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THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,

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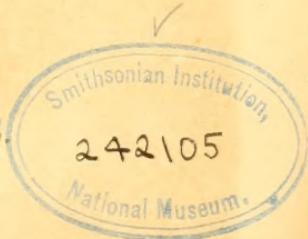
ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

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VOL. IV.—SECOND SERIES.



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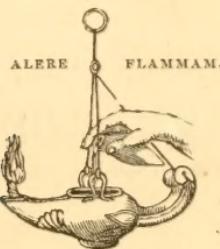
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"Omnis res creatæ sunt divinæ sapientiæ et potentiaæ testes, divitiae felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis eluet. Earum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

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

J. TAYLOR, *Norwich, 1818.*



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ERRATA.

Page 162, 4 lines from top, for *Podopilumnus* read *Notopocorystes*.

—, 12 —, for *Notopocorystes* read *Basinotopus*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

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

N. Parthenii Giannettasii Ecl. 1.

No. 19. JULY 1849.

L.—*Account of a Ribbon Fish (Gymnetrus) taken off the coast of Northumberland.* By ALBANY HANCOCK and DENNIS EMBLETON, M.D.*

[With two Plates.]

ON the 26th of March, 1849, a fine specimen of a species of *Gymnetrus*, or Ribbon Fish, was captured by Bartholomew Taylor and his two sons, the crew of a fishing coble belonging to Culleoreoats. It was found at about six miles from shore, and in from twenty to thirty fathoms water. The men having started from their fishing ground to return homewards, observed at a little distance what appeared to be broken water; the old man being struck with such a novelty directed his lads to pull towards it; on nearing the spot they perceived a large fish lying on its side on the top of the water. The fish as they approached it righted itself, and came with a gentle lateral undulating motion towards them, showing its crest and a small portion of the head occasionally above water; when it came alongside, one of them struck it with his picket—a hook attached to the end of a small stick, and used in landing their fish; on this it made off with a vigorous and vertical undulating motion, and disappeared, Taylor says, as quick as lightning under the surface. In a short time it

* Read at the Anniversary Meeting of the Tyneside Naturalists' Field Club, April 21, 1849.

reappeared at a little distance, and pulling up to it they found it again lying on its side; they plied the picket a second time, and struck it a little behind the head; the picket again tore through the tender flesh by a violent effort of the fish, which escaped once more, but with diminished vigour; on the boat coming a third time alongside, the two young men putting their arms round the fish, lifted it into the boat. Signs of life remained for some time after the fish was captured, but no doubt it was in a dying or very sickly state when first discovered by the Taylors.

It was exhibited the same day in Tynemouth, North and South Shields, and brought to Newcastle next morning. In the afternoon we first saw it; we found it much injured by the strokes of the hook and by rough handling during its removals and the examinations it had undergone. The fins were a good deal torn, but the fish evidently quite fresh.

Its colour was a uniform silvery gray all over, resembling bright tin foil or white Dutch metal, except a few irregular dark spots and streaks towards the anterior part of the body. On closer inspection the remains of a bright iridescence were seen about the pectoral fin and head, the blue tint predominating.

External description.—The fish presents somewhat the form of a double-edged sword blade, being excessively compressed; its greatest thickness is decidedly nearer the ventral than the dorsal border; from the thickest part it slopes gradually to each border, the dorsal being the sharper. The length of the fish is 12 ft. 3 in., the mouth not being projected forward; immediately behind the gills it measures $8\frac{1}{2}$ in. in depth; from this point it gradually enlarges to a distance of upwards of 2 feet further back, where it attains its greatest depth of $11\frac{1}{4}$ in.; this dimension remains much the same for $1\frac{1}{2}$ ft. beyond; it then gradually but perceptibly diminishes to the end of the dorsal fin, where the depth is 3 in.

The thickness through the head at the gill-covers is 2 in., at the part of greatest depth $2\frac{3}{4}$ in.; Plate I. fig. 2 shows a section at this part. Opposite the anus somewhat less; it then gradually diminishes to the end of the dorsal fin, where it is upwards of $\frac{7}{8}$ ths of an inch, fig. 3.

