluous fluid would otherwise flow out from the edges. The ring is now removed from beneath the slide, and laid upon the spot marked out for it with the cement. The plate is next warmed by holding it over fire, and then laid, ring downwards, on a cold piece of mirror glass till the cement has become cool and hard.

Gutta-Percha Cells.

Gutta-percha, which, like caoutchouc, resists the action of almost all chemical agents, has, besides, the property of becoming soft and plastic in warm water, and can thus be fashioned into any required shape, which it retains on cooling and resuming its former consistence. Gutta-percha sheeting may be procured in commerce, like caoutchouc sheeting, of any thickness, and will be found very useful for microscopical purposes. Plates of this substance may be provided of various thicknesses, according to the required depth of the cells,—for example, from $\frac{1}{10}$th of a millimetre to three millimetres ($\frac{1}{250}$th to $\frac{1}{8}$th of an inch) in thickness. These plates must then be cut into square pieces, a little narrower than the glass slides on which they are to be fastened. The openings may be cut out with scissors, or struck out with a punch and hammer, the plate being laid upon a piece of cork. To fasten gutta-percha rings to the glass plates the cement recommended for caoutchouc is employed, and the process conducted in the same way, with this difference, that, after the last heating, which makes the gutta-percha soft again, pressure should be made upon it for a few seconds with a cold piece of mirror glass. The upper surface of the cell is thus rendered quite flat and smooth, so that the glass cover, when applied, is everywhere in contact with it. In this respect the gutta-percha cells are preferable to those of caoutchouc, the upper surface of which, especially about the edges, has always some degree of convexity.—Vol. ii. pp. 125–127.—*Monthly Journal of Medical Science*, April 1852.

ARENARIA SERPYLLIFOLIA.

Messrs. Hooker and Arnott observe (Br. Fl. p. 67): "Mr. W. Wilson finds a *var.* at Bangor with five stamens and the petals only a quarter as long as the calyx, which has prominent ribs." Mr. Babington copies the observation, 'Manual,' 3rd edit. p. 49.

Specimens agreeing with this description are not uncommon at this season on the sandy commons of Surrey; they appear to be only the autumnal state of the common plant.—SAMUEL OCTAVUS GRAY.

Note of the Observation of Cilia in Grantia. By William Murray Dobie, M.D., Annual President of the Royal Medical Society of Edinburgh.

The present somewhat dubious position of the Sponges in the systems of naturalists, leads me to hope that the following isolated observation may not be without its value, as an additional proof of the distinctly animal nature of these organisms.

At the end of last February, while residing for a short time at Marshalmeadows, near Berwick-on-Tweed, I had an opportunity of examining perfectly fresh specimens of a species of *Grantia*, in which very distinct and vigorous currents were in constant operation. Having scraped a portion of the gelatinous covering from the interior wall, and laid this on a piece of glass, and covered it with a thinner piece, I viewed the specimen through an achromatic microscope, amplifying about 150 diameters. The field of view was crowded with the minute granular cellules of the sponge, which, although they do not always show a distinct nucleus, are, I have no doubt, of the same nature as nucleated particles in general. These cellules were in a state of active and independent motion, and, when aggregated into masses, very much resembled some of the Compound Monads. When a single particle was seen isolated, the motion was of a jerking character, suggesting at once the existence of cilia, if they could have been seen. I now proceeded to a more accurate scrutiny. Another specimen was selected; a portion of the gelatine was diluted with water pressed from the interior of the sponge, and the whole covered with a film of glass of 1-120th of an inch in thickness. This I viewed with a very excellent 1-8th of an inch lens, by Smith and Beck, magnifying 450 diameters. The size and apparent motion of the cellules being thus greatly increased, I now could, without much difficulty, detect extremely attenuated cilia attached to every particle in the field of view, and lashing with considerable vigour. When the light and focus were adjusted with great care, I was able to sketch a considerable number of the individual particles. The average length of each cilium was equal to three times the diameter of the cellule to which it was attached. No perceptible difference in thickness could be observed throughout its entire length. Each cellule very strongly resembled some species of Monads. The motion ceased in all the particles very soon after separation from the general mass. I was able to repeat this observation several times in the *Grantia*. In the *Halichondria*, which I found at the same time, no currents could be seen. Only in one example could I find anything resembling ciliated particles, and that very imperfectly. No further opportunity presented itself for continuing these observations.

From this it seems evident, that in the *Grantia* the whole inner surface is lined with a ciliated epithelium, and that the currents are produced by the motion of these filaments.

I have little doubt that cilia will eventually be found to exist in all marine sponges, where currents are in operation, provided sufficient care be taken to examine the cellules, in perfectly fresh specimens, with first-rate instruments.

The evidence for the animality of the *Porifera* is, I think, more conclusive than some naturalists of the present day are inclined to admit. I feel assured that few botanists would be disposed to claim for these organisms a truly vegetable nature. The following peculiarities taken together seem sufficient to establish their true animal nature :—The existence of distinct currents in definite directions; vibratile cilia; ciliated locomotive gemmules; peculiar animal smell of burnt gelatinous matter. I may also mention the observations of Milne-Edwards and Audouin on the Irritability of *Tethea**. Dr. Johnston informs me, that some very recent observations on a large foreign species tend remarkably to confirm the statements of Audouin and M.-Edwards. Dujardin's interesting observations on *Spongilla* also tend to prove the sponge an animal†. He noticed the remarkable property which detached portions of the granular matter of *Spongilla* possess, of spreading into "*Expansions variables en lobes arrondis, comme certaines amibes.*" Both Dujardin and Professor Allen Thomson have observed cilia in the freshwater sponge; but the existence of cilia in marine sponges has, so far as I am aware, been always denied. In conclusion, I will only allude to Mr. J. A. Carter's interesting observation of species of *Spongilla* in the water-tanks in Bombay‡. Mr. Carter confirmed and considerably extended Dujardin's observations, but did not detect cilia. All these circumstances being considered, the animality of the *Porifera* will not, I think, be so equivocal as the following concluding sentence of Professor Rymer Jones's late article on the *Porifera* seems to intimate: "The admissibility of sponges into the animal series is indeed extremely problematical, and we doubt not, that among naturalists of the present day, the balance of opinion would be unfavourable towards retaining them in the rank, which they at present occupy in zoological classification §."—*Proceedings of the Royal Medical Society of Edinburgh.*

Experimental Researches upon the Process of Fecundation in Mosses. By M. H. Philibert.

The author in concluding his memoir gives the following *résumé* of his conclusions :—

1. The *archegonium* of Mosses is a true ovule.

2. The external envelope, which has been called *epigonium*, and which afterwards becomes the calyptra, is analogous to the nucleus of the ovule of the Phanerogamia.

* Hist. Nat. du Litt. de la France, vol. i. p. 78.

† Dujardin, Hist. Nat. des Infusoires, p. 305.

‡ Notes on Sponges. Trans. Med. and Phys. Soc. Bombay, No. 8. Reprinted in the 'Annals and Mag. of Nat. Hist.' New Series, April 1848. A second paper on the same subject appeared in the third volume of the 'Annals,' 1849.

§ Cyclopædia of Anat. and Phys. vol. iv. p. 70.

3. The membranous envelope which is concealed by the epigonium and which had not hitherto been observed, represents an embryo-sac.

4. The internal body, which afterwards becomes the seta and urn, is a true embryo.

5. In the Mosses, the embryo, instead of detaching itself from the parent plant to originate a new plant, is developed in its place and gives rise to a capsule filled with spores.

6. The organs called *antheridia* are true male organs, inclosing a fecundating matter.

7. This fecundating matter is introduced by the tubular neck of the epigonium.—*Comptes Rendus*, xxxv. 137.

METEOROLOGICAL OBSERVATIONS FOR AUG. 1852.

Chiswick.—August 1. Very fine: uniformly overcast. 2. Very fine: densely clouded. 3. Partially overcast: slight shower. 4. Fine: clear. 5. Fine: slightly overcast. 6. Showers: heavy rain. 7. Cloudy: clear. 8. Fine: clear. 9, 10. Very fine. 11. Constant heavy rain. 12. Heavy rain: cloudy. 13. Very fine: clear. 14. Very fine: heavy rain at night. 15. Foggy: clear at night. 16. Heavy dew: fine: overcast. 17. Densely overcast: frequent vivid lightning and distant thunder: chiefly sheet lightning till 11 P.M., then forked lightning, with heavy thunder and rain in torrents. 18. Very fine: cloudy, with lightning at night. 19. Very fine: clear at night. 20. Overcast. 21. Light clouds: uniformly overcast. 22. Overcast: clear. 23. Cloudy and fine. 24. Overcast and mild: rain at night. 25. Cloudy and fine. 26. Slight haze: very fine: clear. 27. Very fine. 28. Foggy: remarkably dusky and dark about 9 A.M.: very fine. 29. Very fine: densely overcast: light clouds. 30. Cloudy: very fine: clear. 31. Clear: very fine.

Mean temperature of the month .... 63°·67
Mean temperature of Aug. 1851 .... 62 ·79
Mean temperature of Aug. for the last twenty-six years ... 62 ·12
Average amount of rain in Aug. .... 2·44 inches.

Boston.—Aug. 1. Cloudy. 2. Fine. 3. Cloudy: rain P.M. 4. Fine. 5. Fine: rain P.M.: thunder and lightning. 6. Fine: rain P.M. 7, 8. Cloudy: rain P.M.: thunder and lightning. 9. Cloudy: rain P.M. 10. Fine: rain P.M.: thunder and lightning. 11. Rain: rain A.M. and P.M. 12. Cloudy: rain A.M. and P.M.: thunder and lightning. 13. Fine. 14. Fine: rain and hail P.M.: thunder and lightning. 15. Cloudy: rain A.M. 16. Fine. 17. Fine: rain P.M.: thunder and lightning. 18. Cloudy: rain early A.M. 19. Cloudy. 20. Cloudy: rain early A.M. 21—23. Cloudy. 24. Cloudy: rain A.M. and P.M. 25. Cloudy: rain A.M. 26, 27. Fine. 28. Cloudy: rain P.M. 29, 30. Fine. 31. Fine: rain and hail P.M.: thunder and lightning.

Sandwick Manse, Orkney.—Aug. 1, 2. Cloudy. 3. Cloudy: rain. 4. Bright: clear: fine. 5. Clear: fine: aurora. 6. Clear: fine. 7. Drops: clear: fine. 8. Bright: clear: fine. 9. Clear: fine. 10. Bright: fine: clear: fine: aurora. 11. Bright: fine: clear: fine. 12, 13. Bright: fine: cloudy: fine. 14. Bright: fine: clear: fine. 15. Clear: fine. 16. Cloudy: drops. 17. Fog: cloudy. 18. Drizzle: showers: clear. 19. Drizzle: bright: fine. 20. Showers: bright: fine. 21. Clear: fine: fog. 22. Fog: fine: fog. 23. Bright: fine: cloudy: fine: aurora. 24. Cloudy: fine: clear: fine. 25. Clear: fine: aurora. 26. Clear: fine: cloudy: fine. 27. Cloudy: fine. 28. Bright: fine: cloudy: fine. 29. Damp: clear: fine. 30, 31. Bright: fine: clear: fine.—This month has been very fine, warm and dry.

Mean temperature of Aug. for twenty-five years .... 54 ·75
Mean temperature of this month .... 60°·64
Average quantity of rain in Aug. for six years .... 3·05 inches.

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

Days of Month.	Barometer.					Thermometer.					Wind.			Rain.		
	Chiswick.		Boston. 8¾ a.m.	Orkney, Sandwick.		Chiswick.		Boston. 8¾ a.m.	Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Orkney, Sandwick.	Chiswick.	Boston.	Orkney, Sandwick.
1852. Aug.	Max.	Min.		9¼ a.m.	8½ p.m.	Max.	Min.		9¼ a.m.	8½ p.m.						
1.	30·037	29·937	29·46	29·90	29·88	82	52	73	60	58½	sw.	n.	wsw.	....	....	·16
2.	29·861	29·662	29·33	29·73	29·49	81	49	66	62½	58½	w.	calm	se.	....	....	....
3.	29·464	29·268	28·95	29·25	29·20	71	47	72	61½	58	s.	s.	sse.	·03	....	....
4.	29·419	29·338	28·83	29·15	29·28	72	46	60·5	61½	62	sw.	sw.	calm	·01	·06	·17
5.	29·458	29·439	28·95	29·33	29·38	74	47	63	63	62	s.	s.	......	·04	....	....
6.	29·398	29·353	28·90	29·35	29·33	68	54	66	63	61	s.	s.	e.	·42	·22	....
7.	29·336	29·298	28·80	29·22	29·18	74	52	67	61½	60	s.	sw.	se.	·12	....	....
☾ 8.	29·477	29·396	28·90	29·14	29·25	72	51	65	65½	60	w.	sw.	calm	·02	·34	·06
9.	29·523	29·499	29·00	29·34	29·39	71	47	67·5	62	61	sw.	sw.	se.	·06	·03	....
10.	29·631	29·583	29·08	29·46	29·52	71	49	60	63	60	sw.	sw.	calm	·28	·07	....
11.	29·351	29·123	28·98	29·53	29·49	67	52	58	63	60	s.	sse.	n.	·78	·48	....
12.	29·507	29·248	28·17	29·46	29·51	60	52	62	60	60	sw.	wnw.	n.	·47	·56	....
13.	29·760	29·611	29·12	29·51	29·65	71	49	62	60½	60	nw.	wnw.	n.	....	·14	....
14.	29·781	29·591	29·27	29·72	29·75	74	54	59·5	60½	55	sw.	wnw.	e.	·64	....	....
● 15.	29·866	29·293	29·07	29·76	29·89	70	47	59	60	57	ne.	ne.	e.	....	1·25	....
16.	29·930	29·917	29·47	29·85	29·79	71	62	64	61½	59	s.	sse.	se.	....	....	....
17.	29·914	29·678	29·37	29·62	29·48	76	59	69	65½	62	se.	s.	s.	·76	....	·07
18.	29·862	29·741	29·23	29·69	29·84	74	52	63	63	58	w.	wnw.	nw.	....	·67	·01
19.	29·930	29·909	29·40	30·04	30·10	70	55	65	61½	58	n.	n.	ne.	....	·09	·09
20.	30·074	29·991	29·50	30·05	30·12	64	57	60	58½	58½	n.	n.	......	·03	....	·06
21.	30·205	30·128	29·64	30·23	30·31	72	60	66	60	61	n.	n.	se.	....	....	....
☽ 22.	30·242	30·213	29·73	30·33	30·32	72	53	67	61	59	w.	n.	se.	....	....	....
23.	30·260	30·195	29·75	30·23	30·18	72	55	62	64	60	ne.	n.	s.	....	....	....
24.	30·168	29·995	29·60	30·04	29·95	71	55	70	62	56	sw.	ssw.	calm	·05	....	....
25.	29·915	29·882	29·30	29·84	29·87	73	56	65·5	60	56	sw.	sw.	calm	....	·19	....
26.	30·045	29·973	29·52	29·87	29·90	74	54	59	61½	62½	e.	se.	s.	....	....	....
27.	30·117	30·107	29·65	29·99	30·05	75	54	63	63	62	e.	ene.	se.	....	....	....
28.	30·040	29·993	29·57	30·03	29·97	76	57	64·5	67	61	sw.	calm	se.	....	....	....
○ 29.	30·024	29·969	29·47	29·84	29·88	76	47	65·5	63	58	se.	wsw.	calm	....	·17	....
30.	30·019	30·006	29·50	29·77	29·77	72	45	60·5	62	58	sw.	sw.	calm	....	....	....
31.	30·077	30·007	29·50	29·69	29·74	69	44	57·5	60	57	sw.	w.	sw.	....	....	....
Mean.	29·796	29·720	29·26	29·708	29·724	75·32	52·03	64·0	61·96	59·32				3·71	4·27	0·62

THE ANNALS

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XXX.—*On a new Genus of the Family of* Volvocineæ. By Dr. Ferdinand Cohn of Breslau*.

[With a Plate.]

The number of imperfectly known organisms in the animal and vegetable kingdoms is already so considerable, that to increase it might, under ordinary circumstances, be regarded rather as burdening than enriching science; this, however, is not the case in respect to forms which not only come to fill up a vacancy in systematic arrangement, but contribute, in the phænomena of their morphology and development, new material for the solution of more important and general questions. On these grounds I believe that the form which is now, so far as I know for the first time, fully described and figured, deserves the attention as well of botanists as of zoologists, both of whom will claim it as their own especial property.

I owe my first acquaintance with the elegant organism constituting the subject of this essay to my friend Dr. von Frantzius. During a journey through Tyrol in the year 1850, he observed at Salzburg a green mucilaginous colouring of rain-water which had collected in the hollow of a grave-stone in the churchyard of St. Peter; the colour was caused by the presence of innumerable colourless vesicles, moving about like Infusoria, containing eight small green globules arranged at regular distances at their periphery. They were accompanied by *Chlamydococcus pluvialis*, which is common in such hollows in stones. The first discoverer was M. Zambra, an optician of Salzburg, who was, as I am informed by Dr. Frantzius, the delineator of the figures in Werneck's

* Translated from Siebold and Kölliker's Zeitschrift für wissenschaftliche Zoologie, vol. iv. p. 77, 1852, by A. Henfrey, F.R.S., F.L.S.

celebrated illustrations of the Infusoria; this gentleman had regarded the moving globules as a new Infusorium, which he called the *wreath-animalcule*; Dr. Frantzius, on the other hand, looked upon it as a *microscopic Alga* which must form the foundation of a new genus (see Frantzius's Naturhistorische Reiseskizzen aus dem Salzkammergut und Tyrol, Siebold and Kölliker's Zeitschrift f. wiss. Zoologie, iii. part 3).

So much the pleasanter was my surprise in finding a large quantity of the elegant *wreath-animalcules* in a living condition, a few days after I received the above information. I had taken advantage of the Whitsuntide holidays of the past year (1851) to explore our Silesian highlands, and used that opportunity of seeking out the granite block, almost classic in the history of microscopic organisms, on which our first German lichenologist, Major von Flotow of Hirschberg, discovered his *Hæmatococcus pluvialis*, ten years ago. Through the friendly instructions of this distinguished naturalist I soon succeeded in finding the stone, which forms a bridge across a ditch in the neighbourhood of Hirschberg: lying in the path between the village of Grunau and its church, this stone has in the course of time been so worn away by the number of church-goers, that it now presents a large irregular hollow; in this the rain-water collects, which, like the stone itself, is inhabited by millions of *Chlamydococcus*-globules. When, however, I collected water from this place myself on the 17th of June, to my amazement I found, scattered individuals of the *Chlamydococcus pluvialis* indeed, but a far greater quantity of the inseparable companion of the *Chlamydococcus*, the beautiful rose-red Rotifer *Philodina roseola*, which always occurs with the red *Chlamydococcus*-globules in Silesia, at Liège and Giessen, in the lake of Neufchatel, and even in the eternal snow; and moreover I at the same time detected in the water numerous specimens of that elegant wreath-animalcule with which I had already made acquaintance from the sketches of Dr. von Frantzius. Major von Flotow informed me, at the same time, that he had seen this remarkable form as long ago as the end of June in the year 1846, and had applied to Ehrenberg respecting it, but had not received any answer from him. I brought home to Breslau a bottle of rain-water from this granite block, for the purpose of further investigation, and this furnished me abundant material for the following researches.

I. *Organization.*

The organisms I am now about to describe exhibit an extraordinary variety of size and shape, but they are all essentially of similar structure, and consist, as already mentioned, of *eight green spherical corpuscles having their central points situated at the cir-*

cumference of a circle (Pl. VI. fig. 3 *b, b*), *and of a large common envelope, enclosing the former as a colourless vesicle, at the equator of which are ranged the said eight green globes* (fig. 3 *a*).

The common envelope is bounded by a membrane wholly devoid of structure and transparent, so that it may be overlooked if the illumination be not properly modified, under which circumstances the eight green globes appear destitute of any common bond of union. But the *membrane* of the envelope always exists, and although very delicate and thin while young, it becomes thickened with age, and then possesses an evident breadth, albeit no compound structure can be detected. *The membrane of the envelope is absolutely rigid* and never changes its shape, excepting through the ordinary expansion of growth; therefore it is not only totally devoid of contractility, but is even elastic only in a slight degree.

In whatever direction the total organism may lie during its movements, the envelope always appears as a perfect, absolutely regular circle (figs. 1, 2); thence it results most decidedly that the *membrane of the envelope forms a sphere,* which may perhaps deviate but very little from the mathematical ideal. The diameter of the envelope varies between tolerably wide limits: while younger forms possess an envelope some $\frac{1}{80}$th of a line (0·028 mm.) in diameter, most attain one of $\frac{1}{50}$th (0·044 mm.), and the largest are as much as $\frac{1}{40}$th of a line (0·055) in diameter.

The phænomena in dissolution and during propagation prove that the membrane of the envelope immediately surrounds a colourless watery fluid, the refractive power of which does not differ from that of water. The envelope may therefore be regarded as a broad, spherical *cell* with a delicate structureless membrane, colourless and transparent like glass, *containing* a thin, water-like, colourless fluid; consequently I shall denominate it the *envelope-cell* (*Hüll-zelle*).

While the envelope-cell varies generally speaking only in size, and no difference whatever of shape and structure can be detected in the different individuals, the variations in the development of the *eight green globes* in its interior are very great (fig. 3 *b, b*). In fact it is difficult to represent the multiplicity of forms which here display themselves, so as to give a full and clear idea of them; and our figures even can afford but a very insufficient picture, since scarcely a single individual exactly resembles another, in this respect. The eight green bodies in the interior of each envelope-cell, which, for reasons to be given hereafter, I shall call *primordial-cells,* are in their simplest condition globular, and stand at equal distances in a circle at the largest circumference of the envelope-cell, so that the whole structure looks like a hollow glass globe with a ring formed of eight green globules in its interior (figs. 1, 3). If the circular line in which the centres of the eight primordial-cells stand, is regarded as the *equator of the envelope-cell*, we ordinarily find their position such that the equatorial zone lies parallel with the plane of the object-glass, and the observer consequently looks down upon the pole of the envelope-cell (figs. 1, 3, 14). In this, the *polar view*, the eight primordial-cells stand in a perfect circle and are placed very close to the circumference of the envelope-cell. The distances between the primordial-cells are more or less considerable according as they are proportionately larger or smaller; sometimes they constitute an elegant wreath composed of eight large green rosettes, almost without any intervals between them, or resemble an interrupted eight-angled star (figs. 1, 14); sometimes the green globules are so far apart as to look like the eight spokes of a wheel (fig. 3). The diameter of a primordial-cell in the polar view amounts, in the former case to $\frac{1}{180}$th of a line (0·012 mm.), in the latter to $\frac{1}{330}$th (0·0065), —on an average to $\frac{1}{250}$th of a line (0·0087 mm.).

When, however, the whole revolves, so that the axis passing through the two poles of the envelope-cell lies parallel with the stage of the microscope, and the equatorial zone marked by the eight green primordial-cells stands perpendicular to the latter, consequently in the optic axis of the microscope, the envelope-cell still looks like a circle, because it is a sphere; but the eight primordial-cells, lying in one plane, are then projected in a line which corresponds to the diameter of this circle, so that the whole resembles, under the microscope, a colourless disk cut in half by a green zone (figs. 2, 4, 5). And in this, the *equatorial view*, according to the position, the four primordial-cells in the anterior hemisphere sometimes completely cover the four behind, so that only four are seen altogether; sometimes the latter appear through the interspaces between the former, and all eight are seen in one line. This view also of course gives very different pictures according to the size of the primordial-cells and the distance between them (Pl. VI. figs. 2 & 4).

Between the polar and equatorial views lie countless intermediate positions in which the ring of primordial-cells, more or less contracted, appears as an ellipse, with its longest axis constantly in the diameter of the envelope-cell, while the shorter axis appears longer or shorter, and the separate primordial-cells are approached more or less towards each other according to the laws of projection (figs. 9 & 10).

Besides this difference of the aspect which one and the same individual affords merely in consequence of the different *positions* resulting from its movements, a still greater variation is displayed in the *shape of the green primordial-cells themselves.* I have called them globes above; properly they are always acuminated to some extent, in the form of a pear, toward the periphery of the envelope-cell, and they are imperceptibly attenuated to a point here, from which *two cilia* pass out (fig. 1). *These cilia therefore arise from the primordial-cells inside the envelope-cell,* and they emerge freely into the water through minute orifices in the latter: from the analogy with *Chlamydococcus,* I conjecture that there is a separate passage for each cilium, so that the orifices corresponding in each case to the primordial-cells are placed in pairs, and all sixteen orifices occur in the equator of the *envelope-cell.* Hence in the polar view the eight pairs of cilia go out from the circumference of the envelope-cell like elongated rays (Pl. VI. figs. 1, 3, 14).

The primordial-cells moreover *expand principally in the direction of the axis perpendicular to the equatorial plane,* so that in the equatorial view they appear, not spherical, but rather elliptical, or even sometimes stretched so considerably in this direction, that they become cylindrical or almost spindle-shaped, without undergoing any remarkable enlargement on the other axes (fig. 4 corresponding to fig. 3). If in this case the primordial-cells are large and near together, they form in the equatorial view a broad green zone inside the colourless envelope-cell, filling up a more or less considerable portion of this (fig. 2), while in the polar view they form only a circular wreath. In some instances the proper green body of the primordial-cells is only shortly cylindrical; but it becomes elongated at both ends into long beaks which reach almost to the poles, and give each primordial-cell something of the shape of the *Closterium setaceum* figured by Ehrenberg (Infusionsth. vi. 9). In this case the whole resembles a sphere surrounded by eight green bands placed in meridians and swollen only in the equatorial region. But even in this very frequently occurring, preponderating development of the one dimension, the cilia of each primordial-cell are sent out from the middle of its shorter axis, and when the primordial-cells appear projected in a zone, in the equatorial view, the motile cilia are visible only at four points of the diameter (Pl. VI. fig. 4).

The primordial-cells are very frequently developed unequally in the two hemispheres of the envelope-cell; they are not then divided into two equal halves by the equator of the envelope-cell, but show themselves crowded principally into one hemisphere, which they almost fill, and they reach almost to the pole there, while they occupy but a far smaller portion of the other, which consequently appears in greater part colourless (fig. 5). In such a case the primordial-cells almost touch with one end, while they diverge widely at the other, and thus they look like a kind of basket composed of eight pieces, like the gaping dental apparatus of a Chilodon.

Besides the two cilia which pass out from each primordial-cell, through the orifices of the envelope-cell into the water, the former very frequently send out other prolongations, which however do not perforate the envelope-cell. These are *colourless mucilaginous filaments, going out from each primordial-cell, especially from the ends of their longer axes,* and which hence present themselves especially clearly in the equatorial view. The ends of the primordial-cells are mostly not green but colourless, and elongated into numerous, likewise colourless, broader or thinner bristle-like processes, which run out like rays in all directions, are often ramified, and are attached to the inside of the envelope-cell, without however perforating it (figs. 2, 4, 5). If these filaments are much developed, they form a proper network, which maintains each primordial-cell floating in the common envelope. The extremities of the primordial-cells are also frequently divided dichotomously into colourless mucilaginous bands, which again branch into radiating filaments and thus produce the most wonderful forms. These colourless, filiform prolongations of the primordial-cells may also be seen in the polar view, stretching in all directions, and giving the total structure a most strange aspect, almost similar to that of a Xanthidium (Pl. VI. figs. 6, 7).

In the *internal organization of the primordial-cells,* all that can be made out is a green-coloured, softish substance of which they are composed, and in which numerous delicate granules or points are imbedded. When the primordial-cells are actively vegetating, they are of a transparent vivid green; but the colour exhibits various tints; in the youngest conditions it is purer, more yellowish green, less obscured by dark points; in the largest forms, on the contrary, the contents appear brownish green and opake, with the dark granules multiplied to such an extent, that the whole almost loses its transparency. In the middle of the primordial-cells are found *two larger, nucleus-like vesicles,* mostly symmetrically placed, and these examined separately appear annular, *so that they possess an internal cavity*; iodine colours them remarkably dark, with a violet tinge (figs. 2, 3, 4, 5). The centre of each primordial-cell is frequently occupied by a lighter circular space, which however does not vanish periodically, and therefore cannot be regarded as a contractile vesicle.

The primordial-cells are not surrounded by any special rigid membrane; and this is not only made evident by the multifold changes of form which they undergo in the course of vegetation, and by the filiform prolongations and ramifications which are produced directly from their substance, but is clearly shown by the transformations which the primordial-cells pass through in consequence of external influences. Under certain circumstances, namely, the filiform processes may be retracted, being torn away from the envelope-cell and taken up into the substance of the primordial-cells; the produced ends of the primordial-cells also disappear, the latter becoming rounded off into their original spherical or short cylindrical form. Such a change would be impossible if the primordial-cells were surrounded by a rigid membrane, such as that of the *envelope-cell* for example. Still more rapid and decided are the metamorphoses which the primordial-cells undergo in the interior of the envelope-cell, through influences destructive to the life of the organism. These phænomena, usually called *dissolution*, do not change the rigid envelope-cell at all; but they totally decompose the primordial-cells, depriving them of their form and dissolving them into a single structureless green mass, which lies upon the inside of the envelope-cell, frequently destroying all evidence of the origin from eight spheres, while not a trace of special enveloping membranes comes to light. These phænomena of dissolution moreover indicate that the envelope-cell, as I have already mentioned, is composed *of a delicate membrane enclosing a clear watery fluid*, which cannot be dense, gelatinous or mucilaginous, since it is readily displaced by the radiating filaments and the dissolved substance, and which therefore is very similar to pure water, if not exactly the same.

II. *Motion.*

The *cilia* which are protruded from the equator of the envelope-cell are but short inside this, but the portion projecting into the water is much longer and vibrates actively, thereby causing all the movements. During their vibration the cilia are difficult to detect; but when dried on glass, and still better by wetting them with iodine, they may readily be traced in their whole length, especially if sulphuric acid is added, this rendering them more distinct and giving them a darker colour. The motion of the entire organism, depending on the eight pairs of cilia, exactly resembles that well known in the *Algæ and many Infusoria*. First there is a rapid revolution round that axis of the envelope-cell which passes through its poles and stands perpendicular to the ring of primordial-cells, so that the envelope-cell rotates like a wheel upon its axle. In the polar view (figs. 1, 3) our form gives exactly the impression of a revolving wheel, while in the equatorial view (figs. 2, 4), where the primordial-cells are mostly elongated, it has more the aspect of a globe turning upon its axis. Besides this revolution on its axis, which endures throughout the whole life, there is an advancing movement, which produces a very irregular course; in this way these organisms *screw* themselves, as it were, onwards in the water. Sometimes they swim straight out with uniform rapidity, the pole going first, the rotating ring of primordial-cells standing at right angles to the course and appearing only in one line; sometimes they turn round, so that the equatorial plane presents itself as a circle again (in the polar view): they rotate thus round their centre without moving from the spot; then they set one pole forward and swim on in another direction, bend to the right or to the left, or turn quite round, mostly without any perceptible obstruction, move in curves of the most varied kinds, run round any point in spiral lines, come into different planes, sometimes ascending, sometimes descending; in short, they exhibit all those most complex and wonderful phænomena of locomotion, which we are acquainted with in the moving propagative cells of the Algæ, and, as I have demonstrated elsewhere*, in *exactly the same way* in the *Astomous* and *Anenterous Infusoria* (*Monadina*, *Astasiæa*, *Cryptomonadina*, &c.), and which certainly do not bear at all the character of purposing, conscious volition, but appear as an activity determined not indeed by purely external causes, but by *internal* causes in the organization and vital process. The collective idea of such motions is best represented by the course described by a top which runs through the most varied curves while at the same time constantly revolving on its axis.

I have endeavoured in vain to determine whether the rotation round the axis, in the organism here described, is constant in one given direction. To render such a determination possible, it would first of all be requisite that the rotating globes should allow the recognition of a right or left, or what is the same, a top and bottom, and the marking of these by morphological differences. Such a determination, however, is altogether impossible in very many cases, in our organisms, since the envelope-cell, as we have seen, is a perfect globe, while the primordial-cells are mostly symmetrically developed toward each end in the longer axis. Under such circumstances there exist no characters for the distinction of the two poles of the envelope-cell, to regard one as the upper, the other as the lower; and in the same cases to demonstrate a revolution in one fixed direction is altogether out of the question.

We might certainly distinguish the two poles by calling that the *upper* which goes first in the motion. In many cases such a difference is already given in the organization, where, namely, the primordial-cells are unsymmetrically developed, projecting

* Nachträge zur Naturgeschichte des *Protococcus* (*Chlamydococcus*) *pluvialis* (Nova Acta Ac. C. C. L. n. c. xxii. pars 2. p. 735).

chiefly into one hemisphere of the envelope-cell. In this way we possess at least the *possibility* of making out whether the revolution takes place to the right or to the left. But in both cases it is found that the rotation of the envelope-cell is not at all constant in *one* direction; for not only do different spheres revolve some to the right and others to the left, but even one and the same individual rotates for a time with striking rapidity towards the right, the rapidity gradually slackens, the globe rests for a moment, and the moment after it revolves towards the left, with gradually increasing rapidity, and after some time the rotation returns again in a similar manner to its revolution toward the right. Although, therefore, Alex. Braun describes a *constant* revolution to the left in the in many respects analogous swarming-cells of *Chlamydococcus* and the swarming-spores of *Œdogonium*, and to the right in the moving gonidia of *Vaucheria* and the families of *Pandorina**, I must assert, *that no such constant law of revolution exists in the structure here described*†.

III. *Systematic Position.*

In the foregoing pages I have confined myself to the simple description of the observed forms, without raising the question of the place which the organism here characterized occupies in the series of known beings,—in what genus, what natural family it is to be arranged; nay, above all, in which *kingdom of nature it is to be enrolled as a citizen.* The settlement of these questions is requisite before anything else, in order to arrive at an actual comprehension of the parts just described.

It is soon seen that it is easier to establish the nearest relationship, particularly the natural family, than to decide the question whether we have to do with an animal or a plant. It is evident at once, namely, *that the organism we have described belongs to the family of the Volvocineæ.* For not only do we find in it the two principal characters which are characteristic of this interesting family; the presence of a number of green globes, which, enclosed in a common colourless envelope, represent a family of cells (polypidom), together with the constant rolling motion which the *Volvocineæ* possess through almost the whole of their life,—but our form also displays, as we shall see hereafter, the third character of the *Volvocineæ*, that the separate globes propagate within the envelope. In fact, there exist the greatest analogies between the known genera of *Volvocineæ*, especially

* Ueber die Verjungung in der Natur, p. 227.

† According to my observations, an alternation of the direction of rotation occurs in *Chlamydococcus pluvialis* similar to that which I have described above (vide Nachträge, &c. *l. c.* p. 736).

Gonium and *Pandorina*, and the organism here described; and these genera are only essentially distinguished by the arrangement of the green globes or primordial-cells, which in *Pandorina* are placed on a spherical surface, in *Gonium* on a flat plane, while in our form they stand at the circumference of a circle. Since, however, this very law of arrangement is, in the family of the *Volvocineæ*, the most important criterion, on which the establishment of the genera depends, it follows, that we here have a peculiar genus, which I do not find described either in Ehrenberg's great work or in any later publication.

I owe to the friendly information of Major von Flotow the only notice which can perhaps refer to our form.

In the Berlin 'Haude-Spener's Zeitung' of the 28th of April 1846, namely, occurs the abstract of a paper read by Ehrenberg on April 24th before the Society of "Naturforsch. Freunde." This states that "in this spring he had observed a new generic form of the naked *animalcules* of the Berlin district, which was closely allied to the green plate-animalcule composed of sixteen corpuscles, called *Gonium pectorale.* Herr Werneck had already discovered an allied new form near Salzburg, which was not tabular but spherical, and formed of eight animalcules, and this he called *Stephanoma.* The new form consisted of 6–21 annularly connected animalcules, was tabular, and each of the corpuscles appeared to bear two proboscides or locomotive organs, with which it moved actively like a rolling wheel. It was denominated *Trochogonium Rotula.*"

So far as can be made out from this, unfortunately very imperfect and obscure statement, regarding which I could nowhere find any more minute details, the two genera, *Trochogonium*, Ehr., and *Stephanoma*, Werneck, are the only ones which admit of being placed in a parallel with our form. At the same time, Ehrenberg's *Trochogonium* cannot possibly be identical with the latter, since this is said to be composed of 6–21 globes, while the structure described here is never formed of more than eight green primordial-cells: moreover Ehrenberg says nothing of a spherical envelope; from the statement that its form is tabular and nearest allied to the genus *Gonium*, it seems rather to follow, that a flat envelope exists in *Trochogonium*.

On the other hand, a greater agreement is exhibited by Werneck's genus *Stephanoma*, which Ehrenberg himself mentions as a form generically different from his; and I should not hesitate to call my organism identical with Werneck's, if reasonable doubt were not excited by the expression of Ehrenberg, that the latter is composed of eight, not tabularly, but spherically combined animalcules. For in the above description no distinction is made between the shape of the envelope and the figure formed by the grouping of the primordial-cells. If, as the meaning of the words indicates, the eight separate cells of Werneck's *Stephanoma* composed a sphere, *Stephanoma* would agree with *Botryocystis Volvox*, inasmuch as the latter genus, furnished with an untenable diagnosis by Kützing, has been applied by Al. Braun to an actually existing being composed of eight (rarely four or sixteen) segments of a sphere surrounded by an envelope pretty closely investing them (Ueber Verjungung, &c., 170*).

Considering the impossibility of clearing up the relation of *Trochogonium* and *Stephanoma* to our form, from the materials to which I have access, it seemed to me requisite for the interests of science to regard the latter, for the time at least, as a peculiar new genus, and to apply a special name to it. I propose for this *Stephanosphæra* (wreath-globe), to combine in one word the characteristics of the genus, the wreath of primordial-cells and the spherical form of the envelope. Since, moreover, our form has been found in the two stations at present known, in the same way, in rain-water accumulated in hollows of stones, with *Chlamydococcus pluvialis*, and, concluding from the rarity of its occurrence, localities of this kind seem to be characteristic generally for the species, I shall assign to it the specific name of *Stephanosphæra pluvialis*.

IV. *On the Systematic Position of the* Volvocineæ *in general.*

The decision of the question whether *Stephanosphæra pluvialis* is to be placed in the animal or the vegetable kingdom is more difficult than the determination of the natural family to which it belongs. It coincides with the general discussion *whether the Volvocineæ as a whole are to be regarded as plants or animals.* The solution of this question is not only of great importance in a general point of view, but on it is essentially dependent the manner in which we have to interpret the conditions of organization observed in *Stephanosphæra*.

The earliest observer of the genera belonging to the *Volvocineæ* did not hesitate to regard the persistence and variety of their movements, which never seemed interrupted by an act of germination, as a proof of their animal nature. O. F. Müller already detected in *Gonium pectorale* almost all the details which investigation has reached since (Kleine Schriften, 1782, 15), especially that the entire organism is composed of a great number of separate animalcules held together by a common shield.

* In most works *Botryocystis Morum* is spoken of as a young form of *Pandorina*, and it was figured as such by Ehrenberg; but I have not been able to demonstrate any genetic connexion in the developmental history of the two genera.

Finally, after Ehrenberg had, by his researches on *Volvox globator,* solved the problem in the remarkable structure of that beautiful form, and declared it also, in correspondence with the structure of *Gonium,* a colony of numerous distinct monad-like animalcules combined into a polypidom, he furnished, by a series of important observations on the other genera of *Volvocineæ,* a revision of this family which marked an epoch in the knowledge of it, and even now, in spite of the varying opinions as to their anatomy and systematic character, must be esteemed as the profoundest and most perfect description of this group (Infusionsthierchen, 49–53). His researches went to place beyond doubt the animal nature of the *Volvocineæ,* which, indeed, had scarcely been questioned by any one up to that time. In agreement with his general view of the Infusorial structure, the *Volvocineæ* were regarded as Infusorial Animalcules,—with rigid bodies, with a mouth and many stomachs, but without intestinal canal, with a nervous system and eyes, with testes, spermatic vesicle and green ovules, and lastly, with one or two proboscides, which in many were enclosed in a common envelope or mantle. This mantle was supposed always, except in *Chlamydomonas, Syncrypta* and *Gyges,* to be open in front, so that the animalcules could protrude themselves some distance out and subsequently remove entirely, somewhat in the same way as the Rotifers *Melicerta* or *Tubicolaria,* from their sheaths. The single animalcules were said to propagate independently and develope into new polypidoms inside this mantle (*l. c.* p. 50).

This idea of the structure of the *Volvocineæ* has been almost universally accepted since the appearance of Ehrenberg's great work; and even those naturalists who, like Dujardin, offered opposition to Ehrenberg's doctrine, confined themselves to denying the existence of stomachs and sexual organs to the *Volvocineæ,* without in other respects doubting their animal nature (Hist. des Zoophytes, 307).

In the year 1844 Von Siebold was first led, by a comparison of the moving spores of Algæ with the true Infusoria, to the important declaration, that *besides* Closterium *and the* Bacillariæ, *very many of the* Volvocineæ *must be removed from the animal kingdom and placed among plants,* since they are destitute of the principal character of animals, *contractility.* "*Familiæ infusoriorum Volvocina . . . . plenæ sunt plantis inferiorum ordinum*" (De finibus inter regnum vegetabile et animalia constituendis, p. 12). This view was established * more in detail by Von Siebold in 1848 in his 'Lehrbuch der vergleichenden Anatomie' (p. 7), and

* A form related to the *Volvocineæ*, the genus *Gonium*, had already been described by Turpin as an Alga, under the name of *Pectoralina hebraica* (Mém. de Musée d'Hist. nat. xvi. 1828).

in 1849 in his essay "Ueber einzellige Pflanzen und Thiere" (Siebold and Kölliker's Journal, vol. i. p. 270; Ann. des Sc. Nat. Ser. 3. vol. xii. p. 138; Botanique, 1849).

At the same time scarcely a single botanist has hitherto ventured to claim as lawful property the family referred to the vegetable kingdom through Von Siebold's researches, which zoologists are just as little inclined to give up; and thus even in the last complete enumeration of the Algæ, Kützing's 'Species Algarum' has included only one single genus belonging to the *Volvocineæ, Botryocystis,* and this only in consequence of imperfect observation. Only a short time ago a most careful and successful observer, to whom the study of the moving spores of the Algæ owes its first establishment and recently its very complete elaboration, G. Thuret, has seen cause to conclude that the *Volvocineæ,* as well as the *Euglenæ* and even *Tetraspora,* are to be regarded as animals, since they are destitute of the principal character of all vegetable spores, germination (Ann. des Sc. Nat. 1850, Ser. 3. xiv. 214, 61; Recherches sur les Zoospores des Algues et les Anthéridies des Cryptogames).

Only in the last few years has a revulsion appeared to be preparing in this particular, since the study of the *Unicellular Plants* has acquired a greater extension and profundity; and it is in particular the merit of Nägeli to have investigated this hitherto neglected group with a criticism and a completeness of which very few other families can boast (vide his 'Neuere Algensysteme,' 1847, and 'Gattungen einzelligen Algen,' 1849). In consequence of his researches, Nägeli has ventured to include at least two of the forms belonging to the *Volvocineæ,* the genera *Gonium* and *Botryocystis,* among the Algæ.

Lastly, in the past year, the remarkable work of Alex. Braun, 'Ueber die Verjungung im Pflanzenreiche,' which contains a fund of the most beautiful observations explanatory of the forms standing on the limits between animals and plants, has also fully recognized the notions first set up by Von Siebold on this point, and included the whole family of the *Volvocineæ* in the vegetable kingdom.

I also have been led, by a series of comparative researches, to the conviction, *that the assignment of the character of an animal, even only of the lowest Infusorium, depends merely on a one-sided criticism of the conditions of organization; that, on the contrary, all analogy of structure and development, as well as the natural relationship, directly indicate to us, that the* Volvocineæ *are to be placed among plants, and indeed in the class of Algæ, in these again in the order of the Palmellaceæ, among which they form a special family.*

From the contradiction which this assertion has hitherto almost everywhere met, and since no special establishment of it has ever been given, it appears to me useful to examine the new genus *Stephanosphæra* more minutely from the point of view, by which the relationship of this as well as of the other *Volvocineæ* to plants will be made clear. I have also been led to consider it advisable to give the description of this new Alga in a Journal of Scientific Zoology, because zoologists alone have hitherto taken an interest in the forms of the *Volvocineæ*, and at present appear unwilling to give up to the botanist this interesting family, to which, however, as will be explained in the sequel, they have no valid claim. I may remark, however, that I shall confine myself here solely to *Stephanosphæra*, and reserve for another occasion the examination of the other genera, on which I have collected some new material.

V. *Relation of the* Volvocineæ *to* Chlamydococcus.

The most incontestable proof of the vegetable nature of all the *Volvocineæ* is furnished by their relationship to the genera *Chlamydomonas* and *Chlamydococcus*, the developmental history of which has been followed out in its most minute details during the last few years in the researches of Von Flotow, Alex. Braun and myself. The latter genus particularly, which, mingled with *Stephanosphæra*, imparts a red colour to cavities in stones filled with rain-water, has, as the most minutely investigated, furnished the most information not only regarding the general position of the *Volvocineæ*, but also as to the import of the individual portions of their organization.

Dujardin indeed thought that the genus *Chlamydomonas* and the closely allied *Chlamydococcus* ought to be separated from the remainder of the *Volvocineæ*, and that they should be embodied in his *Thecamonadiæ*, nearly the same as Ehrenberg's *Cryptomonadina*; but a more profound investigation, not only of the structure but also of the history of development, teaches us that *Chlamydomonas* (*Diselmis*, Duj.) possesses only external analogies with *Trachelomonas*, while this form, as Ehrenberg already discovered, exhibits the closest alliance to *Gonium* and *Pandorina*. The relation of the colourless envelope to the enclosed green globes, the position of the *two* cilia, which arise from the latter and pass out through the former*, and lastly the laws of division of the green cells inside the envelope, in powers of two, display themselves in exactly the same way in *Chlamydococcus* as in the rest of the *Volvocineæ*; and the only distinction between

* I have already mentioned this condition of the cilia in *Stephanosphæra*; it was detected by Focke in *Pandorina*, and was observed previously by Ehrenberg both in this and *Volvox*.

them consists in the circumstance that in *Chlamydomonas* (and *Chlamydococcus*) the individuals produced by the division of the green globes separate after the absorption of the parent-envelope, and live on as individuals, while in the other *Volvocineæ* the daughter-cells produced by the division of *one* green primordial-cell remain connected by the persistent parent-cell as by a common envelope, and move about as a well-defined body composed of many cells.