The fishermen state that when this fish was first taken it was all over of a brilliant silvery iridescent hue, resembling in intensity that of the fresh herring, which soon faded, and shortly after we saw it, all traces of the iridescence except those already mentioned had disappeared. The skin is covered over with a silvery matter in which no scales are visible to the naked eye, but which is most readily detached from the skin and adheres to anything it comes in contact with. Submitted to the microscope it is found to consist partly of minute convex scale-like bodies of

elongated pyramidal outline with the base rounded, Pl. I. fig. 4, which are formed of fine clear crystalline-looking filaments, arranged side by side and radiating from the apex to the base of the scale; these filaments grow much finer towards the base, where a number of minute granules are also observed. The scales remind one of some of those seen on the wings of moths. The bulk of the silvery matter of the skin, however, is made up of a soft matter finely granular, and presenting numerous transparent fragments of what have the aspect of acicular crystalline bodies. We have not been able to detect the mode of arrangement of the scale-like bodies on the skin. Round the posterior margin of the preoperculum is a broadish dusky mark on the skin, and near the top of the head above the eye a crescentic mark of a dark iridescent blue colour; besides these there are on the side of the body several narrow, dusky black, slightly waved lines considerably apart from each other and obliquely inclined from before backwards; of these eight or nine are above the lateral line and of unequal length; below the same line they are more numerous, diminishing in size on the whole till they end in mere spots at some distance behind the anus. The lower series seems to correspond in some measure to the upper. Interspersed among the lines are a few irregular spots of the same hue towards the head. The dorsal and ventral ridges are also dusky. The lateral line was at first smooth and very distinct, but after the fish had been a few days in Goadby's fluid, elongated flat scales became apparent on the line; it can be traced from the back part of the head above and behind the eye, sweeping down gradually to within $3\frac{1}{4}$ in. of the ventral margin at 18 in. from the snout; at the anus it is 2 in. from the margin; it thence runs backwards, still approaching the margin, to the caudal extremity.

Four longitudinal flattened ridges, each rather more than 1 in. broad, extend from the head to the tail immediately above the lateral line, which cuts them off very obliquely in front; the uppermost, which is the longest, running forwards almost to the eye.

The surface of the skin of the body is studded with very numerous distinct and separate tubercles of bone; the smallest and most depressed lie between the ridges and towards the ventral and dorsal margins, the largest and most elevated upon the ridges, some of these last being $\frac{1}{2}$ in. in diameter. On the ventral ridge are numerous, irregular, and prominent tubercles slightly hooked backwards. The tubercles present no regular arrangement, they are imbedded in the skin, and it is difficult to say whether or not they had been covered by the silvery matter of the skin; when we examined them, their apices were uncovered by it. Some were observed to have a perforation at the apex which was occupied by a soft papilla. The tubercles are replaced

in the neighbourhood of the head by irregular depressed inductions of the skin.

The head is small and short, measuring 9 in. from the snout to the posterior margin of the gill-cover; the outline of the lower jaw is a wide arch convex below, and stretching forwards and upwards to the mouth, which is placed in an elevated position and opens upwards and forwards; the mouth is small, nearly circular, and capable of being projected 2 or 3 in. forwards when the lower jaw is depressed. The profile of the head from the anterior end of the crest is at first suddenly concave, the concavity facing forwards and upwards, and just behind the anterior end of the curve exists the nasal chamber which is small, and owing to the damaged state of the fish we could only find one small aperture, which was longer than it was broad. Beyond this concavity the premaxillary bones project nearly horizontally to the mouth. The eye is $1\frac{1}{2}$ in. in diameter, the iris of a beautiful silvery white, and rather broader than the diameter of the pupil. The eye is situated $2\frac{1}{2}$ in. below the base of the crest and $1\frac{1}{2}$ in. behind the frontal concave profile. There is a narrow imperfect circle of a dusky colour round the contour of the eyeball. The eye is very flat. The tongue is rather prominent, but small, smooth and fixed. There are no teeth. The interior of the mouth is black.

The gill-covers are large in proportion to the size of the head, prolonged backwards, their posterior angles considerably elevated. The preoperculum has somewhat of a crescentic form, the lower border convex; the anterior horn is narrow and prolonged to its articulation with the lower maxilla, the posterior border has an obtuse angle pointing backwards. This border corresponds to and may rest upon the edge of the concavity formed by the operculum above and the interoperculum below. The operculum is on the whole broad and irregularly quadrate, with the upper anterior angle prolonged forwards and upwards; the upper margin is smooth and slightly concave nearly as far as the angle, it then curves suddenly downwards a little to the angle which is rather obtuse. Below this is the posterior border, which is somewhat sinuous and rather oblique from above downwards and forwards.