While *Chlamydococcus* is a *unicellular Alga in the strictest sense of the word,* never composed of more than *one* cell at any period of its growth, and each division forms the commencement of a new individual, the remainder of the *Volvocineæ* present themselves as *families of cells,* in which a definite number of equivalent cells are combined in some measure into an individual of a higher order. Consequently, *Chlamydococcus* bears the same relation to the rest of the *Volvocineæ* as *Pleurococcus* to *Palmella, Cyclotella* to *Meloseira,* or as *Vorticella* to *Epistylis,* and *Hydra* to *Campanularia* or *Tubularia.* On the other hand, *Trachelomonas* and the analogous forms do not belong to the vegetable kingdom at all, but are nearest allied to the *Astasiæa,* and appear as loricated *Euglenæ* (not as loricated Monads, as Ehrenberg assumed).

The researches of Alex. Braun, like my own, have proved most distinctly that *Chlamydococcus* can only be placed with propriety among the Algæ. It is distinguished, indeed, from the moving germ-cells by which far the greater part of the species of Algæ are propagated, both by a somewhat more complex structure and by the circumstance that the motion lasts for a very long time, and finally, by the power of the moving cells to propagate as such, without entering into the state of rest (germination), otherwise than as quite a temporary condition. But these objections touch only to some extent the specific character of *Chlamydococcus* and the *Volvocineæ* generally as unicellular plants; and they do not stand there among the Algæ altogether without intermediate conditions, as Alex. Braun has proved in his 'Verjungung' (*l. c.* 227)*, especially from the long movement of the *Volvocineæ.*

On the other hand, the external form, like the chemical and morphological organization of the contents, the laws of motion and the general physiological phænomena, especially however the behaviour in the transition into the condition of rest, in *Chlamydococcus,* agree so perfectly with the moving spores, the transformation of which into undoubted plants has been demonstrated with scientific clearness, that no unprejudiced observer

* Thuret found the swarming-cells of *Ulothrix mucosa* in motion after three days (Ann. des Sc. Nat. 1850, 248).

can discover an essential distinction. I have mentioned in my essay, that Ehrenberg himself, although he claims the moving condition of the forms allied to *Chlamydococcus* as *Infusoria*, has declared the resting-stage of this or a most closely allied genus to be *an undoubted Alga*; and yet the moving Infusoria are only a propagative form of the motionless Alga. Finally, I have succeeded in *demonstrating* the membrane of the cells of *Chlamydococcus* both in the resting, *and particularly in the moving stage, to consist of cellulose*, and thus of establishing the most important criterion of a vegetable cell we are at present acquainted with, the ternary composition of the cell-membrane, in the Infusorioid condition of *Chlamydococcus*. In fact, all the more recent close observers of *Chlamydococcus*, the number of whom is not inconsiderable, have almost without exception agreed in recognizing, *in all conditions of the development of this form, only a plant and nothing but a plant*.

Although I refer to the essay above cited in regard to the special physiological and developmental characters of *Chlamydococcus pluvialis*, I cannot omit to include here a sketch of its general course of development, because the key to the comprehension of the *Volvocineæ* generally, and the *Stephanosphæra* here described in particular, lies in that remarkable organism, and in it is revealed most clearly the complete conception of their vegetable nature.

The moving cell of *Chlamydococcus* is composed of two principal parts, a hyaline spherical *envelope*, which is formed of a delicate structureless membrane consisting of cellulose, and immediately surrounds colourless contents, perhaps consisting of pure water. In the centre of the envelope occurs a *coloured* globule, composed of the universal nitrogenous *protoplasm* or *mucus* of vegetable cells, coloured red or green by chlorophyll or a carmine-red oil, and containing imbedded in it numerous *granules of protoplasm*, as well as one or more large chlorophyll vesicles. This coloured globule is attenuated at the upper end into a colourless point; from this go out two cilia, which protrude into the water through two orifices in the membrane of the envelope and produce the movements of the whole. The inner coloured globule is not bounded by any rigid membrane, but merely by a thickened layer of protoplasm; hence its contour is very changeable and passes through manifold transformations in the course of its development. In particular it frequently becomes elongated in all directions into colourless radiating filaments, which keep the internal coloured globule suspended freely in the envelope, and are afterwards retracted in the course of the development (vide my Nachträge, &c. t. 67. A. figs. 27, 28).

The motionless cells of *Chlamydococcus* are of much simpler structure, and, like all forms of *Protococcus,* consist simply of a tough spherical cellulose membrane and green or red contents organized as primordial utricle. The history of development shows that under certain conditions the contents of the motionless cells become divided into a number of portions, which always correspond to two, or a power of two in their number; that these portions become organized into special primordial utricles, and as such break through the parent-cell, each developing two cilia, and by the aid of these rotating actively in the water. During their motion they excrete a delicate cellular membrane over their entire surface, which is gradually removed farther and farther from the primordial utricle by endosmose of water, until at length it becomes the wide envelope of the moving form described above (Nachträge, tab. 67. A. figs. 23, 35, 29). From this it follows that the latter forms do indeed possess on the whole the character of simple cells, but display some peculiarities in their structure and development, since the internal coloured globule corresponds originally to the primordial utricle of other vegetable cells, yet is not surrounded by a membrane, as usual, but suspended free in it like a cell-nucleus, while watery, unazotized contents appear between the membrane and the primordial utricle. For this reason I have called the enclosed coloured globule, which is formed first, and originally moves about without a special membrane in the manner of a cell, and corresponds to the primordial utricle of vegetable cells in general, the *primordial-cell,* and the enclosing membrane with its watery contents the *envelope-cell.* The moving *Chlamydococcus*-condition is capable of propagating as such, by the enclosed primordial-cell dividing anew, the individual portions slipping out of their envelope-cell and running through the cycle of development of their parent-cells. In passing into the state of rest, the enclosed primordial-cell secretes over its surface, inside its envelope, like every primordial utricle, a new tough cellulose membrane, and through this metamorphosis assumes the form of an ordinary *Protococcus-cell,* while the envelope-cell is dissolved (Nachträge, tab. 67. B. figs. 91, 92, 93). But only such primordial-cells behave in this way as are produced by the division of a *Chlamydococcus*-globule in a lower power of two; the primordial-cells originating from a 16–64-fold division move far more actively and do not secrete an envelope-cell; they are incapable of any propagation and pass immediately into the condition of rest (*l. c.* tab. 67. A. figs. 56–62, tab. 67. B. figs. 79, 80). Alex. Braun has called these forms of *Chlamydococcus,* which develope an envelope-cell, *macrogonidia,* and distinguished the smaller ones originating from multifold division, as *microgonidia.*

VI. *Comparison of* Stephanosphæra *with* Chlamydococcus.

If we now compare the conditions of organization of *Stephanosphæra* with those of *Chlamydococcus* which we have just indicated, we find the most essential agreement. In the first place the envelope-cell of *Stephanosphæra* corresponds exactly to that of the moving macrogonidia of *Chlamydococcus*; it is composed of a delicate colourless membrane and contents resembling water. Chemical actions to which I subjected the envelope-cell of *Stephanosphæra,* bear witness of this agreement in the most minute particulars. The envelope-cell is indifferent to acids and alkalies and is not dissolved in them; but it suffers a peculiar thickening by sulphuric acid which causes it to apply itself more closely to the primordial-cell, and present itself very distinctly and clearly defined. In general the application of *dilute sulphuric acid* is often the best means of making clear delicate vegetable membranes which would otherwise be readily overlooked, especially when iodine is added, which then ordinarily colours the membrane yellow. The cilia also are rendered more distinct by sulphuric acid. The envelope-cells of *Pandorina, Chlamydococcus* and *Volvox* behave in exactly the same way.

With regard to the chemical composition of the envelope-cell of *Stephanosphæra,* I have succeeded in demonstrating in it also the most decisive criterion of a vegetable membrane. Since Nägeli, in his comparison of the Unicellular Algæ with the simple animal cells, arrived at the result, that all distinctions hitherto proposed between the lowest forms of the two kingdoms are fallacious, and that the only decisive criterion must lie in the nature of the membrane, which belonged in animals to the proteine series, and in plants to the group of hydrates of carbon —since that epoch attention has necessarily been directed, in all amphibolic structures, to the investigation of the chemical composition of their membrane. I have *succeeded in demonstrating the characteristic reaction of vegetable cellulose, the blue colouring by iodine and sulphuric acid, in the envelope-cell of* Stephanosphæra. For this purpose it is requisite to allow a drop of *pretty concentrated sulphuric acid* to act upon the swarming *Stephanosphæra*-globes until the green primordial-cells in the interior are decomposed, by which time the proper transformation of the envelope-membrane has taken place, and a drop of solution of iodine (iodine in iodide of potassium), sufficiently diluted to prevent the sulphuric acid precipitating it in crystals, then produces a coloration of the envelope, which appears *at first violet, gradually becoming more intense, and at last beautiful indigo blue.* Thus the chemical behaviour of the envelope-cell in *Stephanosphæra,* as in *Chlamydococcus*, is the most evident proof that the organisms to which they belong cannot be regarded as Infusoria, but are simply Algæ. Moreover this behaviour of the envelope-cell of *Stephanosphæra* shows that the latter is bounded by a true cellulose membrane, and not, as is assumed almost universally of the *Volvocineæ*, and by Nägeli even of all Algæ, of secreted mucus or jelly*. The direct observation of the envelope-cell of *Stephanosphæra* likewise shows that this is completely closed in its normal condition, and only perforated by orifices in the spots where the cilia of each primordial-cell pass out. Not until a later stage, when the primordial-cells singly leave the envelope or have begun to progagate, does the membrane of the envelope tear, gradually collapse and become dissolved, so that the included globes can make their exit freely.

It is obvious that the eight green globes of *Stephanosphæra* correspond exactly to the primordial-cell of *Chlamydococcus*. The primordial-cells of *Stephanosphæra* consist in like manner of nitrogenous protoplasm, in itself colourless, which is coloured brown by iodine and almost wholly dissolved by caustic potash and ammonia. The protoplasm is coloured by the universal colouring matter of vegetables, *chlorophyll*; for alcohol and æther bleach the green globules, and concentrated sulphuric acid changes the green colour into a verdigris-green or blue—a reaction which, from my observations, is characteristic of chlorophyll (vide my essay on *Loxodes Bursaria*, Siebold and Kölliker's Journal, iii. 264).

The chemical nature of the fine granules in the primordial-cells which with age multiply, so that the primordial-cells at length lose their transparent green colour and appear dull, opake and olive-brown, is difficult to determine on account of their small size; they are either *protoplasm-granules*, or, as a bluish colour given by iodine might lead one to conclude, perhaps *starch-granules*. On the other hand, the *two darker nuclei* in each primordial-cell are undoubtedly the same structures which occur in *Chlamydococcus*, and in like manner not only in all the *Volvocineæ*, but also in most of the Algæ of the orders of *Palmelleæ*, *Desmidieæ*, *Conferveæ*, &c. Nägeli has called these *chlorophyll-utricles*, and demonstrated their universal occurrence in the vegetable kingdom by comparative descriptions (Gattungen einzelliger Algen, ii.). Ordinarily there exist only *two* in *Stephanosphæra*, which may be distinguished in the earliest stages, while among other *Volvocineæ*, for instance, *Gonium* contains only *one chlorophyll-utricle*. It is difficult to settle anything definite

* The common envelope of *Gonium* is certainly composed of a gelatinous substance without a bounding cellulose membrane.

concerning their structure and function; they must not be regarded as cell-nuclei, although they resemble them very much, especially when only one is present. Caustic potash, which destroys the rest of the contents of the primordial-cells, makes the chlorophyll-utricles of *Stephanosphæra* show themselves more distinctly as hollow rings, surrounded by a membrane which is rather granular; iodine colours them *deep violet*, which leads to the conclusion of the presence of starch *. Ehrenberg thought the chlorophyll-utricles were to be recognized as the testes of the *Volvocineæ*; it is certain, however, that these structures may be seen in greater or less number, in exactly the same way, in undeniable plants, such as *Hydrodictyon, Œdogonium, Mougeotia* and others (vide, among others, H. von Mohl's Treatise on the Vegetable Cell, in R. Wagner's Handwörterbuch der Physiol. pl. 1. figs. 20–24, and in the English Translation ditto).

I have already shown that the primordial-cells of *Stephanosphæra* as well as those of *Chlamydococcus* are destitute of a special rigid membrane; consequently they do not correspond to perfect cells, but on the whole only to primordial-utricles. In like manner the curious colourless mucous filaments which extend out from the extremities of the primordial-cell of *Stephanosphæra*, are evidently analogous to the rays which make one condition of the *Chlamydococcus*-cells look hairy (var. *setiger*, V. Flotow). They are merely prolongations of the colourless protoplasm forming the substance of the primordial-cells, and correspond pretty well morphologically to the reticulated branching filaments of protoplasm, the sap-currents as they are termed, which maintain the nucleus suspended freely in the interior of the cells of the articulations of *Spirogyra*, or of the hairs of the anthers of *Tradescantia*. Alcohol and acids cause these prolongations to be retracted into the substance of the primordial-cells; the same thing takes place during the course of the development. Ehrenberg has called these peculiar mucous rays, which also occur in some other *Volvocineæ*, in some cases a *tail* (*Synura, Uroglæna*), in others connecting canals or indications of a vascular system (in *Volvox* and *Gonium*). These protoplasm-filaments naturally present a different aspect according to the shape and arrangement of the primordial-cells: while they appear as a wreath of cilia in the globular *Chlamydococcus*-cell, in the more spindle-shaped *Stephanosphæra* they rather resemble

* It is well known that the chlorophyll-utricles of most of the Algæ, as well as the analogous chlorophyll-globules occurring in the cells of almost all Phanerogamia, secrete starch. Alex. Braun indeed has called the corresponding structures in *Chlamydococcus pluvialis* simply "Amylon-globules," in which may be detected an envelope and a nucleus (Verjungung, 222).

bundles of rays passing out from each end; in *Volvox,* if seen only from above, they give the individual primordial-cells a polygonal, radiating aspect, and form threads of communication between them: Focke has wrongly considered them as intercellular passages between the individual animalcules. The connecting threads in *Gonium,* on the other hand, are something quite different, and do not belong at all to the domain of the protoplasm-filaments, as I shall explain more fully at another opportunity.

Thus the microscopic analysis, like the chemical investigation of *Stephanosphæra,* in exact analogy with *Chlamydococcus* and the swarming-cells of the other Algæ, has enabled us to distinguish all the characters of a plant, but not one mark of a true animal organization, in particular not a trace of a mouth, stomach, and sexual organs. But the genus *Stephanosphæra* is thereby pre-eminently important for the decision of the question of the limit between the animal and vegetable kingdom, *because the history of its development affords the most convincing proof of the vegetable nature of this genus, and thus of all the other* Volvocineæ.

VII. *Development of* Stephanosphæra.

Both the very delicate envelope-cell and the widely distant, transparent green globular primordial-cells of the young *Stephanosphæra* are of a relatively small size. Both grow so much as to double their dimensions during their vegetation; the former acquires a tough membrane; the latter fill up the greater part of the envelope-cell, advance towards each other so as to touch, develope thicker, denser contents, and assume most curious forms through the ramification of the protoplasm-filaments. Finally the process of propagation shows itself in the primordial-cells. The radiating ends retract all their prolongations, and become rounded into a perfect sphere; the primordial-cells are now merely attached to the envelope-cell by their cilia, and thus are readily moved from their normal corresponding positions, and then appear devoid of any definite arrangement in the envelope-cell (fig. 8).

These changes take place in the course of the afternoon; towards evening more influential metamorphoses make their appearance. The primordial-cell, namely, extends itself predominantly in *one* direction in the axis perpendicular to the equatorial plane, consequently in the position which fig. 2 represents from above downwards. The two chlorophyll-utricles respectively repair to the two ends; the green contents likewise flow chiefly to the two sides, and leave a broad colourless zone visible in the middle, such as we observe somewhat in the same position in

Closterium (fig. 8). Finally the primordial-cell becomes constricted, gradually from the periphery to the centre, in the middle line, and is thus divided into two secondary cells, the septum of which, in the position above assumed, runs from right to left (in the diagrammatic figure 21 from *a* through *m* to *b* and *n*). Each of the halves cut off by the division then expands somewhat in the direction from left to right; a new constriction soon presents itself in the direction from above downwards (in the diagram fig. 21 from *c* through *m* to *d* and *n*); when this is complete, the originally globular primordial-cell is divided into four quarters (figs. 8, 9).

This process of constriction and cutting off is repeated *once more,* each secondary cell becoming divided by a new septum into two equal halves (fig. 10). The division takes place through two of the largest circumferences, passing from before backwards, and cutting the points *m* and *n* through which the two preceding septa passed: on the diagram fig. 21 these are represented by the circles *e, f, m, n,* and *g, h, m, n.* Since the originally globular primordial-cell has meanwhile only expanded in the direction of the two axes going from above downwards and from right to left, and is not enlarged in the third direction, from before backwards, the whole presents the form of a flattened spheroid, somewhat of the shape of one of our loaves (the shape of a *turban,* or of the bowls used on the bowling-green), which is divided into eight equal segments, meeting in the middle, by four ellipses distant 45° from each other, and intersecting in the axis of rotation (vide figs. 10, 13 & 21).

This process of division, by which each primordial-cell produces in the first generation two, in the second four, and in the third eight secondary-cells, is completed in the course of the night, so that early in the morning, in the long summer days even by 3 o'clock, we perceive each of the eight primordial-cells divided into eight in the manner described (figs. 10, 11). The generations produced in each case by this triple subdivison vary in the duration of their lives and in their capacity of development; the first two rapidly divide again, and therefore are, according to Nägeli's expression, mere '*transitional generations*'; the third alone arrive at complete development and persist a long time as such; these form the '*permanent generation.*'

The process of division does not always take place simultaneously in all the eight primordial-cells of *Stephanosphæra*; we not unfrequently find inside the same envelope-cell some primordial-cells still wholly unaltered, while others are already preparing to divide into two, a third perhaps already into four, and a fourth has already resolved itself into its eight secondary-cells (vide fig. 8). Very often most of the primordial-cells are found already completely separated into eight, while one or other of them is still wholly unaltered.

When the act of division has gone on favourably up to the point to which we have followed it above, some hours elapse before the young families of cells escape completely from the envelope. The process which precedes their birth consists principally in the more complete isolation, in a centrifugal direction around their common centre, of the secondary-cells produced by *each* primordial-cell. Since the parting off of the secondary-cells advances gradually from the periphery towards the centre, they are already completely individualized and separated by intercellular spaces at the periphery, while all eight remain still connected in the centre into a common colourless mucous mass filled with protoplasm-granules (fig. 11). But the flow of the contents from the centre to the borders, which continues up to this time, at length causes the constriction of the central mass of protoplasm also into eight parts; the eight secondary-cells then appear of a deep yellowish green externally, passing internally into colourless green towards finely granular beaks which are all connected in the centre, but become gradually attenuated, torn away and retracted (figs. 10, 11, 13, 14). Then the young primordial-cells become rounded into short cylinders and stand in a circle, without organic connexion, but placed closely beside one another: seen from above (in the polar view), under the microscope, they resemble a wheel with eight notches; from the side, examined in the equatorial view, we see four or eight short cylinders lying side by side, so that the whole is not unlike a small *Scenedesmus obtusus* (fig. 11 *a*).

The primordial-cell undergoing division behaves as a *whole* towards external things, until the parting off into eight is quite completed; that is to say, its two cilia move uninterruptedly, and consequently the entire *Stephanosphæra*-globe still rolls through the water according to the known laws, even when most of its primordial-cells have already become more or less completely divided into four or eight secondary-cells. Only shortly before the completion of the division do the cilia of the *parent-cell* lose their motion and disappear, it may be by being retracted or by being thrown off; but the orifices through which the cilia previously passed out into the water, may now be observed in the common envelope-cell, as minute points surrounded by a thickened border.

Immediately after that, it is seen that the newly-formed secondary-cells have developed their own cilia; for the young generations formed in the interior of the parent-envelope now begin to move and to roll over like a wheel, so far as the confined space allows of this (figs. 11, 12). In consequence of this movement of the eight small wheels rotating in the interior of the common envelope-cell, which constitutes a very pretty object, the parent-cell soon becomes enlarged and attenuated at certain points; the cellulose of which it is composed appears to be transformed into soluble jelly, and soon afterwards one after the other breaks through out of the common envelope and revolves freely and independently in the water, according to the same laws as the old spheres, but more actively and energetically. The young *Stephanosphæra* exactly resembles a green wreath composed of eight small cylinders, upon which by itself no envelope and cilia can be detected (fig. 13); but if killed with iodine, the eight primordial-cells are seen to be surrounded by a common envelope-cell in the form of an exceeding delicate membrane; only this lies in all parts almost immediately upon the green globes, so that it follows the waved outline they produce, and in its total form resembles a flat spheroid with eight notches on its border; it is perforated by the cilia, which go off in pairs from each of the primordial-cells; and two chlorophyll-utricles are already distinguishable in the latter (fig. 14). By degrees the envelope-cell is lifted up by the endosmotic absorption of water; its surface becomes smoothed out, and it appears circular in the polar view; *on the other hand, it retains for a longer time the form of an almost tabular spheroid, and hence presents an ellipse in the equatorial view* (fig. 15); finally it expands uniformly in all directions and thus acquires its normal spherical form, while at the same time it becomes considerably thickened. This whole process of propagation is completed during the night, and on bright days *Stephanosphæræ* are rarely seen in course of division at sunrise; on dull days they may be observed in this condition in the first part of the morning.

The primordial-cells, however, not unfrequently come to a standstill in the stage of division of the second generation, so that they only separate into four secondary-cells; these at once develope cilia and an envelope-cell, without dividing a third time, and make their exit from the parent-envelope in this condition. Here therefore only the *first* generation of each primordial-cell is a *transitional generation,* the *second* already a *permanent generation.* Hence arises the circumstance that we often find among other eightfold *Stephanosphæra*-globes, some in which the envelope-cell encloses only four primordial-cells standing at equal distances, which in other respects behave in the ordinary manner (fig. 7).

It is still more frequently observed, when the primordial-cells have already become constricted into four secondary cells and are beginning to divide again into eight, that this process of division is not perfectly completed in all four portions, but that the young *Stephanosphæra* already becomes free and developes the envelope-cell, *although one or other of the four quadratic segments of the sphere has become constricted but not parted off.* Hence originate monstrous forms, since the general envelope-cell then encloses only seven primordial-cells; but in these cases it is always observed that one of them is distinguished by most curious prolongations or mucous filaments, that it appears twice as large as the rest, that it contains four chlorophyll-utricles instead of two as is usual, and that it is also more or less constricted in the middle. All this furnishes proof, that here *one* secondary-cell of the second generation has not been divided the third time like the rest, but occupies by itself the space which is ordinarily filled by two. Very often only six (fig. 6), or even no more than five primordial-cells are found in one envelope-cell; but then two or three of these are twice as large as elsewhere*. In like manner Alex. Braun figures a *Pediastrum* composed of fifteen instead of sixteen cells, wherein one however is twice as large as the rest (Verjungung, t. ii. 20).

On the whole, it is obvious that the mode of propagation of *Stephanosphæra* already examined corresponds completely to that we are already acquainted with as *formation of macrogonidia* in *Chlamydococcus*. In both cases it depends upon the envelope-cell remaining unaltered, while the primordial-cells become divided, first into two secondary cells, and then so on in a lower power of two, each of the secondary-cells immediately developing two cilia, and secreting over its whole surface, as do all primordial-utricles of vegetable cells, a delicate cellulose membrane, which however becomes gradually removed further from the secreting primordial-cell through absorption of water. The only distinction between *Chlamydococcus* and *Stephanosphæra* arises from the formation of a special envelope-cell to each individual secondary-cell in *Chlamydococcus*, while in *Stephanosphæra* all the generations produced by division form *one* primordial-cell, become enclosed by a common envelope, and move away as *families of cells.* On the contrary, the developmental history of

* Only such imperfect division of a transitional generation gives the possibility of the green cells occurring otherwise than in a power of two, in *Stephanosphæra,* as in all the other *Volvocineæ,* in which the same law holds good; at most the normal number might be rendered imperfect by the emission of one or other of the cells which occurs sometimes. On the other hand, definitions like that of Kützing's *Botryocystis Morum,* which is pretended to be composed of six secondary- (primordial-) cells, evidently have their origin merely in imperfect observation and misapprehension of the law of division. In like manner, Ehrenberg's statement that the number of individuals in his *Trochogonium* varies from six to twenty-one, may depend upon a neglect of the proper character. In general, the earlier observers have frequently overlooked the constant numerical relations in the structure of the *Volvocineæ.*

Gonium, Pandorina and *Volvox* agrees in all essential particulars with the laws of propagation, which I have just described in *Stephanosphæra,* as will be shown elsewhere. We may call the mode of multiplication of the *Volvocineæ* by the general name of *propagation by macrogonidia.*

Another process is met with in *Stephanosphæra,* besides the above, and which I have observed more rarely, viz. *propagation by microgonidia.* In this mode of multiplication the introductory processes are exactly like those of the formation of macrogonidia; in particular each primordial-cell is at first divided into two, then into four, and lastly into eight secondary-cells. But instead of this third generation being permanent and becoming free, as is usual, it not unfrequently happens that the process of division is not arrested with the separation into eight; that the original primordial-cell becomes parted off a fourth, fifth, and even a sixth time, in the same manner, and *at length is broken up into a large number of cells* (16, 32, 64), which naturally are so much the smaller the greater number of times the subdivision into two has taken place (fig. 16). While, moreover, in the formation of macrogonidia, the secondary cells become surrounded by a common envelope, and are not free as an entire, connected family of cells, arranged according to a definite law, in the mode of propagation now described the *little secondary cells finally become totally separated from one another,* without secreting an envelope-cell, and in this way each of the eight original primordial-cells is broken up into 32–64 independent, green, elliptical or spindle-shaped corpuscles, which then separate from one another, commence an independent and active motion, and fill up, in great numbers (as many as 256–512), the common parent-envelope-cell. These little cellules—I shall follow the example of Alex. Braun and call them *microgonidia*—exhibit a very active and energetic motion inside the envelope-cell, hurrying very rapidly up and down in all directions in its cavity; producing by their great number that curious swarming which Alex. Braun has very aptly compared with the intermingling of a crowd of people in a confined area, where every one is constantly changing his place, while the whole together constantly occupy the same space. This *crowding in among each other* of the microgonidia of *Stephanosphæra* presents a picture fixing the attention in the highest degree; sometimes the cellules are scattered in a few large masses; then they unite again into a knot in the middle; every moment the general aspect varies (figs. 17 & 18). At length the common envelope is ruptured here also; then the microgonidia emerge one after another or in large masses, but free and singly, into the water (fig. 19 *a*). Their true form may be then readily detected by killing them with iodine; they are *spindle-*

shaped and acuminated at both ends, bright green in the middle, and run out into a colourless beak at each end, on the whole not unlike young *Euglenæ*, without trace of an envelope-cell; the extremity which goes first in their swimming bears delicate cilia; the *number of the cilia is four* (fig. 19). When the microgonidia reach the water they move most actively in all directions, and in a short time all the corpuscles emitted from an envelope-cell are scattered and disappear in the wide surface of the drop of water.

I have not been able to make out what becomes of the microgonidia subsequently, since they are ordinarily decomposed on the object-holder after a brief swarming; but it may be conjectured that they also serve for propagation, and probably pass into a condition of rest. At least the latter has been observed in the microgonidia of *Chlamydococcus pluvialis* by Alex. Braun and myself: the history of the development of the latter agrees wholly with those of the *Stephanosphæra*; they originate also by the division of the primordial-cell in a higher power, are distinguished by their minute size and more active, peculiarly Infusorioid movement, and never develope an envelope-cell during their movement. The microgonidia of both therefore are true primordial-cells; that is, primordial-utricles resembling cells, organized exclusively of coloured protoplasm, without any cellular membrane*. The only distinction between them is, that the microgonidia of *Chlamydococcus*, like their macrogonidia, possess *two* cilia, while in those of *Stephanosphæra* I observed *four*. That the microgonidia of *Stephanosphæra* correspond perfectly in morphological respects to the macrogonidia, and only depend upon a higher power of division, is proved by a case in which seven out of the eight primordial-cells in one envelope-cell were broken up into microgonidia, while *one* divided merely into *eight* secondary-cells; the latter were developed as macrogonidia and formed a connected wreath surrounded by an envelope-cell, which rolled slowly about in the parent-envelope, surrounded by the swarm of free, rapidly moving microgonidia (fig. 18 *a*). Alex. Braun has also observed a formation of microgonidia in *Chlamydomonas obtusa*; probably all the rest of the *Volvocineæ* have a formation of small isolated microgonidia which become free, as well as the ordinary propagation by large macrogonidia arranged in families of cells.

* In these, and generally speaking in most swarming-cells of Algæ, we have structures which in their development and independent individualization, their vital processes and their mode of movement, *behave exactly as cells, but are composed solely of cell-contents, without cell-membrane*; a proof that in the vegetable kingdom even the definition of the cell must be in many cases conceived in a more extended sense than might be assumed from the schemata of our manuals.

[To be continued.]

XXXI.—*Notice of an Australian* Diplommatina; *and Characters of new East Indian* Helicidæ *from Darjiling and Sincapore.* By W. H. Benson, Esq.

1. *Helix Cycloplax*, nobis, n. s.

Testa late umbilicata, orbiculato-depressa, supra confertim et undatim radiato-striata, striis spiralibus decussata, granulata, rufescenti-cornea, subtus leviori pallida, fascia mediana castanea circumdata; spira convexiuscula, apice planato, sutura obsoleta, demum impressa. Anfractibus 5 planatis, ultimo subcarinato (ætate juvenili acute carinato) antice dilatato, prope suturam antice tumidiusculo, subtus tumido. Apertura subquadrato-lunari, obliqua, intus interdum albido sublabiata, peristomate simplici, acuto, margine columellari non reflexo, cum basali angulum obtusatum formante. Umbilico profundo, perspectivo.

Diam. major 42, minor 34, axis 17 mill.

Hab. ad Darjiling, Himalayæ Sikkimensis montem. Teste R. Trotter.

I am indebted for this fine and interesting shell to Mr. Robert Trotter of the Bengal Civil Service, who collected it, with some other new shells, during a short visit to the Sanatarium of Darjiling, together with a single specimen of the scarce *Helix Orobia*, nobis, and some *Cyclostomata* previously described. Darjiling is situated at an altitude of more than 7000 feet above the sea level.

The shell is nearly related to *H. Oxytes*, nobis, an inhabitant of the mountain group south-east of the Burhampooter river, but it is at once distinguished from it by its sculpture, less acute periphery in the adult, the formation of the last whorl anteriorly, the more tumid base, &c. *H. Oxytes* will be found figured in Reeve's 'Conchologia Iconica' at plate 23 of *Helix*, species 734. In the same and two following plates, many of the *Helices* described in former Numbers of the 'Annals' are represented, besides some other Indian species. It should be remarked, however, that the figure of *H. crinigera* being magnified, and a greater vertical depth being assigned to the mouth than it actually exhibits in proportion, the shell is made to resemble too closely *H. Guerini*, another species from the same quarter, with which I compared it, but from which it is quite distinct. The other figures are very characteristic, particularly those of *H. Ampulla, Cysis, Thyreus, solata, Cestus*, and *radicicola*.

2. *Helix Tugurium*, nobis, n. s.

Testa perforata, depressa, tenui, supra exilissime radiatim costulato-striata, striis spiralibus decussatis, subtus lævigata, luteo-cornea, spira depresso-conoidea, apice acutiusculo. Anfractibus 6 planius-

culis, ultimo ad periphæriam subcarinato, subtus convexiusculo; apertura obliqua, late lunari, intus remote albido-sublabiata, peristomate simplici, acuto, margine columellari breviter subreflexo.
Diam. major 19, minor 16, axis 10 mill.
Hab. ad Darjiling. Teste R. Trotter.

The sculpture of this species is peculiarly delicate and beautiful. The labiation near the aperture forms exteriorly a yellow band similar to those observable in several other Himalayan *Helices,* and in the species *H. verticillus* and *Smyrnensis* of Southern Europe and Asia Minor.

3. *Helix Castra,* nobis, n. s.

Testa mediocriter umbilicata, depressissimo-conica, tenui, exiliter oblique acuto-striatula, cornea; spira ad apicem obtusa, suturis marginatis. Anfractibus $5\frac{1}{2}$ planulatis, ultimo ad periphæriam acutissime carinato, subtus planiusculo; apertura oblique subquadrata, margine acuto.
Diam. major 12, minor $10\frac{1}{2}$, axis 4 mill.
Hab. ad Darjiling. Teste R. Trotter.

This shell, approaching in form to *H. Cyathus,* Pfr., figured in the 'Conchologia Iconica' at no. 139, bears much resemblance to the Javanese species *H. Zollingeri* of the same author, represented in 'Conchologia Iconica' at no. 605, but differs in sculpture, marginate suture, less obtuse spire, and colour.

4. *Helix Lychnia,* nobis, n. s.

Testa imperforata, valde depresso-conica, tenui, translucente, polita, fusca; spira conica, obtusiuscula, suturis marginatis. Anfractibus $6\frac{1}{2}$ angustis, planiusculis, ultimo vix latiori, ad periphæriam acute compresso-carinato, subtus convexiusculo, medio excavato; apertura vix obliqua, angusta, securiformi, peristomate simplici acuto, margine inferiori arcuato, versus periomphalum leviter incrassato.
Diam. major vix 12, minor 11, axis $5\frac{1}{2}$ mill.
Hab. in Insula Sincapore. Teste Dr. J. F. Bacon.

This pretty species, remarkable among the depressed conic forms for its imperforate base and closely wound spire, was found by Dr. J. F. Bacon at Sincapore, where it does not appear to be scarce. A small specimen of *H. Janus,* Chemnitz, accompanied *H. Lychnia* from the same locality, to which it had not previously been assigned, the recorded habitat being Mount Ophir, near Malacca.

5. *Helix lubrica,* nobis, n. s.

Testa perforata, depressa, obsolete radiato-striata, politissima, luteofulvescente vel olivacea; spira planiuscula, apice vix prominulo, obtuso, sutura leviter subcanaliculata. Anfractibus 5, ultimo rotundato, basi convexo; apertura late lunari, vix obliqua, peristomate acuto, intus interdum subremote albido-labiato, margine columellari oblique descendente, subsinuato, leviter incrassato, superne reflexiusculo.

Diam. major 24, minor 20, axis 11 mill.

Hab. ad Darjiling.

Distinguished by the proportion of the whorls and other characters from *H. resplendens,* Philippi, and from *H. vitrinoides* also by the greater depth of the last whorl, and the characters of the mouth. I have long possessed the pale-coloured variety from Darjiling; the acquisition of a second dark-coloured specimen from Mr. Trotter has confirmed the distinctness of the species.

Pfeiffer has ascribed his handsome reversed species, *Helix Bajadera,* to Bengal, on the authority of Cuming's collection. I have always held this habitat as more than doubtful; no specimen having ever been detected in any quarter of the Bengal Presidency by myself or my fellow-labourers in this field. I am now enabled to announce the true habitat as Bombay, a small, but characteristic specimen having just been transmitted to me by Mr. T. Jerdon from that locality. The habitat of *Helix vitellina,* Pfr., is recorded as unknown; a shell received from the same indefatigable naturalist, from the base of the Nilgherries, belongs, without doubt, to that form.

6. *Clausilia Iös,* nobis, n. s.

Testa vix rimata, fusiformi, oblique costulato-striata, pallide cornea, spira gradatim attenuata, apice obtusiusculo; anfractibus 8–9, vix convexiusculis, ultimo ad basin rotundato, antice fortius remotiusque costulato; apertura pyriformi, lamellis subæqualibus, inferiori furcata; plicis palatalibus duabus, 1^{ma} longissima, a sutura remotiori, 2^{nda} obliqua, brevi, a lunella, satis distincta, interdum vix divisa, subcolumellari immersa; peristomate continuo, superne soluto, undique breviter reflexo.

Long. 13, diam. 3 mill. Apert. long. 3, lat. 2 mill.

Hab. ad Darjiling. Teste R. Trotter.

This is the third species which has been discovered in the Northern Dependencies of the Bengal Presidency, and the second only from the Cis-Gangetic Territory. The others are *Cl. loxostoma,* nobis, described in 1836 from specimens obtained from the Khasya Hills to the south-east of the river Burhampooter, and *Cl. cylindrica,* Gray, discovered by Capt. Hutton at Simla, near the Sutlej in the Western Himalaya, and found subsequently by myself ranging through the mountain chains of Sirmore and Kemaon towards the river Gagra.

None of the species of this genus are to be met with in the Gangetic plain, nor have any yet been obtained to the south and west of the Ganges, although the conditions under which several fine species thrive on the eastern side of the Bay of Bengal, and even across the equator in Java, are equally present in Southern India. Under these circumstances, it seems that the vast alluvial country which stretches from the mouth of the Indus, in an immense arc, to the Delta of the Ganges, has proved an impassable barrier to this genus, which delights in a moist mountain climate, whether in cold or warm latitudes.

It may not be irrelevant to notice in this place an interesting fact in the geographical distribution of the terrestrial Mollusca. In 1844 I established in this Journal the genus *Diplommatina* for two small shells with a peculiar animal from the Western Himalaya. Captain Hutton has a third sinistrorse species, with a tubercle in the aperture, from the same quarter. I know not if it be identical or not with *Diplommatina Huttoni* of Pfeiffer, also from India, described in the unpublished Proceedings of the Zoological Society for 1851. In July last I had the satisfaction of detecting a fourth species among the East Australian collections of Mr. Strange, by whom it had been considered to be a *Pupa*. It is also sinistrorse, and has all the characteristics of the genus, including the double peristome. I referred the genus to the *Carychiadæ*, with reference to the absence of an operculum, which neither Capt. Hutton, Dr. Bacon, nor myself had been able to detect in the living animal. Dr. J. E. Gray, in his *Cyclophoridæ* of the British Museum, has placed *Diplommatina* among the operculated land-snails, and describes the operculum, in specimens of *D. folliculus* from Capt. Boys' collection, as being thin and shelly, with few whorls and prominent lamellæ on their outer edges. Mr. Strange failed to observe any operculum in the species which he found on the promontory of Point Danger, where it occurred, like its Himalayan congeners, under damp decayed leaves. This is not to be wondered at when that accessory piece evaded the examinations which both Capt. Hutton and myself instituted on living specimens with the view of discovering its existence, assisted, in my own case, by glasses of moderate power.

Dr. Pfeiffer, in his amended conspectus, follows Gray in considering *Cyclostoma minus* of Sowerby, a Philippine shell, to be a *Diplommatina*; and in referring the genus to the *Cyclostomacea*. Neither Sowerby nor Pfeiffer appears to have seen the operculum of *D. minor*. Its larger size, although not so great as in Sowerby's magnified figure, would show the operculum plainly if present. Pfeiffer, in the 'Conchylien Cabinet,' noticed the anomalous character of this species. It wants, however, the double peristome of the typical species.

Malvern, September 16, 1852.

XXXII.—*On the Priority of the Term* Polyzoa *for the Ascidian Polypes.* By George Busk, F.R.S. &c.

To the Editors of the Annals of Natural History.

Gentlemen,

From the published Reports of the discussions, in the Zoological Section of the British Association at Belfast, it would appear that there is still some difference of opinion among naturalists as to the proper appellation of the Ascidioid Zoophytes. As, however, questions of this kind cannot be too soon definitively settled, and as, in a Catalogue of the Marine Species in the British Museum Collection, I have, not without consideration, adopted the term 'Polyzoa,' you will perhaps allow me to say a few words in justification of the use of that term instead of 'Bryozoa.'

The question, at least as I understand it, appears to be of a very simple nature and to admit of a very easy solution.

Mr. J. V. Thompson's memoir, constituting the 5th Part or Number of his 'Zoological Researches,' in which the term '*Polyzoa*' is for the first time employed, and its explanation given, was published in December, probably on the 1st of December 1830—of this there can of course be no doubt.

Ehrenberg's paper on the Corals of the Red Sea, in which the term '*Bryozoa*' is first proposed, was read, or rather was in part read, before the Berlin Academy on the 3rd of March 1831. It was not, however, completed till December 1833, nor published till February 1834. The former date, however, only is of consequence here, because in June 1831, that Part of 'Symbolæ Physicæ' containing the "Animalia evertebrata" may be said to have been published;—though it was probably not really published till long afterwards.

The evidence upon which these dates rest is short and satisfactory.

1. With respect to the Paper on the Red Sea Corals. This paper is given in the volume of Berlin Reports, professing to contain those papers which were read before the Academy in the year 1832, and which volume was published in 1834. It appears somewhat remarkable that Ehrenberg's paper is the only one in the whole volume which was not read in 1832. It has for its title, "Beiträge zur physiologischen Kenntniss der Corallenthiere im Allgemeinen, und besonders des Rothen Meeres, nebst einem Versuche zur physiologischen Systematik derselben," and bears the prefix, "(Gelesen in der Academie der Wissenschaften, am Marz 3, 1831—mit Zusätzen, gedruckt am 1 Dec. 1833)." Allowing, therefore, the earliest date for the *quasi* publication of

this paper, it is at least three months later than that of Mr. J. V. Thompson. This, however, appears to me a mode of stating the point far too favourable to Ehrenberg. From the prefix above quoted, and still more from intrinsic evidence, it is clear that part at least, and probably a very great part of the paper as it now appears, was not written till 1833, as it was certainly not published in a complete state till after February 1834. From the paper itself it is impossible to say what part was read in 1831, and what added or altered afterwards; and I cannot avoid the remark, that it appears not a little discreditable to the publishing management of the Berlin Academy, that such a confusion of dates should be allowed to exist in memoirs published under their direction. The fact is, that with respect not only to this paper, but also to a second by Ehrenberg in the same volume of Reports*, which was read on the 22nd of March 1832, but not "revidirt und gedruckt" till February 1834, as no means exist by which it can be determined what part was really read at the times specified, and what subsequently added or altered, the only just and safe way of applying them in questions of date would be to take that of their final and real publication, viz. 1834.

2. With respect to 'Symbolæ Physicæ,' no difficulty whatever exists in our assigning the date of 1831 to the Part with which we are here concerned, viz. that containing the "Animalia evertebrata, exclusis Insectis." For in the first place, that is the date given to it upon the cover in which it is stitched; and in the second place, Ehrenberg himself in the former paper above referred to, p. 254, gives the date of that Part of 'Symbolæ Physicæ' as June 1831. Moreover, though the further citation of evidence is supererogatory, in the commencement of the same paper read March 3, 1831, he styles it a precursor "Vörlaufer," to the further details which he intended to give in 'Symbolæ Physicæ'; and again in the latter work itself, he adverts to the above paper as having been read before the Academy "some months previously," "abhinc aliquot menses."

With reference to the other portions of 'Symbolæ Physicæ,' (leaving out of the question that or those containing the Insects, by Klug) as they are not concerned in the present inquiry, I would merely remark, that in them, as in the papers read before the Berlin Academy, such a confusion of dates appears to exist, that notwithstanding the title-page and preface, both of which are dated 1828, it would seem from intrinsic evidence that a consi-

* "Ueber die Natur und Bildung der Corallenbänke des Rothen Meeres," &c.

derable part, if not the greatest part, cannot have been published before 1833 or 1834.

Having thus endeavoured to show that the term 'POLYZOA' has a priority over 'BRYOZOA' of at least three, or more correctly perhaps of six months, I cannot conclude without an additional observation upon the former term, which after all does not appear to be used at present with strict propriety. It seems to have escaped notice that the word 'Polyzoa' is employed by Mr. J. V. Thompson in the *singular* number, with the plural 'Polyzoæ,' which latter term ought in strict right therefore to be employed as the appellation of the Ascidioid Polypes. As, however, the word has come to be generally employed, and, as far as regards rules of construction, much more correctly employed, in the plural sense, it may probably now be allowed to remain in peace and to claim universal adoption.

I am, your obedient servant,

GEORGE BUSK.

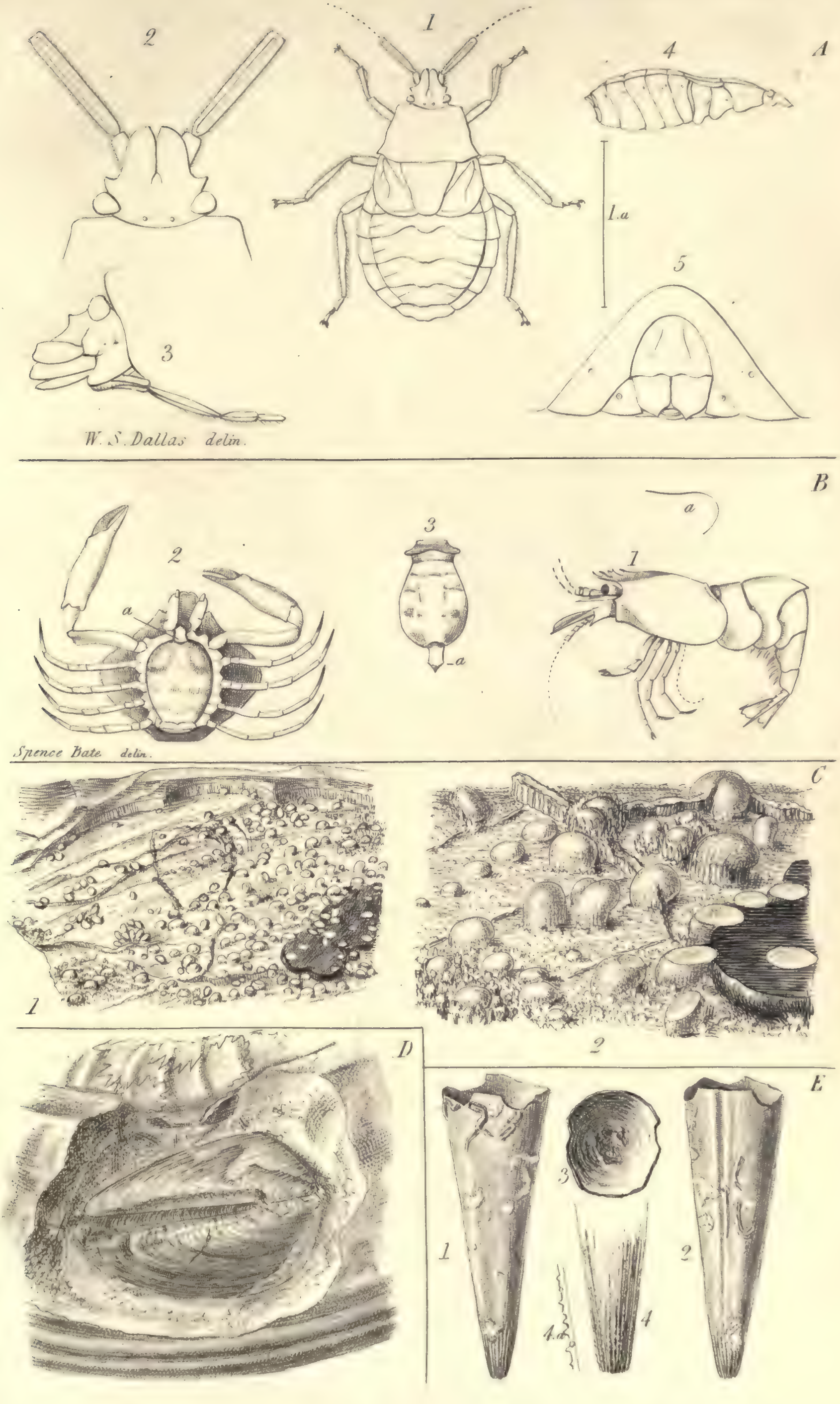
XXXIII.—*Note on a new species of* Clionites. By N. T. WETHERELL, Esq., F.G.S., M.R.C.S. &c.