The inferior border is nearly straight, and directed upwards and forwards corresponding to the interoperculum.

The remaining bone, which we take for the interoperculum, is narrow and thin, prolonged almost to a point under the jaw and widening gradually to its posterior end, which is rounded and projects backwards beyond the preoperculum. Its lower border is convex and lies almost horizontally.

These are the only pieces observed as entering into the forma-

tion of the gill-covers. The above bones are exceedingly delicate and fragile, and present the radiating lines of development with great prominence; the silvery skin covering them is remarkable for its delicacy.

The branchiostegal rays are seven in number; the uppermost a broadish plate marked by radiating lines, the rest diminishing successively in size having the ordinary characters of such rays.

The four branchial arches diminish in size backwards, and the pharyngeal is less than the fourth branchial arch. The rays of the convexities of the branchial arches are very numerous; the concavities of these arches are beset with prominent blunt-pointed tubercles which are studded with a number of short setæ or bristles, sharp-pointed but rather soft, which project inwards towards the pharyngeal cavity. The first branchial arch has in addition a row of short pale-coloured rays or plates, the inner edges of which are also furnished with setæ which project likewise inwards. On the roof of the pharynx are two or three pairs of short laminæ (pharyngo-branchial) furnished with similar setæ, pointed backwards and downwards in the direction of the entrance to the cesophagus.

The dorsal fin extends from immediately behind the upper and posterior end of the curved frontal profile to within 3 inches of the tail of the fish. The anterior part of the fin, more prominent than the rest, is composed of twelve rays, which were stated by the captors to have been 12 or 14 inches in length when the fish was taken, and to be each furnished with a membranous expansion on its posterior edge, increasing in width upwards something like a peacock's feather.

The first ray is a pretty strong spine arising just within the frontal curve, the three next are very slender, and much closer together than the rest, and when we first saw the fish, united for 4 or 5 inches (their length at that time) by a membrane; the next is equally slender with the preceding, but rather farther apart; the three or four after this are nearly as strong as the first, the rest diminish in strength and length, and become uniform with the rays of the dorsal fin.

It is difficult for us to say whether the twelve front rays constituted a detached crest or formed merely the anterior continuation of the dorsal fin, though after careful and repeated examinations we found shreds of membrane in each interval between them, and their bases also were connected with a continuous membrane. In the interval between the twelfth and thirteenth rays the remains of a membrane were found connecting the bases of these rays, and their shafts were ragged and woolly-looking, as if a membrane had been torn off from them. We are therefore inclined to conclude that the crest was really a continuation of the

dorsal fin and not a separate structure, though it is probable enough that the ends of its rays may have been for some distance free and even furnished with a membrane on their posterior margin widening to the top, giving them the appearance of peacocks' feathers as asserted by the fishermen. This probability is heightened by the fact of the head of the *Gymnetrus* from the Cornish coast being provided with two long rays having broad membranous expansions at their ends, which would justify a casual observer in comparing them in form to the above feathers. It is not unlikely besides that the second, third, fourth and fifth rays, on account of their resemblance in delicacy to the ordinary fin-rays, may have terminated differently from the rest. The rays having been broken, we cannot say of ourselves whether they were uniform in size or not; but from what we have learnt by questioning those who saw the fish, we conclude that the middle rays were the longest, those in front and behind them gradually decreasing in length. The rays of the crest are more closely set generally than those of the rest of the dorsal fin, which stand about half an inch apart. Exclusive of the crest there are 268 rays in the dorsal fin. They terminate in fine points that project a little beyond the margin of the very delicate connecting membrane. This membrane was colourless according to the fishermen, but was bordered by a pale red when we observed it. The rays of the back are highest about the middle of the fish, where they measure upwards of $3\frac{1}{2}$ in., and at the termination of the fin are about 1 in. in height.

From the end of the fin the dorsal margin slopes rather rapidly downwards to within about an inch of the ventral margin, and is then prolonged to a rounded point at the caudal extremity. There is no caudal fin. The skin at this part, it is true, was broken, but on pressing together the broken edges they seemed to leave no hiatus. The fishermen persisted that the part was at first entire, and that there was no appendage whatever. At a distance from this point of about 2 inches along the ventral margin there exists a shallow notch. Both the margins of the fish at this part are very thin. On carefully inspecting the surface of the body, something like a series of transverse marks corresponding to the bodies of the vertebræ can be discerned, and the number of these has from this appearance been roughly estimated at about 110.