[With a Plate.]

DURING a recent visit to the Isle of Wight, I obtained among other interesting fossils a specimen of flint which had evidently formed a cast of a large species of *Inoceramus*, probably *Inoceramus Cuvieri*. The specimen is about 10 inches in length, the fibrous part of the shell having decayed away, with the exception of some small portions.

The cast itself exhibits a numerous but very irregularly disposed series of small siliceous oviform bodies with a granulated surface, and most of which were joined together by small threads of flint. These bodies were unquestionably the casts of some parasitic animal which perforated the test of the *Inoceramus*, and which may possibly be due to a species of *Clionites* (*C. Conybearei*), as they appear to resemble those generally referred to that genus, described and figured in the 'Annals,' vol. viii. pl. 4, for August 1851, but from which they differ in form, as will be seen by comparing the figures.

Mr. Morris informed me that he had previously seen some small specimens of the species in the collection of Dr. Mantell, but he rather doubted their specific value. The large specimen now discovered, of which only a fragment is figured, and the uniformity of the character would lead us to infer a specific difference, which I have much pleasure in dedicating to my friend Dr. Mantell, who long ago noticed these singular bodies. Mr.



J. De C. Sowerby sc.

Morris has also directed my attention to the fact, that Colonel Portlock, with his usual acumen, had described similar bodies as occurring in the flints of the Irish chalk, and that the species described by him under the name of *Entobia cretacea* (and arranged among the Annelides) is probably the same as the *Clionites Conybearei* before adverted to.

Clionites Mantelli. Pl. V. C. figs. 1 & 2.

Cells small, oviform, numerous, more or less closely aggregated, connected together by minute slender canals. External openings rather large.

Locality. In the substance of the shell of an *Inoceramus* from the Upper Chalk of the Isle of Wight.

Highgate, Sept. 29, 1852.

XXXIV.—*Description of a species of* Belemnite, *with Observations on* Aptychus. By J. Morris, F.G.S.

[With a Plate.]

The following species of Belemnite, obtained by M. Bouchard of Boulogne from the lias of France, appears to be sufficiently distinct from any species figured by M. D'Orbigny in the 'Paléontologie Française,' and to differ somewhat from the Belemnites usually found in the lias, and may be described as follows:—

Belemnites Bouchardi. Pl. V. E. figs. 1, 2, 3, 4.

Testa brevi, conica, subcompressa, unisulcata; apice obtuso, rugoso, alveolo magno, apertura subquadrata.

A Belemnite with a very short, conical and slightly compressed rostrum, the apex obtuse and marked by numerous granulose ridges (fig. 4 *a*); the fibrous substance of the shell is extremely thin; the alveolar cavity is large, and occupies nearly the whole length of the rostrum; the ventral furrow is very distinct, and is prolonged from the apex to the aperture, which is subquadrate. The posterior side is slightly compressed by two rather obscure furrows, which become obsolete towards the opening.

This species in the general form and large alveolar cavity resembles *Bel. brevirostris*, D'Orb.; it is however less conical, and the broad continuous furrow and rugose apex will readily distinguish it from that species.

Locality. From the Upper Lias of Vieux Pont, Calvados. Length $1\frac{1}{2}$ inch, aperture 6 lines.

Note on Aptychus.

Through the kindness of the Rev. A. Griesbach of Wollaston, I have lately received an interesting specimen of Ammonite (*A. Walcottii*) obtained by him from the lias of Northamptonshire, containing the remains of the anomalous body *Aptychus* or *Trigonellites*. By a fortunate fracture, the *Aptychus*, of a corneo-calcareous nature, was found imbedded in the matrix filling the last chamber, about 6 inches from the aperture; the two lobes are semi-elliptical in form, about $1\frac{1}{3}$ inch in length by 1 inch in breadth, and exhibit the concentrical striated surface or lines of growth. Pl. V. D. fig. 1.

The comparative rarity in England of these bodies in direct connection with the Ammonite, of which they are presumed to be the opercula, has induced me to record the above fact. Mr. Strickland has described the occurrence of similar bodies in the Ammonites from the lias of Defford (Geol. Proc. iv. p. 451), and Mr. Moore in those from Ilminster.

Bronn enumerates about forty species of *Aptychus* from the Jurassic and Cretaceous strata, a small proportion to the numerous Ammonites found in these formations.

XXXV.—*On some Crustacea dredged by* Mr. Barlee *in the Shetlands.* By C. Spence Bate, Esq.

[With a Plate.]

Through the kindness of Mr. Barlee (whose indefatigable industry has been of such benefit to conchology), I received the following Crustacea dredged by him off the Haaf, Shetlands, during the fall of 1851.

Hyas coarctatus.
Inachus Dorsettensis.
Portunus pusillus.
Ebalia Pennantii.
Lithodes Maia.
Crangon spinosus.
Hippolyte Sowerbei.
—— *Barleei* (new species).

Nymphon gigantea.

The distant locality from which these come make them worthy of being recorded, at a period when research is endeavouring to illustrate the fauna of particular districts.

It is rather curious to remark, that in the two standard works on British Crustacea, Dr. Leach's 'Malacostraca Podophthalmata Britanniæ,' and Prof. Bell's 'Hist. of the British Crustacea,' the artists employed have incorrectly figured the female abdomen in the genus *Ebalia* by the omission of the seventh and ultimate ring,—an articulation so peculiar as to have been classed by each author among the generic characters,—while in the text it is correctly described by the respective authors. This circumstance, together with the peculiar manner in which it is imbedded between the base of the pedipalps, has induced me to forward a figure of the underside of *Ebalia Pennantii* as well as the unattached abdomen (Pl. V. B. figs. 2 & 3).

Scarcely knowing which to trust, the more so since it is omitted in the description of the genus in Prof. Milne-Edwards's 'Histoire des Crustacés,' I communicated, for the purpose of being certain, with Mr. Gray of the British Museum, where I believe the original specimens of Dr. Leach are preserved, who with courtesy immediately replied, and thus strengthened me upon the point.

The only other of the above list to which it is at all necessary to allude, is that which I have taken upon myself to name *Hippolyte Barleei*, after him to whose labours we are indebted for the discovery. (See Pl. V. B. fig. 1).

It has the rostrum one-third the length of the carapace, the front slightly turned up; the lower margin smooth, the upper armed with four teeth, the two centre of which are partially confluent.

Unfortunately the specimen is not too well-preserved as a whole, the sixth pair of legs being lost when I received it, and also one of the anterior pair, together with the antennæ, all of which are broken off to the peduncle; it may therefore be considered rash to describe the specimen as belonging to this genus; but as far as research has yet carried us, the rule, that when the first two pair of legs are cheliform, with the first pair short, strong, and apparently useful (not slender as in *Palæmon*), the internal antennæ are furnished with two setæ, is so constant, that until a more perfect specimen be dredged, an opportunity for which may not again readily occur, since the Haaf (or deep-sea fishing) is, I believe, forty miles distant from the nearest point of land, or a distinct species be found showing the above rule to be inconstant, I think we are justified in supposing it to be a *Hippolyte*.

The specimen is small and rather greenish, but colour among Crustacea can scarcely be depended upon, it being dead.

Mulgrave Place, Plymouth.

XXXVI.—*On a new Arrangement of British* Rissoæ. By H. and A. Adams.

To the Editors of the Annals of Natural History.

Gentlemen, Haslar Hospital, Gosport, Oct. 6, 1852.

In revising the *Rissoæ* for the "Genera of Recent Mollusca" about to be published, we found the group composed of most dissimilar forms. The recent observations of the learned and accurate William Clark have enabled us to offer a new distribution, an outline of which, perhaps, you may think worthy of a place in your 'Annals.'

We are, Gentlemen, your most obedient servants,

H. and A. Adams.

Genus *Rissoa*, Fremenv. (Acme, *Hartm.*)

Opercular lobe with a single distinct cirrhus. Shell with the outer lip dilated; spire elevated.

R. labiosa. R. costata. R. parva.

Genus *Alvania*, Risso. (Cyclostrema, *Flem.* Turbona, *Leach.*)

Opercular lobe winged; three caudal cirrhi. Shell turbinate, cancellated; outer lip varied.

A. cimex. A. reticulata.
A. calathiscus. A. abyssicola.
A. striatula. A. zetlandica.
A. lactea.

Genus *Cingula*, Fleming. (Sabinea, *Leach.*)

Opercular lobe and caudal cirrhus indistinct and rudimentary. Shell banded; spire elevated; outer lip simple.

C. cingillus.

Genus *Onoba*, nobis. (Turbonilla, *Leach*, non *Risso.*)

Opercular lobe winged, no caudal cirrhus. Shell spirally striated; outer lip simple.

O. striata.

Genus *Paludinella*, Pfeiffer.

Tentacles short, obtuse; eyes sessile on their upper surface near the middle. Opercular lobe and caudal filaments none. Shell orbicular, thin, umbilicated, covered with an epidermis.

P. littorea, *Chiaje*.

We have lately observed the animal ourselves and find it as above described. (Fam. Truncatellidæ.)

Genus *Hyala,* nobis.

Head long, emarginate at the end, forming two lobes. Tentacles flat, not clavate at tip, with fine setæ at the extremities. Eyes sessile on the centre of their bases. Foot simple behind. Opercular lobe without any caudal cirrhus. Shell hyaline. (Fam. Jeffresiidæ.)

H. vitrea.

Genus *Hydrobia,* Hartmann.

Opercular lobe small, no caudal cirrhus. Shell covered with an epidermis. Outer lip thin, simple. Animal amphibious. Spins a glutinous byssus during hybernation.

H. ulvæ. H. anatina. H. ventricosa.

Genus *Ceratia,* nobis.

Tentacles flat, rather short, claviform at tip, clothed with long aciculate setæ. Foot in front auriculated, behind divided into two long distinct tails. Opercular lobe without a caudal cirrhus.

C. proxima.

Genus *Setia,* nobis.

Tentacles pilose. Opercular lobe small, no caudal cirrhus. Foot simple behind.

S. soluta. S. fulgida.
S. pulcherrima. S. inconspicua.

XXXVII.—*Description of a new Hemipterous Insect forming the type of a new genus.* By W. S. Dallas, Esq., F.L.S. &c.

[With a Plate.]

To the Editors of the Annals of Natural History.

Gentlemen,

I beg leave to enclose, for insertion in your Magazine, the description of a remarkable new Hemipterous insect from Sylhet, which forms part of a collection made in that country by Messrs. Cotton and Turner. The collection was exhibited at one of the meetings of the Zoological Society, and was very remarkable from the curious manner in which it was arranged, the numerous insects composing it being attached to the bodies and limbs of some large Stick-insects as though walking upon them.

I am, &c.,
W. S. Dallas.

I am indebted to Mr. Samuel Stevens for the opportunity of describing this insect. It belongs to the family Phyllocephalidæ, in which it will necessitate the formation of a new generic group. It is remarkable from its presenting so close a resemblance to the larvæ of the larger species of the group to which it belongs, that at the first glance it may readily be mistaken for one of them; but the presence of ocelli, of three joints in the tarsi, and of a distinct scutellum, demonstrate that it has arrived at its complete development. A small insect belonging to the family Sciocoridæ, described by me (Brit. Mus. Cat. Hemip. p. 145) under the name of *Aëptus singularis*, presents a very similar conformation; in this case, however, the ocelli are also wanting.

The specimen is unfortunately mutilated in its antennæ, the first and second joints only remaining; from the form of these it is probable that the antennæ are four-jointed, although this of course can be only a matter of conjecture.

Genus Atelides, n. g. Pl. V. A.

Corpus subovatum, postice latius. *Caput* foliaceum, spina utrinque ante oculos armatum; lobis lateralibus intermedium longe superantibus, contiguis, apice hiantibus. *Oculi* prominentes. *Antennæ* crassæ, articulo primo brevi, secundo elongato, compresso, sulcato; reliquis carentibus. *Rostrum* ad basin pedum intermediorum attingens, articulo secundo longissimo. *Scutellum* et *elytra* abbreviata. *Sternum* canaliculatum.

Body somewhat ovate, broadest behind the middle. *Head* (2) foliaceous; lateral lobes reflexed at the sides, much longer than the central lobe, with their inner margins contiguous throughout nearly their whole length, gaping slightly at the apex; central lobe very small; lateral margins with a strong spine in front of the eyes. *Eyes* very prominent; *ocelli* small, placed close to the base of the head, and about equally distant from one another and from the eyes. *Antennæ* very stout; basal joint short, not passing the apex of the head; second joint very long, compressed, and with a deep longitudinal furrow on each side. *Rostrum* (3) rather slender, reaching the intermediate coxæ, inserted about the middle of the under surface of the head, between two somewhat triangular lamellæ; basal joint rather stout, passing the anterior margin of the prosternum; second joint longest, thinner than the first; third joint shorter than the first, about equal to it in thickness; fourth joint shortest and thinnest. *Pronotum* subquadrate, rather narrower in front than behind, lateral angles slightly spinous. *Scutellum* short and broad, with the apex broad and rounded. *Elytra* very short, covering only the two first segments of the abdomen, with their apical margin truncated, somewhat membranous. *Sternum* with a narrow longitudinal canal. *Abdomen* (4 & 5) nearly circular, slightly convex above, very convex beneath, with the apex somewhat truncated; the two lateral vulvar plates bearing stigmata. *Legs* stout; thighs unarmed; tibiæ prismatic, the posterior pair slightly dilated internally and channelled beneath.

Atelides centrolineatus, n. s. Pl. V. A. fig. 1.

A. castaneus, supra nigricans; linea media lata e capitis apice ad apicem abdominis currente, lateribusque pronoti fulvo-luteis; corpore subtus utrinque fascia submarginali nigra; antennis nigris. ♀. Long. lin. 10.

Hab. in Sylhet.

Head above brassy black, somewhat obscure, rather finely rugose, with the lateral margins tinged with chestnut, and with a longitudinal orange-yellow band down the centre; beneath brownish fulvous, with the orbits brassy. Eyes brown; ocelli yellow. Antennæ with the first two joints black, thickly clothed with short stiff hairs, but with the furrows of the second joint naked; basal joint fulvous at the base, the rest of the joints wanting. Rostrum pale chestnut, with the basal joint fulvous. Pronotum blackish, somewhat brassy, with the annular spots near the anterior margin and an indistinct patch within each lateral angle chestnut, the surface minutely punctured and wrinkled transversely; the disc with a smooth orange-yellow band, continuous with that on the head; the sides broadly margined with dull orange, with the extreme edges black. Scutellum black, very thickly and minutely punctured and transversely wrinkled, with a smooth orange-yellow band continuous with that on the thorax. Breast brownish fulvous, sparingly punctured, with a broad, brassy black, rugose longitudinal band on each side within the lateral margins. Legs pale chestnut-brown. Elytra blackish, somewhat brassy, finely granulose; outer margin broadly fulvous, edged with black; the submarginal nervure, a streak on the disc, and the base of the inner margin fulvous; rudimentary membrane brown. Abdomen above blackish, somewhat brassy, finely granulose, with the sides dull chestnut irrorated with black points; the centre with a longitudinal orange band continuous with that on the scutellum; margins pale chestnut-brown, with the edges and a band on each of the sutures black; abdomen beneath pale chestnut-brown, minutely granulated, with a blackish brassy band down each side within the line of stigmata; stigmata black; apical and lateral vulvar plates edged with black.

EXPLANATION OF PLATE V. A.

Fig. 1. *Atelides centrolineatus,* enlarged : *a,* natural size.
Fig. 2. Head seen from above, with the antennæ.
Fig. 3. Head seen from beneath, with the rostrum.
Fig. 4. Lateral view of the insect.
Fig. 5. The apex of the abdomen, showing the structure of the vulvar plates.

BIBLIOGRAPHICAL NOTICES.

The Natural History of Animals. By T. RYMER JONES, F.R.S. Vols. 1 and 2, 1845–52. London: Van Voorst.

WE are glad to be able to announce to our readers the appearance of a second volume of Prof. Rymer Jones's excellent popular Natural History. Among the many writers upon natural science, we know of none who clothes his subject in so attractive a dress, or adds so much to the beauty of his subject by the graces of a clear and elegant English style.

The present work may be considered as a light and popular introduction to the 'Animal Kingdom' of the same author, a work which, when it appeared, was decidedly the clearest and most elegant exposition of the facts of zoology in the English language. Ten years however have elapsed since its publication—ten of the busiest years that zoological science has ever known, especially as regards the Invertebrata—and students are looking forward to a new edition, with such additions as may be necessary for the full expression of the improvement which has taken place in our knowledge. In the meanwhile, let those who are desirous of preparing for a more extensive and careful study acquaint themselves with the present volumes; and if there be any dense utilitarian who can resist the fascinations of the varied scene to which he is here introduced, because he cannot see what good it does him to know all about flies and spiders, let him lay to heart the following passage:—

"Nothing is more calculated to excite the astonishment of the student of animated nature, than the strict balance which is preserved between the destruction and the reproduction of insects. Countless millions are continually making their appearance upon the stage of existence, millions equally innumerable are as constantly perishing, and yet, steady to their appointed duties, the insect races return with the seasons to which they belong, neither dangerous by their multitudes on the one hand, nor on the other inadequate to perform the gigantic tasks that devolve upon them. Dreadful indeed would be the consequences, if the strict and vigilant superintendence under which insects live were but for a very little time intermitted; for not a species could be pointed out, however diminutive and apparently contemptible, that might not, unless jealously restricted in its fertility, become a scourge to the rest of the living creation. . . . . . A locust is not in itself a very redoubtable foe, and, were it not for the dire experience of its ravages, would be as little feared as the grasshopper that chirps in our meadows; nevertheless, as we are told, there is an Eastern fable, which says that upon the wing of the locust is an inscription to this effect:—'We are the army of the Most High God: we lay ninety and nine eggs; did we lay the hundredth, we should eat up the whole world and all that it contains:' and the language of this splendid orientalism, forcible as it is, is by no means too strong for the occasion."

Parks and Pleasure-Grounds, or Practical Notes on Country Residences, Villas, Public Parks and Gardens. By CHARLES H. J. SMITH, Landscape Gardener and Garden Architect, &c. &c. London: Reeve, 1852, post 8vo, pp. 290.

The author tells us in his preface, "The design of the following work is altogether a practical one. While engaged in his profession during the last eighteen years, the author has often been requested to recommend a book which might enable persons consulting him to acquire some general knowledge of the principles of Landscape Gardening, and which might aid them in carrying his suggestions into effect." As he states, most of the existing works on this subject are general treatises calculated for forming and cultivating the taste, rather than practical treatises on the operations of carrying out the principles; hence he has been induced to give the results of his experience in a form accessible and available to all of ordinary education. The work consists of a series of chapters treating separately of the different departments and classes of operations, commencing with instructions for choosing the site and arrangement of the plan and style of the house; and in the eight following chapters, the gardens, pleasure-grounds, park, plantations, water, &c. are treated in detail. Then we have a chapter on public parks and gardens, useful at the present time, since it contains many sensible suggestions. The villa and its appurtenances, as a more frequent if not so ambitious subject of the art, has its special chapter; and after another of 'general observations,' the volume closes with two chapters on 'the Arboretum' and 'the Pinetum.'

The views inculcated appear to us judicious, and the practical instructions are conveyed in simple and perspicuous language, so that Mr. Smith's book seems to us exceedingly well-calculated to fulfill the object with which it was prepared; and it may be remarked that the diffusion of a treatise like this, which gives at once a clear and compendious view of the points to be kept in view in planning work of this nature, must be of great advantage not only to those who have the conduct of such operations, but to persons whose taste induces them to enter upon improvements on their own property, and who in the absence of experience but too frequently raise monuments to their own incapacity.

Revue et Magasin de Zoologie. Par M. F. E. Guérin-Méneville. 2e sér. vol. iv. no. 1. Janvier 1852.

This periodical, which is devoted to the various branches of pure and applied zoology, including palæontology and comparative anatomy, is published monthly in Paris. It is divided into three sections: the first contains original articles, the second reports of the proceedings of the Parisian learned societies, and the third consists of analyses of new works.

Of these three sections the first is the most important, from its containing many descriptions of new species of animals; and as the work possesses only a limited circulation in this country, and many of these descriptions are consequently liable to be quite unknown to the English naturalist, we propose to furnish our readers from time to time with an analysis of the contents of this portion of the work, giving, as far as possible within moderate limits, the diagnostic characters of any new animals described, with analyses of any original anatomical or physiological papers which may appear in the magazine.

The number for January 1852 contains—

I. Descriptions of some new species of Birds, by Dr. G. Hartlaub (pp. 1–7). These birds are ten in number, namely, 1. *Strix thomensis,* an inhabitant of the tropical African island of St. Thomas; 2. *Zonotrichia mysticalis,* from Mexico; 3. *Formicivora erythronotos,* from Brazil, a species in form and size resembling *F. axillaris,* Vieill.; 4. *Thryothorus murinus,* from Mexico; 5. *Setophaga intermedia,* a species inhabiting Guatemala, intermediate between *S. vulnerata* and *S. verticalis*; 6. *Dromolæa incompta* (*Saxicola incompta,* Licht. MS. in Mus. Brem.), from Caffraria; 7. *Tyrannula rufula,* from Brazil; 8. *Picus Kaupii,* from Chili; 9. *Cypselus Abyssinicus,* Streubel; and 10. *Anser Gambelli,* a species from Texas, nearly allied to *A. albifrons,* Hartl.

II. Descriptions of six new Birds belonging to the Collection of the Museum of Natural History at Paris, by P. L. Sclater (pp. 8, 9). Five of these species are from New Grenada; the sixth is without indication of locality. The following are the characters of these birds given by Mr. Sclater:—

1. *Arremon mysticalis.* A. supra olivaceus, pennis caudaque nigris olivaceo limbatis; pileo rufo: fronte et capitis colliqne lateribus cum gula, nisi media, atris; mento, gula media et linea a basi rostri ad collum utrinque descendente albidis; abdomine crissoque flavis, lateribus olivascentibus; rostro nigro, pedibus corneis. Total length $6\frac{1}{4}$ inches; wings $3\frac{7}{8}$ in.

2. *Pipilopsis flavigularis.* P. supra olivacea, pennis caudaque nigris olivaceo limbatis: infra abdomine toto cum mento cinereis, gutture flavo, crisso flavescente; rostro plumbeo, basi albo notato; pedibus plumbeis; ventre medio albescentiore. Total length $5\frac{1}{2}$ in.; wings $3\frac{1}{4}$ in.

3. *Pipræidea albiventris.* P. supra cærulea, pennis nigris, anguste cæruleo marginatis; cauda nigra; ventre crissoque albis; rostro pedibusque nigris. Total length $3\frac{1}{4}$ in.; wings $2\frac{1}{8}$ in.

4. *Pipra Isidorei.* P. atra; capite albo; uropygio cyaneo. Tota length 3 in.; wings $1\frac{7}{8}$ in.

5. *Pipra flavicapilla.* P. flavo-olivacea, remigibus rectricibusque nigricantibus olivaceo limbatis; capite toto cum cervice supra aurantio-flavo; subtus aureo-flava gutture et cervicis lateribus olivaceo-tinctis; pedibus nigricantibus; rostro plumbeo. Total length $4\frac{1}{2}$ in.; wings 3 in.; tail $1\frac{3}{4}$ in.

6. *Pipra pyrocephala.* P. roseo-brunnea; subtus dilutior, leviter saturatiore striata; alis et lateribus cervicis olivaceis; remigibus et rectricibus nigricantibus; capite supra flavo, vertice medio ruberrimo; rostro nigricante, pedibus albescentibus. Total length $3\frac{1}{4}$ in; wings $2\frac{1}{4}$ in.

III. Description of a new species of the genus *Argonauta,* by M. E. L. Lorois (p. 9).

This species of *Argonauta* is dedicated by its describer to the gentleman who brought it from the Pacific, M. Noury, the captain of a French frigate. It is characterized as follows:—

Argonauta Nouryi. Testa parvula, involuta, elongata, tenui, translucida, albido-grisea, rugis lateribus undulatis, spira tantum carinata, tuberculis carinarum nigris, minimis, linea alba separatis, ultimo anfractu subrotundato, ad spiræ carinarum prolongationem paulisper depresso. Long. 58 mill.; larg. 35 mill.

It is figured in the plate accompanying the number.

IV. Catalogue of the Molluscous animals inhabiting the coast of the "Charente-Inférieure," by M. Henri Aucapitaine (pp. 10–21).

This catalogue includes 164 species, belonging to 75 genera; it is accompanied by a few notes relative to some of the species.

V. Descriptions of four new and remarkable Coleopterous insects, by M. Reiche (pp. 21–25).

This paper consists of descriptions of four Lamellicorn beetles, three of them of rather large size. They are nicely figured in outline in the plate accompanying the part. The first,

1. *Democrates Burmeisteri,* differs from the type of the genus, *D. Crœsus,* Newm., in its smaller size, the blackish tint of its head and thorax, and in the punctuation of the elytra. It is from Quito.

2. *Megalosoma Mars.* This insect is very nearly allied to *M. Actæon.* It is from tropical America, about the Rio Negro.

3. *Anoplocnemus Dejeanii*; probably an inhabitant of the East Indies.

4. *Anoplocnemus Lafertei,* a fine species from Australia, which M. Reiche thinks may probably form the type of a new generic group characterized by its exposed eyes, the straightness of its mandibles, and the form of its thorax.

The remainder of the number is occupied by reports of the sittings of the 'Académie des Sciences' of the 5th and 12th of January 1852, and notices of two or three new works.

In the Press.

Prodromus Faunæ Zeylanicæ, being Contributions to the Zoology of Ceylon. By Ed. Fred. Kelaart, M.D., F.L.S., Staff-Surgeon, &c.

We have much pleasure in drawing attention to this work: the fauna of Ceylon has always been classed among the richest in the world, but till within the last few years very little of it was known to the systematic naturalist. Dr. Kelaart's work will contain a *familiar* and a *technical* description of all the known Ceylon quadrupeds and other animals of the class Mammalia (upwards of eighty in number). The work will also contain a systematically arranged catalogue (with English names) of more than 200 Ceylon birds, and a descriptive account of all the known Chelonian, Saurian, and Batrachian reptiles; to which will be added an Appendix replete with information on other branches of the zoology of the island. On the whole, this work (Prodromus Faunæ Zeylanicæ) will contain the fullest and most recent information on the extensive and beautiful fauna of Ceylon.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Jan. 14, 1851.—Prof. Owen, F.R.S., Vice President, in the Chair.

The following papers were read:—

1. On a new and most remarkable form in Ornithology. By John Gould, F.R.S. etc.

I have the pleasure of introducing to the notice of the Society on the present occasion the most extraordinary bird I have seen for many years, and which forms part of a collection made on the banks of the upper part of the White Nile, by Mansfield Parkyns, Esq., of Nottingham. For this bird I propose the generic name of Balæniceps, with the following characters:—

Bill enormously robust, equal in breadth and depth; sides of the upper mandible much swollen; culmen slightly elevated, depressed in the middle of its length, and terminating at the point in a very powerful hook; tomiæ sharp, turning inwards and very convex; lower mandible very powerful, with a sharp concave cutting edge and a truncated tip; nostrils scarcely perceptible, and placed in a narrow slit at the base of the bill, close to the culmen; orbits denuded; head very large; occiput slightly crested; wings very powerful, the third, fourth and fifth feathers the longest; tail of moderate length and square in form; plumage soft and yielding; skin of the throat loose, and capable of dilatation into an extensive pouch; tibiæ and tarsi lengthened, the latter a fourth shorter than the former; the lower third of the tibiæ denuded; toes four in number, all extremely long, and without the slightest vestige of interdigital membrane; hind-toe on the same plane as the anterior ones and directed inwards; tibiæ and tarsi reticulated, the reticulations becoming much smaller on the joints; upper surface of the toes scutellated; nails powerful, and not much curved; the nail of the centre toe impectinated.

BALÆNICEPS REX.

Bill pale yellow, becoming horn-colour on the culmen and tip, and blotched with dark brown; orbits pale yellow; head and neck slaty grey, darkest on the crown; chest ornamented with lanceolate feathers of a similar colour, with a dark stripe down the centre; abdomen, flanks, thighs and under tail-coverts very pale grey; upper surface generally very dark grey, most of the feathers margined with light grey; primaries, secondaries and tail blackish grey; rump and upper tail-coverts light grey; legs greyish black.

Total length, from the tip of the bill to the extremity of the tail, 52 inches; from the tip of the bill to the end of the centre toe, 67; bill, from the gape to the tip, 9; depth of the bill, $4\frac{3}{4}$; breadth, 4; wing, 27; tail, 12; tibiæ, 13; tarsi, 10; middle toe and nail, 7; external toe and nail, $6\frac{1}{2}$; internal toe and nail, $5\frac{1}{4}$; hind toe and nail, 4.

Hab. The upper part of the White Nile, in Eastern Africa.

Remark.—This is evidently the Grallatorial type of the *Pelecanidæ*; at least such is the conclusion to which I am directed after a careful examination and comparison of it with *Pelecanus, Grus, Ardea,* and *Cancroma,* to none of which genera is it so nearly allied, except in general contour, as to *Pelecanus.* Perhaps the most singular feature connected with this form is the entire absence of interdigital membrane, a character so conspicuous in the Storks, Herons, and the Boatbill, which latter bird is as nearly allied to *Nycticorax* as the present bird is to *Pelecanus.* Both *Cancroma* and *Nycticorax* have the nail of the centre toe strongly pectinated, which character is not found in *Pelecanus* nor in *Balæniceps.*

2. DESCRIPTIONS OF TWENTY SPECIES OF COLUMBELLÆ, AND ONE SPECIES OF CYPRÆA. BY J. S. GASKOIN.

1. COLUMBELLA TENUIS. *Testa pyramidalis, subventricosa, lævis, tenuis, albicans, maculis irregularibus fuscis magnis longitudinaliter dispositis; anfractibus octo, duobus anticis gibbosis; spirâ subelongatâ, acuminatâ; aperturâ latâ, anticè divergente, posticè acuminatâ, labio externo tenui, internoque edentulo, varice externo subelevato; striis tenuibus ab varice anticè continuis; canali brevi.*

Length, $\frac{60}{100}$ of an inch; width, $\frac{27}{100}$ of an inch.
Hab. ——? Cab. Gaskoin, specimen unicum.

2. COLUMBELLA ALBINODULOSA. *Testa oblongo-ovata, pallidissimè luteo-fulva, fasciis angustis interruptis tribus brunneis; spirâ acuminatâ, anfractibus septem; nodulis latis prominentibus subdistantibus albi-coronatis; aperturâ oblongâ subquadratâ albâ; labio externo crasso, recto, submarginato, intus denticulato; dentibus posticis majoribus, labio interno dentibus irregularibus subvaricosis; canali recto latiusculo subelongato.*

Length, $\frac{45}{100}$ of an inch; width, $\frac{20}{100}$ of an inch.
Hab. ——? Cab. Gaskoin.

3. COLUMBELLA INTERRUPTA. *Testa oblongo-ovata, albicans,*

fasciis duabus interruptis latis rufescenti-brunneis; fasciâ anticâ pallidiore; spirâ acuminatâ, anfractibus septem vel octo; aperturâ latiusculâ præcipuè ad partem posticam; labio externo crasso margine acuto, intus denticulato, denticulis quatuor vel quinque; labio interno cum margine externo denticulato, aurantiaco; testâ extus cancellatâ striis spiralibus validis, longitudinalibus tenuibus; peritremate pallide aurantiaco, posticè subobtuso angulari; canali breviusculo latiusculo.

Length $\frac{40}{100}$ of an inch; width, $\frac{21}{100}$ of an inch.
Hab. ——? Cab. Gaskoin.

4. COLUMBELLA LEUCOSTOMA. *Testa ovata, albicans, nitens, posticè fasciâ latâ brunneâ spirali ornata; apice albicante dimidio antico anfractûs ultimi albido; spirâ acuminatâ, anfractibus septem; aperturâ gulâque albis latiusculis, illâ posticè subquadratâ, labio externo intus subdenticulato, dentibus sex posticis majoribus; canali brevi latiusculo.*

Length, $\frac{35}{100}$ of an inch; width, $\frac{17}{100}$ of an inch.
Hab. ——? Cab. Gaskoin.

5. COLUMBELLA PACIFICA. *Testa oblongo-ovata, lacteo-opaca, maculis irregularibus distantibus rufescenti-brunneis ornata; intus alba; spirâ acuminatâ, anfractibus convexis septem vel octo posticè obtusissimè coronatis; aperturâ latâ rectiusculâ; labii externi margine tenui intus edentulo; labio interno lævi externè margine tenui; anfractu ultimo anticè valde striato, striis tenuioribus longitudinaliter decussantibus; canali brevi, lato, subrecurvo.*

This shell differs from *Columbella Miser*, Sowerby, in the absence of denticulation, in the last volution being much more gibbous, the aperture much wider, the channel decided, the spire more pyramidal, and much less coloration and markings.

Length, $\frac{45}{100}$ of an inch; width, $\frac{25}{100}$ of an inch.
Hab. Sandwich Islands. Cab. Gaskoin.

6. COLUMBELLA VARICOSA. *Testa oblongo-ovata, nitens, crassa, albicans, colore nigricanti-brunneo irregulariter induta; marginibus posticis anfractuum albicantibus; spirâ acuminatâ, anfractibus septem vel octo subventricosis varicosis validis prominentibus subobliquis instructis; parte anticâ ultimi anfractûs lævigatâ, anticè supra canalem transversè striatâ; aperturâ oblongâ subquadratâ rectâ intus cærulescente, labio externo recto, marginato posticè incisurâ magnâ instructo, intus denticulato denticulis posticis validiusculis, labio interno lævi margine elevato tenui; canali brevi latiusculo.*

Length, $\frac{80}{100}$ of an inch; width, $\frac{35}{100}$ of an inch.
Hab. Peyta, Peru. Cab. Cuming, Gaskoin.

7. COLUMBELLA AUSTRALIS. *Testa oblongo-ovata, albicans, maculis parvis irregularibus brunneis inæqualibus ornata, majoribus saturatioribusque apud marginem posticum anfractuum positis; spirâ acuminatâ, anfractibus octo subgibbosis, apice albicante; aperturâ latiusculâ intus cærulescente, labio externo*

recurvo ad canalem convergente, intus denticulis septem ad octo subprominentibus subdistantibus, labio interno lævi anticè angulifero; canali latiusculo brevi recurvo, anfractu ultimo anticè transversim striato; peritremate posticè angulari.

Length, $\frac{80}{100}$ of an inch; width, $\frac{25}{100}$ of an inch.

Hab. Sydney. Cab. Gaskoin, Cuming.

8. COLUMBELLA CANCELLATA. *Testa ovata, pallidè aurantiaco-brunnea; apice roseo, superficie omnino cancellatâ, serie posticâ granulorum majore; spirâ acuminatâ anfractibus septem; aperturâ latiusculâ brevique, labio externo subrecurvo convergente, intus denticulis quatuor vel quinque subprominentibus, labio interno lævi; canali latiusculo, brevi, peritremate posticè obtusè angulari.*

Length, $\frac{35}{100}$ of an inch; width, $\frac{18}{100}$ of an inch.

Hab. West Indies. Cab. Gaskoin.

9. COLUMBELLA PULLA. *Testa oblongo-ovata, saturate brunnea; parte anticâ ultimi anfractûs, columellâque albicantibus; spirâ acuminatâ, anfractibus octo vel novem, convexiusculis, suturâ lævi; aperturâ latiusculâ posticè acuminatâ, labio externo tenui lævi, intus subdenticulato, saturate brunneo, labio interno lævigatè subdenticulato, anticè subalbido, margine interno varicem rectum efformante, parte anticâ testæ transversim striatâ; canali mediocri, recto.*

Length, $\frac{52}{100}$ of an inch; width, $\frac{20}{100}$ of an inch; length of spire, $\frac{30}{100}$ of an inch; length of last whorl, $\frac{22}{100}$ of an inch.

Hab. ——? Cab. Gaskoin.

10. COLUMBELLA INTEXTA. *Testa oblonga, angusta, lævis, albicans, strigis punctulisque irregularibus saturate brunneis ornata; spirâ acuminatâ, anfractibus novem vel decem; marginibus posticis anfractuum brunneo maculatis, ultimo anfractu anticè similariter colorato; suturâ elevatâ; aperturâ breviusculâ angustâque, labio externo arcuato, ad marginem acutiusculo, extus crassiusculo, ad canalem convergente, labio interno ad marginem subvaricoso, lævi, edentulo; canali breviusculo, angustato, extus transversim striato.*

Length, $\frac{55}{100}$ of an inch; width, $\frac{20}{100}$ of an inch.

Hab. Australia. Cab. Cuming, Gaskoin.

11. COLUMBELLA CONTAMINATA. *Testa oblonga, lævis, saturate brunnea, intus subalbida, lineâ suturali albicante subinterruptâ; spirâ acuminatâ dimidium testæ superante, anfractibus octo vel novem convexiusculis; aperturâ posticè latâ, anticè angustiore, margine externo lato, crasso, intus denticulis linearibus sex vel septem; margine interno tenui, albicante, intus denticulis prominentibus confertis albicantibus sex supra columellam continuis, columellâ interstitiisque rufescenti-brunneis; canali prominente angusto subrecurvo, margine interno violaceo, parte externâ transversim striatâ.*

Length, $\frac{50}{100}$ of an inch; width, $\frac{20}{100}$ of an inch.

Hab. ——? Cab. Gaskoin.

I have seen but one of this characteristic species: the aperture is allied in form to that of *Columbella Puella*, Sowerby. It may be convenient to readers to state, that the species *Col. Puella* is by accident, in the index of the 'Thesaurus Conchyl.' of Sowerby, jun., entered as *Col. Nympha*.

12. Columbella Marquesa. *Testa oblongo-ovata, albicans; anfractibus sex vel septem; 4 vel 5 posticis roseis, longitudinaliter striatis, anfractibus tribus anticis lævibus spiraliter rufescenti-brunneo lineatis; spirâ acuminatâ, dimidium testæ æquante; aperturâ mediocri rectiusculâ; labii externi margine tenui posticè marginato, extus incrassato, edentulo, labio columellari lævi nitido, margine crassiusculo elevato; canali extus transversim striato, brevi.*

Varietas hujus testæ major differt pro colore.

Length, $\frac{35}{100}$ of an inch; width, $\frac{15}{100}$ of an inch.

Hab. Marquesas. Cab. Gaskoin, Gubba.

13. Columbella Austrina. *Testa oblongo-ovata, lævis, nitens, albicans, punctulis distantibus pallidissime brunneis, fasciâque anticâ latâ brunneâ ornata; spirâ acuminatâ, anfractibus septem vel octo, convexiusculis; suturâ distinctâ; aperturâ latiusculâ, labio externo posticè intus emarginato; margine acutiusculo versus canalem incurvo, intus denticulis prominentibus octo vel novem; labio columellari recto, nitido, denticulis septem anticè positis, margine externo subelevato; peritremate albicante, aperturâ intus violaceo-brunneâ; canali subprominente, latiusculo, dorso canalis transversim striato.*

Length, $\frac{50}{100}$ of an inch; width, $\frac{22}{100}$ of an inch.

Hab. Australia. Cab. Cuming, Gaskoin.

14. Columbella baccata. *Testa oblongo-ovata, albicans, fasciis tribus interruptis saturate rufescenti-brunneis, punctulis opacis albicantibus rotundis per lineas obliquas vel longitudinales positis; spirâ acuminatâ, anfractibus septem, quorum tribus anticis lævibus, posticis obtuse longitudinaliter striatis; apice albicante; aperturâ latiusculâ intus albicante fasciis brunneis tribus conspicuis; labio externo crassiusculo denticulis paucis intus prope centrum positis; labio interno recto, ad marginem externum varice prominente instructo; canali lato, obtuso.*

Length, $\frac{25}{100}$ of an inch; width, $\frac{12}{100}$ of an inch.

Hab. ——? Cab. Gaskoin.

15. Columbella sagitta. *Testa oblonga, subcylindracea, angustata, lævis, nitens, semipellucidula, pallidissime brunnea; fasciis duabus angustis interruptis albidi-opacis, ab postico margine anfractuum ad apicem continuis; spirâ acuminatâ,* 3–5 *longitudinis testæ; anfractibus octo; aperturâ brevi, latâ; labio externo crassiusculo extus margine albini-opaco, versus canalem incurvato, labio interno lævi nitido; dorso anticè transversim striato; canali longiusculo, latiusculo; peritremate subquadrangulo.*

Length, $\frac{32}{100}$ of an inch; width, $\frac{12}{100}$ of an inch.
Hab. Africa; West Indies. Cab. Metcalfe, Cuming, Gaskoin, &c.

16. Columbella conspersa. *Testa oblongo-ovata, pyramidalis, pallide brunnea, maculis anticis, albi-opacis, irregularibus; fasciis tribus albi-opacis, brunneo interruptis, duabus posticis ab aperturâ ad apicem continuis; spirâ acuminatâ anfractibus novem vel decem convexiusculis; aperturâ rectâ, latiusculâ; labio externo ad marginem acuto, margine externo lato prominente, intus denticulis quatuor quinque vel sex parvis; labio interno lævi, nitido, intus varice parvo denticulato, extus varice subprominente ad latus canalis extenso; striis tenuibus per anticam partem dorsi continuis; canali longiusculo, angusto, leviter recurvo; peritremate subquadrangulo, lilacino.*
Length, $\frac{50}{100}$ of an inch; width, $\frac{22}{100}$ of an inch.
Hab. ——? Cab. Gaskoin.

17. Columbella formosa. *Testa oblongo-ovata, lævis, nitida, colore flori-lacteo induta; fasciis duabus maculis albicantibus brunneisque interruptis; spirâ acuminatâ, ad dimidium longitudinis testæ æquali; anfractibus septem vel octo convexiusculis, suturâ subprominente; aperturâ latiusculâ et breviusculâ; labio externo lævi tenui, interno lævi; canali lato.*
Length, $\frac{40}{100}$ of an inch; width, $\frac{20}{100}$ of an inch.
Hab. ——? Cab. Gaskoin.

18. Columbella hirundo. *Testa ovato-pyramidalis, lævis, nitens, pallida, strigis punctisque brunneis leviter maculata; spirâ mucronatâ, dimidium longitudinis testæ æquante; anfractibus novem vel decem planis; aperturâ latiusculâ; labio externo crasso albo semicirculari, dentibus duobus vel tribus latis posticis internis, margine externo crasso albo; labio interno lævi, subspirali, dente solitario majusculo ad posticam partem; canali longo, latiusculo, recurvo, rostris prominentibus, externo divergente quasi furcato ut in formâ caudæ hirundinis.*
Length, $\frac{60}{100}$ of an inch; width, $\frac{26}{100}$ of an inch.
Hab. Per the 'Samarang.' Cab. Gaskoin.
This species is of the stamp of *Col. bicanalifera* of Sowerby, Proc. Zool. Soc. part ii. page 113; Sowerby's Thesaurus, fig. 144.

19. Columbella Californiana. *Testa oblongo-ovata, subpyramidalis, lævis, nitens, brunnea, vel brunneo variabilis, aliquando lineis tenuibus, fortioribus, aut latiusculis irregularibus; spirâ acuminatâ dimidium testæ subæquante; anfractibus septem convexis; aperturâ latâ subquadrangulari; labio externo tenuiusculo intus denticulato, labio interno leviter denticulato; dorso anticè transversim striato; peritremate purpureo-nigricante; canali brevi.*
Length, $\frac{40}{100}$ of an inch; width, $\frac{20}{100}$ of an inch.
Hab. Sandeago, California. Cab. Cuming, Gaskoin.

20. Columbella Iodostoma. *Testa oblongo-ovata, irregulariter brunnea; spirâ acuminatâ, apice cæruleo-brunneo; an-*

fractibus septem vel octo raptim longitudinaliter decrescentibus; costellis prope aperturam minus prominentibus, costis ad posticum marginem in tuberculis posticè terminantibus; aperturâ posticè latiusculâ, anticè subacutâ; labio externo tenui, intus denticulato; labio interno intus denticulato, varice prominente marginato; dorso anticè extus striato; canali longiusculo; margine peritrematis purpureo-brunnescente.

Length, $\frac{50}{100}$ of an inch; width, $\frac{22}{100}$ of an inch.

Hab. Port Essington. Cab. (specimen unicum) Gaskoin.

Cypræa Clara. *Testa subcylindraceo-ovalis, rufescenti-cinerea, anticè et posticè supra extremitate maculâ brunneâ ornata; fasciis latis saturatioribus tribus; basi marginibusque albescentibus; aperturâ latiusculâ subspirali; labio externo crassiusculo, dentibus circa viginti-sex, regularibus, prominentibus; interno subspirali, dentibus circa viginti; sulco columellari profundo latoque, intus denticulato; marginibus rotundatis, incrassatis; extremitatibus obtusis, punctis minutissimis nigris notatis.*

Length, $1\frac{25}{100}$ inch; width, $\frac{75}{100}$ of an inch.

Hab. ——? Cab. Cuming.

This species is of the stamp of *Cyp. Isabella*, Linn.

3. On the Pterodactyles of the Chalk Formation. By J. S. Bowerbank, Esq., F.R.S. etc.

On the 14th May 1845 I exhibited at the Meeting of the Geological Society the snout and under jaws, extending from the point to about the middle of the cavitas narium, of a new and gigantic species of *Pterodactylus*, with some other bones, a portion of which belonged to the same individual, and others which have every appearance of having belonged to another animal of the same species *, and I then stated my belief that the bone figured by Prof. Owen, in the 'Transactions of the Geological Society,' vol. v. pl. 39, 2nd Series, would probably ultimately prove to be that of a Pterodactyl. From the great size of the snout, and the gigantic proportions also indicated by the bones accompanying it, I was induced to give it the specific name of *giganteus*. On a subsequent occasion, June 9, 1847, I continued my remarks on these Reptile remains, in a paper entitled "Microscopical Observations on the Structure of the Bones of *Pterodactylus giganteus* and other fossil animals," in which I endeavoured to prove, by the strongly-marked peculiarities of the bone-cells in Mammals, Birds and Reptiles, that the whole of the bones described in my former paper, and those figured by Prof. Owen in the Trans. Geol. Soc., 2nd Series, vol. vi. pl. 39. figs. 1 & 2, were in truth of purely Reptilian character; and I also figured a radius and ulna from the Cabinet of Mrs. Smith of Tunbridge Wells, of nearly the same gigantic proportions as the one formerly in the possession of the Earl of Enniskillen, but now in my collection (fig. 1. pl. 39, Geol. Trans.), and a bone from the Cabinet of Mr. Toulmin Smith, equivalent to that represented by Prof. Owen in the same plate, fig. 2, which bones presented the same structural evidence of their Reptilian nature, and

* Quart. Geol. Journ. vol. ii. p. 7. pl. 1. figs. 1–6.

which description of evidence has, I am happy to say, been more fully developed and firmly established by the talented coadjutor of Prof. Owen, Mr. Quekett of the Royal College of Surgeons, who has publicly taught it in the Theatre of that Institution without question or contradiction of its truth. This great radius and ulna in Mrs. Smith's Collection I referred to my previously established species, *P. giganteus*, believing at that time that they were probably the bones of a fully developed animal, while those previously described were the remains of animals not developed to the full extent of their capability.

Since the publication of these specimens it has been my good fortune to obtain the snout of another and still larger species of Pterodactyl, from the same pit at Burham in Kent, and which it is probable will ultimately prove to belong to the species to which the enormous pair of bones in the Cabinet of Mr. Charles of Maidstone belongs. Should this hereafter prove to be the case, it will then remain to be shown whether the beautiful specimen of radius and ulna in the Collection of Mrs. Smith of Tunbridge Wells, and the bone nearly corresponding in size with them, and which was in the possession of the Earl of Enniskillen, belong to the newly discovered species, which I purpose designating *Pterodactylus Cuvieri*, or to the previously named species, *P. giganteus*; or whether there be yet a third species existing in the chalk, to which these bones of an intermediate size may hereafter be referred *.

The snout of the new species, *P. Cuvieri*, differs materially in its form from the same part of *P. giganteus*: while the latter agrees as nearly as possible in that respect with *P. crassirostris* and *P. brevirostris*, the former appears to approach very closely the proportions of *P. longirostris*. Thus, if we take the length of the snout from the distal end of the cavitas narium, as compared with its height, at the same point of *P. crassirostris*, *P. brevirostris* and *P. giganteus*, we find the relative proportions to be,—of the first-named, 29 of height to 56 of length; of the second, 28 of height to 50 of length; and of the third, 28 of height to 58 of length; we may therefore reasonably conclude that, when perfect, the head of *P. giganteus* very closely resembled in its proportions that of *crassirostris*. The length of the fragment of the snout of *P. Cuvieri* at the upper portion of the head is 7·20 inches; at the palatal bones, 6·38 inches; and in this space there are sockets for twelve teeth on each side. The distance between each tooth is about $1\frac{1}{2}$ of the long diameter of the sockets, which are somewhat irregularly placed, but are nearly equidistant from each other. The pair of teeth at the distal end of the snout appear, both from the position of the sockets and the tooth remaining *in situ*, to have been projected more or less forward, in a line with the palatal bones. The head appears to have been exceedingly narrow throughout the whole of its length. At the third pair of teeth from the distal

* A third species, *C. compressirostris*, has since been described by Prof. Owen, page 95, Part III. of 'The Fossil Reptilia of the Cretaceous Formations,' published by the Palæontographical Society, and to which species the bones in question have been referred.

end of the snout it measures ·66 inch, and at the eleventh pair of teeth, ·78 inch wide. Opposite the seventh pair of teeth the skull curves upward suddenly and considerably, which is not the case at any part of the corresponding portion of the skull of *P. longirostris*; it is therefore probable, that although in the number and disposition of the teeth in the upper jaw, as far as our evidence goes, it strongly resembles *longirostris* in its structure, yet in the length of its skull it is probably shorter in proportion than that species, apparently in that respect being intermediate between *longirostris* and *crassirostris*; thus uniting the long-nosed with the short-nosed species of Pterodactyls.

There are no remains of the cavitas narium in the new species, but it is not to be expected that it should make its appearance so near to the termination of the snout, as in *longirostris* the distal portion of that cavity is situated as far backward from the last of the dental series of the upper jaw as that tooth is from the end of the snout. The number of teeth on each side of the upper jaw in *P. longirostris* is twelve, and the like number of sockets are apparent in our specimen; it is therefore probable that we have the whole of that portion of the head.

If we estimate the size of the head on the scale of *P. longirostris*, it would appear to be 25·52 inches in length; but as we have observed that the skull curves upward considerably at the seventh pair of teeth, it is probable that its length may not be so much.

The length of the wing of *P. crassirostris* in proportion to the length of its head is 3·91 times. The length of the wing of *P. longirostris* compared with the length of its head is 2·51; if therefore we assume, from the peculiar form of the snout of *P. Cuvieri*, that the head as regards length is intermediate in its proportions between *P. crassirostris* and *P. longirostris*, it should be 3·21 parts of the length of the wing.

The snout contracts in width gradually upwards from the sockets of the teeth, so that its upper portion forms a narrow ridge, and this is its form as far backward as it can be traced. The palatal bones are depressed, the suture forming a prominent ridge as far as it is visible, but not in so great a degree as in *P. giganteus*.

One of the first pair of teeth remains in its socket; the whole of the other large teeth are displaced, but there are two of them imbedded in the chalk, one within an inch and the other an inch and a half of the sockets, and in the fifth right and eighth left socket there is a rudimentary tooth *in situ*. The largest of the displaced teeth exceeds 1·32 inch in length, and has been buried in the socket for nearly an inch; the second large tooth, which is imbedded near the third pair of sockets, does not exceed an inch in length; both teeth are slightly curved, smooth, and are hollow at the base.

The great diversity in the size of these remarkable Reptiles will render a short review of some of the known species interesting; and if we arrange them in order, as they increase in size, the following will be the series:—1. *P. brevirostris*, 2. *P. longirostris*, 3. *P. crassirostris*, 4. *P. Bucklandi*, 5. *P. grandis*, 6. *P. giganteus*, 7. *P. Cuvieri*; and to these may be added the bones in the possession of Mrs. Smith, the

Earl of Enniskillen, and Mr. Charles. Of these, *brevirostris, crassirostris* and *giganteus* are short-nosed species, *longirostris* and *Cuvieri* long-nosed. With regard to relative length and proportions of the other parts of the skeleton we have ample means to arrive at tolerably correct conclusions, in consequence of the nearly perfect condition of *brevirostris, crassirostris* and *longirostris*. In the former two we find the cervical vertebræ short and thick, the length being about equal to the height in the latter of the two, while in *longirostris* they vary in length from three to five times their own diameter at the middle. Very uncertain results therefore would arise from finding single bones of this portion of the skeleton, excepting that a long and attenuated cervical vertebra would seem to indicate a corresponding length of snout; but from the other bones of the animal, more especially those of the wing, much more satisfactory results may arise. Upon a careful measurement of the casts in the British Museum from the original specimens, I find the following to be the length of the bones of the wing of *P. longirostris*:—

	inch.		
Humerus	1·25	=	8·55 of length of wing.
Radius and ulna	1·90	=	5·57 ,,
Carpus	0·13	=	0·82 ,,
Metacarpus	1·34	=	7·97 ,,
1st Phalange	1·90	=	5·57 ,,
2nd ,,	1·75	=	6·10 ,,
3rd ,,	1·25	=	8·55 ,,
4th ,,	1·17	=	9·13 ,,
	10·69		

	inches.
The length of the head	4·25
From the tip of the nose to the commencement of the cavitas narium	2·10
Height of the skull at the commencement of the cavitas narium	0·38
Length of the femur	1·34
Length of the tibia	1·90
Smallest diameter of the radius near the distal extremity	0·14

By these measurements it is apparent that the tibia, radius and ulna and 1st phalange are equal in length. The humerus and 3rd phalange are also equal to each other, and so likewise are the metacarpus and femur equal to each other. If we also compare the smallest diameter of the radius, 0·14 inch, with its length, 1·90 inch, we find that the bone is $13\frac{8}{14}$ diameters long, and in *P. Macronyx* (*Bucklandi*) it is $13\frac{9}{32}$. We may therefore be enabled, by keeping these comparative measurements in view, to predict with a tolerable degree of certainty the spread of wing of any Pterodactyl of which we may find one or more of the principal bones of the wing, and especially if we take into consideration the comparative length of each bone with regard to its total extension, as exhibited in the table of the dimensions of *P. longirostris*. In the case of the great specimens of radius we may arrive at their length in many cases, although the bone may be imperfect at even both terminations. Thus the diameter of the smallest portion of the bone formerly in the possession of the Earl of Enniskillen and figured by Prof. Owen, is ·81 inch at the smallest portion of the shaft: this bone therefore, on the scale of 13½ diameters to its length, should be 10·93 inches in length. The measurement of the smallest portion of the bone belonging to Mrs. Smith (Geol. Journ. vol. iv. pl. 2. fig. 1 *a*) is ·77 inch: we may therefore, by the same rule, conclude that its length was 10·39 inches when perfect. The length of the imperfect ulna beside it is 9·25 inches in the specimen. The diameter of the smallest portion of the bone (Geol. Journ. vol. ii. pl. 1. fig. 6) is ·45 inch, which, in the proportion of 13½ diameters to its length, will give 6·07 inches for its length. The width of the corresponding bone in the possession of Mr. Charles of Maidstone is 1·25 inch at the smallest diameter: by the same rule, therefore, the approximate length should be 16·87. The remains of the bone alongside of it is, although imperfect at both ends, actually 12·25 inches in length.

Upon these grounds therefore, in every case derived as much as possible from direct measurements from the skeletons of the respective species, I have given the following table of the dimensions of a series of species of Pterodactyls, the most interesting either from the state of perfection in which their remains have been found, or from the gigantic proportions which they present; and thus have endeavoured to realize to the mind an idea, as nearly as possible correct, of the dimensions of the animals when alive.

Table of the relative proportions of known species of ***Pterodactylus***, with the length of each of the wing-bones and half of the width of the body.

	Humerus.	Radius and Ulna.	Carpus.	Metacarpus.	1st Phalange.	2nd Phalange.	3rd Phalange.	4th Phalange.	Half width of body.	Total expansion from tip to tip of wing.
	in.	in.	in.	in.	in.	in.	in.	in.		ft. in.
P. brevirostris ...	0·48	0·75	0·06	0·52	0·82	0·76	0·48	0·35	0·19	0 9
P. longirostris ...	1·25	1·90	0·13	1·34	1·90	1·75	1·25	1·17	0·47	1 10
P. crassirostris...	2·08	4·42	0·34	1·32	2·83	2·53	2·08	2·32	1·10	3 2
P. Bucklandi.....	3·25	4·25	0·40	3·75	3·91	4·83	3·25	3·00	1·06	4 7
P. grandis	3·75	5·70	0·39	4·02	5·70	5·50	2·75	3·51	1·42	5 5
P. giganteus......	4·43	6·74	0·46	4·75	6·74	6·21	4·43	4·14	1·68	6 7
P. (Mrs. Smith's)	6·76	10·39	0·70	7·26	10·39	9·49	6·76	6·33	2·59	10 2
P. Cuvieri	10·99	16·87	1·14	11·79	16·87	15·56	10·99	10·29	4·22	16 6

In the above table I have presumed that the largest bones should be associated with the snout described as the type of *P. Cuvieri*, but the truth of this assignment of the bones belonging to Mr. Charles can alone be determined by the acquisition of more complete specimens of the animal than those at present known.

In the construction of this table I have taken the proportions of *P. longirostris* as the foundation, as it is the only species from which I could get the measurements of all the bones of the wing from the same animal; but it must not be supposed that the restorations effected in the table will be absolutely correct at all times in its application, for we see that in *P. longirostris* the radius and first phalange are equal, but in *crassirostris* and *Bucklandi* this is not the case: the greatest discrepancy rests with *crassirostris*, while *Bucklandi* and *brevirostris* accord much more nearly with the proportions of *longirostris*; and if we may judge by the comparative difference between those bones in *longirostris* on the one part, and *Bucklandi* and *crassirostris* on the other, it may perhaps be fairly surmised that the greater length of wing would be found to exist in the long-nosed species, and consequently that *Bucklandi* will prove to belong to the short-nosed ones; and this also would seem to be indicated by what remains of the cervical vertebræ in the original specimen in the British Museum.

Prof. Owen, in treating of these animals in my late friend Mr. Dixon's work 'On the Geology and Fossils of the Tertiary and Cretaceous Formations of Sussex,' has thought proper to re-name *P. giganteus*, and designate it *P. conirostris*, Owen. I certainly did not lend my specimens to my late friend Mr. Dixon for the illustration of his work, with a view of having the name which I had assigned to this new and gigantic species subverted, and without in the slightest degree being consulted on the subject. Nor can I concur with the reasons given by Prof. Owen for thus re-naming it, as the name *giganteus* was not given, as stated by the learned Professor, "because certain bones of another and larger animal, of a different species, have been erroneously referred to it;" but, in truth, from its being the largest distinct species at that time known, exceeding *P. Bucklandi* (or *Macronyx*) by two feet in the spread of its wings, and *P. grandis* of Cuvier by above a foot. The beautiful specimen of radius and ulna in the possession of Mrs. Smith, and subsequently figured in my second paper, was at that time unknown to me, and the bone then in the possession of the Earl of Enniskillen was claimed by the Professor as that of a bird. I had therefore no other material than that in my own possession on which to base my name of *giganteus*.

If the learned Professor's reason for the proposed change of name is to hold good, that of exclusive fitness in specific nomenclature, then the one he proposes is also inappropriate, as it might be with equal propriety given to either *crassirostris* or *brevirostris*; or if specific names, based on comparisons of size, are to be extinguished, and new names given on the discovery of new species, there would be no end of the confusion generated; thus, as *P. brevirostris* is thicker in its proportions than *crassirostris*, they would require to exchange names, or the latter at least to be re-named; *medius* would no longer be *medius*, with the addition of our new species, and *grandis* would no longer be grand in comparison. Into what an unenviable state of confusion should we not plunge nomenclature if we were to adopt the *practice* of the learned Professor, instead of the precepts so judiciously laid down by himself and others of the Committee of Nomenclature of the British Association, and which I quote as a justification on my part for my refusal to adopt the learned Professor's exchange of my name for the one he has proposed!

In page 4 of the Report, under the head of "Law of Priority the only effectual and just one," we find the following passages:—"It being admitted on all hands that words are only the conventional signs of ideas, it is evident that language can only attain its end effectually by being permanently established and generally recognized. This consideration ought, it would seem, to have checked those who are continually attempting to subvert the established language by substituting terms of their own coinage." . . . . . "Now in zoology no one person can subsequently claim an authority equal to that possessed by the person who is the first to define a new genus or describe a new species; and hence it is that the name originally given, even though it be inferior in point of elegance or expressiveness to those subsequently proposed, ought, as a general principle, to be permanently retained. To this consideration we ought to add the injustice of erasing the name originally selected by the person to whose labours we owe our first knowledge of the object." To these excellent principles the learned Professor has given the sanction of his signature. Prof. Owen, in the article on *Pterodactylus* in Mr. Dixon's work, has not quoted my observations on those Reptiles so fully as I could have wished; inasmuch as he has adverted to the strongly-marked peculiarities of the bone-cells, which are the principal characters in the question at issue, in so slight a manner, as almost to induce me to imagine that he must have forgotten them entirely. I shall simply content myself in challenging Prof. Owen to produce any such general structure and proportions of the bone-cells from the skeleton of any recent or extinct bird as those existing in the long bone described as *Cimoliornis,* or to produce any such radius and ulna of a bird containing similar bone-cells as those in the possession of Mrs. Smith, and figured by me in my paper in the 'Quarterly Journal of the Geological Society for February 1848,' vol. iv. pl. 2.

On the subject of the strictures with which Prof. Owen has favoured me at the conclusion of his observations in Mr. Dixon's work, and how far I have been "wanting in a due comprehension of the subject, and have been a hindrance instead of a furtherance of true knowledge," I am content to leave to the judgement of those who may feel a sufficient degree of interest to induce them to peruse what I have written in my former papers on the Pterodactyles of the Chalk.

January 28.—R. H. Solly, Esq., F.R.S., in the Chair.

The following paper was read:—

ON A NEW SPECIES OF PTERODACTYLE (PTERODACTYLUS COMPRESSIROSTRIS, OWEN) FROM THE CHALK; WITH SOME REMARKS ON THE NOMENCLATURE OF THE PREVIOUSLY DESCRIBED SPECIES. BY PROF. OWEN, F.R.S.

The honour of having first made known the existence of remains of the Pterodactyle in the Chalk deposits belongs to James Scott

Bowerbank, Esq., F.R.S. This indefatigable collector had the good fortune to receive in 1845, from the Kentish Chalk, the characteristic jaws and teeth, with part of the scapular arch and a few other bones, of a well-marked species of Pterodactyle, and the discovery was briefly recorded in the 'Quarterly Journal of the Geological Society of London,' and in the 'Proceedings' of the Society for May 14, 1845, with an illustrative plate (pl. 1).

Mr. Bowerbank concludes his notice by referring to a large fossil wing-bone from the chalk, previously described and figured by me in the 'Geological Transactions,' and remarks that, "if it should prove to belong to a Pterodactyle, the probable expansion of the wings would reach to at least eight or nine feet. Under these circumstances," he says, "I propose that the species described above shall be designated *Pterodactylus giganteus*." (*loc. cit*. p. 8.) Subsequent discoveries and observations have inclined the balance of probability in favour of the Pterodactylian nature of the fossils to which Mr. Bowerbank refers, but have shown them to belong to distinct species.

These fossils are not, indeed, amongst the characteristic parts of the flying reptile: one of them is the shaft of a long bone exhibiting those peculiarities of structure which are common to birds and pterodactyles; the other shows an articular extremity, which, in our present ignorance of those of the different bones of the Pterodactyle, has its nearest analogue in the distal trochlea of the bird's tibia. These two specimens, which are figured in the sixth volume of the Second Series of the 'Transactions of the Geological Society,' 1840, pl. 39. figs. 1 & 2, were transmitted to me by the Earl of Enniskillen and Dr. Buckland, as being "the bones of a bird" (p. 411), and my comparisons of them were limited to that class.

The idea of their possibly belonging to a Pterodactyle did occur to me, but it was dispelled by the following considerations. The act of flight—the most energetic mode of locomotion—demands a special modification of the Vertebrate organization, in that subkingdom, for its exertion. But in the class *Aves*, in which every system is more or less adapted and co-adjusted for this end, the laws of gravitation seem to forbid the successful exercise of the volant powers in species beyond a certain bulk; and when this exceeds that of the Condor or Albatros, as, for example, in the Cassowary, the Emeu, or the Ostrich, although the organization is essentially that of the Vertebrate animal modified for flight, flight is impossible; and its immediate instruments, to the exercise of which all the rest of the system is more or less subordinated, are checked in their development; and, being unfitted for flight, they are not modified for any other use. There is not, perhaps, a more anomalous or suggestive phænomenon in nature than a bird which cannot fly! A small section of the Mammalia is modified for flight; but the plan of the organization of that warm-blooded class being less directly adapted for flight than that of birds, the weight and bulk of the body which may be raised and transported through the air are restricted to a lower range, and the largest frugivorous Bat (*Pteropus*) does not exceed the Raven in size. The Reptilian modification of the Vertebrate type would seem to be still less fitted for any special adjustment to aërial locomotion; and in the present day we know of no species of the class that can sustain itself in the air which equals a Sparrow in size. And the species in question—the little *Draco volans*—sails rather than flies, upborne by its outstretched costal parachute in its oblique leaps from bough to bough.

Of the remarkable reptiles now extinct, which, like the Bats, had their anterior members modified for plying a broad membranous wing, no species had been discovered prior to 1840 which surpassed the largest of the *Pteropi*, or Flying-Foxes, in the spread of those wings, and there was, *à priori*, a physiological improbability that the cold-blooded organization of a Reptile should by any secondary modification be made to effect more in the way of flight, or be able to raise a larger mass into the air, than could be done by the warm-blooded Mammal under an analogous special adaptation. When, therefore, the supposed bird's bone (Geol. Trans. 1840, pl. 39. fig. 1) was first submitted to me by Dr. Buckland, which on the Pterodactyle hypothesis could not be the humerus, but must have been one of the smaller bones of the wing, its size seemed decisive against its reference to an animal of flight having a cold-blooded organization. The subsequent discovery of the portion of the skull of the Pterodactyle, described by Mr. Bowerbank at the last meeting of the Society (Jan. 14), shows that the resources of Creative power in past time surpass the calculations that are founded upon actual nature.

It is only the practised Comparative Anatomist that can fully realize the difficulty of the attempt to resolve a palæontological problem from such data as the two fragments of long bones first submitted to me in 1840. He alone can adequately appreciate the amount of research involved in such a generalization as that "there is no bird now known, north of the equator, with which the fossils can be compared;" and when, after a wearying progress through an extensive class, the species is at length found to which the nearest resemblance is made by the fragmentary fossil, and the differences are conscientiously pointed out—as when, in reference to the humerus of the Albatros, I stated that "it differs therefrom in the more marked angles which bound the three sides"—the genuine worker and searcher after truth may conceive the feelings with which I find myself misrepresented as having regarded the specimens "as belonging to an extinct species of Albatros." My reference of the bones even to the longipennate tribe of natatorial birds is stated hypothetically and with due caution: "On the supposition that this fragment of bone is the shaft of the humerus, its length and comparative straightness would prove it to have belonged to one of the longipennate natatorial birds equalling in size the Albatros." (*loc. cit.* p. 411.)

Since the discovery has been made of the manifestly characteristic parts of the genus *Pterodactylus* in the Burham chalk-pit, it has been objected that the bones first discovered there, and described by me as resembling birds of flight, "are so extremely *thin*, as to render it most improbable that they could ever have sustained such an instrument of flight as the powerful wing of the Albatros, or of any other bird: their tenuity is in fact such," says the *ex post facto* Objector, "as to point out their adaptation to support an expanded membrane, but not pinions *."

The reply to this assertion need only be a simple reference to nature: sections of the wing-bones of birds may be seen in the Museum of the Royal College of Surgeons, and have been exposed to view, since the discovery of their structure by the Founder of that Collection, in every Museum of Comparative Anatomy worthy to be so called.

To expose the gratuitous character of the objection above cited, I have placed on the table a section of the very bone that directly sustains the large quill-feathers in the Pelican; its parietes are only half as thin as those of the antibrachial bone of the great Pterodactyle which is figured in my 'History of British Fossil Reptiles,' pl. 4, and is not thicker than those of the bone figured in the Geological Transactions, 1840, above cited.

HUNTER, who had obtained some of the long bones with thin walls and a wide cavity from the Stonesfield slate, has entered them in his MS. Catalogue of Fossils as the "Bones of Birds," and perhaps no practical anatomist had had greater experience in the degree of tenuity presented by the compact walls of the large air-cavities of the bones in that class. Of all the modifications of the dermal system for combining extent of surface with lightness of material, the expanded feather has been generally deemed the consummation. Well might the eloquent Paley exclaim, "Every feather is a mechanical wonder: their disposition all inclined backwards, the down about the stem, the overlapping of their tips, their different configuration in different parts, not to mention the variety of their colours, constitute a vestment for the body so beautiful and so appropriate to the life which the animal is to lead, as that, I think, we should have had no conception of anything equally perfect, if we had never seen it, or can imagine anything more so." It was reserved for the author of the 'Wonders of Geology' to prefer the leathern wing of the Bat and Pterodactyle as the lighter form, and to discover that such a structure as is displayed in the bone described and figured in the 'Geol. Trans.' vol. vi. pl. 39, was a most improbable one to have sustained a powerful wing of any bird! † Let me not be supposed, however, to be concerned in excusing my own mistake; I am only reducing the unamiable exaggération of it. Above all things, in our attempt to gain a prospect of an unknown world by the difficult ascent of the fragmentary ruins of a former temple of life, we ought to note the successful efforts, as well as the occasional deviations from the right track, with an equal glance, and record them with a strict regard to truth. The existence of a species of Albatros, or of any other actual genus of bird during the period of the Middle Chalk, would be truly a wonder of Geology; not so the existence of a bird of the longipennate family.

I still think it for the interest of science, in the present limited extent of induction from microscopic observation, to offer a warning

* Mantell, 'Wonders of Geology,' 1848, vol. i. p. 441. † *Ibid.*

against a too hasty and implicit confidence in the forms and proportions of the Purkingean or radiated corpuscles of bone, as demonstrative of such minor groups of a class as that of the genus *Pterodactylus*. Such a statement as that "these cells in *Birds* have a breadth in proportion to their length of from one to four or five; while in *Reptiles* the length exceeds the breadth ten or twelve times," only betrays the limited experience of the assertor. In the dermal plates of the Tortoise, *e. g.*, the average breadth of the bone-cell to its length is as one to six, and single ones might be selected of greater breadth.

With the exception of one restricted family of Ruminants, every Mammal, the blood-discs of which have been submitted to examination, has been found to possess those particles of a circular form: in the *Camelidæ* they are elliptical, as in birds and reptiles. The bone-cells have already shown a greater range of variety in the Vertebrate series than the blood-discs. Is it then a too scrupulous reticence to require the evidence of microscopic structure of a bone to be corroborated by other testimony of a plainer kind, before hastening to an absolute determination of its nature, as has been done with regard to the Wealden bone, figured in the Geol. Trans., 2nd Series, vol. v. pl. 13. fig. 6*? As a matter of fact, the existence of Pterodactylian remains in the chalk was not surmised through any observation of the microscopic structure of bones that are liable to be mistaken for those of birds, but was first plainly proved by the characteristic portions of the Pterodactyle defined by Mr. Bowerbank, as follows, in his original communication of this discovery to the Geological Society of London, May 14, 1845:—

"I have recently obtained from the Upper Chalk † of Kent some remains of a large species of *Pterodactylus*. The bones consist of—

"1. The fore part of the head as far as about the middle of the *cavitas narium*, with a corresponding portion of the under jaws, many of the teeth remaining in their sockets.

"2. A fragment of the bone of the same animal, apparently a part of the coracoid.

"3. A portion of what appears to be one of the bones of the auricular digit, from a chalk-pit at Halling.

"4. A portion of a similar bone, from the same locality as No. 1.

"5. The head of a long bone, probably the tibia, belonging to the same animal as the head, No. 1.

"6. A more perfect bone of the same description, not from the same animal, but found at Halling."

* Compare, for example, two of the longest of the cells figured by Mr. Bowerbank in pl. 1. fig. 9, 'Quarterly Journal of the Geological Society,' vol. iv. as those of a bird, with two of the widest of the cells figured in fig. 1 of the same plate as those of the Pterodactyle; and contrast the want of parallelism in the bone-cells of the Wealden bone, fig. 9, with the parallelism of the long axes of the cells in that of the Albatros, fig. 3.

† Mr. Toulmin Smith, in an able paper "On the Formation of the Flints of the Upper Chalk," in the 'Annals of Natural History,' vol. xx. p. 295, affirms that no upper chalk exists in the localities whence the above-defined specimens came. They are from the "Middle Chalk."

In a subsequent communication, dated December 1845, Mr. Bowerbank states with regard to the specimens Nos. 5 and 6, which he supposed to be parts of a tibia, that "on a more careful comparison with the figures of *Pterodactylus* by Goldfuss, I am inclined to believe they are more likely to be portions of the ulna."

With respect to the long bone, No. 6 in the above list, comparing it with that figured in the Geol. Trans., 2nd Series, vol. vi. pl. 39. fig. 1, and referred by me to *Cimoliornis diomedeus*, Mr. Bowerbank writes:—

"Although the two specimens differ greatly in size, there is so strong a resemblance between them in the form and regularity of the shaft, and in the comparative substance of the bony structure, as to render it exceedingly probable that they belong to the same class of animals;" and he concludes by remarking, that "If the part of the head in my possession (see fig. 1) be supposed similar in its proportions to that of *Pterodactylus crassirostris*,—and there appears but little difference in that respect,—it would indicate an animal of comparatively enormous size. The length of the head, from the tip of the nose to the basal extremity of the skull, of *Pt. crassirostris* is about $4\frac{5}{8}$ inches, while my specimen would be, as nearly as can be estimated, $9\frac{1}{8}$ inches. According to the restoration of the animal by Goldfuss, *Pt. crassirostris* would measure as nearly as possible three feet from tip to tip of the wings, and it is probable that the species now described would measure at least six feet from one extremity of the expanded wings to the other; but if it should hereafter prove that the bone described and figured by Prof. Owen belongs to a Pterodactyle, the probable expansion of the wings would reach to at least eight or nine feet. Under these circumstances I propose that the species described above shall be designated *Pterodactylus giganteus*." (Quarterly Geol. Journ. vol. ii. p. 8.)

In a subsequent memoir, read June 9, 1847, and published in the 'Quarterly Journal of the Geological Society,' vol. iv. February 1848, Mr. Bowerbank gives figures of the 'bone-cells' from the jaw of a Pterodactyle (pl. 1. fig. 1), from the shaft of the bone in question (*ib.* fig. 2), and from the femur of a recent Albatros (*ib.* fig. 3), in corroboration of the required proof: and he adds, "Fortunately the two fine specimens from the rich collection of Mrs. Smith of Tonbridge Wells, represented by fig. 1. pl. 2, in a great measure justify this conclusion; and in the bone *a*, which is apparently the corresponding bone to the one represented by fig. 1 in Prof. Owen's paper, the head is very nearly in a perfect state of preservation." (*op. cit.* p. 5.) Mr. Bowerbank, in his explanation of plate 2, describes the two fine specimens above mentioned as "Fig. 1. Radius and ulna of *Pterodactylus giganteus*, in the cabinet of Mrs. Smith of Tonbridge Wells." (*tom. cit.* p. 10.) He proceeds to state, "There are two other similar bones, imbedded side by side, in the collection of Mr. Charles of Maidstone, of still greater dimensions than those from the cabinet of Mrs. Smith;" and he assigns his grounds for the conclusion, that "the animal to which such bones belonged could, therefore, have scarcely measured less than fifteen or sixteen feet from tip to tip of its expanded wings."

The Committee of the British Association for the Reform and Regulation of Zoological Nomenclature, amongst other excellent rules, have decided that, "A name which is glaringly false shall be changed" (Report, p. 113). I submit that this is the case when the name *giganteus* is proposed for a species less than half the size of others previously discovered. Now, although those remains of the truly gigantic Pterodactyles had not been demonstrated to be such, yet they were suspected so to be by Mr. Bowerbank when he proposed the name *giganteus*; and the name is in fact proposed, subject to the condition of that demonstration, and under the evident belief that they belonged to the same species as the obvious Pterodactyle remains he was describing. He says, "Under these circumstances I propose that the species shall be designated '*giganteus*'," and the circumstances referred to are the probable case that the bones, which from their large size I had supposed to belong to a bird, should prove to belong to a Pterodactyle.

The Committee for the Reform of Zoological Nomenclature next proceed to determine that, "Names not clearly defined may be changed. Unless a species or group is intelligibly defined when the name is given, it cannot be recognised by others, and the signification of the name is consequently lost. Two things are necessary before a zoological term can acquire any authority, viz. *definition* and *publication*. Definition properly implies a distinct exposition of essential characters, and in all cases we conceive this to be indispensable." (Report, pp. 113, 114.) Now with regard to the *Pterodactylus giganteus*, Mr. Bowerbank had unreservedly applied the term to the species to which the long wing-bone first described by me might appertain, under the circumstances of its being proved to belong to a Pterodactyle; inasmuch as he had figured two similar and equal-sized bones in the 'Quarterly Journal of the Geological Society,' vol. iv. pl. 2. fig. 1 (Proceedings of the Society for June 9, 1847), as the "radius and ulna of *Pterodactylus giganteus*." So far as a species can be intelligibly defined by figures, that to which the term *giganteus* was in 1845 provisionally, and in 1847 absolutely applied, seemed to be clearly enough pointed out by the plate 2 in the work above cited. But, with the large bones appropriately designated by the term *giganteus*, some parts of a smaller Pterodactyle, including the portions of jaws first announcing the genus in the Chalk, had been associated under the same name. Supposing those bones to have belonged to a young individual of the *Pterodactylus giganteus*, no difficulty or confusion would arise. After instituting, however, a rigid comparison of these specimens, when drawing up my Descriptions for Mr. Dixon's work, I was compelled to arrive at the conclusion that the parts figured by Mr. Bowerbank in plate 2, figs. 1 & 2, of vol. ii. of the 'Quarterly Geological Journal,' and the parts figured in plate 2, figs. 1 *a* & *b*, of vol. iv. of the same Journal, both assigned by Mr. Bowerbank to the *Pterodactylus giganteus*, belonged to two distinct species. The portions of the scapula and coracoid of the Pterodactyle (pl. 1. fig. 2, *tom. cit.*) indicated by their complete anchylosis that they had not been part of a young individual of the species to which the large antibrachial bones (pl. 2. fig. 1 *a* & *b*, *tom. cit.*) belonged; although they might well appertain to the species to which the jaws belonged. Two species of Pterodactyle were plainly indicated, as I have shown in the above-cited work, by my lamented friend Mr. Dixon, 'On the Tertiary and Cretaceous Deposits of Sussex,' 4to, p. 402. The same name could not be retained for both, and it was in obedience to this necessity, and not with any idea of detracting an iota from the merit of Mr. Bowerbank's original announcement of the existence of a Pterodactyle in the chalk, that I proposed the name of *conirostris* for the smaller species, then for the first time distinctly defined and distinguished from the larger remains to which the name *giganteus* had also been given by Mr. Bowerbank. I proposed the name, moreover, provisionally and with submission to the 'Committee for the Reform of Zoological Nomenclature,' according to whose rules I believed myself to be guided.

My conclusions as to the specific distinction of the remains of the smaller Pterodactyle (pl. 1, *tom. cit.* 1845) from those figured in plate 2. *tom. cit.* 1848, have received full confirmation by the valuable discovery of the portion of the cranium of the truly gigantic Pterodactyle, about to be described, to which they belonged; and it is certainly to be wished that, in determining to assign to Mrs. Smith's specimens the name of '*giganteus*,' Mr. Bowerbank should have conformed to the following equitable rule of the 'Committee of Nomenclature':—"The author who *first* describes and names a species, which forms the groundwork of later generalizations, possesses a higher claim to have his name recorded than he who afterwards defines a genus which is found to embrace that species. . . . . . By giving the authority for the *specific* name in preference to all others, the inquirer is referred *directly* to the original description, habitat, &c. of the species, and is at the same time reminded of the date of its discovery." (Reports of the British Association, 1842, p. 120.)

Now the species which I originally described under the name of *Cimoliornis diomedeus* comes precisely under this category: it has formed the groundwork of later generalizations, which have led to its being embraced by another genus. In this case the Committee of Nomenclature, whilst determining that the specific name should be retained, recommend that the describer should "append to the original authority for the species, when not applying to the genus also, some distinctive mark, such as (*sp.*), implying an exclusive reference to the specific name." In conformity with the above recommendation, the gigantic species of Pterodactyle, of which parts have been described by Mr. Bowerbank, and parts previously by myself, would be entered into the Zoological Catalogues as follows:—

Pterodactylus diomedeus, Owen (sp.), Proceedings of the Zoological Society, January 1851.

Cimoliornis diomedæus, Ibid., British Fossil Mammals and Birds, p. 545, cuts 230, 231 (1843–1846).

Osteornis diomedæus, Gervais, Thèse sur les Oiseaux Fossiles, 8vo, p. 38 (1844).

Pterodactylus giganteus, Bowerbank, Quarterly Journal of the Geological Society, vol. iv. p. 10. pl. 2. figs. 1 & 4 (1848).

Leaving, however, the question of names, regarding which I have no personal feeling except that they should indicate their objects without ambiguity or obvious impropriety, I proceed to lay before the same Society to which Mr. Bowerbank has communicated his last interesting and important discovery, similar evidence of a third species of Pterodactyle from the chalk, intermediate in size between the species of which the jaws were figured as the *Pterodactylus giganteus* in 1845, and the truly gigantic species which he has named *Pterodactylus Cuvieri*.

The specimens, which consist of two portions of the upper jaw, form part of that gentleman's collection, and were in fact exhibited on the table, but unnoticed, at our last meeting, their true nature not having been recognised. The chief portion might well indeed be mistaken, at first sight, for a crushed portion of an ordinary long bone; and it was not until after a close comparison of several specimens of these rare and interesting remains of Pterodactyles, kindly confided to me by Mrs. Smith of Tonbridge Wells, Mr. Toulmin Smith of Highgate, Mr. Charles of Maidstone, and by Mr. Bowerbank himself, for description in my forthcoming 'Monograph on the Fossil Reptiles of the Chalk,' that I discovered them to be parts of a skull of an undescribed species of Pterodactyle.

In order to make this understood, it will be necessary to premise a few words on the Pterodactyles in general, and on some of the characters of the jaw of the *Pterodactylus Cuvieri* in particular.

The Order *Pterosauria* includes species of flying reptiles so modified in regard to the structure and proportions of the skull, the disposition of the teeth, and the development of the tail, as to be referable even according to the partial knowledge we now possess of this once extensive group, to different genera.

M. Von Meyer *e. g.* primarily divides the Order into—

A. *DIARTHRI*, with a two-jointed wing-finger.
Ex. *Pterodactylus* (*Ornithopterus*) *Lavateri.*

B. *TETRARTHRI*, with a four-jointed wing-finger.
Ex. All the other known species of the order.

These again are subdivided into—

1. *Dentirostres.* Jaws armed with teeth to their ends; a bony sclerotic ring; scapula and coracoid not confluent with one another*; a short moveable tail.
Ex. *Pterodactylus* proper.

2. *Subulirostres.* Jaws with their ends produced into an edentulous point, probably sheathed with bone; no bony sclerotic; scapula and coracoid confluent; a long and stiff tail.
Ex. *Pterodactylus* (*Ramphorhynchus*) *Gemmingi* †.

* The condition of the scapular arch in the *Pt. giganteus*, Bow., *Pt. conirostris* mihi, demonstrates the fallacy of this character.

† Palæontographia, Heft 1, 4to. 1846, p. 19.

The extremity of the upper jaw of the *Pterodactylus Cuvieri* is sufficiently perfect to demonstrate that it had a pair of approximated alveoli close to its termination, and we may therefore refer it to the Dentirostral division.

In this division, however, there are species which present such different proportions of the beak, accompanied by differences in the relative extent of the dental series, as would without doubt lead to their allocation in distinct genera, were they the living or recent subjects of the modern Erpetologist. In the *Pterodactylus longirostris*, the first species discovered and made known by Collini in 1784 *, the jaws are of extreme length and tenuity, and the alveoli of the upper jaw do not extend so far back as the nostril. In the *Pterodactylus crassirostris*, Goldfuss †, on the other hand, the jaws are short, thick, and obtusely terminated, and the alveoli of the upper jaw reach as far back as the middle of the vacuity which intervenes between the nostril and the orbit, and which Goldfuss terms the 'cavitas intermedia.'

In the solid or imperforate part of the upper jaw anterior to the nostril, the *Pterodactylus longirostris* has twelve long, subcompressed teeth, followed by a few of smaller size: the same part of the jaw in the *Pt. crassirostris* has but six teeth, of which the first four are close together at the end of the jaw, and the first three shorter than the rest. The *cavitas intermedia* in *Pt. longirostris* is much smaller than the nostril; in the *Pt. crassirostris* it is larger than the nostril. Were these two species of dentirostral *Pterosauria* to be taken, as by the modern Erpetologist they assuredly would, to be types of two distinct genera, the name *Pterodactylus* should be retained for the longirostral species, as including the first-discovered specimen and type of the genus; and the crassirostral species should be grouped together under some other generic name.

The specimen of gigantic Pterodactyle described by Mr. Bowerbank at the last meeting of the Society consists of the solid anterior end, *i. e.* of the imperforate continuous bony walls, of a jaw, compressed and decreasing in depth, at first rapidly, then more gradually, to an obtusely-pointed extremity. As the symphysis of the lower jaw is long and the original joint obliterated, and its depth somewhat rapidly increases by the development of its lower and back part into a kind of ridge in some smaller Pterodactyles, the present specimen, so far as these characters go, might be referred to the lower jaw, and its relatively inferior depth to the upper jaw in the *Pt. conirostris* would seem to lead to that conclusion. But the present is plainly a species which has a longer and more slender snout in proportion to its size, and the convex curve formed by the alveolar border, slight as it is, decides it to be part of the upper jaw. The lower jaw, moreover, might be expected, by the analogy of the smaller Pterodactyles, to be flatter or less acute below the end of the symphysis.

The specimen of *Pt. Cuvieri* consists of the anterior extremity of

* Acta Academiæ Theodoro-Palatinæ, V. p. 58, tab. 5.

† Beiträge zur Kenntniss verschiedener Reptilien der Vorwelt, 4to. 1831, sec. 1. tab. 7, 8, 9.

the upper jaw, of seven inches in extent, without any trace of the nasal or any other natural perforation of its upper or lateral parietes. From the number of teeth contained in this part, the *Pt. Cuvieri* presents a much closer resemblance to the *Pt. longirostris* than to the *Pt. crassirostris*; and if the entire skull were restored according to the proportions of the *Pt. longirostris,* it would be twenty-eight inches in length.

But nature seems never to retain the same proportions in species that differ materially in bulk. The great *Diprotodon,* with the dental and cranial characters of a Kangaroo, does not retain the same length of hinder limbs as its living homologue; the laws of gravity forbid the saltatory mode of locomotion to a Herbivore of the bulk of a Rhinoceros; and accordingly, whilst the hind-legs are shortened the fore-limbs are lengthened, and both are made more robust in the *Diprotodon* than in the Kangaroo. The change of proportions of the limbs of the Sloths is equally striking in those extinct species which were too bulky to climb, *e. g.* the *Megatherium* and *Mylodon.* We may therefore infer, with a high degree of probability, when a longirostral Pterodactyle much surpassed in bulk the species so called 'par excellence,' that the same proportions were not maintained in the length of the jaws; and that the species to which the fine fragment belonged, far as it has exceeded our previous ideas of the bulk of a flying reptile, did not sustain and carry through the air a head of two feet four inches in length, or nearly double the size of that of the Pelican.

Although the fractured hinder part of the jaw of the *Pt. Cuvieri* shows no trace of the commencement of the wide nasal aperture, there is a plain indication that the jaws were less prolonged than in the *Pt. longirostris,* in the more rapid increase of the vertical breadth of the jaw. Opposite the ninth tooth, *e. g.*, the depth of the jaw equals two-fifths of the length in advance of that tooth, whilst in the *Pt. longirostris* it is only two-sevenths. The contour of the upper border of the jaw in the *Pt. Cuvieri* differs from that in both the *Pt. longirostris, Pt. crassirostris,* and *Pt. Gemmingi,* in sinking more suddenly opposite the ninth, eighth and seventh teeth, than it does along the more advanced part of the jaw; a character which, while it affords a good specific distinction from any of those species, indicates the hinder parts of the head that are wanting in the present specimen to have been shorter and deeper than in the *Pt. longirostris.*

The first pair of alveoli almost meet at the anterior extremity of the jaw, and their outlet is directed obliquely forwards and downwards; the obtuse end of the premaxillary above these alveoli is about two lines across. The palate quickly expands to a width of three lines between the second alveoli, then to a width of four lines between the fourth alveoli, and more gradually, after the ninth alveoli, to a width of six lines between the eleventh alveoli: here the palate appears to have been slightly crushed; but in the rest of its extent it presents its natural form, being traversed longitudinally by a moderate median ridge, on each side of which it is slightly concave transversely. It is perforated by a few small irregular vascular foramina. There are no orifices on the inner side of the alveoli; the successional teeth emerge, as in the Crocodiles, from the old sockets, and not, as in certain Mammalia and Fishes, by foramina distinct from them. The second and third alveoli are the largest; the fourth, fifth and sixth the smallest, yet they are more than half the size of the foregoing, with which the rest are nearly equal. The outlets of the alveoli are elliptical, and they form prominences at the side of the jaw, or rather the jaw sinks gently in between the alveoli, and is continued into the bony palate without any ridge, the vertical wall bending round to form the horizontal plate. The greatest breadth of the under surface of the jaw, taken from the outside of the alveoli, varies only from seven lines across the third pair to nine lines across the eleventh pair of alveoli; and from the narrow base the sides of the jaw converge with a slight convexity outwards at the anterior half of the fragment, but are almost plane at the deeper posterior half, where they seem to have met at one acute superior ridge; indeed such a ridge is continued to within an inch of the fore part of the jaw, where the upper border becomes more obtuse.

The whole portion of the jaw appears to consist of one uninterrupted bone—the premaxillary; the delicate crust of osseous substance, as thin as paper, is traversed by many irregular cracks and fissures, but there is no recognizable suture marking off the limits of a maxillary or nasal bone. The bone offers to the naked eye a fine fibrous structure, so fine as to produce almost a silken aspect, the fibres or striæ being longitudinal, and impressed at intervals of from two to six lines by small vascular foramina.