The pectoral fins are placed close behind the gill-covers, and much nearer to the ventral margin than to the lateral line, which is at least half an inch above the points of the rays of the fins; these fins are colourless, delicate, subtriangular, and the longest rays measure 2 inches. They are eleven in number and a good deal arched.

The ventral fins are represented by a pair of very strong and

straight spines, stated by the fishermen to have been 7 or 8 inches long and as if broken at the end, and furnished along the posterior edge with a delicate membrane about half an inch broad. When we saw them they were about 4 in. long, and the membrane was distinctly visible at their bases. These spines, which at their root measure about $\frac{1}{4}$ in. in diameter, project from each side of the ventral ridge immediately behind the pectoral fins, are inclined backwards, and capable of a limited lateral and backward motion. We are assured by a gentleman who witnessed the landing of the fish, that these spines were bright crimson and resembling the feelers of a boiled lobster; hence we conclude that they must have been originally flexible towards the end, and much longer than 7 or 8 in. as stated by the fishermen. The same gentleman says that the rays of the dorsal crest were simple and unbordered by a membrane.

The whole fish is remarkably delicate and tender, and easily broken when bent laterally, as shown by the injuries it has sustained by being lifted in and out of the boat, &c.; the flesh is white and fine.

Internal examination.—On opening the fish, the abdominal cavity, Pl. II. fig. 2, is found to be small, and the eye is at once arrested by the bright pale orange vermillion colour of the liver, the rest of the viscera presenting no peculiarity of tint.

The œsophagus, Pl. II. figs. 2 & 3 *a*, at first slightly funnel-shaped, soon assumes a diameter of 1 inch, and then forms a gradually increasing tube as far as the coming off of the duodenum $2\frac{1}{2}$ in. below the orifice, where it measures $2\frac{1}{4}$ in. in diameter.

Nothing like any cardia or line of demarcation between the œsophagus and stomach exists in this tract. The duodenum comes off abruptly as a short tube $1\frac{1}{2}$ in. in diameter, inclining forwards from the under surface of the stomach. The stomach, fig. 3 *b*, is continued on beyond the duodenum as a straight tube, gradually diminishing in diameter towards the posterior end of the fish, measuring an inch across opposite the anus. At this point it has the rectum or intestine lying below it, the ovaria and ureter above, the oviduct and ureter running down to the anus on its right side.

It is slightly contracted opposite to the anus, and a little beyond this enters a canal among the muscles, a continuation of the abdominal cavity, situated at about $1\frac{1}{2}$ in. from the ventral margin and with tendinous walls, to which it is pretty firmly adherent throughout. It is enlarged slightly after entering the canal, and then diminishes gradually from the diameter of rather more than an inch to the size of a crowquill. It can be traced backwards to within 1 ft. 8 in. of the caudal end of the fish, gradually approaching the ventral border and terminating in a

blunt blind extremity, Pl. II. figs. 2 & 3 c. The canal in which the cæcal prolongation is lodged is prolonged for an inch or two beyond the end of this latter, and contains several small blood-vessels, and the cellular coating of the cæcum arranged in cords, the vessels being gradually lost by passing backwards and outwards into the surrounding muscular tissue, the cellular cords being attached to the sides of the termination of the canal.

The anterior main part of the stomach, when laid open, was quite empty, the inner surface of the oesophagus and stomach as far as 2 in. below the pylorus perfectly uniform and smooth ; from the point here indicated, the upper wall of the stomach presents the gradual beginnings of a few longitudinal plicæ, on tracing which backwards they are found to increase in number until at 5 in. in front of the anus the whole inner surface of the tube is provided with them. They are continued on in the stomachic cæcum to within 2 or 3 inches of its termination. At about halfway along this cæcum was found a small quantity of the spawn of some fish partially digested, several of the ova being still entire ; a little way in front of these was an angular bit of cinder.

The pylorus, fig. 3 d, coming off as above mentioned from the most enlarged part of the stomach, extends for only $1\frac{1}{2}$ in., when it becomes suddenly constricted and presents internally the usual circular valve.