Having premised so much with reference to the characters of the *Pt. Cuvieri*, I proceed to the description of the distinct species, for which I propose the name of *Pterodactylus compressirostris*.

Pterodactylus compressirostris, Owen.

This species is represented by two portions of the upper jaw, obtained from the Middle Chalk of Kent, the hinder and larger of which include the beginning of the external nostril. The depth of the jaw at this part is fourteen lines, whence it gradually decreases to a depth of ten lines at a distance of three inches in advance of this, indicating a jaw as long and slender as in the *Pt. longirostris*, supposing the same degree of convergence of the straight outlines of the upper and alveolar borders of the jaw to have been preserved to its anterior end: that this was actually the case is rendered most probable by the proportions of the smaller anterior part of the jaw obtained from the same pit, if not from the same block of chalk, and which, with a vertical depth of seven lines at its hinder part, decreases to one of six lines in an extent of one inch and a half in advance of that part. The sides of the jaw as they rise from the alveolar border incline a little outwards before they converge to meet at the upper border. This gives a very narrow ovoid section at the fore part of the larger fragment, the greatest diameter at its lower half being four lines, and the sides meeting above at a slightly obtuse ridge. This very gradually widens as the jaw recedes backwards, where the entireness of the walls of the smoothly convex upper part of the jaw proves that the narrowness of that part is not due to accidental crushing. Had that been the case, the thin parietes arching above from one side to the other would have been cracked. The only evidence of the compression to which the deep sides of the jaw have been subject is seen in the bending in of the wall above the alveoli, close to the upper ridge at the fore part of the fragment.

In an extent of alveolar border of three and a half inches there are eleven sockets, the anterior one on the right side retaining the fractured base of a tooth: the alveoli are separated by intervals of about one and a half times their own diameter; their outlets are elliptical, and indicate the compressed form of the teeth: they are about two lines in long diameter at the fore part of this fragment, but diminish as they are placed more backwards, the last two being developed beneath the external nostril. The bony palate is extremely narrow, and presents in the larger portion a median smooth convex rising between two longitudinal channels, which are bounded externally by the inner wall of the alveolar border. There is no trace of a median suture in the longitudinal convexity. The breadth of the palate at the back part of the fragment is eight lines; at the fore part it has gradually contracted to less than three lines, but it is somewhat crushed here. The naso-palatine aperture commences about half a line in advance of the external nostril, three inches behind the fore part of the larger portion of the upper jaw; which exemplifies the characteristic extent of the imperforate bony palate formed by the long single premaxillary bone in the genus *Pterodactylus.* The fragment from the more advanced part of the jaw contains five pairs of alveoli in an extent of two inches, these alveoli being rather larger and closer together than in the hinder part of the jaw. Owing to the compression which the present portion has undergone, the orifices of the alveoli are turned outwards, the bony palate being pressed down between the two rows, and showing, as the probable result of this pressure, a median groove between two longitudinal convex ridges; but the bone is entire and imperforate.

The form of the upper jaw in the present remarkable species differs widely from that of the two previously known species from the chalk, in its much greater elongation and its greater narrowness; and from the *Pt. Cuvieri,* in the straight course of the upper border of the jaw, as it gradually converges towards the straight lower border in advancing to the anterior end of the jaw. The alveoli, and consequently the teeth, are relatively smaller in proportion to the depth of the jaw than in the *Pt. Cuvieri*, and are more numerous than in the *Pt. giganteus*; they are probably also more numerous than in the *Pt. Cuvieri*; although, as the whole extent of the jaw anterior to the nostril is not yet known in that species, it would be premature to express a decided opinion on that point. As we may reasonably calculate from the fragments preserved, that the jaw of the *Pt. compressirostris* extended seven inches in front of the nostril, it could not have contained less than twenty pairs of alveoli, according to the number and arrangement of those in the two portions preserved.

The osseous walls in both portions present the characteristic compactness and extreme thinness of the bones of the skull of the genus: the fine longitudinal striæ of the outer surface are more continuous than in the *Pt. Cuvieri,* in which they seem to be produced by a succession of fine vascular orifices produced into grooves. The conspicuous vascular orifices are almost all confined to the vicinity of the alveoli in the *Pt. compressirostris.* This species belongs, more decidedly than the *Pt. Cuvieri,* to the 'longirostral' section of the *Pterosauria*: whether it had an edentulous prolongation of the fore part of the upper and lower jaw remains to be proved.

In attempting to form a conception of the total length of the head of the very remarkable species of Pterodactyle represented by the portions of jaw above described, we should be more justified by their form in adopting the proportions of that of the *Pt. longirostris* than in the case of the *Pt. Cuvieri*: but allowing that the external nostril may have been of somewhat less extent than in the *Pt. longirostris,* we may still assign a length of from fourteen to sixteen inches to the skull of the Pterodactyle in question.

It could not have been anticipated that the first three portions of Pterodactylian skull—almost the only portions that have yet been discovered in the cretaceous formations—should have presented such well-marked distinctive characters, one from the other, as are described and illustrated in Mr. Bowerbank's Memoirs and in the present communication. Such, nevertheless, are the facts: and, however improbable it may appear, on the doctrine of chances, to those not conversant with the fixed relations of osteological and dental characters, that the three corresponding parts of three Pterodactyles for the first time discovered, should be appropriated to three distinct species, I have no other alternative, in obedience to the indications of nature, than to adopt such determination *.

* The same criticism or objection may be offered to the conclusions in the text, as the following one, which was called forth by my determinations of the species of *Balænodon* found in the red crag. "The specimens exhibited by Prof. Henslow were only *eleven* in number; so that, without allowing anything for the circumstance of each whale having *two* tympanic bones, and the probability of some of the above being in *pairs,* we have the first twelve determinable cetaceous bones discovered in the red crag appropriated to no less than *five* species. I have no pretensions to call in question the decision of Prof. Owen upon osteological grounds, but I must own that I am disposed, upon the doctrine of chances, to consider it hardly probable that these determinations are accurate."—*Searles V. Wood,* Feb. 16, 1844, London Geol. Journal, p. 35. The *fifth* species is a gratuitous addition to the four described by me, the determinate characters of which have been confirmed by numerous additional discoveries. Mr. Wood should have remembered, before he attempted to discredit the determinations from anatomy, and to substitute the numerical test, that the second mammalian fossil from the oolite, although a lower jaw, like the first, was of a different species, and that of five subsequently discovered unequivocal mammalian remains from Stonesfield, *all* are parts of the lower jaw, whilst two of them demonstrate a *third* species. Very improbable this to him, on the doctrine of chances; but only showing, as Sir Charles Lyell has remarked, "the fragmentary manner in which the memorials of an ancient terrestrial fauna are handed down to us."

MISCELLANEOUS.

THE NATURAL-HISTORY COLLECTIONS AT THE BRITISH MUSEUM.

Somebody has said that the English people are a great people, not so much in consequence of what they say and do, as in consequence of what they leave unsaid and undone. British reserve (next to the British lion) is supposed to be the main-stay of the British constitution. Unfortunately, as in our social habits so in our public proceedings, we are given to carry this virtue to an excess; so that our light instead of shining as it should do before other nations, too often glimmers ignominiously under a bushel—invisible to the eye of even the natives themselves. A singular illustration of this is to be found in the Reports of the Keepers of the Zoological and Mineralogical Collections of the British Museum contained in the Blue Book just published by order of the House of Commons.

Every naturalist is acquainted with the magnificent zoological collection contained in those galleries of the British Museum which are *above* the level of the bases of the columns of the façade, but few are aware of the existence of a no less admirable collection in the vaults *below*, consisting of osteological and spirit specimens, not merely supplementary to the dried skins above, but for the zoological student the necessary completement and explanation of the latter. The spectator wandering through the galleries, as he looks at the stuffed skins glancing at him from all sides with their speculationless eyes, little thinks that, could each speak, it would address him very much in the words of the resurrectionized damsel immortalized by Hood:

> "As for my *bones*, they 're all pack 'd up
> To go by Pickford's van."

And yet so it is: thanks to the zeal and energy of the indefatigable keeper of the department, Dr. Gray, the bones belonging to every skin are in the catacombs below, labeled and marked and ready to be exhibited, like the works of a clock beside its case, whenever room can be made for them.

But let the reports of Dr. Gray and Mr. Waterhouse speak for themselves:—

"British Museum, December 12th, 1851.

"Mr. Gray begs to state to the Trustees, in case any additions should be made to the present buildings, that it is very desirable that some more rooms should be assigned to the Zoological department for the exhibition of the collection of animals in spirits, and of the osteological collection, which are now arranged in the basement, and consequently are in some measure hidden from the public, who are constantly inquiring after them.

"The osteological collection is of the greatest importance, as it is by far the largest and most complete ever formed in this country; indeed, Mr. Gray believes that it is as large as all the collections in the country put together, and its exhibition is of the greatest importance to the progress of zoological science, as the classes, orders, families, and genera into which the vertebrated animals are divided, are greatly dependent on the characters furnished by the variations in the bones, teeth, &c.; and it is also of great importance to artists, as affording them the best means of studying the forms, attitudes, and characteristic marks of the different animals.

"To give some idea of the importance of the osteological collection, M. Gervais, before he would undertake to continue the late M. de Blainville's 'Ostéographie,' came to England this autumn for the purpose of examining the collection, and assuring himself that there would be no difficulty in his examining and figuring the specimens contained in it; for, he observed, if this was not the case, it would be impossible for him to undertake the work with justice to his subscribers, as the skeletons were better determined, and it contains many species which were not to be found in any other collection.

"The exhibition of the animals in spirit is required to afford students the means of studying the distribution and arrangement of the animal kingdom, and of determining the species of them.

"Indeed, until these two collections are exhibited to the public, and arranged in the same order as the stuffed animals now shown, the students visiting the Museum may be considered as being deprived of half the assistance in their studies which the collections might, and indeed ought to afford them."

"British Museum, February 11th, 1852.

"Mr. Gray and Mr. Waterhouse beg to report to the Trustees, that they hope, if any new building should be undertaken, that space would be found for the exhibition of the collection of skeletons of vertebrated animals.

"The exhibition of this collection is of the greatest importance to the progress of zoological and palæontological science; first for the scientific arrangement and determination of the genera and species of recent vertebrated animals; and, secondly, for the determination and identification of the fossil species.

"Mr. Gray and Mr. Waterhouse further beg to observe, that they believe that such a collection is very interesting to the general visitors, and most instructive, as enabling them to understand the fossil remains; and it is also of great importance to artists, as it would assist them to draw the different animals on true principles. These facts are proved to Mr. Gray and Mr. Waterhouse by the number of inquiries that are made after the few skulls which were formerly exhibited in the first room of the northern Zoological Gallery, and the number of persons who now daily come to consult the collection in the basement for scientific purposes, and are also assured of the popular desire of seeing such a collection by the number of persons who visit the celebrated Osteological Museums of Paris and Leyden, where it is of as great interest as the stuffed collections."

"June 26th, 1851.

"Mr. Gray, in conformity with the minute of the Trustees of the 21st of June, 1851, begs to report that he regrets he has no means of giving a very accurate reply to the first part of the minute, as he has no estimate of the number of specimens of the various classes of animals existing in the collection of 1836.

"Mr. Gray believes that he will not be very far wrong when he states, first, that the zoological collection is now at least ten times as numerous in kinds and specimens as it was in the year 1836; and secondly, that nearly three times as much space is now devoted to its display and arrangement. He begs to add, that nearly one-half of the additional specimens are kept in rooms on the basement, which are only accessible to the public on special permission."

"July 5th, 1851.

"In 1836 the zoological collections occupied 13,745 square feet; in 1851 they occupy 36,600 square feet. To arrange the present collections to be accessible to the visitors, they would require at least 20,000 more.

"N.B. This is independent of the space that would be required if the recent osteological specimens and the fossil ones were arranged together, so as to make them useful to the zoologist and palæontologist."

Some of our contemporaries, while they press the necessity of giving greater space to the Natural-History collection in the British Museum, at the same time advocate the principle of centralization, and would merge the various public collections into this one. We cannot think this advisable. In the first place, the resources of the British Museum alone always have been, and are always likely to be, more than a match for its accommodation; and in the second place, however useful it may be to have Societies centralized under one roof, it should be remembered that it is a very different thing, and may not be so useful, to have various collections merged into one collection. Keepers and conservators are but men, and have their whims and oddities, likings and dislikings, personal or otherwise, very much like other people. Suppose, fifty years hence, that all the public zoological specimens in England are gathered together into the British Museum, and are placed under the curatorship of Director A. Suppose that you and Director A are working at the same point, or have had a controversy in print, accompanied with personalities (such things have been known to occur in the scientific world), do you expect that peculiar facilities will be afforded you for examining that collection, if you want to do so? Not if you know human nature. And therefore we maintain that it is a very good thing not to centralize too much; to be able to go to Director B, curator of the other zoological collection—who is not working at the same point, or who is on very good terms with you, or who will at any rate help you, because he is not too fond of A.

Centralize books, statues, pictures, then, as much as you please, for centralization facilitates access, but beware how you centralize Natural-History collections, or indeed any others whose nature is such, that a wide discretion must be left to the curator in permitting or denying examination.

ON THE NIDIFICATION OF THE STICKLEBACK.

To Richard Taylor, Esq.

Newcastle-on-Tyne, Oct. 16th, 1852.

DEAR SIR,—I find that I have committed an error, in my paper which appeared in the last number of the 'Annals,' in assuming that Mr. J. Couch is the author of the memoir, "On the Nidification of the Fifteen-spined Stickleback," which was published in the Transactions of the Royal Institution of Cornwall: this memoir is, I am informed, from the pen of Mr. R. Q. Couch. Not being able to refer to these 'Transactions,' I quoted from the 'Illustrations of Instinct,'—the work of the former gentleman; and in it the author's name of the communication in question is not given. Mr. R. Q. Couch has assured me that he still entertains the opinion he originally expressed, that the nest described by him really belongs to the Fifteen-spined Stickleback.

Since the publication of my paper I have also ascertained that, so far back as 1839, Dr. Johnston described the nest of this fish in the 'Transactions of the Berwickshire Naturalists' Club.' In the Doctor's communication it is stated that "in an early volume of the 'Edinburgh Philosophical Journal,' there is a slight notice of fishes' nests found on the coast of Berwickshire by Admiral Milne, but the species of fish by whom they are constructed is not mentioned." And it is further stated that "Mr. Duncan of Eyemouth has ascertained that they belong to the Fifteen-spined Stickleback,—a fact confirmed by the Rev. Mr. Turnbull, to whom the Club is indebted for specimens." The nest and habits of the fish are then accurately described; and in a concluding note it is announced that "Mr. Maclaren of Coldingham had seen and watched the stickleback in the act of making the nests."

It would therefore appear that the credit, not only of publishing the first observations on this interesting subject, but also that of determining the fact that these nests belong to the Fifteen-spined Stickleback, is due to these gentlemen.

In conclusion, I have to ask that you will be so obliging as to allow this letter to be inserted in the forthcoming number of the 'Annals.'

I remain, dear Sir, yours truly,

ALBANY HANCOCK.

FOSSIL PACHYDERMATA IN CANADA.

To the Editors of the Annals of Natural History.

Woodstock, Upper Canada, April 1852.

GENTLEMEN,—I think it may be worth while to record the first discovery of the remains of one of the large extinct Pachydermata in Canada; for the Mastodon's remains mentioned by Lyell are found on the right bank of the Niagara, which is not in the province, although so close as to be only divided from it by that river.

At the latter end of January, in cutting through, for the transit of a railway, a narrow spit of land at the head of Lake Ontario known as Burlington Heights, two bones of an Elephant were discovered (*E.*

primigenius?), viz. the whole of the right ramus of the lower jaw to beyond the symphysis, and a tusk. The tusk was much curved, as will appear from the following dimensions:—length along the greatest curve, 6 ft. 8 in.; from the base straight to the point, 4 ft. $2\frac{1}{2}$ in.; two feet from the base, to which length I suppose was imbedded in bone, straight to the point, 3 ft. $3\frac{3}{4}$ in. The dimensions of the jaw are—from the angle to the symphysis 19 in., from the condyloid process to the symphysis 2 ft. 2 in., from the angle to the top of the condyloid process 18 in., from base of angle to top of the coracoid process 12 in. The jaw contained only one molar; this tooth was very perfect; the width of the upper surface $3\frac{1}{4}$ in., the length 13, of which $4\frac{3}{4}$ had been used.

The remains were found 40 feet below the surface and 60 above the level of the lake, in a layer of sand, superimposed on which were successive layers of cemented gravel and sand, the layers of gravel varying both in width and in the size of the pebbles: this narrow spit of land seems to have been a bar formed at the mouth of a large estuary which must have flowed into Lake Ontario. To the east of this bar is Burlington Bay, the head of Lake Ontario, from which it is separated by a similar bar through which a canal is cut into the lake, and which bank I am informed is still rising. To the west are the Dundas marshes, which find their exit into Burlington Bay round the point of Burlington Heights, and through which the Desjardin Canal is carried. Behind Dundas, running east and west, is a long, deep and wide valley bounded on the north and south by ridges of Niagara limestone, and down which valley doubtless once flowed a large body of water.

In sinking a coffer-dam near this spot for the foundation of a bridge where the railroad will cross the Desjardin Canal, were found, deep in the silt, the scapular and some fragments of the bones of the extremities of an herbivorous animal about the size of a fallow-deer.

Your obedient servant,

THOMAS COTTLE.

Remarks on the Mode of Vegetation of European and North American Trees transported to Madeira. By Prof. OSWALD HEER.

M. Heer, of Zurich, so well known by his observations on the botanical geography of the Swiss mountains, having been compelled by the state of his health to make some stay at Madeira, has employed his time whilst there in studying, in various points of view, the vegetation of that island, the climate of which is remarkably equable throughout the year.

Since his return he has laid before the Société Helvétique des Sciences Naturelles, several interesting observations relative to the periodical phænomena of vegetation. After remarking that all the woody plants of Madeira are evergreen trees or shrubs, blossoming very often during the cool season, he observes how much the species introduced from more northern countries contrast with these indigenous species in their mode of vegetation.

The oak and the beech, for instance, continue to lose their leaves during the winter, although the weather is then milder than it is in several parts of Europe during the summer. Thus, at Funchal, the leaves of oaks (*Quercus pedunculata*) planted in some public gardens and promenades began to grow yellow at the end of October, and gradually became dried up to the 1st of January. Some isolated trees began to shoot by the 10th of January, and were green again on the 6th of February; but all the others remained in a state of repose and were not generally covered with new leaves until the 20th of February. In Mr. Gordon's garden, at an elevation of 1800 feet, they were a month later.

The leaves of the beech became yellow at Funchal by the 8th of November, at Mr. Gordon's garden by the 28th of October. The leaves, or at least the greater part of them, remained in a dry state upon the trees, until they began to shoot in the spring, which was about the 1st of April. At Funchal, the terminal buds were open by the 8th of April, and the lateral a little later.

At Glaris, the period of repose of the beech on an average is 194 days; in Madeira, where the cold season is like the summer at Glaris, it is 149 days. The difference is only 45 days. The oak in Switzerland has a period of repose nearly equal to that of the beech, whilst at Madeira it is only 110 days, or 49 days less than the beech. M. Heer supposes that this difference may arise from the beeches of Madeira having been introduced from England and the oaks from Portugal, so that the latter would have previously acquired the habit of losing their leaves later and vegetating sooner than in the centre of Europe.

M. Heer ought perhaps to have added, what he no doubt knows, that sudden variations of temperature in the twenty-four hours, especially the instantaneous diminution to 32° Fahr. or lower, are one of the great causes of the fall of the leaves in Switzerland. The absence of these variations retards the phænomenon in the west of Europe, and still more in Madeira.

In the facts stated by M. Heer,—facts of which we previously had examples in the hothouse culture of tropical plants,—there is a proof of that important physiological law, too often forgotten by meteorologists, that *the same temperature or the same sum of temperatures, combined with the season, does not always produce the same effect upon organized beings.*

Every species is as it were a machine which performs its functions under the influences of external causes, modified by particular internal conditions. These vary not only between one species and another, between one race of a species and another, and even up to a certain point between one individual and another, but also between one period and another,—the same heat after the repose of vegetation for instance, not producing the same effect as in other circumstances.

In Madeira, the *Platanus occidentalis,* a native of the United States, loses its leaves very slowly from the middle of October, or rather they gradually become yellow and fall afterwards from the action of wind and rain. The repose is complete in January, February, and up to April, during a period of 87 days. The *Liriodendron tulipifera,* also a native of North America, has a complete repose of 151 days.

The apple and pear trees generally begin to lose their leaves in December. They come into flower, at Funchal, by the 7th of April, and their fruit is collected in August. There are, however, varieties of apple and pear trees which flower and produce fruit twice in the year, and one variety of apple is perpetually in flower and fruit. The peach-trees about the 4th of November already exhibit some flowers amongst their leaves; they then, to the great astonishment of M. Heer, continued blossoming in abundance during the months of December and January, and the fruit came to maturity from the 23rd of February to the end of the summer. In February there were flowers on the upper parts of the trees and fruit below, and it was also then the leaves were renewed, the interval between the falling and shooting of the leaves being scarcely sensible. The vines around Funchal began to lose their leaves about the 24th of October. The soil of the vineyards in winter offered the singular appearance of being covered with the flowers of *Oxalis speciosa* (a Cape plant) and of *Calendula arvensis.* New leaves appeared by the end of March, and by the 8th of April the vines were completely in leaf, with young floral grapes. The flowers open at the end of April and the beginning of May, and the vintage takes place in September. The repose lasts 157 days.—A. DeCandolle *in Bibl. Univ. de Genève,* Août 1852, p. 325.

COLYMBUS SEPTENTRIONALIS.

To the Editors of the Annals of Natural History.

The Willows, Swansea, Oct. 2, 1852.

Gentlemen,—On the 30th of September, *Colymbus septentrionalis,* the Red-breasted Diver, was taken in one of the weirs in Swansea Bay. Only two of these birds have been noted here previously, and as far as I can ascertain, both of them were killed in the winter. The very early advent of this native of the north is my reason for thinking that you may wish to insert the above notice.

Your obedient servant,
Matthew Moggridge.

On the Structure of the Stem of Victoria Regia. By Arthur Henfrey, F.R.S., F.L.S. &c.

The investigation of the anatomy of *Victoria regia* acquires its interest from the fact of the relations which have been pointed out to exist between the Nymphæaceæ and some of the undoubted Monocotyledonous families, especially also from the researches of M. Trécul on the anatomy of *Nuphar lutea,* which plant that author describes as having a stem of the Monocotyledonous type of structure. Through the unfortunate death of the plant of *Victoria regia,* which had flowered for some time in the gardens of the Royal Botanic Society of London, the author had an opportunity of examining the anatomy of its stem. It is an upright rhizome, with undeveloped internodes, growing by a single terminal bud, apparently perennially, and attaining considerable thickness; on the outside it bears the remains of the petioles and flower-stalks, which separate by disarticulation, and their remains are found arranged in spiral lines upon the outside, so as to give the short, thick rhizome the aspect of a piece of a palm stem. As in *Nuphar*, the roots are produced in bundles at the bases of the petioles, and fall off successively upwards as the new ones are developed, leaving very conspicuous scars. The internal structure of the stem is quite Monocotyledonous in its character, presenting no trace of the arrangement of the vascular bundles into rings of wood, no true woody fibres, and no cambium layer. The vascular bundles, which are composed exclusively of spiral, annular and reticulated ducts surrounded by elongated parenchymatous cellular tissue, are isolated and arranged just as in Monocotyledons, such as the Palms; and the outer part of the stem exhibits a cortical parenchyma, much more like that of the herbaceous rhizomes of the rush-like plants, than any other known structure; it bears not the least resemblance to the bark of Dicotyledons. The results of the investigation show that *Victoria*, like *Nuphar*, has a stem of essentially Monocotyledonous structure. The paper was accompanied by drawings illustrating the general and microscopic anatomy of the stem.—*Proc. Royal Society.*

METEOROLOGICAL OBSERVATIONS FOR SEPT. 1852.

Chiswick.—September 1. Slight rain. 2. Foggy: cloudless and hot. 3, 4. Very fine. 5. Overcast: clear. 6. Very fine: rain at night. 7. Hazy: rain. 8. Heavy rain: thunder and lightning: cloudy: clear at night. 9. Cloudy: showery. 10. Cloudy. 11, 12. Fine. 13. Very fine. 14. Clear: dry air: densely overcast at night. 15. Overcast. 16. Fine: clear and cold at night. 17. Slight fog, with very heavy dew: very fine: clear and cold. 18. Foggy: heavy rain. 19. Cloudy: uniformly overcast. 20. Slight rain: showery: clear. 21. Boisterous, with rain. 22. Clear: very fine. 23. Overcast: very fine. 24. Foggy: very fine: dense fog at night. 25. Dense fog: very fine. 26. Heavy dew: foggy: hazy throughout. 27. Dense fog: overcast: heavy rain at night. 28. Constant rain: barometer very low: foggy. 29. Cloudy: slight showers: cloudy. 30. Overcast: fine but windy: overcast.

Mean temperature of the month	56°·20
Mean temperature of Sept. 1851	55 ·15
Mean temperature of Sept. for the last twenty-six years ...	57 ·15
Average amount of rain in Sept.	2·52 inches.

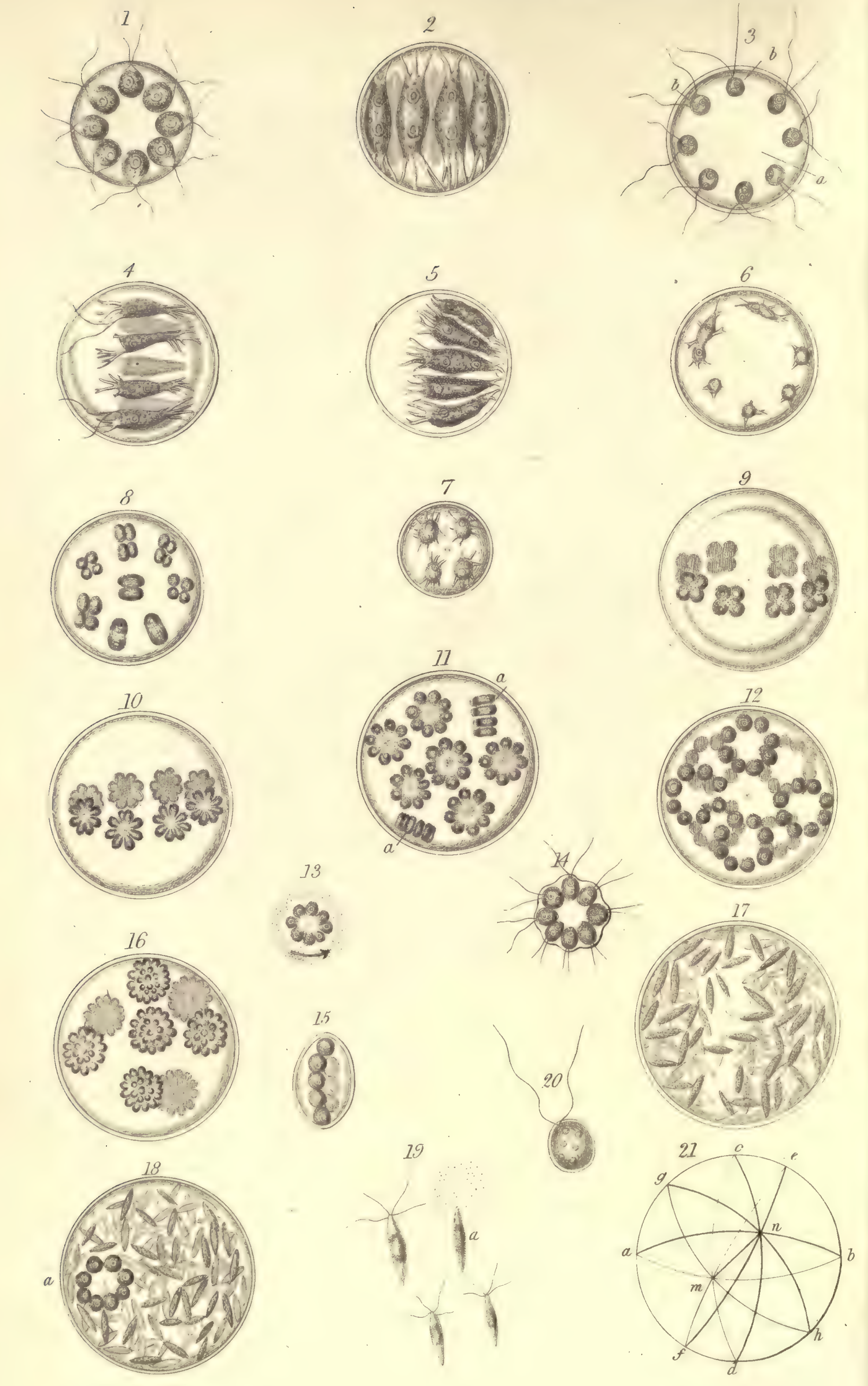
Boston.—Sept. 1. Cloudy. 2. Fine. 3, 4. Cloudy. 5. Cloudy: rain A.M. 6. Cloudy: rain P.M. 7. Cloudy: rain: thunder and lightning early A.M.: rain P.M. 8. Fine. 9. Fine: rain P.M. 10. Fine. 11—13. Cloudy. 14. Fine. 15. Cloudy: rain A.M. and P.M. 16. Fine: rain early A.M. 17. Fine. 18. Fine: rain A.M. and P.M. 19, 20. Cloudy: rain early A.M. 21. Rain: rain A.M. 22. Fine. 23. Cloudy. 24. Fine. 25—27. Foggy. 28. Rain: rain A.M. and P.M. 29. Cloudy: rain A.M. 30. Fine.

Sandwick Manse, Orkney.—Sept. 1. Showers. 2. Clear: fine: cloudy: fine. 3. Clear: fine. 4. Bright: clear: fine: aurora. 5. Fog. 6. Hazy: cloudy. 7—9. Fine: clear: fine. 10. Cloudy: showers. 11. Showers: drops: aurora. 12. Showers: aurora. 13, 14. Sleet-showers. 15, 16. Showers. 17. Bright: showers: aurora. 18. Drizzle: rain. 19. Bright: clear: rain. 20, 21. Bright: cloudy: rain. 22. Showers: cloudy. 23. Cloudy: rain. 24. Showers: clear. 25. Bright: cloudy. 26. Clear. 27. Showers: rain. 28. Showers: lunar rainbow. 29. Bright: cloudy: rain. 30. Rain: cloudy.

Mean temperature of Sept. for twenty-five years	52°·22
Mean temperature of this month	53 ·45
Average quantity of rain in Sept. for six years	2·49 inches.

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

Days of Month.	Barometer.					Thermometer.					Wind.			Rain.		
	Chiswick.		Boston.	Orkney, Sandwick.		Chiswick.		Boston.	Orkney, Sandwick.		Chiswick.	Boston.	Orkney, Sandwick.	Chiswick.	Boston.	Orkney, Sandwick.
1852. Sept.	Max.	Min.	8¾ a.m.	9¼ a.m.	8½ p.m.	Max.	Min.	8¾ a.m.	9¼ a.m.	8½ p.m.	1 p.m.					
1.	30·195	30·030	29·57	29·76	29·90	72	43	60	57½	58	sw.	sw.	s.	·01	·18	·18
2.	30·261	30·220	29·73	30·06	30·16	77	45	60	61	62	sw.	s.	se.	....	....	·07
3.	30·187	30·121	29·70	30·15	30·16	76	49	67	63	61	e.	se.	se.	....	....	....
4.	30·093	30·024	29·60	30·15	30·16	75	51	66·5	63	60	e.	ese.	se.	....	....	....
5.	29·990	29·935	29·48	30·15	30·05	73	50	66·5	63	62	s.	n.	se.	·02	....	....
☾ 6.	29·970	29·938	29·45	29·95	30·07	69	50	62·5	64	60½	n.	nw.	ese.	·32	·10	....
7.	29·929	29·918	29·39	30·23	30·49	69	55	65·5	67½	61	w.	se.	calm	·48	·57	....
8.	29·982	29·951	29·53	30·44	30·41	68	58	65·5	63	63½	e.	ne.	calm	·14	·37	....
9.	29·926	29·859	29·53	30·38	30·31	69	59	65·5	60	60	ne.	ne.	e.	·09	....	....
10.	29·907	29·822	29·42	30·13	29·91	69	49	65·5	58	52½	ne.	ne.	nw.	·10	·07	....
11.	29·862	29·826	29·33	29·83	29·63	67	45	67·5	50	50	nw.	nw.	n.	....	....	·10
12.	29·925	29·848	29·33	29·71	29·77	68	42	58·5	52	46	n.	nnw.	nw.	....	....	·06
● 13.	29·937	29·896	29·41	29·77	29·79	67	46	58·5	48	45	w.	wnw.	nw.	....	....	·16
14.	29·947	29·788	29·50	29·66	29·66	63	46	47·5	47½	44	nw.	wnw.	nw.	·07	....	·10
15.	29·578	29·398	29·20	29·55	29·64	63	45	53	48	48	s.	w.	n.	·11	....	·32
16.	29·817	29·682	29·26	29·69	29·78	61	34	47·5	53	48	n.	n.	wnw.	....	·93	·27
17.	29·849	29·811	29·47	29·76	29·65	62	37	43·5	50½	52	e.	calm	ssw.	....	....	·07
18.	29·643	29·226	29·30	29·46	29·46	66	53	52	55	45	e.	se.	nnw.	·84	....	·20
19.	29·639	29·263	28·92	29·45	29·57	63	43	56·5	44	42	ne.	n.	wnw.	·03	·87	·08
☽ 20.	29·593	29·531	29·10	29·57	29·64	65	45	57·5	50	45	se.	s.	ene.	·23	....	·01
21.	30·164	29·605	29·11	29·85	30·01	57	34	48·5	48	49	w.	nnw.	w.	·01	·07	·03
22.	30·417	30·376	29·88	29·93	30·09	62	47	48·5	56	56½	w.	w.	w.	....	....	·05
23.	30·462	30·457	29·95	30·06	30·02	66	43	56·5	58	55½	w.	wnw.	w.	....	....	....
24.	30·460	30·322	29·98	30·11	30·11	67	46	50	57	56½	ne.	sw.	sw.	·01	....	·23
25.	30·239	29·960	29·80	29·98	29·86	66	44	54	56	51½	e.	calm	wnw.	·01	....	....
26.	29·906	29·884	29·47	30·02	30·07	61	45	53	50	44½	e.	calm	nw.	....	....	....
27.	29·869	29·692	29·43	29·95	29·83	61	48	56	58½	47	e.	calm	calm	·63	....	·07
○ 28.	29·391	28·956	29·04	29·87	29·76	62	50	54	46½	44	e.	n.	nne.	·29	·36	·25
29.	29·292	29·179	28·66	29·48	29·32	63	42	56	48	50½	sw.	ssw.	nne.	·02	·77	·06
30.	29·674	29·470	29·00	29·33	29·31	59	42	50	47	44	sw.	w.	calm	·13	·03	·33
Mean.	29·936	29·799	29·41	29·881	29·886	66·20	46·20	57·0	54·76	52·15				3·54	4·32	2·64



J. De C. Sowerby

THE ANNALS

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XXXVIII.—*On a new Genus of the Family of* Volvocineæ. By Dr. Ferdinand Cohn of Breslau.

[Concluded from p. 347.]

VIII. *Comparison of the Development of* Stephanosphæra *with the Formation of Swarming-cells in the other Algæ.*

Whoever has observed the active spores (*gonidia*) of certain Algæ which are formed by the division of a primordial utricle in the interior of a parent-cell, and after the rupture of the latter emerge into the water by the help of moving cilia, will at once perceive the perfect agreement of this phænomenon with the facts observed in the development of *Stephanosphæra*. The formation and evacuation of the swarming-spores, as I have observed it myself many times in *Achlya prolifera, Chytridium,* and *Conferva glomerata,* and others in *Ascidium, Bryopsis, Codium, Ectocarpus,* and the Fucoideæ, presents the exhibition of *swarming* and *streaming out* exactly as we have just described it in the microgonidia of *Stephanosphæra*. The swarming-spores of *Bryopsis, Chætophora, Stigeoclonium, Ulothrix* and *Draparnaldia* have such a complete agreement of form with those of *Stephanosphæra,* that it would not be possible to distinguish them if they were seen only singly and not at the moment of emerging from the parent-cell. All these spores of Algæ bear *four cilia* at the anterior extremity, like the microgonidia of *Stephanosphæra*; a condition which has not hitherto been observed in any true or pseudo-Infusorium. Other swarming-cells have exactly similar form, development and motion, but bear only two cilia, as in those of *Cladophora, Characium, Apiocystis, Phycoseris, Chætomorpha* and others. The treatise of G. Thuret on the moving spores of the Algæ (Ann. des Sc. Nat. 3 série, tom. xiv. 1850) has very recently given us most excellent representations of this phænomenon, to which I refer every one who may wish to acquire a clear idea of this remarkable mode of propagation of the Algæ and aquatic Fungi*. Yet to be warranted in deciding this question, it is indispensable to make a direct and unprejudiced observation at least of the most important phænomena, which is so much the easier to effect, that, with the exception of the *Oscillatorieæ, Nostochineæ* and *Conjugatæ,* almost all the Algæ propagate by swarming-spores throughout the whole year. An independent examination is here the more indispensable to every one who wishes to acquire an unprejudiced opinion as to the organisms standing on the limits between the animal and vegetable kingdoms, since the phænomena here in question are totally different from anything elsewhere known in the vegetable kingdom, and must be regarded as *sui generis.* The macrogonidia of *Stephanosphæra* themselves also agree perfectly in structure and movement with the swarming-cells bearing two cilia which Nägeli has represented of *Tetraspora* (Einzell. Algen. t. ii. C. *f*), of *Characium* (*l. c.* t. ii. A. *k*), or of *Apiocystis* (t. iii. D. *b*); only the common enveloping cell and the combination into families of cells, which elsewhere occur merely in immoveable forms of Algæ, have not previously been observed in swarming-cells, and must be regarded as specific characters of the *Volvocineæ,* without this organization standing in any contradiction to their vegetable character.

The developmental history of *Stephanosphæra* is especially decisive for the position of the *Volvocineæ,* because of the essential agreement it exhibits with another organism as to the real nature of which no doubt has ever been raised.

One of our most widely diffused freshwater Algæ, *Hydrodictyon utriculatum,* is composed, as is well known, of large utricular cells, which are arranged reticularly in such a manner that three or four always meet in a point, and five or six bound each polygonal space. The green contents lining the walls of the individual cells, in which a great quantity of chlorophyll-utricles are imbedded, are transformed in the propagation into a very large number of swarming-cells, the structure of which was misunderstood until very recently, and was first revealed by the masterly history of its development by Alex. Braun in his often-cited

* Compare especially my drawing of the microgonidia of *Stephanosphæra* (fig. 19) with the figures which Fresenius has given of the swarming-spores of *Chætophora* (zur Controverse über die Verwandl. von Algen in Infusorien), or Thuret at pl. 16. fig. 5, pl. 18. figs. 6, 10 & 11, pl. 19. fig. 3, pl. 21. fig. 3, of his treatise above cited. See also "Sur les organes reproducteurs des Algues," par MM. Derbès et Solier, 'Ann. des Sc. Nat.' 3 ser. xiv. pl. 33, on *Draparnaldia*.

work (Verjungung, &c., 279), with which my own observations agree perfectly. The essential point in this is, that the contents of the large cells of *Hydrodictyon* are transformed in two ways: first, into a number of *large moving spores*, which are of globular form, send out two cilia from a colourless point, only tremble and jerk hither and thither within the parent-cell, and never leave this; after a brief swarming these attach themselves into a network in the interior of the envelope and secrete a rigid membrane which surrounds the whole; in this manner they, the *macrogonidia*, become *combined* into a *family of cells* and grow into a new net exactly like the original. Secondly, in other cells of *Hydrodictyon* the contents are converted into a far greater number of smaller *microgonidia*, 30,000 to 100,000 of which are developed in one utricle; these are spindle-shaped, possess *four cilia*, move very actively and quickly, emerge singly from the parent-cell into the water, and after a long movement pass into a condition of rest, without ever becoming united into a net-shaped family of cells.

Abstracting the differences which may be shown always between two genera, we detect the *same law of development*, that in *Hydrodictyon* as in *Stephanosphæra*, the bi-ciliated, less numerous macrogonidia arrange themselves into a *family of cells* already within the parent-cell, according to the character of the given conditions of the two genera, the cell-family being active in the *Volvocineæ* and immoveable in the *Protococcaceæ*; while the more numerous, more actively moving microgonidia with four cilia leave the parent-cell and enter upon a metamorphosis, the retrogradation from which to the normal type of the genus has not been observed yet here, or indeed in the microgonidia of any of the Algæ. Such an undeniable agreement of the law of development of *Stephanosphæra* with an undoubted plant like *Hydrodictyon*, which testifies to a near relationship, would be inconceivable if the former were to be regarded as of essentially different organization,—as belonging to quite another kingdom of nature*. Thus the developmental history of *Stephanosphæra* also furnishes the most convincing proof of the vegetable nature of this genus, and consequently of the *Volvocineæ* generally.

* Thuret has also observed in one of the *Dictyoteæ*, *Cutleria multifida*, besides large swarming-cells which are developed to the number of eight in a parent-cell and readily germinate, the formation of smaller, likewise moving cellules, which originate exactly in the same way, only by often-repeated division (to thirty-two?), and never germinate. Thuret regarded the latter as analogous to the spermatozoids; we should rather consider them as a proof that a simultaneous formation of macrogonidia and microgonidia occurs also in the higher forms of the marine Algæ (see Thuret, *l. c.* vol. xiv. pl. 31, and vol. xvi. pl. 1).

IX. *On the Physiology of* Stephanosphæra.

That the formation of macro- and microgonidia does not exhaust the whole series of forms which *Stephanosphæra* may pass through is proved by the following observation, which unfortunately I have not yet been able to complete. Having cultivated some *Stephanosphæra* for a long time in a little glass cup, in the way described in my essay on *Loxodes Bursaria* (*l. c.*), all the primordial-cells at length exhibited dark, thick, greenish brown contents, so densely filled with numerous granules that the two chlorophyll-vesicles could no longer be detected; their form was more or less globular, and the mucous radiating processes were entirely absent; their outlines were remarkably sharply defined, as if they had become surrounded by a rigid membrane. At the same time I remarked that the primordial-cells were no longer fixed immoveably at the periphery of the envelope-cell, never changing their relative positions; but *jerked backwards and forwards, finally tore themselves away from the envelope-cell, and then began to rotate slowly and lazily in the interior.* Soon after I saw the envelope-cell also burst at some spot and collapse; and the eight primordial-cells gradually emerged, one after another, as independent globes; they were now seen to be *enclosed in a pretty closely applied envelope,* through which penetrated two cilia, and hence they present the utmost resemblance to *Chlamydomonas Pulvisculus* (fig. 20). They moved about for some time in the water and *at length came to rest, losing their cilia and accumulating like little green Protococcus-globules at the bottom of the glass.* We therefore have here a motionless, perfectly plant-like stage of *Stephanosphæra,* such as we are acquainted with in *Chlamydococcus* and *Chlamydomonas*; the remainder of the *Volvocineæ* undoubtedly pass into a similar condition of rest, which is the means of their preservation when the water of ditches is dried up in summer. The emergence of single globes from the common envelope, in a form resembling *Chlamydomonas,* may also be readily observed in *Gonium* (Ehr. Infusor. pl. 3. fig. 1).

I conjecture that the motionless, Protococcoid cells of *Stephanosphæra* are the means for the preservation of the species when the water, as is always the case in the shallow hollows in stones, their natural station, is dried up for a long time and all the living inhabitants are precipitated on the stone. The observations of Major von Flotow have already demonstrated that the dried-up muddy sediment always reproduces *Stephanosphæræ* when water is again poured on to it. This *capability, of reviving from the dried condition,* is shared by *Stephanosphæra* with *Chlamydococcus pluvialis,* in which likewise the motionless cells remain living after being dried up for years and are capable of giving birth to moving forms, while the swarming-cells themselves are destroyed for ever by rapid desiccation. Herr von Flotow has sent earth with dried *Stephanosphæræ* to Dr. Rabenhorst in Dresden, who, in like manner, succeeded in reviving them by moistening; in this way the latter obtained abundant material for distributing *Stephanosphæra* under No. 102 of the 11th Decade of his 'Algen Sachsens resp. Mitteleuropas,' and thus to effect the more general diffusion of this remarkable organism*.

Since the moving *Stephanosphæræ,* as numerous experiments have taught me, are destroyed, just like the swarming-cells of *Chlamydococcus,* by rapid desiccation, I believe that the motionless, Protococcoid globes, the development of which I have just described, are the forms which do not lose their vitality by drying, but are capable, when wetted again with water, of going through a cycle of development, by which they return to the normal moving form of *Stephanosphæra.* Yet I must remark that I have not hitherto obtained sufficient material to observe the resting *Stephanosphæra,* and to trace the processes which occur in the revivification, and that in reference to this most important phænomenon I must leave a gap, which I hope to fill up next summer.

In conclusion I add a note on the mode by which I have succeeded in obtaining sufficient material for my observations, since this also is of physiological interest. At their stations the *Stephanosphæra*-spheres occur mingled with *Chlamydococcus,* but by no means in the abundance requisite for the investigation; and although green clouds do collect at certain points in the water wholly composed of our *Volvocineæ,* it is difficult to extract sufficient of them for examination, since they immediately start apart when touched. I succeeded in overcoming this inconvenience by a simple means, so as to bring thousands of these elegant organisms on to the object-holder at any moment. I took, namely, a flat bottle with a short narrow neck, and nearly filled it with the water containing *Stephanosphæræ,* stopped it with a cork, and then laid it horizontally so that the cork partly dipped in the water. In a few hours almost all the *Stephanosphæræ* in the water collected on the cork, which was covered with a green coat composed exclusively of the revolving spheres, while the rest of the water in the bottle contained only *Chlamydococcus* and scarcely any *Stephanosphæra*; so that when I wished

* I must observe, however, that some of the specimens compared by myself contained no *Stephanosphæra.* A few printed details are given with the specimens, gathered from information furnished in my letters, not intended for publication in this form and not revised by myself; they contain many and essential inaccuracies.

to examine them I had only to take out the cork, and a drop of the water adhering to it furnished me with all the stages of development of our organism simultaneously in very large numbers. After a short time the *Stephanosphæræ* had again assembled on the cork. I may remark in passing, that there is scarcely any sight more beautiful under the microscope, than a large number of these elegant crystal-like spheres crowded together, rolling through the water in all directions like revolving wheels, with their bright green and often curiously branched wreaths of primordial-cells, sometimes exhibiting themselves as rings, and sometimes as zones, sometimes rotating round a centre, and at others rolling away in the strangest curves.

I made some experiments to investigate more closely the cause of accumulation of the *Stephanosphæra* alone on the cork, and this furnished me with a sufficient explanation of the behaviour of the spheres towards light. When I placed water filled with *Stephanosphæra* and *Chlamydococcus pluvialis,* in a shallow porcelain saucer in a window, a green band was soon found at the margin of the fluid turned towards the window, and this was almost exclusively composed of *Stephanosphæra,* while at the opposite side the *Chlamydococcus* had collected, but with scarcely a single *Stephanosphæra.* Since the side of the water turned towards the window was kept in shadow by the projecting margin of the saucer, and thus constituted the *darkest* part, while the *brightest* point was on the opposite side, it followed that the *Stephanosphæra* avoids the light, and accumulates at the darkest part of the vessel, as is also shown by the collection under the shadow of cork. When I next covered the side of the saucer turned towards the window with a strip of wood, so that this part was kept quite dark, while the opposite side of the saucer was not overshadowed by it, within two hours all the *Stephanosphæræ* removed from the darker margin at which they had previously collected, yet did not repair to the opposite illuminated margin, but arranged themselves in a *green line going transversely across the water,* which corresponded accurately to the limit between the deep- and half-shadow of the slip of wood,—a position the more striking, since green microscopic plants when uninterfered with collect always at the margins alone and never in the middle of the water. When I placed the slip of wood so that it reached across from the front to the back, from the darkest to the lightest place, the green band was seen neither on the margin next the window nor on the opposite; but the green cloud of *Stephanosphæræ* soon appeared on each side of the strip of wood outside its central shadow. Repeated experiments gave the same result with the greatest certainty. From these facts it follows, that *the moving spheres of* Stephanosphæra *seek the darker* *part of the vessel, avoiding however a total absence of light and assembling in preference in a moderated light or half-shadow.* Since other Algæ and Infusoria exhibit a different behaviour towards the light, we thus possess a means of *sorting,* to a certain extent, the microscopic inhabitants of a specimen of water, as I did the shade-loving *Stephanosphæræ* from *Chlamydococcus,* which ordinarily seek the brightest light.

X. *Summary of the Results.*

I conclude my essay with the diagnosis of the new genus which has formed its subject:—

ALGÆ.

Order PALMELLACEÆ. (*Chamæphyceæ,* Kütz.)

Family VOLVOCINEÆ.

Stephanosphæra, nov. gen. (Wreath-globe.)

Stephanoma? Werneck, according to Ehrenberg's paper in 'Gesellsch. naturforsch. Freunde' (Spenersche Zeitung, vol. xxviii. April 1846).

Trichogonium? Ehrenb. *l. eod.*

Stephanosphæra in Rabenhorst's 'Algen Sachsens,' Dec. xi. No. 102.

Gen. Char.—A family of cells, rotating and moving throughout life; composed of *eight* green primordial-cells, bearing *two* active cilia, arranged at equal distances in a *circle passing round,* enclosed in a common, hyaline, *globose* vesicle; propagated both by *macrogonidia* originating from *eightfold* division of each of the green cells, and bearing two cilia, congregated into eight octonary families, and *very numerous* smaller *microgonidia,* produced by *multifold* division, turning round first within the common vesicle by the action of *four cilia,* and then escaping singly.

Spec. Char.—*Stephanosphæra pluvialis,* n. s. Green cells globose, elliptical or fusiform, often running out into mucous rays at both ends. Diameter of the cells $=\frac{1}{330}$th to $\frac{1}{180}$th of a line (0·0065 to 0·012 mm.); diameter of common vesicle $=\frac{1}{80}$th to $\frac{1}{40}$th of a line (0·028 to 0·055 mm.).

Obs. Revives after desiccation.

Inhabits hollow stones filled with rain-water, in company with *Chlamydococcus pluvialis*: Salzburg, *Werneck*?. Zambra, *A. von Frantzius*; Hirschberg, *Von Flotow.*

The principal results of my investigations may be pretty accurately comprised in the following statements:—

1. *Stephanosphæra* is a new genus of the group of *Volvocineæ,* and only essentially differs from *Pandorina, Gonium* and *Volvox* through the law of arrangement of the internal green globes.

2. It is formed of eight equivalent green *primordial-cells,* which are arranged at the circumference of a circle; these are enclosed in a common *envelope-cell,* in which they stand at the equator, near the circumference.

3. The envelope-cell is of perfectly spherical form, and is composed of a structureless, completely closed cellulose membrane, filled with limpid contents (water ?).

4. The eight primordial-cells are globular, cylindrical or spindle-shaped, and are composed of the universal nitrogenous protoplasm of vegetable cells, which is coloured green by chlorophyll, and rendered opake by numerous fine granules (starch or protoplasm ?); they ordinarily enclose two chlorophyll-utricles containing starch. They are not bounded by any rigid membrane.

5. The substance of the primordial-cells becomes prolonged, especially at the two ends, into radiating and often ramified mucous filaments, which are retracted in the course of vegetation; the protoplasm-filaments occur also in other *Volvocineæ,* and have been differently interpreted in them (as hairs, tails, a vascular system, intercellular passages, &c.).

6. Each primordial-cell bears two cilia at the point turned outwards, and these penetrate, through orifices in the envelope-cell, into the water, and cause the movement of the entire organism.

7. The laws of the movement agree with those of the swarming-cells of Algæ, and Astomous or Anenterous Infusoria; it consists of a rapid rotation round the axis of the envelope-cell, which does not take place in any given direction, and of a simultaneous screwing forward, by which the *Stephanosphæra* runs through manifold curves in different planes.

8. The propagation takes place by division of the primordial-cells inside the envelope-cell. Each primordial-cell separates, by successive septa, first into two, then into four, and lastly into eight secondary cells; from this last division proceeds a permanent generation, while the two preceding were only transitional generations; the eight secondary-cells originating from one primordial-cell arrange themselves at the circumference of a circle, each developing two cilia, and remain united, secreting a common envelope over their surface, which, at first appressed and tabular, becomes removed away and acquires a spherical form through absorbing water. In this propagation by macrogonidia eight exactly similar young *Stephanosphæræ* originate in each envelope-cell of the parent organism. More rarely, the second division forms a permanent generation, and then the envelope-cell contains only four primordial-cells.

9. In the propagation by microgonidia, which commences in a similar manner, when however it is only the sixth or seventh

generation which becomes permanent, the secondary-cells produced by the multifold subdivision separate from each other; they are smaller, spindle-shaped, and bear four cilia, by means of which they move very actively, even inside the parent envelope, and after breaking out of this, move freely and singly through the water, without ever secreting an envelope-cell, and giving rise to the production of a family of cells.

10. At certain times the individual primordial-cells develope a special membrane inside their envelope-cell, closely enclosing them; they then break away, move at first in the interior of the envelope, and finally emerge free into the water as *Chlamydomonas*-like globes; after a short swarming these pass into a Protococcoid condition of rest.

11. It is probably this resting condition which alone of all the forms of development of *Stephanosphæra* possesses the power, after being dried up from water, of being revived by a new addition of water, and causing the origin of new moving generations; but the process here in question has not yet been completely observed.

12. The *Stephanosphæræ* avoid both bright light and complete darkness; they seek moderately lighted spots and half-shadow.

13. The organization and development of *Stephanosphæra* agree essentially with those of *Chlamydococcus pluvialis*, the vegetable nature of which has been placed beyond doubt by recent researches. The only distinction consists in the type of the latter genus being represented by a simple cell, while that of *Stephanosphæra* and the rest of the *Volvocineæ* is represented by a family of cells.

14. The mode of propagation by micro- and macrogonidia in *Stephanosphæra* exhibits the most unquestionable analogies with an evident plant, *Hydrodictyon utriculatum*, and testifies to the near relationship of the two genera.

15. All the other *Volvocineæ*, as well as *Stephanosphæra*, are to be regarded as plants, and their organization can be understood and judged of naturally only according to analogy with vegetable cells.

EXPLANATION OF PLATE VI.

Fig. 1. Polar view of a *Stephanosphæra* with large globular primordial-cells.

Fig. 2. The same in the equatorial view, the points of the primordial-cells run out into mucous filaments.

Fig. 3. Polar view of a *Stephanosphæra* with eight smaller, distantly placed primordial-cells: *a*, envelope-cell; *b*, *b*, primordial-cells.

Fig. 4. The same in the equatorial view; the primordial-cells running out into variously ramified mucous filaments; the two front (interior in the figure) ones exhibit the points from which the cilia arise.

Fig. 5. Equatorial view as in fig. 4; the primordial-cells are more crowded into one hemisphere of the envelope-cell.

Fig. 6. Polar view; only six primordial-cells exist, but the upper two are twice as large as the others.

Fig. 7. Polar view; the envelope-cell contains only four primordial-cells, the product of the second division having become a "permanent generation."

Fig. 8. Commencement of the formation of macrogonidia; the primordial-cell * is still unaltered; the cell ** exhibits a flow of the contents towards the two ends; the primordial-cell in the middle has divided into two, the rest already into four secondary cells.

Fig. 9. All the eight primordial-cells have divided, in the four secondary cells of the second "transitional generation."

Fig. 10. The division already advanced to the third "permanent generation," so that each primordial-cell has separated in eight wedge-shaped pieces.

Fig. 11. The young *Stephanosphæræ* produced by the division have become more organized, the colourless connected mass of protoplasm in the middle having been gradually constricted and cut off; they already begin to move inside their envelope: at *a*, two are seen in the side view.

Fig. 12. The division completed and the eight young *Stephanosphæræ* rotating in the common envelope.

Fig. 13. A young *Stephanosphæra* just emerged; its cilia are only visible by the eddy they produce in the water.

Fig. 14. A similar one killed by iodine, in the polar view; it exhibits the cilia and the common envelope-cell which is closely applied to the periphery of the primordial-cells.

Fig. 15. A somewhat older *Stephanosphæra*; the envelope-cell still has the form of a flat, tabular spheroid, and therefore appears as an ellipse in the equatorial view.

Fig. 16. Commencement of the formation of microgonidia; the eight primordial-cells dividing in a higher power of two.

Fig. 17. The eight original primordial-cells have been broken up into their microgonidia, which swarm about in the common envelope.

Fig. 18. The same stage as in fig. 17; one primordial-cell, *a*, has taken on the formation of macrogonidia and become developed into a young *Stephanosphæra*, which rolls along among the crowd of microgonidia.

Fig. 19. A few microgonidia after their exit from the envelope-cell: *a*, moving actively in water; the rest killed with iodine and exhibiting four cilia.

Fig. 20. A primordial-cell, which after secreting a special coat in a *Chlamydomonas*-like condition, has emerged from the common envelope-cell to pass subsequently into a state of rest.

Fig. 21. Diagram to illustrate the laws of division in the macrogonidia of *Stephanosphæra*; first the septum *a*, *m*, *b*, *n*, is formed, then the second through *c*, *m*, *d*, *n*,—these two generations are "transitional;" the eight cells produced by the septa *h*, *m*, *g*, *n* and *e*, *m*, *f*, *n*, become a "permanent" generation.

The figures are represented magnified 300 times, except fig. 19, which is 500 times.

XXXIX.—*On the Tongues of Mollusca.* By J. E. Gray, Ph.D., F.R.S., V.P.Z.S. &c.

Lister, Leeuwenhoek, Swammerdam, Poli, Cuvier, Fleming, Berkeley (Zool. Trans. iv. 278), Osler (Phil. Trans. 1832), Quoy and Gaimard*, Delle Chiaje, Alder and Hancock, and some other naturalists, have at varied and distant periods described and figured the tongues of different isolated species of Mollusca.

In 1836 Dr. Troschel (Wiegmann's Arch. 1836, 257. t. 9 & 10) published an essay, describing in systematic order and figuring the jaws and tongue of various species of the land and freshwater Mollusca of Germany; unfortunately the figures are very small and indistinct.

In the volume of the same work for 1839 (v. 177. t. 5. f. 8) he described and figured the teeth on the tongue of *Amphipeplea* of Nilsson, and proposed to form the family *Lymneadæ* into two groups, according to their teeth, thus: A. *Physa* and *Amphipeplea*, B. *Planorbis* and *Lymnea*; and in the volume for 1845 (xi. 197. t. 8. f. 6) he gives a description of the anatomy of the animal, and especially of the teeth on the tongue of *Ampullaria urceus*.

It is to be observed that all these observations are confined to, and give a very good connected view of, the teeth in the terrestrial and fluviatile Mollusca.

In 1847 Dr. Lovén (Öfversigt af Kongl. Vetensk. Acad. Förhandl. 1847, 175) describes and figures the teeth on the tongue of the several orders, families, and genera of Mollusca. The figures are all drawn on the same plan, and with great distinctness and accuracy. He divides the tongues he has seen into fourteen groups, and separates the genera into families and sections characterized by the position and form of the teeth.

The groups he has formed are exceedingly natural, and this paper, like his work on the Scandinavian Mollusca, opened a new field of observation to the naturalist.

In the following year Dr. Troschel, in the third edition of Wiegmann and Ruthe's 'Handbuch der Zoologie,' Berlin, 1848 (a work, only the first edition of which has come into my hands; there is however an abstract of the arrangement in Wiegmann's Archiv, 1849, 84), proposed a new arrangement of the Gasteropodous Mollusca, characterized by their sexual peculiarity, the

* The figures of the teeth by these authors are, like many details in French scientific works, not given with sufficient care to be of much use. They figure the teeth of the male and female *Strombus Lambis*, t. 49. f. 20♀, t. 50. f. 8♂, quite unlike each other; and their figures of the teeth of *Ampullaria*, *Mitra*, and other genera are so indistinct as to be of little use for scientific purposes.

respiratory organs, and the structure of the tongue; the latter characters of the marine kinds being evidently taken from Dr. Lovén's paper. He proposes to form the group of genera which Dr. Lovén named *Trochina,* into an order under the name of *Rhiphidoglossa,* and divides the Pectinibranchous Mollusca, after the above group has been abstracted, into three suborders, according to the disposition of the teeth on the tongue, thus:—

1. *Tænioglossa.* Tongue band-like, with seven rows of teeth, without a retractile proboscis.

This suborder contains the first eight families of Gasteropods in Lovén's paper.

2. *Toxoglossa.* Tongue with two rows of teeth often barbed at the end. Equal to the *Pleurotomacea* and *Conina,* the eleventh family of Lovén.

3. *Proboscidea,* with a retractile proboscis and tongue with only three rows of teeth. This group is equal to the ninth (*Buccinea* and *Muricinæ*) and the tenth family (*Volutacea*) of Lovén.

This division of the tongues into three kinds is very useful, to abbreviate the technical descriptions of the families, but I fear that it fails as a natural division of the families into groups. First, for I cannot consider *that* a natural system which separates the *Strombidæ, Cypræadæ* and *Coriocellidæ* from the other Zoophagous Mollusca, and places them in a different suborder from the other zoophagous families.

Secondly, the characters are not sufficiently distinct; for example the zoophagous genera, *Aporrhais, Struthiolaria, Dolium* and *Coriocella,* and the zoophagous tribes of *Naticidæ, Velutinidæ,* which have seven rows of teeth, of the *Tænioglossa* suborder, have a very long retractile proboscis, the character of the *Proboscidea.*

Thirdly, these suborders do not provide for the genera of operculated ptenobranchous Mollusca, *Scalaria* and *Tornatella,* and the peculiar floating genus *Ianthina,* which have numerous series of teeth on the tongue like the *Pulmonobranchia* and many *Nudibranchia* and *Potamobranchia* (this kind of tongue may be designated *Ptenoglossa*); or for the genera like *Eulima* which have no teeth on the tongue.

Since this paper appeared Dr. Troschel has continued his observations, and published descriptions and figures of the tongues of several exotic genera of terrestrial Mollusca (as *Bulima* and *Nanina*), (Wiegmann's Archiv, 1849, 225, t. 4), and of sundry genera of marine Mollusca found on the coast of Peru (Wiegmann's Archiv, 1852, 152).

M. Oersted has figured and described the teeth of *Sycotypus* or *Pyrula reticulata,* and MM. Eydoux and Souleyet (Voy. de Bonite) have figured the tongue of *Pyrula tuba* and other marine Mollusca; and more lately Mr. Thomson (in the Annals and Mag. Nat. Hist. 1851, vol. vii. p. 86. t. 3) has published a most interesting account of the dentition of British *Pulmonifera.*

Dr. Troschel in his system, for some reason which I cannot understand, places the family *Ampullariadæ* with *Cyclostoma* and *Helicina,* among the operculated *Pulmonifera*; the families *Ancyloidea* and *Siphonariacea,* which have distinct lungs and no gills, with the plumose-gilled *Pleurobranchidæa,* characterizing the order *Monopleurobranchiata,* in which he arranges them, as having a plumose gill. In his former paper (Wiegmann's Archiv, 1836, 277) he referred the genus *Ancylus* to the order *Hypobranchia,* which is quite as remarkable, since that order is generally confined to the genus *Phyllidia.*

After studying these papers and examining the tongue of many specimens of some species of Mollusca, I am satisfied that the tongue offers a very permanent character of the species, and is very rarely liable to variation. Characters of such permanence in the species afford one of the best means to divide the species into natural genera; and when we consider the important function the teeth have to perform in the œconomy of the animal, one may be convinced that any important alteration in the form or position of the teeth must be accompanied by some corresponding peculiarity in the habit and manners of the animal; hence they must afford good characters to bring together the genera into natural groups or families. To carry out these views will require a very much more extended series of observations on these organs than we at present possess, though we know enough at present to show that an examination of the kind will produce most extensive changes in our existing system, and explain many points which are now involved in much obscurity.

One result of the study of these papers and the personal examination of the tongue of various molluscs has been, to establish more firmly the theory which I have long entertained, that no species of gasteropodous molluscous animal can be properly placed in the system unless we are enabled to examine the animal, the shell, the operculum, and the structure of its tongue; and as none of these parts but the shell can be examined in the fossil species, their position in the various genera must be always attended with more or less uncertainty.

I have repeatedly observed, that there are many genera of Mollusca which cannot be distinguished by the examination of the shell unless it is accompanied by the animal. There are several genera of marine univalves so alike in form and character of the mouth of the shell, that they cannot be distinguished from each other with certainty without the examination of the operculum; and Dr. Lovén has shown that there are some genera,—*Buccinum* and *Trichotropis* for example, which have the animal, shell, and operculum so like each other, that the latter genus is only to be known by a certain prolongation of the periostraca on the keel of the last whorl,—which have the tongue so unlike, that I believe they ought to be considered as the types of different families; and Dr. Troschel in his system would place them in two distinct suborders, the genus *Buccinum* being referred to *Proboscidea*, and *Trichotropis* to *Tænioglossa*.

Dr. Troschel gives a striking instance. *Triton succinctum* has been considered as a typical species, having the usual animal and operculum of the genus, yet Dr. Troschel describes and figures the tongue as having the seven series of teeth of his *Tænioglossa*.

The similarity of appearance of the animal and shell of *Ancillaria* and *Oliva* are great, yet Dr. Lovén has figured the teeth of the former as very like those of *Nassa* and *Buccinum*, the typical genera of the *Buccinidæ*; but Dr. Troschel has very lately figured the teeth of *Oliva peruviana*, and they are so different, that he thinks I have inaccurately referred these two genera to that family, and proposes to form for them a separate family (see Wiegmann's Archiv, 1852, 166).

The same similarity of the animal and shell exists between the genera *Cypræa* and *Ovula*, yet Dr. Lovén and Troschel have described and figured the teeth of different species of *Cypræa*, showing them to be nearly typical *Tænioglossata*; and the latter has very lately figured the teeth of *Ovula tuberculosa* (Wiegmann's Archiv, 1852, 163. t. 7. f. 6), which are so unlike those of any mollusc before known, that they must belong to a peculiar family; however, the specimen he examined was in such an imperfect condition, that he was not able to describe their position on the tongue. Several other instances of the kind might be cited.

In the outline of the system of Gasteropodous Mollusca, appended to the explanation of the plates of Mrs. Gray's 'Figures of Mollusca,' I have attempted to combine the labours of Dr. Lovén with my own observations on the animal and operculum, but every day adds to our knowledge of these animals, and renders constant revision necessary.

Dr. Troschel in a late paper (Wiegmann's Archiv, 1852, 166) observes on this essay: "Mr. Gray, in his systematic arrangement of the Gasteropoda, has proceeded exactly upon my principles, and being assisted by rich materials and a perfect knowledge of bibliography has done much that is excellent, although in particular instances many errors have slipped into his work. He has, for example, frequently described the parts of the mouth of a single species as giving family characters, when, by the examination of several species, he would have been placed in a position either to form several families, or to have circumscribed the characters of his families differently." I have only to observe, that Dr. Troschel and I have gone on the same principles, because we have worked from the same source, viz. Dr. Lovén's memoir; for I have not been able to see a copy of Dr. Troschel's work, and had overlooked the abstract in the 'Archiv,' until my attention was called to the divisions in Dr. Troschel's paper above quoted, and I was desirous of finding out when they were first characterized.

In the outline of the system I took care to consult my own observations, and to combine in it all the accounts of the teeth of the different species of Gasteropodous Mollusca which had then (1850) been published, and regret, as much as Dr. Troschel can, that there were not more materials derived from different species of the same genus and family to be used. I do not find the necessity of making any alterations in that system from the genera and species since described, except that of separating *Ovula* from *Cypræadæ*,—unfortunately, however, Dr. Troschel's paper does not afford me the means of characterizing the family *Ovulidæ*—; and removing the genus *Sycotypus* from *Muricidæ*, and placing it provisionally as the type of a new family differing from *Lamellariadæ* in the want of a trunk or proboscis.

While on the subject I may further observe, that if there is this difficulty of distinguishing the genera unless we have the shell and the animal, with its operculum, tongue, and other organs complete, we can well understand that there must exist a similar difficulty in distinguishing species except under similar circumstances.

This is especially the case with the shells which, like the *Patellæ*, *Emarginulæ*, *Fissurellæ*, *Calyptrææ* and *Crepidulæ*, have large apertures, the animals of which rest for a long time in a particular station.

In such instances, I am induced by experience to believe that geographic situation is a character of much importance. The very great variations which *Patella vulgata* and *P. pellucida* exhibit on our coast, *Patella saccharina* on the coast of the Cape, and *Patella zebrina* on the coast of South America, would scarcely be believed, if we did not know that they all came from the same localities, and did not sometimes find specimens which exhibit two or more varieties or nominal species on the same individual, the animal having changed its place twice or more during its life.

I believe that it will be utterly impossible to make a proper description of the species of these genera of Mollusca, until we have a collection of them formed with great care, with all their habitations most accurately marked and arranged strictly geographically, or rather in natural geographic stations; and when this has been done, we shall be surprised to find how we have been manufacturing species which nature never intended; and on the other hand, equally surprised how we have associated specimens together as one species which are most distinct from each other. As an instance of the latter kind, I may cite *Crepidula unguiformis* of authors. This shell is said to be found in the Mediterranean, on the north-east coast of America, the West Indies, the southern and the tropical portions of the west coast of America. In all these localities it is found on the inner surface of shells; being attached to a concave surface, it is flat or slightly concave externally, and is always of a white colour, like most shells which live in a situation where they are not exposed to the light. Believing that this form and colour are caused by the situation in which it is found, I feel convinced that the *Crepidula unguiformis* of Sicily is an accidental variety of the usual-shaped *Crepidula* of the Mediterranean seas; and that the same is the case with the specimens which have been called *C. unguiformis* from other seas; and if the natural-formed species of these countries are distinct, which I believe is now universally admitted, the flat, uncoloured varieties of them are equally distinct; though I am quite willing to own that I know no character or mark on the shell by which the monstrosities from the different localities can be distinguished from each other when placed side by side in the cabinet.

Many conchologists, especially those who collect the specimens from their native habitat, assert that certain specimens are a most distinct species, because they are always found in a peculiar locality, when it is the locality to which they are attached which gives them the peculiarity of form or colour: thus, the *C. unguiformis* must be a species because it is found on the inside of the shell, is flat and is white, whereas the colour and form depend on the locality. Specimens are, however, rarely found which were flat or concave externally, and white when young, and are convex and brown-rayed when adult, or *vice versâ*; the animal having changed its locality during its life. In the same way, others assert that *Crepidula incurva* is very distinct, because it is very convex with a narrow base, and is always found attached on shells, and is generally crowded together one on another; the narrow shape being produced by the shape of the shell, and the convexity of the back by the convexity of the back of the shell entering into and pushing up the cavity of the specimen which is attached to it.

These are treated by many conchologists as theories, but they are proved to be facts, by some specimens of these shells combining in one individual what have been regarded as two or more species. If, in such cases, all the *Crepidulæ* and *Calyptrææ* from one geographic district were arranged together, we should see that the species of each of those districts exhibit similar varieties, and that the species which have been made on the form of the shell are in fact varieties, from similar causes, of different species.

Unfortunately the animals of these genera show themselves so little beyond the shell when the animal is alive, and afford so few characters as they come to us preserved in fluid, that we can expect but little assistance from them in the determination of the species. They have no operculum to help us; yet we may hope that the examination of the tongues of the different kinds may help in determining the distinctness of the geographic species; but as yet no attempt has been made, except by Dr. Lovén and Mr. Thomson, to use the teeth for this purpose. It would be an admirable subject for a young malacologist who can use the camera lucida on the microscope to take up, as by so doing he would be rendering most important assistance to the study of Mollusca.

XL.—*Description of* Carterodon sulcidens, *Lund.* By John Reinhardt*. Translated from the Danish by Dr. Wallich, F.R.S., Vice-Pres. L.S.

Lagoa Santa, 19th July 1851.

Among the heaps of small bones, so frequently met with in the limestone caves of this part of the Brazils, and which owe their existence to *Strix perlata*, Licht., are often found skulls, more or less broken, of a small animal, belonging to the family of Pig-rats, but distinct from the cognate forms, in having on each side of the upper incisors, along the middle, a projecting ridge, with a lateral, rather deep furrow. Dr. Lund founded on these crania his *Echinomys sulcidens*, in his first treatise on the extinct animal creation in Brazil †, which he subsequently thought could be referred to the genus *Nelomys* ‡, on account of certain peculiarities in the dental system, and at last to *Aula-*

* From a letter to Prof. L. Steenstrup; communicated to the Association of Natural History at Copenhagen, at the meeting on the 14th Nov. 1851.

† Blik paa Brasiliens Dyreverden, &c. (View of the Animal World of Brazil before the last Revolution of the Globe.) First memoir. Introduction, p. 23.

‡ *Loc. cit.* Third mem. p. 30.

codus, under the name of *A. Temminckii**, but which Mr. Waterhouse has recently proposed as the type of a distinct genus, *Carterodon*†. But as Lund never succeeded in obtaining the animal itself, and as Waterhouse had no other materials at his disposal than the crania fractured by the Cave-owl, all that was known of this new genus consisted of an outline of the head and the nature of the teeth. I am in a position to supply some of the desiderata, having lately been fortunate enough to procure a nearly full-grown female and a half-grown young, from which I now take the following short description of this remarkable animal.

Carterodon sulcidens has somewhat the appearance of a large *Hypudæus*, it being a clumsily-built animal, with a large head, a short, blunt snout, small eyes, rounded low ears, which however extend beyond the fur-covering; and short limbs and tail.

The upper part of the body is clothed with long bristles; among these are mixed spines, which entirely resemble in structure those of most of the other members of the family, but are scarcely broader than half a millimetre, and end in a hair-like point, long and flexible, and so far from pricking, that it is scarcely perceptible to the touch. They become narrower and fewer down the sides of the animal, until they quite disappear on the under side, where the covering consists of stiff bristles only.

The dental system having been figured and exhausted by Lund and Waterhouse, I pass it over here.

The ears are almost as broad as they are long, and covered, both internally and externally, with short soft hairs, more dense towards the margins, but not enough to conceal the skin entirely.

The naked spot which surrounds the nostrils is of small spread; and between it, and the margin of the upper lip, is seen a rather broad band, thickly covered with very short whitish hair.

The extremities, especially the hinder, are very short; the anterior are proportionally broader. The toes, being (as usual in the family) five on each foot, are, with exception of the innermost, connected by means of a rather developed skin. Their relative length resembles that usual among Echinomyds. The rudimentary thumb of the fore-foot is furnished with a flat nail; the other toes have gently curved, rather long claws, which in the fore-legs are inconsiderably shorter than in the hind ones; at

* Fortsatte Bemærkninger, &c. (Continuation of Remarks on the Defunct Animal Creation of Brazil), p. 16.

† Natural History of Mammalia, vol. ii. pp. 351–353. pl. 16. fig. 7.

their root there is a quantity of stiff hairs which extend over and partly conceal them.

The tail is shorter than one half of the head and body together, scaly, and covered with numerous hairs, which spread in all directions, so as in no manner to conceal the scales. Immediately before the anal aperture, rather in its anterior, somewhat labiate margin, there is, in both sexes, a small pore leading to a minute bag or cavity, secreting an offensive matter. This glandular organ I do not find recorded in the family, although it occurs in all the other Pig-rats of these parts.

The clitoris is not furnished with a furrow, but forms an *entirely closed tube* having an opening at its apex*. I have only found three pair of paps, each surrounded by a little naked area, the hindermost between the thighs, about equidistant from the sexual organs and the navel; the two other pairs are situated rather on the sides of the body than below the belly; one of the pairs before the navel, the other distant about 40 millimetres from it.

The skin is remarkably brittle and loose in texture.

The colour of the upper part of the body is yellow-brown, much shaded with black. All the hairs and spines are here bluish gray at the base, becoming gradually darker towards the apex; or they are marked with a broad, rust-coloured zone below the black apex; but in such proportion that, while by far the majority of the spines want this bright zone, the reverse obtains in regard to the hairs. On the sides of the body, downwards, the ferruginous yellow prevails, while the spines diminish in number, and the black colour tends more and more to the grayish, until it entirely disappears on the belly. Here the hairs are of one uniform colour their whole length; along the sides of the belly there is a band of yellow-red; the middle is pure white, and the portion so marked, which widens both before, towards the chest, and behind, towards the groins, is sharply defined from the above-mentioned enclosing band, and without the slightest transition of colour. The bands unite between the fore-legs, excluding entirely all white colour on the breast; the lower part of the neck and throat is reddish, though this colour becomes fainter anteriorly. On the outside the limbs have the same colour as the sides of the body, becoming fainter towards the feet, where there is a greater admixture of white hairs; the long bristles which extend over the claws are white. The inner part of the extremities is almost naked, especially of the hind-

* This peculiar structure belongs to all the other forms of the family which I have been able to examine, but has not hitherto been noticed, as far as I know.

legs. On the upper side of the tail the hairs are black, below they are whitish yellow.

The half-grown young animal was a male and resembled entirely the old one, with exception of the spines still being considerably narrower and less stiff; and those placed on the lower parts of the body, which in the full-grown individual were yellow-red, had here a grayish colour. I am unable to decide whether this difference was accidental, or connected with the difference of age or sex.

Several points in its organization, particularly the broad fore-legs, the proportionally weak hind-legs, and the long, slightly curved claws, point at the *Carterodon sulcidens* having a considerably developed power of burrowing, and its being destined probably in a great measure to a subterraneous existence. This in fact, as far as has been related to me, is really the case; it inhabits the open *Campos,* overgrown with shrubs and trees, where it digs its residence, consisting of a rather long tube 3 to 4 inches in diameter, and leading in a slanting direction into a chamber, scarcely beyond a foot from the surface of the ground, which the animal lines with grass and leaves. The stomach of the two specimens which I examined was entirely filled with a yellow pasty substance, evidently of vegetable origin; and to conclude from the strong, broad incisors, it seems probable, that the animal subsists wholly on vegetable food, rarely, if ever, consuming insects, as is the case in regard to the Echinomyds* with narrower and sharper incisors.

I subjoin the dimensions of the specimens. The male had only two molars cut through, and can scarcely have been much more than half-grown; the female wanted still the hindmost fourth molar; but as it was pregnant with a fœtus $1\frac{1}{2}$ inch long, it may be considered as about full-grown.

	♂	♀	
Entire length	196	270	millim.
Length of tail	53	82	,,
End of snout to anterior corner of the eye	$14\frac{1}{2}$	18	,,
Length of the opening of the eye	0	7	,,
Distance of end of snout from anterior margin of the eye	29	35	,,
Length of ear	0	19	,,
Width of ear	0	18	,,
Length of hind-foot	27	$30\frac{1}{2}$	,,
Length of claw on the middle toe of the fore-leg	0	4	,,
Ditto ditto ditto hind-leg	0	5	,,

* What Dr. Lund says (View of the Animal World of Brazil before the last Revolution of the Globe, Third memoir, p. 30) concerning the "habit of the genus *Nelomys*" has reference to the other species.

XLI.—*Contributions to British Palæontology:—On some new* Brachiopoda *from the Carboniferous Limestone.* By FREDERICK M'COY, Professor of Mineralogy and Geology in Queen's College, Belfast.

Discina bulla (M'Coy).

Desc. Hemispheroidal, regularly tumid, inflated; base circular; antero-posterior profile nearly semicircular; greatest depth not at the apex, but at about the middle of the length. Surface glossy, smooth, or with very faint, obsolete, obtuse, concentric and longitudinal striæ; a small sulcus extends anteriorly a short way from the apex, which is obtuse, and nearly vertically over the posterior margin. Length $7\frac{1}{2}$ lines, width the same, proportional depth $\frac{45}{100}$, distance of apex from posterior margin $\frac{55}{100}$.

The remarkably inflated bubble-like form of this species easily separates it from any I know. The beak is very little within the margin. The traces of concentric markings are rather broad and very obtuse lines, scarcely recognizable in the only specimen which has occurred; the traces of very fine longitudinal striæ are only to be seen on one decorticated spot with a lens, the general aspect of the specimen being remarkably smooth.

Reddish sandy bed of limestone at Lowick, Northumberland. (*Col.* University of Cambridge.)

Seminula ficus (M'Coy).

Desc. Longitudinally broad-ovate, gibbous; greatest width slightly in front of the middle; lateral margins slightly raised into a tri-undate, wide, flattened wave, towards the entering valve in old specimens (lines of growth indicating a regular margin up to 1 inch long); no distinct ridge extends from this wave towards the beak of the entering valve, but the surface near the front slopes more rapidly away from it towards the lateral edges; on the receiving valve obscure indications of the mesial hollow and bounding ridges extend a short way towards the beak in specimens an inch and a half long; receiving valve evenly tumid, regularly arched from the beak to the front margin; greatest depth about the middle; beak moderate, obtuse, lateral angulation nearly obsolete; perforation large; surface closely granulo-punctate under the lens; dental lamellæ at sides of foramen large, diverging at 45°. Length 1 inch 6 lines, proportional length of entering valve $\frac{90}{100}$, width $\frac{85}{100}$, depth of receiving valve $\frac{28}{100}$, depth of entering valve $\frac{32}{100}$.

The broad-ovate, tumid form distinguishes this easily from the other carboniferous species, as well as the absence of any distinct mesial hollow or emargination of the front in either valve. The punctures of the surface are considerably smaller than those of the *S. virgoides* (M'Coy) or *S. hastata*.

Rare in the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Spirifera fasciculata (M'Coy).

Desc. Longitudinally very broad-ovate; length and width nearly equal, depressed; hinge-line only half the width of the shell; cardinal area rather more than one-third higher than wide; lateral margins horizontal, front margin abruptly raised into a defined, obtusely angular sinus; entering valve depressed slightly, and gently convex on the sides; mesial fold very strongly defined by a sulcus and depression of the surface on each side; convex, very obtusely angular, but not very prominent, having three ridges near the beak, which dichotomize into six as they approach the margin; each side has about seven to nine flat, smooth ridges near the beak, most of which branch into two or three as they approach the edge; the intervening sulci very narrow; receiving valve more convex, moderately gibbous along the middle, sloping rapidly towards the side margins; mesial hollow strongly defined, very deep, narrow, flattened near the beak, widening, and receiving about two plaits on each side of the middle one as it reaches the front sinus. Width of average-sized specimen 9 lines, proportional length of receiving valve $\frac{90}{100}$, of entering valve $\frac{80}{100}$, width of cardinal area $\frac{53}{100}$, width of sinus in front margin $\frac{42}{100}$, depth of ditto $\frac{19}{100}$, depth of entering valve $\frac{15}{100}$, of receiving valve $\frac{35}{100}$; width of very large Irish specimen 1 inch 5 lines, proportional length of receiving valve $\frac{80}{100}$, depth of both valves $\frac{50}{100}$.

Distinguished from the *B. duplicicosta* (Phill.) by the more longitudinally oval depressed form, very short hinge-line and cardinal area.

Not very uncommon in the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Spirifera grandicostata (M'Coy).

Desc. Transversely subrhomboidal, sides abruptly attenuated and flattened, twice as wide as long, moderately convex; hinge-line acute-angled, cardinal area broad, with parallel sides; profile of receiving valve abruptly arched to the incurved beak in the posterior third of its length, much more gently arched in the anterior two-thirds, so that the anterior lobe projects much from the front margin; mesial hollow deep, corresponding ridge moderately prominent; radiating ridges very large, thick, angular, three strongly marked on the mesial hollow, of which the middle is much the broadest and most depressed on the shell; the two lateral are imperfectly and obscurely triplicated towards the margin; corresponding sulci on mesial ridge faintly marked; on each side are about five great angular radiating ridges, some of which show a faint tendency to imperfect division towards the margin; the narrow flattened sides, or cardinal angles, when preserved, show five or six very much smaller obscure radiating ridges. Width about 2 inches 6 lines, proportional length of receiving valve $\frac{53}{100}$, of entering valve $\frac{45}{100}$, width of cardinal area $\frac{8}{100}$, depth of sinus in front margin $\frac{16}{100}$, depth of both valves $\frac{50}{100}$.

This is allied to the *S. trigonalis* of Martin, but differs from it by its abruptly narrowed and attenuated sides, and by its few very large angular ridges occupying the body of the shell, and the abrupt diminution in size of the five or six outer ridges on each side. A very young specimen, 9 lines wide, has the three ridges in the mesial hollow distinctly marked, but nearly as large as the lateral ones, of which there are three or four great ones on each side, but scarcely a trace of any additional ones on the flattened cardinal angles, which are strongly striated parallel to the margins.

Rare in the carboniferous limestone of Derbyshire, but common in the Irish limestone at Ardagh.

(*Col.* University of Cambridge.)

Spirifera paucicostata (M'Coy).

Desc. Globose, or very broad, ovate; hinge-line slightly shorter than the width of the shell; cardinal angles slightly obtuse, sides and front moderately rounded, very obtuse from the meeting of the valves at a large angle, front abruptly raised into a wide semielliptical sinus. Entering valve evenly convex, sides tumid, with six or seven strong, rounded, obtuse simple ribs on each side; mesial ridge broad, prominent, very strongly defined from the beak, having three ridges about the size of the lateral ones, each of which dichotomizes close to the margin. Receiving valve very gibbous, semicircularly arched from the beak to middle of front margin; mesial sinus deep, strongly defined from the beak, having at first three, subsequently six small obscurely marked ribs; beak very large, incurved; cardinal area moderately wide. Width 9 lines, proportional length of receiving valve $\frac{90}{100}$, length of entering valve $\frac{70}{100}$, depth of both valves $\frac{70}{100}$, width of mesial fold $\frac{47}{100}$, height of sinus in front margin $\frac{22}{100}$, width of cardinal area $\frac{15}{100}$.

This species is most nearly allied to the *S. trigonalis*, from which it is distinguished by the more spheroidal form, the obtuse rounding of the sides, and the very small number of its lateral ribs; the distinctly ribbed mesial ridge separates it from *S. pinguis*, as well as its more depressed form, and the fewer and more prominent radiations.

Not very uncommon in the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Hemithyris heteroptycha (M'Coy).

Desc. Transversely oval, very gibbous; hinge-margin obtusely arched, front much elevated into a deep, subquadrate oblong sinus, inclining backwards from the line of the lateral margins at about 80°, which only affects the even convexity of the entering valve near the margin; entering valve evenly gibbous, slightly flattened, or even concave in the mesial line near the beak; profile abruptly incurved at the beak, and rather abruptly curved downwards near the front margin; intervening portion nearly straight, the greatest depth being at about two-thirds the length from the beak; sides very abruptly arched downwards to the lateral margins, which are very slightly sigmoid at the sides, the commissure obtusely angular up to the beak, having on each side of the rostral portion a very slight narrow depression; three mesial ridges occupy the width of the top of the sinus, very large, obtusely angular, deeply indenting the margin, and continued simply to the beak; lateral ribs dichotomizing at from one to two lines from the beak, unequal in size, fifteen or sixteen on each side near the margin, scarcely half the size of the mesial ridges, very strongly arched at the sides; receiving valve with the lateral third on each side, and the rostral portion slightly convex, the middle portion after about two lines long very abruptly curved downwards into a very wide mesial hollow to fill the oblong sinus in the front margin, the profile of the middle being nearly semicircular, the lateral ridges all bifurcate at about three lines from the beak, the two large mesial ridges simple, having besides a small dichotomous pair on each side in the sinus. Width 6 lines, proportional length of receiving valve about $\frac{85}{100}$, length of entering valve $\frac{80}{100}$, width of sinus in front margin about $\frac{60}{100}$, depth thereof $\frac{55}{100}$, depth of receiving valve at middle of side $\frac{20}{100}$, greatest depth of entering valve

$\frac{45}{100}$; the three mid-ridges at margin occupy a space of 2 lines, six of the lateral ones occupy the same space, surface smooth.

The great number of small obtuse dichotomizing plaits on the sides distinguishes this from any of the varieties of *A. flexistria*, *A. ventilabrum*, &c., as well as their extending quite to the beak, and the disproportionally large mesial ridges separate it from the *A. bifera* and *A. cuboides*. I have not seen the dental lamellæ.

Rare in the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Hemithyris longa (M'Coy).

Desc. Longitudinally trigonal, length exceeding the width or depth, greatest width at one-third from the front margin, lateral anterior margins obtusely rounded, front very obtusely angulated in the middle; posterior lateral margins long, nearly straight, converging to the beak at an angle of 80°; commissure with a slight wave towards the entering valve in the posterior half of the lateral margins; anterior half of the lateral margins nearly straight, with a very faint indication of one plate on each side; middle of the front margin elevated at an angle of 85° with the plane of the lateral margins into a wide tongue-shaped sinus with sigmoid sides, acutely angular in the middle; entering valve with the profile very slightly arched, greatest depth about the middle of the length; sides convex, arched abruptly downwards on each side from the obtuse mesial line; receiving valve flattened or very slightly convex for about three lines from the beak, after which the very narrow sides alone are continued nearly straight to the obtusely rounded anterior lateral angles, the wide mesial portion being strongly depressed to fill the sinus in the front margin; beak rather large, very slightly incurved; surface smooth, with a few obtuse imbrications of growth near the margin; tissue very coarsely fibrous, almost visible to the naked eye; dental lamellæ in beak of receiving valve very short, subparallel, slightly divaricating; entering valve very minute. Length nearly 6 lines, proportional width $\frac{90}{100}$, length of entering valve $\frac{90}{100}$, depth of entering valve $\frac{45}{100}$, depth of receiving valve $\frac{15}{100}$, width of sinus $\frac{80}{100}$, depth thereof $\frac{50}{100}$.

By the great thickening of the margins, it is obvious that this little shell is adult. It only approximates in the most remote degree to one other *Hemithyris* that I know of, viz. one of the varieties of *H. acuminata*, from which it is distinguished by its very small size, *and the length exceeding both the width and the depth.*

Very rare in the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Pentamerus carbonarius (M'Coy).

Desc. Globose, more or less inequilateral; hinge-line nearly as wide as the shell, cardinal angles obtuse; lateral and greater portion of front margin in one plane; middle of front margin abruptly raised into a very narrow, short, oblong or rounded sinus; commissure blunt from the meeting of the valves at a very obtuse angle. Entering valve varying from semicircular to rhombic, very gibbous; beak large, prominent; profile regularly arched from the apex to its front margin, its greatest depth about the middle of the length; mesial ridge narrow, flattened, prominent, and strongly defined from the front margin to the apex of the beak, either simple, divided by one mesial hollow, or divided into four narrow ridges near the margin, each side with about seven very large, rugged, angular, irregular, subequal ridges, at six lines from the beak, beyond which they either continue simple to the margin, or some or all of them dichotomize: surface rather rugged and very coarsely granulo-punctate, or minutely pustular under the lens, with strong thickened interruptions of growth at the margin after nine or ten lines long. Receiving valve extremely gibbous; beak very large, usually slightly inclined to one side, varying greatly in its inrollment, according to the form of the cardinal area, which is sometimes nearly half as high as wide, triangular, very slightly concave, and nearly at right angles with the plane of the lateral margins, in which case the beak is prominent, and only slightly incurved, the greatest depth of the valve being a little in front of its apex, and the profile arching very gradually from thence to the front margin; in other specimens the beak is inrolled so as nearly to touch that of the entering valve, when the cardinal area is greatly reduced, very concave and lying nearly in the plane of the lateral margins, the profile being more than semicircularly curved; mesial hollow very strongly defined by two thick ridges from the apex to the narrow sinus in the front margin, either simply hollowed, or bearing four ridges, much smaller than the lateral ones; lateral ridges about ten to twelve on each side at seven or eight lines from the beak, beyond which they are either simple, or more frequently di- or tri-chotomous, as they approach the margin more rugged and irregular in direction than those of the entering valve, varying from three to six in three lines at 1 inch from the beak according to the amount of bifurcation. Internal mesial septum of receiving valve very long, reaching nearly to the front margin, the lines of growth slightly arched towards the beak; rostral divaricating portions scarcely two-thirds the length of the combined mesial portion, but of slightly greater width: two mesial septa of entering valve narrow, scarcely one-third the depth of the mesial septum of the receiving valve; anterior broad ends very obliquely truncated, but reaching rather less than half the length of the valve. Average width 1 inch 2 lines, proportional length of entering valve $\frac{75}{100}$, length of hinge-line $\frac{87}{100}$, length of receiving valve varying from $\frac{95}{100}$ to $\frac{100}{100}$, height of cardinal area varying from $\frac{13}{100}$ in the former to $\frac{47}{100}$ in the latter, width of mesial ridge and sinus in the front margin $\frac{25}{100}$, depth of entering valve $\frac{20}{100}$ to $\frac{23}{100}$, depth of receiving valve $\frac{50}{100}$ to $\frac{65}{100}$.

Some of the specimens of this species so nearly resemble *Spirifers*, that it was not until I made sections in various directions of several specimens, demonstrating the invariable presence of the two narrow longitudinal subparallel septa in the entering valve, and the wide, extremely long mesial septum in the receiving one, with its internal divaricating portions flanking the triangular opening in the cardinal area, perfectly agreeing with *Pentamerus*, as well as the absence of spiral appendages, that I was convinced of its true genus. I have had the pleasure of demonstrating those specimens to M. de Verneuil, who, like myself, was fully satisfied of their being true *Pentameri*, and saw in them the first example of the genus in carboniferous rocks (the *Pentamerus Sella* and *P. plicatus* of Kutorga being obviously *Camerophoriæ*).

Not very uncommon in the impure lower carboniferous limestone of Kendal, Westmoreland.

(*Col.* University of Cambridge.)

Leptæna (*Chonetes*) *polita* (M'Coy).

Desc. Transversely fusiform; hinge-line exceeding the width of the shell, forming narrow semicylindrical convoluted ears, each bearing four or five small spines; receiving valve nearly hemispherical, very gibbous in the middle and towards the beak, which is large, inflated, and seems considerably to overhang the hinge-line from the abrupt contraction of the ears, which are separated by an abrupt curve from the steeply sloped sides; front margin slightly elevated into a broad wave extending its whole width, no mesial furrow; entering valve almost as concave as the receiving one is convex; cardinal area about ten times wider than high; substance of the shell thick; external surface of both valves perfectly smooth, or under a strong lens, with minute concentric striæ of growth near the margin; internal cast of receiving valve marked with very large quincuncially arranged punctures, usually about twice their diameter apart; rostral portion divided by a narrow slit left by the mesial septum, extending less than one half the length of the shell. Width of large specimen $4\frac{1}{2}$ lines, proportional length of receiving valve $\frac{70}{100}$, depth $\frac{35}{100}$.

This species has much the form of *Leptæna* (*Chonetes*) *volva* (M'Coy), but is not so wide and is more gibbous: it is the only carboniferous species I know at this date that has a smooth surface. The measurements given above are from a large Irish specimen in the collection from the limestone of Mount Rath, the English ones being only 2 lines wide.

Rare in the dark carboniferous limestone of Lowick, Northumberland.

(*Col.* University of Cambridge.)

Leptæna (*Chonetes*) *subminima* (M'Coy).

Desc. Rotundato-quadrate, length three-fourths or four-fifths the width; receiving valve very gibbous in the middle, greatest depth a little behind the middle; hinge-line as long as the shell is wide, forming flattened ears, slightly acute from the sigmoid outline of the sides, having three or four moderately long slender spines on each side of the beak, extending backward as usual in the plane of the margins; front margin moderately convex; surface uniformly covered with close obtuse striæ once or twice branched, but nearly uniform in size on all parts of the shell, and so fine that twelve at the margin only occupy half a line when decorticated, the impressed lines between the striæ of the surface very coarsely punctured, and the beak slit by the deep impression of the mesial septum extending half the length of the shell; entering valve nearly as concave as the receiving one is convex; surface similar in both valves, the striæ being crossed by fine close lines of growth. Average width $1\frac{1}{2}$ line; the depth seems about half the width.

This little species is so extremely like the Silurian *Leptæna minima* that it required a comparison of the specimens to distinguish them, more especially as the spines on the hinge-line of the present species are not often seen; the carboniferous fossil has more uniform and less branched striæ, and they are so much finer than in the Silurian species, that double the number is uniformly found to occur in the same space of half a line near the margin. It is possible that this may prove identical with the *Leptæna gibberula* of my volume on the 'Mountain Limestone Fossils of Ireland,' t. 20. f. 11 (which certainly has no relation to my *L. crassistria* and *sulcata,* with which M. de Koninck unites it); but as I there described the width as rather greater, and do not give the absolute dimensions of the fine striæ, I hesitate to unite them without a comparison of specimens.

Very abundant in a piece of the black upper carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Lingula latior (M'Coy).

Desc. Broad ovate anteriorly, gradually acuminated posteriorly; moderately convex towards the beak, very gradually flattened towards the margins; sides meeting at the beak at an angle of about 75°; front wide, semielliptically rounded; greatest width at about the middle of the length, from whence the posterior end is rapidly narrowed to the beak; surface with fine, sharply defined, strong, close, elevated, obtuse, concentric striæ slightly irregular from occasional branchings and interruptions, crossed in parts by longitudinal microscopic striæ. Length $4\frac{1}{2}$ lines, proportional width $\frac{80}{100}$.

Distinguished from the other described Carboniferous *Lingulæ* by the very wide ovate form of its anterior end, and the great comparative length and straightness of the posterior lateral edges, which, by their convergence at so small an angle, give the remarkable posterior attenuation or pointed beak, characteristic of the species.

Not very uncommon in the black limestone over the main limestone of Derbyshire.

(*Col.* University of Cambridge.)

XLII.—*On a species of* Strombus *in the Hunterian Museum at Glasgow.* By Thomas Gray, Esq., Glasgow*.

In the collection of shells bequeathed to the University of Glasgow by the late celebrated Dr. William Hunter, and preserved in the museum which bears his name, there is one interesting species which deserves to be recorded. The specimen in question is a *Strombus,* belonging to that section of the genus of which *S. vittatus* and *S. epidromis* form part, and what is very remarkable, a sufficiently characteristic figure of it is given in the admirable 'Historia Conchyliorum' of our countryman Dr. Martin Lister, published in London in 1685. The shell is engraved on

* Communicated by the Author, having been read before the Natural History Society of Glasgow.

pl. 855. f. 12 *a*, to which is added the following brief description:—"Buccinum bilingue Canadense, labro lævi, ex inferiore parte mucronato, clavicula dense admodum striata, longa, tenui."

Mr. Dillwyn, in his Index to the 'Historia Conchyliorum' of Lister, remarks that this figure "has been generally quoted for *Strombus vittatus*; *but I never saw that species with the lip so much expanded.*" *S. vittatus*, Linn., a figure of which is given by Lister on the same plate (f. 12 *b*), is perhaps the species to which this shell bears the nearest resemblance, particularly as regards the spire; the expansion of the lip however reminds one of *S. epidromis*, Linn., but its form, as may be seen on consulting Lister's figure, is very different from either. Linnæus, in the last edition of his 'Systema Naturæ,' does not quote Lister for his *S. vittatus*, no doubt for the reason given in the note at p. 1210; but Martini has appropriated both figures on Lister's plate to *S. vittatus*, in which he has been followed by Gmelin. Both of these authors had evidently, like Dillwyn, never seen the shell, but it is somewhat surprising that they should have confounded two species so very unlike each other.

As we are not aware of any recent conchological work in which this shell is taken notice of, and having every reason to believe that this is the only specimen known to exist in any collection, at least in this country, we have been induced to publish it anew, and to point it out to collectors and others who take an interest in conchological pursuits.

By the kind permission of Dr. Wm. Couper, the Professor of Natural History, we have been allowed to examine the shell and take a drawing of it. In describing it anew, we propose to give it the name of the author, and the only one we believe who has figured it, whose work is a lasting memorial of unwearied diligence and perseverance.

Strombus Listeri, T. Gray.

S. testa fusiformi, turrita, alba, luteo-fasciata et maculata, ultimo anfractu subcompresso, obtuse angulato, inferne sulcato; spira longitudinaliter plicata, transversim striata; labro plano, valde expanso, subquadrato, superne producto, intus lævi. Long. $4\frac{3}{5}$ unc., lat. $1\frac{4}{5}$ unc.

The colour and disposition of the markings very much resemble those of *S. vittatus*, *succinctus*, and others belonging to the same group, and for this reason, as well as from its general form, we are inclined to suppose the species to be oriental.

We would only remark further, that the shells which belonged to Dr. Hunter were purchased by him from the trustees of Dr. Fothergill, and it is not at all improbable that this specimen was the very individual from which the figure in Lister was taken, as it agrees perfectly in size as well as general contour, and is evidently, from the comparative faintness of its coloration as well as its general appearance, a very old shell.

XLIII. — *Experiments on the Transformation of the Cystoid Worms into Tænias.* By C. T. Von Siebold*.

I was the first to advance, in the second volume of my 'Manual of Physiology,' published in 1844, the statement that the cystoid worm which lives as a parasite in the livers of rats and mice (the *Cysticercus fasciolaris*) was nothing but a stray *Tænia* which had become vesicular, and which was in fact the tape-worm of the cat (*Tænia crassicollis*). I also affirmed that the *Cysticercus fasciolaris*, like all other Acephalocysts, never possessed sexual organs, and therefore could only propagate by sexual generation when it found a suitable body, where it would lose its vesicular form and acquire the power of sexual development.

In the experiments made at the Institute of the University of Breslau, these transformations took place, as soon as the liver of a mouse or rat, previously ascertained to contain a *Cysticercus fasciolaris*, had been devoured by a cat. In the stomach of the cat, the livers of these Rodents were digested, whilst the worms contained in them remained unhurt; this parasite lost the caudal vesicle filled with fluid, and was then to be seen, without a tail, in the chyme of the stomach and small intestines of the cat, where, finding itself in a suitable place, it became developed in the articulated form of a tape-worm (*Tænia crassicollis*) with adult sexual organs. The perfect agreement of the head of the *Cysticercus fasciolaris* with the cephalic extremity of the *Tænia crassicollis*, as well as the fact that the different phases of development of the latter are often to be met with side by side in the intestines of cats, conducted to the preceding conclusion, which has received the approbation of many naturalists, but the correctness of which is still doubted by others.

Last year, Dr. Kuchenmeister, of Zittau, made some experiments with the *Cysticercus pisiformis*, which is frequently met with in the cysts of the coats of the intestines of the hare and rabbit. He caused some dogs and cats to devour these cysts, in the hope that after some time they would be developed in the intestines of these animals in the form of tape-worms. This experiment succeeded completely with the dogs, thus confirming that which

* From the Ann. Sci. Nat. 3 ser. xvii. p. 377.

I had only been able to establish by the comparison of the *Cysticercus fasciolaris* of rats and mice with the *Tænia crassicollis* of cats; but neither M. Kuchenmeister's experiment nor the consequences to be deduced from it were satisfactory to physicians and naturalists. He was charged with having published his experiments before they could be considered properly terminated. The discussion which arose on every side on this question was by no means calculated to throw much light on the subject, especially as M. Kuchenmeister did not appear to have sufficient knowledge of helminthology to be able to affirm positively the identity of the species indicated by him. This has determined me to go over the subject again, making use especially of young dogs, and causing them to swallow not only the *Cysticercus pisiformis,* but also the *C. cellulosus* and *tenuicollis,* the *Cœnurus cerebralis,* and the *Echinococcus veterinorum.* In this work I have been zealously seconded by M. Lewald, my pupil. The following results were obtained with *Cysticercus pisiformis.*

These cystoid worms, the size of which did not exceed that of a pea, and which were still contained in the cyst of the intestinal membrane, were introduced by means of milk into the stomachs of some young dogs, to the number of from thirty to sixty individuals to each. These dogs were then killed by means of chloroform at various intervals of time, and the contents of the stomach and intestines carefully examined, when the worms which had been swallowed as food were readily observed in various states of development.

Two hours after they were swallowed, all the cystoid worms still remained in the stomach, but in most cases the cysts in which they had been enveloped had disappeared; at the same time most of the worms which had been deprived of their cyst had also lost their terminal vesicle, which had either been digested or still adhered in fragments to the abdominal extremity. All the worms found in the stomach, whether with or without their vesicle, had the head and neck withdrawn into the body.

Three hours after ingestion there were no longer any worms in the stomach; they had all passed with the chyme from this organ into the small intestine. Then, after having lost their cyst and terminal vesicle by the digestive action of the stomach, they all, without exception, as though feeling themselves at home, had again pushed out the head and neck. In all, a distinct lesion was perceptible at the abdominal extremity, at the point where the terminal vesicle had existed.

In dogs killed several days after the ingestion of the *Cysticerci,* these worms were found greatly increased in size; the largest had attained a length of 3 inches, the smallest of 1 inch. The body, at first merely wrinkled transversely, now distinctly exhibited the articulations, and the point torn by the loss of the vesicle actually presented a cicatrix.

After twenty or twenty-five days, the worms were several inches in length; they were articulated to the extremity of the abdomen, and the last of their joints still bore the cicatrix above mentioned, which was still very perceptible; traces of sexual organs even were already to be discovered in the posterior segments.

At the end of eight weeks the worms had attained a great length (the longest were from 36 to 39 inches). The sexual character of their posterior segments was completely developed, a great number of ova in a state of maturity being contained in them. Some individuals had already separated their last joints in a perfectly mature state.

In the *Cysticercus pisiformis* thus elongated, I recognized the *Tænia serrata* of the dog. The extremity of the head, the form of the segments, the nature of the organs of generation, and above all of the mature ova of this worm, agreed exactly with the same parts of the *Tænia serrata*. There was no longer therefore any doubt that the *Cysticercus pisiformis* of the hare and rabbit is to the *Tænia serrata* of the dog, what the *Cysticercus fasciolaris* of the mouse and rat is to the *Tænia crassicollis* of the cat.

The *Tænia serrata* is rarely found in watch-dogs or house-dogs, but more commonly in coursing dogs, which is easily explained by the fact that the latter frequently devour the intestines of hares and rabbits captured in the chase, and consequently swallow the *Cysticercus* more frequently than other dogs.

Although the experiments with the other worms above mentioned are not yet completed, those relative to the *Cœnurus cerebralis* are sufficiently advanced to convince me that this *worm, so dreaded by the sheep farmers, becomes transformed into a* Tænia *in the intestines of the dog*. As yet, the Tænias thus produced by the *Cœnurus cerebralis* have not, in my experiments, arrived at the adult state, the sexual organs not being yet mature; it is therefore impossible to determine the species to which they belong, but I hope shortly to be able to do so. I hope also that I shall be able to indicate to those interested in the raising of sheep, the means of opposing the development of this parasite in the brain of that animal, for I am convinced that the cystoid worms are not produced by a local generation, but by the microscopic ova of the tape-worms of certain Carnivora, and that when these ova are accidentally introduced into the bodies of Rodent or Ruminant animals, they are not developed there into elongated tape-worms, but into cystoid worms, which, according to the importance of the organ in which they take up their abode, exercise a more or less fatal influence upon the life of the animal in which they live.

The experiments commenced on the *Echinococcus veterinorum* are sufficiently advanced to enable us to declare that this cystoid worm also belongs to a *Tænia*. A quantity of these destructive worms given to some young dogs, showed at the end of a few days myriads of exceedingly delicate Tænias, which already adhered to the mucous membrane of the small intestine by their four suckers and their crown of hooks. All these Tænias only possessed as yet three divisions in the body—one for the head and neck, a small joint behind this, and lastly a long segment. In these two joints the sexual organs had commenced their development; but this was not sufficiently advanced to enable one to be certain that these little Tænias were adult, or to determine the species. I am continuing the experiment and hope soon to be able to publish the result.

XLIV.—*Some Account of a Dredging Expedition off the coast of the Isle of Man during the months of May, June, July and August* 1852. By T. C. Eyton, Esq., F.L.S., F.Z.S.

[Continued from p. 285.]

The following is a list of Echinodermata taken with the dredge and on shore:—

Ophiura texturata. Dredged off Maughold Head: not very plentiful.

Ophiocoma neglecta. Under stones and roots of *Laminaria* off Derby Castle at low water mark.

—— *granulata*. Dredged off Laxey in abundance.

—— *rosula*. Very common.

—— *bellis*. Dredged off Laxey in 16 fathoms water.

Uraster glacialis. Not very common round the island.

—— *rubens*. Common.

Cribella oculata. Common in from 10 to 20 fathoms water, but not so much so as in from 5 to 10 fathoms, or as on the Welsh coast.

Solaster endeca. Dredged off Maughold Head and Laxey, but not very common.

—— *papposa*. Common.

Palmipes membranaceus. I took only three specimens, one off Douglas Head and two off Laxey Head.

Asturina gibbosa. Only once found in a cavity of the rock opposite Derby Castle.

Asterias aurantiaca. Several specimens were dredged up, but it does not appear to be very abundant.

Echinus sphæra. Common.

—— *miliaris.* Common.

—— *lividus.* Common.

Spatangus purpureus. Common off Laxey and Maughold Head.

Amphidotus cordatus. Common on the shore at Ramsey, but only one broken specimen was dredged off Maughold Head.

The following is a list of the Annelidæ, only a few of which I was able to name, for want of a good work on the subject; I have however preserved in spirits a large number taken both off the Isle of Man and on the Welsh coast, which I shall be happy to place in the hands of any brother-naturalist who is better acquainted with them than I am. Many notes and drawings were made of those collected.

Nereis bilineatus. On shore near Douglas.

Aphrodite aculeata. Dredged off Laxey.

Cirratulus medusæ. On the shore near Derby Castle.

Arenicola piscatorum. Common.

Many of the common species of Zoophytes abounded. The following is a list of those which I have not found in great abundance on the Welsh coast, and some not at all:—

Anthea cereus. Douglas Bay, on rocks.

—— *Tuediæ.* Douglas Bay, on rocks.

Actinea maculata. Dredged off Maughold Head and Douglas Head: not common.

Coryne squamata. Douglas Bay, on rocks.

Tubularia indivisa. On rocks round the Calf of Man at low spring-tide-mark, in abundance; it was among this coralline, having filled several cans with it, that I found three specimens of *Acheus Cranchii*, a *Dendronotus*, and a *Tritonia* which I have been unable at present to name. The former was found on pulling the clusters to pieces, the two latter crawling on the stems.

Sertularia pinnata. Taken round the Calf on sea-weed at low spring-tide water-mark.

Laomedia geniculata. On sea-weed round the Calf.

Campanularia syringa. Douglas Bay.

Cydonium Mulleri. Dredged off Douglas Head.

Cellipora pumicosa. On other species of coralline in Douglas Bay and on the Calf.

Flustra membranacea. Common.

I have also been able to identify the following Sponges:—

Halichondria Johnstonii. In caves below spring-tide low water-mark, under Black Head.

Halichondria panicea. On sea-weed round the Calf.

—— *incrustans.* Dredged up off Douglas Head in 18 fathoms water: common in every locality.

—— *fruticosa.* Dredged off Laxey in 16 fathoms water.

Since my last paper on this subject was published, I have been able to identify the following species of Mollusca in addition to those mentioned in it:—

Chiton cancellatus.

—— *cinereus.*

—— *lævis.*

—— *discrepans.*

—— *prunum.*

All the Chitons, except *marmoreus*, a very marked species, I found in considerable abundance, dredging on dead shells. *C. cinereus* was found on rocks on the coast in Douglas Bay.

Ascidia vitrea. Dredged off Laxey Head.

—— *virginea.* Dredged off Laxey Head.

Goniodoris castanea. On sea-weed in Douglas Bay.

Botrylloides albicans. Not uncommon on rocks.

Botryllus violaceus. On rocks in Douglas Bay.

—— *polycyclus.* On rocks in Douglas Bay.

Leptoclinum violaceum. Douglas Bay.

The names used for the Molluscous animals are those given in Forbes and Hanley's work on the 'British Mollusca' now in course of publication; those of the Crustacea are the same as employed in Bell's 'British Crustacea,' and Desmarest's 'Considérations générales sur les Crustacées.' The nomenclature of the Zoophytes is taken from Forbes's 'Echinodermata' and Johnston's 'British Corallines.' The Annelidæ and Sponges are named from Dr. Johnston's numerous papers in the 'Annals of Natural History' on the former family, and from his work on the latter.

XLV.—*Further Note on* Atelides centrolineatus. By W. S. Dallas, F.L.S.

Having obtained, since the publication of the last Number of the 'Annals,' specimens of both sexes of the Hemipterous insect which I there described under the name of *Atelides centrolineatus*, I think it desirable to add one or two particulars to my description, which, having been drawn from a mutilated specimen of the female, was necessarily imperfect in some respects.

The individuals which I now possess are smaller than that previously described, the female being $9\frac{1}{2}$ lines instead of 10, and the male only 8 lines in length.

The antennæ, as I supposed, consist only of four joints; the second is longer than the third and fourth together; it is *prismatic*, with three longitudinal furrows, and not *compressed* as previously stated. The third and fourth joints are nearly equal in length, the fourth being perhaps a little longer than the third; they are much thinner than the second; the third is prismatic, like the second; the fourth elliptical, elongated; the third joint is black and hirsute, like the second; the fourth orange, somewhat pilose, with the base black.

The anal apparatus of the male, when viewed from beneath, appears to consist of a plate of a semicircular form, broadly notched on its posterior margin, and occupying a broad emargination of the last abdominal segment; viewed from above it presents a nearly circular horny ring, the upper portion of which is very narrow, whilst the lower is produced and emarginate posteriorly; the opening of the ring is narrowed and rendered irregular by a large tooth on each side, close to which the margin of the ring is clothed with yellowish hairs.

I may add, in order to remove all doubts as to this insect having attained its perfect state, that I have in my collection a specimen of its *nympha* or larva in the last stage of the metamorphosis, which presents all the customary marks of its imperfect condition.

XLVI.—*Descriptions of several new Genera of Reptiles, principally from the Collection of H.M.S. Herald.* By J. E. Gray, Esq., Ph.D., F.R.S., V.P.Z.S. &c.

To the Editors of the Annals of Natural History.

Gentlemen,

Sir John Richardson having kindly allowed me to examine the reptiles brought home by this expedition, I send for insertion in your pages characters of the following new genera, which will be figured in the forthcoming work on the Zoology of that Voyage.

I am, Gentlemen, yours &c.,

British Museum, Nov. 15, 1852, J. E. Gray.

Iguanidæ.

Section *Basiliscina.* Nostril lateral; back of head with a crest of compressed skin; throat with a cross fold behind; hinder toes fringed on the side; outer one webbed at the base; femoral pores none.

This tribe is distinguished from *Corythophanes* and *Chamæleopsis* by the occiput being rounded, and only furnished with a thin, flexible crest of skin, and by the margined toes, instead of having the prolongation of the lateral bony processes of the head, as in those genera. When the Catalogue of the Museum Reptiles was published, I only knew three genera; we have since received a new one from Mr. Dyson from Honduras, and this collection has produced two others from Quibo, on the west coast of America. They may be thus characterized:—

I. ***Occiput swollen on each side, with a high crest of compressed skin from the back edge of the eyes.***

1. Ptenosaura.

Back and tail with a series of large, short, compressed scales forming a slight crest; occiput and crest covered with large thin smooth scales.

Ptenosaura Seemanni.

Head (in spirits) blackish; body brown, blackish speckled; tail and legs with irregular black cross bands; angle of mouth and hinder part of chin white; scales of nose flat, keeled; of crown and eyebrows small, edged with a series of larger scales; scales of back small, smooth; of tail, and especially the outside of legs, larger, keeled; tail with five series of keeled scales beneath.

Hab. Quibo.

Named in honour of Berthold Seemann, Esq., the botanist who accompanied the expedition and brought many zoological specimens home.

II. *Occiput swollen, covered with convex scales, the hinder part (far behind the eyes) produced into a high crest of compressed skin.*

2. Basiliscus, Gray, Cat. Rep. B. M. 192.

Back and tail with a high erect crest, supported by bony rays; occipital crest large, rounded, covered with thin flat polygonal scales.

B. americanus, Gray, Cat. Rep. B. M. 192.

Hab. Guiana.

3. Lophosaura.

Back and tail with a high erect crest supported by bony rays; occipital crest small, angular, covered with large keeled scales.

Lophosaura Goodridgii, n. s.

Brown (in spirits); head dark; back and neck with eight oblique dark cross bands extending up the base of the dorsal fin; legs and feet dark spotted; scales of the nose, eyebrows, crown and occiput small, keeled, with a series of small keeled scales on the outer edge of the eyebrows; of the back small; of the tail and outside of limbs larger keeled; dorsal fin high and toothed on the edge, especially behind; caudal fin high, rather sinuous on the edge, and covered with large six-sided scales.

Hab. Quibo.

Named in honour of J. O. Goodridge, Esq., Surgeon R.N., who brought the specimen to England.

This species is very much larger than the *Basiliscus* from Guiana.

4. CRISTASAURA.

Back with a high erect crest supported by bony rays; tail rather compressed, slightly ringed, sharp-edged, and furnished with a series of large compressed scales on its upper edge; occipital crest large, rounded, thin, covered with thin small six-sided scales.

Cristasaura mitrella.

Olive (in spirits), beneath paler; angle of the mouth and chin white, the latter marbled with bluish; scales of the nose, of the eyebrows and occiput moderate keeled, of the crest rather smaller, very thin and slightly keeled; of the back very small, of the tail larger, and of the outside of the limbs much larger, both keeled; dorsal crest moderate, extending the whole length of the back, edged with a series of compressed scales; scales of the caudal crest rather large, especially those near the base.

Hab. Honduras, *Dyson.*

5. CORYTHEOLUS, Gray, Cat. Rep. B. M. 192.

Back and tail with a series of large, short, compressed scales forming a slight crest; occipital crest rather large, covered with small flat scales, and supported by the slender central straight process of the occipital bone.

C. vittatus, Gray, Cat. Rep. B. M. 193. The hinder lower labial plates with small scales beneath.

Hab. Mexico; Honduras?

III. *Occiput flattish, with a very small compressed crest on the middle of the hinder edge.*

6. THYSANODACTYLUS, Gray, Cat. Rep. B. M. 193.

Back and tail with a series of rather large, short, compressed scales forming a slight crest.

T. bilineatus, Gray, *l. c.* 193.

Hab. Fernando de Noranha.

SCINCIDÆ, § D. (*Siaphosinæ*), Gray, Cat. Rep. B. M. 88, add. after *Soridia*.

ANNIELLA, n. g.

Limbs none; nasal shield large, bent at the edge so as to form part of the labial margin of the head; head shield and other characters like *Soridia*.

This is the only genus of the tribe yet found out of Australia. It has all the form and characters of *Soridia*, except the absence of the small rudimentary legs on the side of the vent, and that the nasal shields are larger and are bent up beneath, so that they form part of the outer side of the head (while in *Soridia* they end just at the edge), and the upper labial shield under the nasal is very small, linear, scarcely observable; it also has a pair of chin shields below the lower rostral shield, while *Soridia* has only a single large one.

Anniella pulchra, n. s.

Silvery (in spirits); upper part with very narrow brown zigzag lines placed on the margin of the series of scales, the line down the centre of the back and two or three on the upper part of the sides being thicker and nearly half the width of the scales.

Hab. California, *J. O. Goodridge, Esq., Surgeon R.N.*

BIBLIOGRAPHICAL NOTICES.

Revue et Magasin de Zoologie. Par M. F. E. GUÉRIN-MÉNEVILLE. Nos. 2 & 3, Fevrier et Mars 1852. Paris, 8vo.

IN our last Number we gave an abstract of the contents of the first number of the present volume of this work. We now propose to do the same by the second and third. The second number contains original papers—

I. On the mode of nidification of a small Bird of the Island of Mauritius called the "Astrild" (*Loxia astrild*, Linn., *Senegalus striatus*, Briss.), by M. F. de Lafresnaye (pp. 49, 50).

The nest of this bird, represented on the plate accompanying the number (plate 2 of the vol.), is of an ovoid form, and consists of two united nests. The author considers that the form and construction of this nest, which resembles those of the weaver-birds (*Plocei*), confirms the opinion of M. Cabanis that the birds of the genera *Senegalus, Ploceus,* and *Vidua* should be separated from the *Fringillidæ* to form a new family under the name of *Ploceidæ*.

II. Studies on the *Anodontæ* of the Aube, by M. Henri Drouet. First article (pp. 51–65).

This article commences with a short historical notice of the genus *Anodonta*. The author states that the genus, which has long been supposed to include only two French species, really contains twenty perfectly distinct forms, of which about twelve inhabit the department of the Aube.

He divides the genus into two groups—of one of which *A. cygnea* is the type, of the other *A. anatina*. He states that in every piece of water in which species of this genus exist, members of both these groups will be found; that is to say, "That the discovery of one species in any piece of fresh water is the certain sign of the coexistence of a second."

The present notice is devoted to the consideration of the species allied to *A. cygnea*; of these the department of the Aube possesses four, namely—

1. *A. cygnea* (*Mytilus cygneus*, Linn.).
2. *A. ventricosa*, Pfeiff.
3. *A. Cellensis* (*Mytilus Zellensis*, Schröt.).
4. *A. oblonga*, Millet.

The species are described at considerable length, with Latin characters, which however we do not insert here, as the author promises to furnish a table of all the species at the close of his work.

The synonymy is given in detail and accompanied by copious remarks.

III. Catalogue of the *Carabidæ* collected by M. Bocandé in Portuguese Guinea, with descriptions of the new species, by M. de Laferté-Senectère (pp. 65–75).

This is the concluding paper of a series which has been published in the 'Revue et Magasin de Zoologie' during the last two years. It contains descriptions of nine new species, with remarks upon four others which have already been described; the new species are as follows:—*Epomis Bocandei, E. Latreillei, Tomochilus Westermanni, Æacus stygius, Hoplolenus insignis, Prionognathus fossor, Oodes tenebrioïdes, sulcatus* and *ellipticus*. The descriptions are too long for extraction, and the author gives no short characters.

IV. Notice on a new species of Ant, discovered by M. Auguste Sallé in St. Domingo, making its nest on bushes in the marshy plains, by M. Guérin-Méneville (pp. 75–79).

This ant was found by M. Sallé inhabiting a marsh called the *Cienega del Timbladero*, from its trembling soil, and forming a portion of an immense valley bordering the river Nisao, in St. Domingo. This valley is inhabited by wild cattle, and has hitherto remained almost unknown; it was formerly a refuge for negroes escaping from slavery. This *Cienega del Timbladero* is a large plain, covered with tall reeds and with bushes here and there. During the rainy season it forms an immense lake. In crossing it M. Sallé's attention was attracted by some nests which he observed attached to the summits of the branches of some of the bushes, and which, as his negro guide informed him, were constructed by ants. Examination confirmed this statement; on touching one of them it was immediately covered with ants, which appeared furious at being disturbed: they stung very severely.

The ant belongs to the genus *Myrmica* of Latreille, and bears a great resemblance to the common European *Myrmica rubra*. M. Guérin-Méneville describes it under the name of

Myrmica Sallei. M. fulva, rugosula, thorace postice bispinoso, nodo primo infra mutico; femoribus cruribusque apice valde inflatis; antennis abdomineque fulvis.

The length of the males and neuters is 5 mill., of the females 7 mill. The males differ considerably in appearance from the other sexes.

The nest is very remarkable from being composed entirely of a brown, papyraceous substance similar to that of which the European wasps make their nests. This paper is formed of the fibres of rushes.

A nearly allied but distinct species of *Myrmica* was also found in this nest by M. Sallé, and is indicated by M. Guérin under the name of *M. cariniceps.*

Plate 3 of this volume of the 'Revue' contains figures of the different sexes of *Myrmica Sallei,* and also of its nest. This plate is contained in the third number.

The remainder of the number is occupied by reports of the meetings of the "Académie des Sciences" of 26th January, and 2nd, 9th, 16th, and 23rd February, and some notices of new works.

The third number contains—

I. Observations on the propositions submitted by M. Dareste to the Academy of Sciences, regarding the Convolutions of the Brain, by M. P. Gratiolet (pp. 97–113).

In this memoir the author supports the views formerly advanced by himself in a paper laid before the Academy of Sciences, to which those of M. Dareste are directly opposed. M. Gratiolet considered, from the study of the convolutions of the brain in the Apes, that the number and distinctness of these convolutions are greatest in those animals of each group which display the greatest amount of intelligence. M. Dareste, on the other hand, considers that those animals in which the brain has the greatest volume are the most intelligent, and that the degree to which the convolutions are developed is in relation with the size and not with the intelligence of the animal. He also states that the brain is proportionately larger in small animals than in large; consequently, says M. Gratiolet, according to M. Dareste, the "intelligence of animals is in an inverse ratio to their size."

In opposition to these views and in support of his own, M. Gratiolet institutes a comparison between the cerebral organs of various animals. He shows that in many cases the brains of small animals have a greater number of convolutions than those of others of much larger size. Thus he compares the brain of the ocelot with that of the jaguar, and that of the Bornean bear (*Ursus euryspilus*) with that of the great white bear. The brains of these animals, that of the Guinea pig and that of the Echidna, are represented on the four plates which accompany the memoir (pl. 4–7).

II. Researches into the Utility of Reptiles, either as articles of food, as furnishing products for use in domestic œconomy, or, lastly, as animals of mere curiosity, by M. Al. Guichemot (pp. 113–122).

The object of this memoir is sufficiently explained by its title. The author adopts the classification of M. Is. Geoffroy St. Hilaire, in which useful animals are divided into five classes, namely *auxiliary, alimentary, industrial, accessory* or *ornamental,* and *medicinal animals.* The three first classes are treated of in the present number, but the memoir contains nothing of sufficient importance to render it advisable to present our readers with an abstract of its contents.

III. Abstract of a first series of researches upon the insects injurious to the rape crops, by M. Ad. Focillon (pp. 123–128).

The principal facts contained in this paper have already been published in this Journal (Ann. n. s. ix. p. 356).

IV. Descriptions of new species of Lepidoptera belonging to the Entomological collections of the Museum of Paris, by M. H. Lucas. First decade (pp. 128–141).

This memoir contains descriptions of ten new species of the genus *Papilio,* and is the first of a series of similar papers intended to form a sort of *prodromus* to the Catalogue of Lepidopterous insects contained in the Museum of the "Jardin des Plantes." The descriptions being very long and unaccompanied by diagnoses, we are unable to give more than the names of the species, with the localities from which they are derived, and abstracts of the remarks appended to each by M. Lucas.

1. *Papilio Godartianus.* Allied to *P. Polydorus,* Linn., but smaller. Upper wings destitute of longitudinal white streaks; lower wings without red marginal lunules, and not presenting a spatulated tail. Inhabits the islands of the Pacific Ocean.

2. *Papilio Celadon.* Allied to *P. Sinon,* Fab., with which it was confounded by Cramer. The tail of the posterior wings is shorter than in *P. Sinon,* and entirely black, and the sixth green band, which is macular, does not touch the posterior margin of the superior wings. From North America.

3. *Papilio Arcesilaus.* Allied to *P. Ajax.* Inhabits North America.

4. *Papilio Cacicus.* Allied to *P. Grayi* and *Cleotas.* From Columbia.

5. *Papilio Sadalus.* Allied to *P. Machaon* and *Asterias.* The ochreous common band of the wings is much broader than in *P. Asterias*; the tail of the posterior wings is black, linear, and shorter than in *P. Machaon.* Inhabits the environs of Quito.

6. *Papilio Eurydorus.* Allied to *P. Proneus* and *Phryneus.* The yellowish white band of the posterior wings is much narrower, and the tail, which is black and spatulate, less elongated than in those species. Inhabits Brazil.

7. *Papilio Phryneus.* Intermediate between *P. Proneus* and *Agavus.* Inhabits Cayenne.

8. *Papilio Zelicaon.* Resembles *P. Machaon.* Distinguished by having the black margins of the wings much broader and of a deeper black; by the lunules of the posterior wings which are not all preceded by spots of blue points; and by the yellow spot in the anal angle of these, which has in its centre a deep black lunule. It inhabits California.

9. *Papilio Rutulus.* Very near *P. Turnus.* The black margins and bands of the wings similar to those of that species, but broader and deeper in tint; the posterior wings with five marginal lunules instead of six. From California.

10. *Papilio Eurymedon.* Allied to the preceding species. The ground colour is white instead of ochreous, as in *P. Rutulus,* and the tail of the hinder wings is broader. It also inhabits California.

The remainder of this number is occupied by reports of the proceedings of the Academy of Sciences for the sittings of the 1st, 10th, 15th and 22nd March; an analysis of the proceedings of the Zoological Society of London; and a note from M. Z. Gerbe containing descriptions of two new species of *Arvicola* (p. 159).

1. *Arvicola leucura.* A. corpore supra cinereo-flavescente, subtus albo; hypochondriis subflavis; pedibus canescentibus; mystacibus crassis, capite longiusculis; auriculis magnis, capite villosis, vellere longioribus; cauda subpilosa utrinque albida. "Basses-Alpes."

2. *Arvicola Selysii.* A. supra fusco-ferruginea, subtus cinerea pallide fulva; hypochondriis rufescentibus; pedibus cinereis; auriculis vellere prominulis, atris, pilosis; mystacibus exilibus; capite brevioribus; cauda superne fusca, interne flavescente, penicillo sordide albo apice instructo. "Basses-Alpes."

M. Guérin also announces that M. Poey, director of the Museum of Natural History of Cuba, is about to publish a work on the natural history of that island, under the title of "Mémoires sur l'Histoire naturelle de l'île de Cuba."

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 28, 1851.—R. H. Solly, Esq., F.R.S., in the Chair.

Description of two new Genera and some new Species of Scutellidæ and Echinolampidæ in the Collection of the British Museum. By John Edward Gray, Esq., F.R.S., P.B.S. etc.

The collection of the British Museum is extremely rich in species of recent *Echinoids,* and fortunate in possessing long series of different ages of several of the species.

Having been recently occupied in arranging and forming a catalogue of these animals, I transmitted to the 'Annals of Natural History' for February a description of several genera and species of *Spatangidæ.*

MM. Agassiz and Desor having recently published, in the Monograph of Echini and other papers on these animals, all the species of these two families then known to them, and as they had every facility for examining the British Museum specimens, the species now to be described are but few in number.

Fam. 1. SCUTELLIDÆ.

Genus ECHINANTHUS.

Among the species which have the base concave, of which *E. rosaceus* may be considered the type, are to be added—

1. ECHINANTHUS AUSTRALASIÆ.

Vent beneath, at a little distance from the edge; back very convex in the middle; upper margin rather flattened, with a slight concavity at the end of the ambulacra; under side flat near the margin, deeply concave in the middle; spines of the under side near mouth very fine.
Hab. Australia; N.S.W., Brisbane Water.

2. ECHINANTHUS TESTUDINARIUS.

Vent beneath a little within the edge, depressed; back slightly raised, evenly convex; under surface rather concave from the edge.
Hab. Indian Ocean; Borneo.

3. ECHINANTHUS OBLONGUS.

Ovate-oblong, elongate, rounded at the end; sides thick, rounded; back depressed round the end of the ambulacra; crown rather convex; ambulacra ovate, lanceolate, broad, and closed at the end; under side concave nearly to the edge; ambulacral grooves indistinct; vent near the margin.
Hab. Philippines; Siquijor.

4. ECHINANTHUS PRODUCTUS.

Shell ovate, elongate, the hinder end produced and flattened, the edge rather thick, thinner behind; the ambulacral petal broad, the bands not quite united at the end; under side concave to the margin; vent near the margin.
Hab. —— ?

5. ECHINANTHUS COLEÆ.

Shell ovate, subpentagonal, depressed; margin thick, rounded; back depressed as far as the end of the ambulacra, and then rather convex in the middle, the under side concave nearly to the edge; ambulacral petal ovate lanceolate, closed at the end; vent near the margin.
Hab. Mauritius. Lady Mary Cole.

To those which have a flat base may be added—

6. ECHINANTHUS EXPLANATUS.

Depressed, much expanded, centre of the back rather convex; ambulacra occupying rather more than half the space between the vertex and margin, the lines of pores of the anterior pair and posterior odd one far apart at the end; cavity with thin concentric lines of short compressed columns near the margin; jaws depressed.
Hab. Mauritius?

Genus Rotula.

The British Museum series induces me to believe that *Rotula digitata* of Agassiz is not distinct from *R. Rumphii,* as M. Agassiz first considered it to be.

Genus Echinodiscus.

I cannot find any permanent difference to distinguish *Lobophora bifissa* from *L. aurita*; they are found together in the same habitat in the Red Sea.

Genus Mellita.

The larger spines on the back of this, the former, and succeeding genus are short, equal in size, and furnished with a more or less spherical head.

The Museum series of specimens show a very gradual passage between the *Echini* which have been called *Mellita testudinaria* and *M. quinquefora* by Agassiz.

The species which have six slits on the disc are found on the coast of Tropical America, and others on the shores of the Red Sea; I believe they form two species, which appear to have been confounded under one name.

The American *Mellita hexapora* has only narrow linear bands of larger tubercles (bearing the larger spines) between the branched lines radiating from the mouth on the under surface, and these lines are very much branched.

Mellita similis and *M. lobata* of Agassiz, also from the West Indies; the first appears to be only a variety, and the latter a monstrosity of this species.

The Red Sea species I have named

Mellita erythræa.

Shell depressed, with five ambulacra and one posterior interambulacral slit; inferior oral grooves branched, branches very slightly divided; the larger spines and tubercles in a broad band, occupying nearly the whole interambulacral space between the inferior oral grooves.

Hab. Red Sea. Sir J. Gardiner Wilkinson.

There is a new genus which has the edge of the disk perforated and the vent near the mouth, as in *Echinoglyphus*, but differs in the oral grooves being more simple and only branched near the edge, in the lanceolate form of the ambulacra, and in the square form of the tesseræ of the ambulacral zones beyond the tip of the ambulacra.

Genus Leodia.

Body depressed, with a posterior slit and five perforations between the end of the ambulacra and edge; the marginal ambulacral tesseræ squarish, like the interambulacral ones; ambulacra lanceolate, acute at the tip, the anterior one most narrow and longest; pores united by a groove; ovarial plate pentangular; ovarial pores three; oral grooves simple, slightly impressed, converging towards the margin in front of the ambulacral perforations; vent near the mouth, in front of the anal perforation, with a group of three or four larger spines between it and the mouth.

1. Leodia Richardsonii.

Body suborbicular, slightly depressed, five-lobed, hinder edge transverse; ambulacra lanceolate, not reaching to the discal perforations; discal perforations ovate, small, the anterior smaller, the hinder largest, with two pairs of rather large tesseræ between the ends of the ambulacra and the foramen, the upper pair subtrigonal; oral grooves simply forked near the edge.

Hab. West Indies.

The single specimen I have seen of this species was presented by Sir John Richardson. It is rather deformed and sinuous on the right side, the hinder lateral perforation being nearly obliterated on that side.

In *Echinoglyphus* the tesseræ of the ambulacral bands are broad and band-like between the ambulacra and the ambulacral slits.

Genus Echinoglyphus, Van Phelsum. The Encope of Agassiz.

The large Brazilian species of this genus appear to be very variable. The young specimens have large notches on the edge of the shell, and as the animal increases in size, the marginal edges of these notches more or less approximate together, and sometimes even become united, so as to transform the notch into a perforation. M. Agassiz on these variations has formed several species; but the Museum series, from the Brazils and other parts of the east coast of Tropical America, show that they are all mere variations of the species which Van Phelsum called *Echinoglyphus frondosus*, and Lamarck *Scutella emarginata*. I am induced to believe that *Scutella quinqueloba* of Eschscholtz, *Encope Valenciennesii*, *Encope subclausa*, *Encope oblonga*, and *Encope Michelini*, are only varieties of this species: they are all remarkable for the large size and longly-rayed star-like form of the madreporiform plate.

Genus Fibularia.

The following species is peculiar as having an oblong, longitudinal vent.

1. Fibularia oblonga.

Shell ovate, elongate, ventricose; vent oblong, longitudinal, according to the axis of the shell.

Hab. N. Australia.

Fam. 2. Echinolampidæ.

Genus Echinolampas.

The species of this genus may be divided into two sections, according to the form of the ambulacra.

Echinolampas oviformis and its allies have the porous bands of the anterior and other pair of ambulacra equal; the lower side of the shell flat; the mouth oblong, transverse, with (5) tubercles between the oral ambulacra.

The other species have the anterior porous band of the anterior pair of ambulacra shortest; under side rounded, convex; mouth oblong, transverse, large, marked with no tubercles, and only very rudimentary oral ambulacra.

1. Echinolampas depressus.

Ovate, depressed, subpentangular; back regularly convex.
Hab. ——?

Genus Mortonia.

Shell ovate, thin, rather produced in front, rounded behind, covered with small tubercles; vertex central, convex; internal cavity quite simple; ambulacra petaloid, narrow, open at the end; bands rather diverging; pores rather crowded, united by an oblong groove; beneath concave, especially near the mouth and vent; mouth rather large, roundish-oblong, transverse, without any ambulacral star; vent large, transverse, oblong, in the middle of the space between the mouth and hinder edge; ovarial pores four; madreporiform plate small, central.

? Echinocyamus, sp., *Desmoulin.*
Mortonia, *Gray, Cat. Echinoida in Brit. Mus.*

This genus differs from *Echinocyanus* in the thinness of the shell, and especially in the ambulacra being larger, more perfect, and in the pores of the ambulacra being united in pairs by a cross groove. It differs from the fossil genus *Pygaulus* in the vent being inferior, intermediate between the mouth and edge, and transverse.

This genus is named after Dr. Morton, the historian of Northamptonshire, who first attempted to arrange the fossil *Echini* into generic groups.

Mortonia australis.

Elliptical, depressed, rather acute in front, rounded behind, under side concave near the mouth and vent; vent large, oblong, transverse, in the centre between the mouth and hinder margin.

Fibularia australis, *Desm. Tab. Syn.* 240.
Echinocyamus australis, *Agassiz et Desor, l. c.* 140.
Hab. South Sea. Mallet.

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

The following papers were read:—

1. Description of a new genus and family of Cyclosaurian Lizards, from Para. By J. E. Gray, Esq., F.R.S., P.B.S.

This interesting Lizard has lately been purchased by the Museum, from a collection of Saurians recently made by Messrs. Wallace and Bates, during their excursion within a circuit of about 300 miles of Para.

It is exceedingly interesting as presenting an entirely new form, different in many particulars from any before observed; so much so, that I am induced to form for it a new family, to be placed near *Anadiadæ* and *Chirocolidæ*, which may be thus characterized:—

1. Iphisadæ.

Scales of the back, belly, nape and throat smooth, broad, six-sided, transverse, forming a single series on each side of the tail, narrow, lanceolate, elongate, regularly keeled, in rings alternating with each other; head shielded; chin shielded; ear open, circular; femoral pores distinct.

Iphisa.

Head depressed, shielded; anterior frontal single, broad, four-sided; posterior frontals two, small, subtrigonal; vertebral single, rather elongate; posterior vertebral two, small, five-sided; occipital three, larger, middle one narrow, longitudinal; superciliary shield 3–3, hinder smaller, anterior smallest; temple with small shields; labial shields moderate; rostral and mental broad; chin entirely shielded; anterior single, transverse, first pair very large, triangular, covering nearly the whole of the chin, second pair small, at the outer hinder angle of the former; nostrils lateral, in the lower edge of the nasal shield, between it and the labial shield; eyes large, lateral; eye-lids scaly?; ears circular, open; nape, back, throat and belly covered with two series of broad, smooth scales; sides rounded, covered with three or four series of six-sided, smooth scales, placed in oblique series; chest with a collar of five scales, the central one elongate, triangular, the lateral ones four-sided, the outer pair very narrow; preanal shields three, the central one elongate, narrow, subtriangular; limbs short, weak, covered with broad smooth shields above, the hinder shield beneath; femoral pores 10–10, distinct, the series nearly united in front of the preanal plates; toes 5–5, unequal, the inner very short, the outer hinder separated from the other by a space like a thumb; tail elongate, cylindrical, tapering, covered above and below with whorls of narrow, elongate, regular, lanceolate, strongly keeled pointed scales, those of each series alternating with those that succeed and follow it.

1. Iphisa elegans.

Olive-brown black marbled; sides darker, white varied; chin and beneath yellowish white.

Hab. Para.

Descriptions of some New Birds in the Museum of the Earl of Derby. By Dr. Kaup.

During my visit to London last year I had the honour to receive an invitation from the Earl of Derby, to visit his collection at Knowsley Hall, with permission to use the materials I might find there for the monography of *Muscicapidæ* on which I was engaged. Of that collection I had already formed very high expectations; but I was agreeably surprised by finding them all surpassed, so great is the richness of this noble collection. It contains more than 14,000 specimens of stuffed birds, besides skins, which are not yet numbered. What adds still greater interest to this collection is, that it contains a large number of the original specimens described by Latham and other English authors, of whose writings these specimens are the only explanation. To the pleasure of working in so rich a collection must be added the command of a colossal library, to which not one work of importance is wanting. All this, with the aviaries of magnificent living birds, from every zone of the world, must have the greatest charm for the naturalist, and make Knowsley Hall for him a perfect Eden, which once seen shall never be forgotten.

The new birds described here include only one portion of my researches, because I could not finish so many genera. The materials of the very rich family of *Muscicapidæ* are too extensive, for a complete elucidation during the limited period of my visit from a foreign country; I wish my descriptions therefore to be considered only as fragments.

The object of my visit to England was to collect materials for a complete monography of the *Muscicapidæ*; but notwithstanding the many favours I received, and the extreme liberality with which my labours were facilitated in every English collection, I must confess with sorrow that I shall never be able to make a complete whole (perfectly free from objection), with materials collected in different museums. A perfect arrangement can only be achieved by the study of the materials present together, so that at every moment a comparison may be made between any two or any number of the species.

Were it my good fortune to assemble the whole materials of one family in my rooms at Darmstadt, one winter only would be necessary to finish each family in such a manner as to satisfy the requirements of modern science.

Were any one museum willing to accord me the whole materials in its possession, it is probable that all the supplementary species not contained in that collection would be readily furnished by other museums, as the absence of a few species for a short period would be of little or no importance.

That we can only climb to the summit of our science by means of well-made monographies, there can be no possible doubt; and I attach a higher value to a monography constructed on philosophical principles, than to the best fauna of any single part of the world: for only by a strict comparison of the birds of the five parts of the globe can we know what is a family, a subfamily, genus, species and subspecies. Only in this way—a difficult way no doubt—can we learn the true harmony of nature; and thus shall we be filled with admiration, when we see that every species, genus, family or order represents a certain type, and must receive its place in a scheme of classification according to fixed laws, which man must discover, but over which he has no control.

This charm can never belong to merely descriptive ornithology, because even the best descriptions are only like mosaic stones, which, when placed without rules, or arranged according to false principles, give us only a scattered mass of heterogeneous materials, or a picture destitute of truth.

These claims I have urged over and over again in my dissertations, but hitherto without effect. When shall the time arrive when a catholic spirit shall guide the destinies of science, and lead onward to that triumph of true knowledge, in which every director of a museum, and every student of the works of nature, may take his part?

At present it is impossible that a naturalist can without help arrange the whole materials of one class in his museum. Our museums are little more than great exhibitions for the people, who look too often only to colour, instead of being stores of nature's treasures, ready to be communicated to every naturalist who has proved himself worthy of the name. Every museum ought to accord freely and liberally the wished-for materials, for this is the cheapest way in which a family can be properly named and accurately classed. The common excuse that the lent materials might come to harm, is little more than an excuse. Time and destructive insects will do the harm, without the slightest advantage to science.

NISUS (seu ACCIPITER) CHIONOGASTER, Kaup.

Diagnosis.—Above dark blue grey, beneath pure white.

Description.—The male is less than the *Nis. fringillarius.* Above dark blue grey, the crown, lorum, and a stripe over the eye- and ear-cover feathers more approaching to black; ear-covering, cheek and crop with fine black quill lines; tail with three black bands and a broader band at the end, which is white bordered; the underside of the tail has the bands more silver-grey; the first tail-feather with five bands before the large end-band; the wings on the inner side with four bands before the large end-band. Before the emarginations the bands are grey, and after them whiter.

The larger female with a white eye-stripe, and broader black quill stripe on the crop; the cover feathers of the tibia with a fine rufous tint.

According to the ticket of M. de Lattre, the iris of the female is orange, and that of the male dark brown, like burnt sienna.

These two specimens were procured by M. de Lattre in Coban, in the year 1843.

Dimensions in millimetres.—

	♂	♀
Head	40	45
Gape	16	19
Wings	173	206
Tail	140	160
Tibia	47	56
Middle toe without nail	32	37

We possess several species in the genus *Nisus*, Cuv., seu *Accipiter* of the English authors. Most of these are very near to the common Sparrow-Hawk; and I think some of them, like the North American *fuscus* seu *velox*, the African *rufiventris*, the *madagascariensis*, and perhaps the *erythrocnemius* of G. Gray, are not true species, but that they are subspecies of the common European *Nisus fringillarius*, forming a group amongst themselves, and exhibiting by no means the decided differences apparent between *fringillarius* and *pileatus*, or *pileatus* and *tachiro*.

In the same near relation to the *chiquera* of Western Africa do I consider the true *chiquera*, Vaill. 30, from India; and this opinion I found on the following characteristics.

The West African *chiquera* has the body above darker cinereous, with very distinct narrow black lines, and the stripe beneath the eye, and the black stripe over the eye and ear-covers, are more distinct; the rufous head with darker fine stripes.

The Indian *chiquera* has the head without stripes; the body above lighter grey, with very few traces of black bands; and the black semicircle round the eye is shorter and not so complete.

But these slight differences will not justify us in considering the West African *chiquera* as a true species distinct from the Indian true *chiquera*; it is only a subspecies of the latter true species. As such we must make a distinction, and as such it must be accorded a place in the system. I think the best way is to give a description of the oldest known subspecies, and arrange all the other subspecies with different names, distinguished by the letters of the alphabet, *a*, *b*, *c*, &c., amongst the true species. In this way it would only be necessary to give a very short description of the subspecies, consisting of the few marks by which it differs from the old known subspecies. Until we have discovered all the species contained in one and the same subgenus, we can never say with certainty whether a given specimen represents a true species, or only a subspecies; I must therefore confess that in the following descriptions of the family *Muscicapidæ*, it is very probable that I have described as species some specimens which hereafter will be arranged as subspecies, when the whole species composing the subgenus are completely known.

One of the most interesting birds in the collection of Lord Derby is a little Falcon, belonging to the subfamily *Falconinæ*, which enabled me to correct the characters of the genus *Harpagus*.

The characters must be changed as follows:—Bill large, with two teeth, slender and indistinct, or strong and distinct; wings short, and in the proportions of the quills very like *Nisus* seu *Accipiter*; toes short, and the inner and outer toes of the same length.

The genus *Harpagus* must be divided into two subgenera.

The older subgenus *Harpagus* must be distinguished by the following characters:—Two strong and distinct teeth; the nostrils placed near the end of a soft membrane covering a large cavity; tibia with scales not divided.

Two species, *diodon* and *bidentatus*.

The other subgenus, in which this new species must be placed, must be characterized:—Two slender indistinct teeth; the nostrils round, very small, and bored in the nasal bones; the first wing-feathers with very distinct emarginations, the fourth the longest; tibia with whole and divided scales.

I give this subgenus the name of *Spiziapteryx*, and the species I have named

HARPAGUS CIRCUMCINCTUS.

Diag.—Size of the Kestril, with white stripe over the eye, which encircles the whole head and is connected with a white collar; the tail-covers, above and beneath, white.

Descr.—Rufous ash-grey, beneath lighter, with dark brown shaft-stripes; the white stripe over the eye, and the collar black marginated; tibia-covers white; the arm and hand wings white at the roots, and like the stronger cover-feathers, with white spots and bands on the inner and outer webs; the first wing-feather without spots on the exterior web, and with fine white spots on the interior web; tail black-brown; beneath with white roots and three small white bands and an end band; the fifth without spots on the exterior web; the fourth with only traces; the third exhibits round white spots; and the two exterior feathers are white-banded. From this very irregular distribution of spots, the tail, seen from above, exhibits a very irregular drawing. Cere, naked eye region and feet yellow; nails dark brown.

I apprehend that this specimen, the only one in England, is not a very old bird. Lord Derby received this bird from Chili, by Mr. Bridges.

Dimen.—Head, 49; bill, from the cere, 16; from the gape, 22; height, 13; breadth, 20; over wing, 123; tip of the wing, 56; middle tail-feather, 148; outer tail-feather, 115; tarsus, 45; middle-toe, 26; nail, 11; outer-toe, $17\frac{1}{2}$; nail, 10; inner-toe, 16; nail, 12; after-toe, 13; nail, 13.

A new species of the subgenus Saurophagus, Swains.

In the little subgenus *Saurophagus*, Swains., we had, till now, only three species. These are, *lictor, sulphuratus,* and *flavus.* I received by Mr. Wollweber from Zacatecas in Mexico an only specimen of a fourth species; but I found in the collection of Lord Derby, and in the British Museum, a great number of the same species.

To this species I have given the name of *Derbyanus,* as a mark of my respect for that distinguished patron of ornithological science, the Earl of Derby, President of the Zoological Society.

All the species of this little subgenus have the same general colouring, and are distinguished only by very few characters taken from the colouring of the wings and from the dimensions. The young ones have, like the young birds of *Scaphorhynchus,* the bill shorter and bigger, and the head is black, without the beautiful crest of the old birds. The old birds have a white front, connected with a white band over the eyes and over the black ear-covers, and surrounding the black head, which in the middle is ornamented with a yellow crest; the chin and underpart of the neck white; breast, belly, under-wings and tail-covers yellow; back olive-coloured; wings and tail brown, with red margins.

Saurophagus lictor, Gray & Mitch. Genera of Birds, t. 62.

Lanius lictor, Licht.—*Saurophagus pusillus,* Swains.—*Swainsonii,* Gould.

Diag.—Only the margins of the outer webs of the wings rufous;

wings 86 mm. long. It shows the finest bill, a more graduated tail, and the smallest dimensions.

Hab. Brazil, Para.

Saurophagus sulphuratus.

Lanius, Gmel.—*Tyrannus,* Vieill. Enl. 296.

Diag.—Only the margins of the outer webs of the wings rufous; wings 110–114 mm. long.

Hab. Amer. meridional.

Saurophagus flavus, Gray.

Corvus, Gmel.

Diag.—Only the margins of the outer webs of the wings rufous; wings 126–130 mm. long.

Hab. Brazil meridional. Bolivia.

Saurophagus Derbyanus, Kaup.

Diag.—The wing-feathers from the second to the sixteenth have the whole outer webs on the greatest part of the length rufous; wings 128 mm. long.

Hab. Zacatecas, in Mexico.

Comparison of the dimensions.—

	Saur. lictor.	*Saur. sulphuratus.*	*Saur. flavus.*	*Saur. Derbyanus.*
Head	41	53–58	60–62	60
Bill, from the forehead	22	29–30	35	32
—— from the gape	26	32–36	40–42	38
Wings	86	110–114	130	128
Tail	74	82–86	100	92
Tarsus	16	25–27	28	29
Middle-toe with the nail	—	21	30	26

In these dimensions *Saurophagus Derbyanus* is very near to *Saur. flavus.*

In what relation with the subgenus *Scaphorhynchus,* Pr. Max., this little subgenus *Saurophagus* is to be placed, I shall determine in my next monography, *Muscicapidæ.*

Of the subgenus *Scaphorhynchus,* Ch. Bonaparte, in his very useful Conspectus, has given five species:—*pitangua, flaviceps, atriceps, audax,* and *chrysocephalus.*

The species *flaviceps* and *atriceps* must go down, because *flaviceps,* Sw., is a female, and *atriceps* a young bird of *pitangua*; *audax* does not belong to this subgenus, and is to be placed in the neighbourhood of *rufinus,* Spix, and *circumcinctus,* Sw., which have the same bill and similar covering.

We have only two species, *pitangua* and *chrysocephalus,* Tchudi, in the section of *Scaphorhynchus.*

Scaphorhynchus, with its broad bill, shorter and feebler tarsi and toes, represents more the Swallow type, and must be placed in the second rank of his genus.

Before I finish I may allow myself the observation, that, till now, the whole family of *Muscicapidæ* has been in a condition of the greatest confusion, and that the greatest number of genera must go down, or must be considered as subgenera of some larger genera.

ROYAL SOCIETY.

May 27.—"Upon the Morphology of the Cephalous Mollusca, as illustrated by the Anatomy of certain Heteropoda and Pteropoda." By Thomas Huxley, Esq., F.R.S.

In the present memoir the author endeavours to determine, upon anatomical and embryological grounds, the true homologies of the different organs of the Cephalous Mollusca, and thence to arrive at some idea of the archetypal form, as definite modifications of which the existing molluscous forms may be considered to have arisen.

The Pelagic Heteropoda and Pteropoda, from their small size and extreme transparency, are peculiarly favourable subjects for the anatomical part of this investigation, and it is from a detailed examination of those systems of organs which are of importance for the purpose that the author deduces the following conclusions:—

1. In the *Heteropoda* the intestine is bent towards the dorsal or *hæmal* side in consequence of the development behind the anus of the visceral "hernia," which is therefore called a *post-abdomen*.

2. In the *Heteropoda*, the "foot," in its most perfect condition, consists of three portions, a *propodium, mesopodium* and *metapodium*.

3. The *Heteropoda* are more or less prosobranchiate, the degree depending upon the amount of development of the post-abdomen.

4. In the *Pteropoda* the intestine is bent towards the ventral or *neural* side, in consequence of the development of the visceral "hernia" in front of the anus. It is therefore called an *abdomen*.

5. In the *Pteropoda*, the foot, besides the parts mentioned above, possesses an additional appendage, the *epipodium*, which forms the expanded wing characteristic of the group.

6. The *Pteropoda* are opisthobranchiate, prosobranchiate, or intermediate in character, according to the degree of development of the *abdomen*.

The *Heteropoda* and *Pteropoda*, then, may be considered to represent two opposite phases of the modification of the molluscous archetype.

In the second part of the paper, the author endeavours, by carefully collating the known facts of the development of the Mollusca, to ascertain (*a*) the primary form of all cephalous Mollusca, and (*b*) the mode in which, in the course of development, this embryonic form becomes metamorphosed into the adult form; in order, if possible, to account, on the safe basis of ascertained morphological laws, for the peculiar modifications of structure which have been found, anatomically, to obtain among the Heteropoda and Pteropoda.

He finds that it is possible not only to deduce the structure of the Heteropoda and Pteropoda from a simple and symmetrical archetype by such morphological laws, but that all the cephalous Mollusca fall under one or other of the great types of which these have been taken as exemplifications.

After a discussion of the various theories of the homology of the organs of cephalous Mollusca proposed by Lovèn, Leuckart, &c., the following general conclusions are set forth :—

1. The cephalous Mollusca are all organized after the same fundamental form or archetype.

2. The arrangement of the systems of organs within this archetype is essentially the same as in the Vertebrata and Annulosa; that is to say, supposing the digestive system to form the axis of the body, the nervous centre lies on one side of that axis; the blood-vascular centre upon the opposite; and furthermore, the archetype is symmetrical with regard to a longitudinal vertical plane, passing through these three.

3. The *molluscous* archetype differs from the *vertebrate* in the circumstance—1, that the mouth opens upon the neural surface; 2, that the embryo commences its development upon the hæmal side.

It differs from the *articulate* archetype in the latter circumstance, and from both in the fact, that the proper appendicular system (represented by the epipodium) is almost rudimentary, and that the locomotive function is mainly performed by a development of the neural surface.

4. The process of concentration and fusion of parts by which the principal modifications are produced among the Vertebrata and Articulata, seems almost absent in the Mollusca; the changes among them being produced by an asymmetrical development of the primarily symmetrical archetype, a process comparatively rare among the Articulata and Vertebrata.

5. The part thus asymmetrically developed is invariably a portion of the hæmal surface, and may be called an *abdomen* or a *post-abdomen*, according as it is placed before or behind the anus.

6. The intestine is found to be bent in two directions among the Mollusca, hæmad or neurad, and these flexures correspond with the development of a post-abdomen or abdomen, respectively.

7. The process of development demonstrates that the Tectibranchiata, Nudibranchiata and Pectinibranchiata (in part at least) belong to the former division, and that the Cephalopoda and Pulmonata belong to the latter.

8. Anatomical evidence shows that the Heteropoda have a hæmal flexure of the intestine, the Pteropoda a neural flexure; and it is almost certain that when their development is traced, the former will be found to have a post-abdomen, the latter an abdomen; there will then be two great divisions of the cephalous mollusca.

a. Those which develope an abdomen :—*Cephalopoda, Pteropoda, Pulmonata.*

b. Those which develope a post-abdomen :—*Heteropoda, Pectinibranchiata, Tectibranchiata, Nudibranchiata.*

9. Prosobranchism and Opisthobranchism may occur as secondary results of either course of development.

10. The principal nervous centres are similar in number and posi-

tion throughout, and differ only in their arrangement and degrees of concentration. The amount of the latter does not correspond with the complexity of organization of the mollusk, but rather the reverse.

11. The organization of the vascular system is equally uniform; its completeness or incompleteness is no mark of complexity or simplicity of the rest of the organization.

12. The cephalous Mollusca are characterized by the possession of a peculiar organ, the dentigerous "tongue," whose mode of action resembles that of a chain-saw.

13. The locomotive apparatus, when fully developed, consists of four parts, the propodium, mesopodium, metapodium and epipodium. These parts are least modified in such mollusks as Atlanta or Pneumodermon; most altered and disguised in such as Cleodora or Octopus.

14. The term "mantle" should be confined to the surface of the *abdomen* or *post-abdomen*, and to the prolonged edges of that surface.

15. It is of great importance to recollect that the "shells" are probably not homologous organs in all the different forms of mollusks.

The shells of Sepia, Spirula (?), Limax, Clausilia and Helix are developed in the thickness of the mantle.

The shells of Nautilus (?), Pectinibranchiata, &c., are developed from the surface of the mantle by a quite distinct process.

Certain curious differences appear to follow the externality or internality of the shell.

An external shell in a mollusk with a hæmal flexure, *e. g.* Atlanta, has its columellar axis *below* the aperture.

An external shell in a mollusk with a neural flexure, *e. g.* Nautilus, has its columellar axis *above* the aperture.

An internal shell in a mollusk with a neural flexure, has its columellar axis *below* the aperture, *e. g.* Spirula, Clausilia, Helix.

In the course of the memoir the author incidentally introduces a number of new, and, as he believes, important facts, with regard to the nervous, circulatory and urinary systems; and describes at length the mechanism of the "tongue" and an organ similar to the "crystalline style" of bivalves, found in the Strombidæ.

LINNÆAN SOCIETY.

March 16, 1852.—Robert Brown, Esq., President, in the Chair.

Read a "Notice of the habits of *Myrmica domestica*, Shuck., together with some account of a means of turning the industry of this minute Ant to account in the preparation of Skeletons of small animals." By George Daniell, Esq.

Mr. Daniell states that his attention was first attracted to this species of Ant some years ago by observing several individuals engaged, in the window of a house in Edwards Street, Portman Square, in dragging to the edge of the casement a large fly, which they finally succeeded in conveying through an opening in the wall.

He found by repeated observations that, like the other species of Ants, they uniformly followed the same track, passing and repassing, but never deviating from the beaten route. There appeared to be a regular chain of correspondence kept up throughout the track; and one of the ants while travelling at its usual rapid rate was frequently observed to be stopped by another, a communication passing between them by means of their antennæ, after which each would return in the opposite direction from that in which they were previously travelling. The track was found to terminate on the ground floor, where it disappeared in the party wall, the adjoining house being occupied by a baker, who stated that in the summer months these ants were a perfect nuisance to him, spreading themselves over all his goods, and especially the sweet cakes and sugar, of which they carried off incredible quantities. He indicated on his premises numerous tracks, traversed by myriads of these minute insects, each engaged in carrying off a grain of sugar or some other description of food to their dwelling-place, which appeared to be in the wall of the cellar, by the side of the oven, and whence he found it impossible to dislodge them. To diminish their numbers he was in the habit of hanging against the wall a boiled sheep's liver, which they speedily covered, and then plunging it into boiling water; but even this wholesale destruction had little apparent effect in thinning their ranks. In the same vault there were also multitudes of crickets (*Gryllus domesticus*) and black-beetles (*Blatta orientalis*, L.), in every stage of growth and variety of colour, from the deep black to the pale albino; all of which appeared to entertain the greatest dread of these apparently insignificant creatures, retreating precipitately when they found themselves in the vicinity of a track, while several of the ants would immediately rush out of the line to chastise their intrusion.

It now occurred to Mr. Daniell that he might make the laborious habits and fondness for animal food evinced by these ants serviceable to himself in the preparation of skeletons. With this view he placed some mice and small birds in boxes against the wall, but although the ants immediately attacked them, so great was the heat of the oven that the subjects were dried hard, and generally abandoned after the brains had been eaten out. Several other attempts in different parts of the cellar also failed, the skeletons being frequently destroyed by the crickets and beetles after the ants had abandoned them, until which time no other insect could approach without undergoing the punishment of death. Mr. Daniell then determined to endeavour to establish a colony in a cellar adjoining the oven and parallel with it, in consequence of which proximity the wall gave out a certain degree of warmth when the oven was heated. He first placed the most inviting food in the warmest corner, to which he had fitted a box with holes in it on the side next the wall, large enough to admit the ants, but not the larger insects; and this failing to attract them, he caught a large number from a piece of liver placed as a trap, and shook them into a box from which they had no means of escape, in which he closed them with abundance of food, but after seeking in vain for an outlet they congregated in one corner of the box and eventually died. His next expedient was to catch them in great numbers and turn them loose in the cellar; and repeating this process for several evenings, he had at length the satisfaction to see a track established extending from a small hole in the wall to the box in which their food was deposited. After some time another track was formed to another corner of the box at right angles with the first; and these tracks were never abandoned while he continued to avail himself of their services, which he did not cease to employ until he had completed by their means upwards of a hundred beautiful skeletons of small quadrupeds and birds, reptiles and fishes, the greater part of which are now in the collection of the British Museum. In the course of these experiments he made the following further observations on their habits.

They will not touch anything tainted, and prefer animals in the blood to such as have been previously cleaned. The plan which Mr. Daniell found to answer best was to take the object quite fresh, to skin it, extract the viscera and cut off as much as possible of the flesh, and then to place it in the box. It is seldom that a skeleton is so entirely cleaned as to require no further preparation; but the smaller skeletons when taken quite fresh require only a very little subsequent maceration to complete the process, the more delicate and difficult portions, such as the cranium and vertebræ, being almost always cleaned in preference to the ribs and limbs; and even those portions of muscle which are not removed by the ants are generally so much detached by them that a slight brushing or two after well-soaking the object suffices to remove them. One of the great advantages of this mode of preparing small skeletons was found to consist in their perfectly preserving their natural size, the ants seldom destroying the ligaments and the bones consequently not requiring wires for their attachment, which in some of the more minute skeletons it would be difficult if not impossible to apply. The labourers require, however, careful watching, as after having eaten the muscles, they occasionally destroy the ligaments, and even commence carrying off the smaller bones; a smart tap on the box is sufficient to drive them away from the object, on which they all immediately move off in a regular line to whichsoever opening they have entered at, leaving the skeleton free. When the objects are too large, they quit them suddenly after devouring what they think proper, so that sometimes where overnight thousands might have been seen at work, in the morning not one is to be found in the box; and nothing is gained by re-moistening the object, for they appear never again to touch anything which they have once abandoned. In the summer their vitality is great; from the cavities of a skeleton that had been three days immersed in water and afterwards placed in the sun, several ants were seen to emerge and to become as lively as ever. But in winter exposure to cold air, or immersion in water, when the thermometer is below the freezing-point, produces instant death, subsequent exposure to warmth failing in these circumstances to revive them. Their sense of smell appears to be very acute; if the finger be drawn across one of their tracks, multitudes rapidly congregate about the spot, examining it and sending out runners to explore the vicinity. But if one of them be crushed by the finger and quickly removed, the next comer is instantly arrested in his progress, encircles the spot, ascertains the death, and communicates the intelligence with such inconceivable rapidity that the whole line falls into confusion, numbers rush to the place, parties set off in pursuit of the offender, and woe to the unfortunate cricket that happens to be found in the vicinity of the track. By degrees the tumult subsides; for some time afterwards, however, every ant that passes makes a halt, but without quitting the line. Light does not appear to have any effect on their operations; they are not disturbed by the approach of a candle, although the slightest touch of the box instantaneously effects their complete dispersion; and the alternations of night and day appear to make no difference in their numbers, perceptions, or labour.

Mr. Daniell was never able positively to ascertain the place of their retreat; he believes it, however, to have been in the earth below the oven, and is inclined to think that they form a nest, inasmuch as they frequently carry off portions of vegetable fibre and even the smaller bones, probably for the purpose of building, as they were always carried off entire, and he could never observe that any portion of a bone was eaten. In consequence of this latter propensity he was never able to procure the skeleton of the small species of *Gasterosteus*, for example, entire, notwithstanding the closest watching. A single ant will carry away a rib of these small fishes; but in removing a larger bone they act simultaneously, some dragging it forwards and others pushing it on with their heads from behind. If, in ascending the side of the box, the bone fell to the bottom, they returned and recommenced their labour, never abandoning an attempt in which they had once engaged. The largest portion of bone which Mr. Daniell has seen them remove, consisted of the ulna and radius of *Mus Messorius*, with the carpus attached. They appeared more eager in carrying off portions of bone in the months of January and February than at any other period of the year; but they worked most rapidly in the summer months, and it is astonishing with what celerity and perseverance they continued their labours, the most rapidly cleaned skeletons being always the best and whitest, the periosteum being entirely removed. With such pertinacity do they penetrate every cavity, that, minute as they are, they are frequently victims to the ardour of their attack, becoming fixed, for example, between the plates of the cranium, in the cellular texture of which they may be seen entangled and dead. Although, as before observed, very susceptible of cold, they appear also to be affected by heat; for in the summer months they were seen to bring forth their pupæ, when the oven was heated, from the various apertures in the wall, and place them in a box by the side, in which a supply of provision was always provided for them, and to return with them when the oven was cooled. Myriads of them might in this way be seen heaped together, but a tap on the side of the box caused a general rush towards the objects of their solicitude, which were carried off with inconceivable rapidity. The pupæ are white, and the whole duty of transporting them devolves upon the males or workers, of whom each female always has several attendant upon her. Young females are first observed towards the end of January, when the abdomen begins to be enlarged and of a whitish colour; they continue to increase in size until June, at which time the females appear to be most numerous. They progress more slowly than the workers, and deposit their eggs as they move along, which are instantly carried off by the attendants. The greatest number of pupæ are seen between June and September; but the eggs (which are white and have the appearance of grains of sand) are carried to and fro during the whole of the summer. Mr. Daniell noticed that skeletons cleaned by the ants were rapidly dissolved in a solution of chloride of lime; while others prepared by maceration remained for some time in a similar solution without injury and were much improved in whiteness.

The species was determined by Mr. F. Smith to be the *Myrmica domestica*, Shuck. A notice of "the domestic habits" of this Ant, by the late Dr. Bostock, in relation especially to the almost incredible numbers in which it makes its appearance, the annoyance thereby created, and the means to be employed for its destruction, is printed in the 2nd volume of the 'Transactions of the Entomological Society,' and observations on the same subject by several members of that Society are also to be found in its 'Journal of Proceedings.'

April 6.—Robert Brown, Esq., President, in the Chair.

Mr. Adam White, F.L.S., made some observations on the subject of Alpine and Arctic plants flowering immediately on the disappearance of the snow, in reference chiefly to an observation by Dr. Lortet, recorded in the 'Annales de la Société Royale d'Agriculture, &c. de Lyon,' vol. vii. p. 385, to which Mr. Curtis, F.L.S., had called the attention of the Society at the previous Meeting. From Dr. Lortet's note it appears that he had observed *Soldanella alpina*, L., on the Alps of Switzerland and Dauphiny flowering beneath the last remaining crust of snow within a dome-like cavity, or piercing through that crust, above which its flowers rose while its vegetating organs remained concealed beneath. Mr. White quoted various recorded and unrecorded instances of the flowering of plants following immediately on the deliquescence of the snow, and in particular some passages from the manuscript journal of Capt. Beechey, with which he had been favoured by that gentleman; but in none of these cases was there any well-authenticated instance of a phænogamic plant being seen in full flower beneath a covering of snow, and M. Lortet's observation was, as far as Mr. White was aware, the only one proceeding to that extent.

May 4.—Robert Brown, Esq., President, in the Chair.

Mr. Hogg, F.L.S., communicated a letter "On the Artificial introduction of a breed of Salmon into the river Swale, and a tributary stream in Yorkshire," which appeared in the 'Durham Advertiser' for April 16th in the present year, under the signature of Isaac Fisher, together with an unpublished letter from the same gentleman in answer to a request from Mr. Hogg for further information; and added some observations of his own upon the same subject. From the letter published in the 'Durham Advertiser,' it appeared that Mr. Richard Harrison of Richmond had procured from the river Tees a brood of spawn, taken and milted from the living fish, which he deposited on the 29th of December last in a small tributary of the river Swale. On the 21st of March two of the ova were brought to the house of Mr. Fisher and placed in a vessel of water, the fœtal signs were clearly distinguished, and in two days more they became living fish; he is consequently satisfied that the salmon is now restored to the river Swale, from which it has of late years been banished. In answer to Mr. Hogg's inquiries, Mr. Fisher states further that the ova and milt were obtained in the Tees, according to the directions given by Boccius, Shaw, and "Ephemera," in his 'Book of the Salmon.' They were taken from three female and two male fishes on the night of the 27th of December, and not deposited in the gravel of a small rivulet until the 29th of the same month. Part of the ova were also placed in a gravel bed in the river Swale; but of the result of this part of the experiment Mr. Fisher has no present information. In one part the ova were placed too deep in the gravel, and on examination were found to be addled; while there is every reason to believe that those which were placed about 3 inches in the gravel have all been hatched. A live fish brought from the spawning-bed leaped out of the vessel in which it was kept and speedily died, and the two mentioned in the published letter also died in the course of about ten days, probably in consequence of the disturbance to which they were exposed from the curiosity of those who came to see them, and who were desirous of observing the extreme velocity with which they moved round the vessel, even while the vitelline bag was still attached to the abdomen. The spawning-bed was formed in a small run of spring-water which is never affected by the frost; it was cleared of minnows, young trout, &c., and at each end of a space of about twenty yards, whins were placed of a good height, kept down with stones, to prevent the entrance into it of other fish. After some observations respecting minnows, Mr. Fisher adds: "We have proved the fact that the river Swale may be again stocked with salmon, provided we can make arrangements with the proprietor of a mill-wear, twenty-five miles from this place, to let the fish, on coming up from the sea, have 'free-gap' from time to time."

On these letters Mr. Hogg observes, that it seems to him there can be little (if any) doubt that, with the precautions indicated, a vast increase of salmon might be obtained, and a sure and valuable source of wealth be secured in many suitable streams in which no salmon are at present found; and the same artificial process of breeding might likewise be applied to trout with an equally advantageous result. He suggests that the breeding might also be carried on in large wooden boxes or cases, having a layer of gravel at the bottom 4 or 5 inches deep, in which the ova and milt, or impregnated ova, might be buried, and the cases filled with pure water, which might be kept constantly fresh by allowing a small stream to run into them. When the fry had grown sufficiently strong, they might be conveyed to any distance in tubs filled with water, which might be occasionally renewed, and having tops perforated with holes. On the subject of the distribution of the species of freshwater fishes, Mr. Hogg refers to the presence of trout and other fishes in mountain streams and alpine lakes, for which it seems difficult to account; but he suggests, that as the presence of unusual plants in similar circumstances is only to be accounted for by the seeds having been dropped by birds, the problem with regard to fishes might be naturally solved in an analogous manner, their fry having been conveyed to these distant localities by means of waterbirds.

MISCELLANEOUS.

On a Venomous Fly of Southern Africa. By MM. W. Oswell and Arnaud.

This fly, called by the natives *Tsetsé*, is the same that was found to the east of the Limpopo, and which infests the country of Sebitoani; it is fortunately confined to certain localities from which it never removes. The inhabitants lead their cattle within a certain distance of the places where it is found, and if they are compelled, in moving about, to cross those portions of the country infested by the insect, they choose for this purpose a moonlight night in the winter, because the insect does not bite during the nights of the cold season.

From what I have seen, I think that it only requires three or four flies to kill a large ox. We examined about a score of ours which had been bitten and died; they all presented the same appearances. On removing the skin, the muscles had a slimy aspect and appeared much altered. The stomach and intestines were healthy; the heart, the lungs, the liver, sometimes all at once, and always one or other of these organs, were affected. The heart especially attracted our attention; it was no longer a hard muscle, but a contracted and emaciated organ which might be crushed by the least pressure of its walls; it resembled flesh which had been soaked in water. The blood was diminished in quantity and altered in quality. The largest ox did not furnish more than twenty pints; it was thick and albuminous. The hands, when immersed in this blood, were not spotted by it. The poison appeared to spread in the blood and to change the rest of the organs through its intervention.

I believe that all domestic animals, except the goat, die of the bite of this insect; calves and other young animals are secure from it during the whole time that they are sucking; man and all wild animals are also proof against its venom.—*Comptes Rendus*, October 16, 1852, p. 560.

At the meeting of the "Académie des Sciences" on the 26th Oct., the following note from a M. Arnaud, who has travelled in Africa, was brought before the Academy:—

"From the inspection which I was able to make of the fly brought by Mr. Oswell, at the 'Société de Géographie,' it appeared to me that it was identical with that found in the Isle of Sennâr, between 15° and 11° N. latitude. Its repeated bites also kill the animals, which compels the keepers of herds, especially of oxen, to leave the country during the season in which it is most troublesome, that is to say, from January to May; they take refuge on the banks of the Nile, where this fly very rarely occurs.

"I have been bitten by one of these flies, and the wound resulting from its bite lasted more than four months with insupportable pain, which sometimes returns even now."—*Comptes Rendus*, Oct. 26, 1852, p. 603.

Experimental Researches upon the Temperature of Reptiles, and on the modifications which it undergoes under various circumstances. By M. Aug. Duméril.

From these experiments it appears that frogs have a proper temperature, superior to that of the water they inhabit. When this water has a temperature of 59° to 64° F., the difference in their favour was in no case less than 0·54° F. or more than 1·26° F. But when transported into much cooler water, this difference became much greater; thus the temperature of the frogs remained at 47·48° F., when the water in which they were immersed was only at 45·5° F. The raniform Batrachia therefore display a certain power of resistance to cold. M. Duméril has observed that this power was maintained as long as the temperature of the water was kept above the freezing-point, more especially when the cooling was not sudden; but when the temperature of the surrounding medium was reduced below this point, the frogs became congealed; this, however, did not always cause the death of the animals submitted to experiment. Thus the author has several times been able to revivify frogs which were in a complete state of rigidity, and the internal temperature of which was fully 1° below the freezing-point, by placing them in contact, first with melting ice, and then with water becoming gradually less and less cold.

Serpents have a proper temperature, which scarcely exceeds that of the medium which they inhabit. But in order to place this fact beyond all chance of error, it is necessary only to observe these reptiles at a period when neither digestion nor the change of skin is going on; the latter producing a diminution of temperature varying from 0·45° to 1·8° F., the operation of digestion, on the other hand, augmenting the temperature from 3·6° to 7·2° F.

M. Duméril has also proved that serpents offer less resistance to increased heat than the frogs; this is owing to the scaly covering of the former, which almost entirely prevents the cutaneous evaporation which takes place with so much facility through the naked skin of the Batrachians.—*Comptes Rendus*, May 31, 1852, p. 837.

LATE APPEARANCE OF THE SWALLOW.

To the Editors of the Annals of Natural History.

Croydon, 24th Nov. 1852.

GENTLEMEN,—I beg to bring to your notice an unusual visitation of Swallows, which occurred on the 22nd instant in this neighbourhood. About a dozen or more of these birds were observed flying in circuits of about 100 yards, keeping close to one building. It was about half-past eight o'clock in the morning when they were first perceived, and the weather was very dark and cloudy.

I have been induced to forward the above communication, as I find in White's 'Natural History of Selborne' that the latest notice of these birds being seen is about the middle of November, except in one instance, when two were perceived on the 23rd of that month.

I am, Gentlemen, your obedient servant,

G. BRYANT.

METEOROLOGICAL OBSERVATIONS FOR OCT. 1852.

Chiswick.—October 1. Fine. 2. Uniformly overcast: very fine: clear. 3. Clear: very fine: clear: slight rain. 4. Constant and very heavy rain: clear. 5. Clear and boisterous. 6. Rain: clear at night. 7. Cloudy: fine: uniformly overcast. 8. Overcast: fine. 9. Clear: very fine: rain. 10. Overcast. 11, 12. Very fine. 13. Fine: dusky haze. 14. Foggy: uniform haze: at night clear above, hazy near the horizon. 15, 16. Foggy: cold haze: clear above at night. 17. Dense fog. 18. Very fine throughout. 19. Foggy: very fine: dense fog at night. 20. Foggy: exceedingly fine: hazy. 21. Foggy: hazy: rain. 22. Hazy: rain. 23. Cloudy: rain. 24. Cloudy: very fine: heavy rain at night. 25. Heavy rain: clear at night. 26. Slight fog: rain. 27. Rain. 28. Densely overcast: cloudy: clear. 29. Clear: overcast: rain. 30. Overcast: rain. 31. Clear and fine: bright sun: overcast at night.

Mean temperature of the month	46°·38
Mean temperature of Oct. 1851	51 ·25
Mean temperature of Oct. for the last twenty-six years ...	50 ·50
Average amount of rain in Oct.	2·60 inches.

Boston.—Oct. 1, 2. Fine. 3. Cloudy: rain early A.M. 4, 5. Cloudy: rain A.M. and P.M. 6. Cloudy: rain P.M. 7. Fine: rain early A.M. 8, 9. Fine. 10. Cloudy. 11—13. Fine. 14. Foggy. 15—17. Cloudy. 18. Fine. 19. Cloudy. 20. Fine. 21, 22. Rain: rain A.M. 23. Cloudy: rain A.M. 24, 25. Fine. 26. Fine: rain P.M. 27. Fine: rain A.M. and P.M. 28. Rain: rain A.M. 29, 30. Cloudy. 31. Fine: rain early A.M.

Sandwick Manse, Orkney.—Oct. 1. Clear: hoar-frost A.M.: fine: hoar-frost P.M. 2. Rain. 3. Bright A.M.: showers P.M. 4. Cloudy. 5. Cloudy A.M.: clear P.M. 6, 7. Sleet-showers. 8. Sleet-showers A.M.: cloudy P.M. 9. Drizzle A.M.: cloudy P.M. 10. Showers. 11, 12. Bright A.M.: cloudy P.M. 13. Rain A.M.: cloudy P.M. 14. Cloudy A.M.: cloudy: fine P.M. 15. Bright A.M.: clear: fine P.M. 16. Fine: hoar-frost A.M.: hazy: fine P.M. 17. Fine: cloudy A.M.: rain P.M. 18. Rain A.M.: cloudy P.M. 19. Drizzle. 20. Cloudy A.M.: drizzle P.M. 21. Fine A.M.: cloudy: fine P.M. 22. Hazy A.M.: drizzle P.M. 23. Cloudy A.M.: clear: fine P.M. 24. Clear: fine A.M.: clear: fine: aurora P.M. 25. Clear: fine. 26, 27. Showers. 28. Showers: bright A.M.: clear P.M. 29. Cloudy. 30. Showers. 31. Rain A.M.: cloudy P.M.

Mean temperature of Oct. for twenty-five previous years	47°·55
Mean temperature of this month	46 ·88
Average quantity of rain in Oct. for six years	4·39 inches.

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

Days of Month.	Barometer.					Thermometer.					Wind.			Rain.		
	Chiswick.		Boston. 8¾ a.m.	Orkney, Sandwick.		Chiswick.		Boston. 8¾ a.m.	Orkney, Sandwick.		Chiswick. 1 p.m.	Boston.	Orkney, Sandwick.	Chiswick.	Boston.	Orkney, Sandwick.
1852. Oct.	Max.	Min.		9¼ a.m.	8½ p.m.	Max.	Min.		9¼ a.m.	8½ p.m.						
1.	29·540	29·436	29·07	29·24	29·39	55	45	45·5	46	41½	sw.	wsw.	calm	·02	....	·08
2.	29·536	29·342	28·93	29·33	29·37	59	41	43	48	49	sw.	wsw.	n.	·03	....	·18
3.	29·849	29·690	29·27	29·50	29·69	59	33	52	51½	48	w.	w.	nne.	....	·05	·68
4.	29·752	29·001	29·36	29·62	29·38	56	49	46	50	47½	s.	s.	ene.	1·06	....	·12
5.	29·486	28·987	28·45	29·18	29·32	56	39	53	48	44	w.	w.	n.	·10	·81	....
☾ 6.	29·741	29·547	29·12	29·44	29·40	52	39	47	44	39	nw.	wnw.	nw.	·06	·04	·03
7.	29·924	29·780	29·47	29·72	29·80	53	37	41	42	37	w.	wnw.	nw.	....	·10	·22
8.	29·969	29·892	29·48	29·87	29·94	47	28	40	44	41	n.	wnw.	nw.	....	....	·08
9.	29·969	29·961	29·58	29·81	29·84	49	31	37·5	45	46	ne.	nw.	calm	·05	....	·10
10.	29·982	29·919	29·58	29·84	29·91	55	38	48	50	49	nw.	w.	nnw.	....	....	·15
11.	30·226	30·052	29·68	30·16	30·26	57	38	45·5	48½	49	n.	n.	wnw.	....	....	·11
12.	30·365	30·331	29·96	30·30	30·34	56	32	44	51½	49	ne.	nnw.	wnw.	....	....	·04
● 13.	30·360	30·303	30·00	30·30	30·28	54	41	40	51½	51	e.	nne.	sw.	....	....	·18
14.	30·291	30·251	29·93	30·30	30·35	48	46	48	51	49½	ne.	calm	ssw.	....	....	....
15.	30·258	30·135	29·89	30·35	30·33	54	44	53	49	42½	e.	ne.	se.	....	....	....
16.	30·234	30·212	29·83	30·30	30·25	52	29	52	44	47	e.	se.	calm	....	....	....
17.	30·195	30·124	29·76	30·19	30·16	54	36	48	51½	48	ne.	w.	sse.	....	....	....
18.	30·345	30·175	29·80	30·19	30·23	56	31	43	52	50	ne.	nnw.	w.	....	....	·53
☽ 19.	30·451	30·305	29·97	30·00	30·05	55	30	44	52	53½	n.	calm	w.	....	....	·14
20.	30·357	30·151	29·85	29·95	29·90	59	33	43	52½	50	s.	w.	nw.	....	....	·18
21.	30·006	29·867	29·60	29·94	29·83	59	49	46	48	49	s.	sw.	ese.	·26	·10	·19
22.	29·762	29·642	29·33	29·60	29·42	60	51	54	52	53	s.	s.	se.	·14	·10	·02
23.	29·686	29·652	29·20	29·50	29·44	58	50	56	51½	46	sw.	sw.	e.	·18	·07	·14
24.	29·629	29·590	29·10	29·28	29·31	57	37	47	48	44	sw.	s.	s.	·65	....	....
25.	29·446	29·285	29·05	29·33	29·35	50	31	42	48	43	w.	s.	se.	·55	....	....
26.	29·377	28·877	29·00	29·44	29·53	49	30	38	43½	44	s.	w.	e.	·33	....	·16
○ 27.	29·195	29·842	28·66	29·66	29·86	46	41	36	44½	43	nw.	n.	ne.	·06	·27	·07
28.	29·644	29·318	29·02	29·96	30·00	49	31	46	41	39½	nw.	n.	e.	·02	·43	·23
29.	29·742	29·463	29·38	29·98	29·86	50	40	42·5	40	40½	sw.	nw.	e.	·22	·10	·13
30.	29·631	29·595	29·20	29·69	29·60	59	48	49	44½	46	sw.	nw.	ese.	·14	....	·08
31.	29·813	29·585	29·12	29·36	29·48	61	44	53	48	46½	w.	w.	se.	....	·34	·28
Mean.	29·896	29·752	29·41	29·784	29·808	54·32	38·45	46·0	47·77	46·00				3·87	2·41	4·12

INDEX TO VOL. X.

171/20 Patt

END OF THE TENTH VOLUME.

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