The duodenum, figs. 2 & 3 e, beyond is a cylinder of about 1 in. in diameter and 1 ft. in length, perforated all round by very numerous circular openings, the orifices of the pancreatic cæca, which measure about $\frac{1}{3}$ inch in diameter and 1 inch in length, and completely mask the whole duodenum. This part of the tube extends forwards, lying parallel to and beneath the stomach, and overlapped by the posterior lobes of the liver for about 4 in., and then emerging as it were from the pancreatic cæca is continuous with the remainder of the intestine, figs. 2 & 3 ff, which then is suddenly bent backwards and runs along the lower border of the pancreas obscured by the cæca of the right side, and then keeping along the floor of the abdominal cavity it passes on as a straight tube to the anus, figs. 2 & 3 g, at the front of which it opens separately. The diameter of the duodenum is diminished one-half at its exit from the pancreas, and the intestine continues of the same size to within an inch or two of the anus, where it is gradually lessened to about $\frac{1}{4}$ inch. The length of the intestine from duodenum to anus is 3 ft. 5 in. The inner surface of the intestine below the duodenum presents a very delicate honeycombed texture, the laminæ being fine, of varying size, and crossing each other in all directions, the largest standing up pretty high and taking a longitudinal course. This

form of valvulae conniventes extends to within 3 or 4 in. of the anus. A few inches below the end of the duodenum was observed a delicate and transparent, but large and crescentic, membranous valve projecting into the cavity of the intestine. There is no division into large and small intestine unless the above valve point it out. No cæcal appendage except to the stomach. The intestine contained nothing but a quantity of pancreatic secretion.

Attached to the upper surface of that part of the intestine which is opposite to the pylorus is the spleen, fig. 3 *h*, ovoid in form, delicate and spongy in texture, 2 in. long by $\frac{3}{4}$ in. broad, and of a very pale reddish brown colour. Large blood-vessels run along both the upper and lower borders of the intestine below the duodenum.

The liver, figs. 2 & 3 *i*, is large, and extends 18 inches backwards from the anterior end of the abdominal cavity lying below the œsophagus, somewhat pointed in front, and becoming more bulky towards the posterior end, where it is truncated diagonally from above downwards and forwards.

The upper surface has a deep fissure partially dividing it into two unequal masses, the left being larger than the right; along this fissure run the hepatic and pancreatic blood-vessels; the gall-bladder and the cystic duct lie also attached to it.

The gall-bladder, fig. 3 *j*, about 5 in. long and $1\frac{1}{2}$ in. broad, is of an irregularly elliptical form, its long diameter corresponding nearly to the length of the fish; the cystic duct comes off from its anterior end, and running backwards parallel to it and to the hepatic duct, joins the latter just before coming to the posterior border of the liver: the common duct, fig. 3 *k*, after this runs backwards among the lower appendices pyloricea of the left side, and debouches into the duodenum on a small papilla upwards of an inch distant from the pylorus. The gall-bladder contains a small quantity of yellow olive-coloured bile. The texture of the liver is so soft and fragile that it cannot be preserved.

The ovaria, figs. 2 & 3 *l*, lie directly above the stomach, are about 3 ft. 3 in. long, and extend forwards nearly as far as the middle of the liver. Their ends taper to points diverging slightly from each other; traced backwards they gradually increase in bulk to $\frac{3}{4}$ inch in diameter at their middle; soon after this they diminish in size, become more closely connected, and unite at 27 in. from their anterior points into one body, which tapers gradually to $\frac{5}{8}$ in. in diameter, and then curving downwards to the external orifice on the right side of the stomachic cæcum becomes rapidly smaller, and opens behind the intestine. On laying open the common tube or oviduct it is found for 2 or 3 in. from the orifice quite plain; above this, longitudinal folds of the lining membrane appear small and irregular at first, but soon

larger, more projecting, and then occupying the whole inner surface of the tube. These plicæ, which become tortuous and collected into rows of two or three together, are found to extend to the ends of the ovarian cavities, and are studded throughout with minute ova of unequal sizes in an undeveloped state.

The ureter, figs. 2 & 3 *m*, a simple tube of the size of an ordinary goosequill, runs from the external orifice, just within which is a slight vesical dilatation, fig. 3 *n*, along the median line, lying above and attached to the ovaria, and in contact with the roof of the abdominal cavity, for a distance of 1 ft. 11 in., when it perforates the fibrous membrane separating the kidney from the other viscera. It runs obliquely forwards and upwards into the kidney, fig. 3 *o*, which, inclosed in its proper cavity, extends from an inch behind where the ureter joins it as far as the cranium, a distance of 2 ft., reaching farther forward than the digestive cavity. The organ is partially and unequally cleft by a median fissure, the left side being larger than the right. Its tissue is reddish brown, spongy and friable. The posterior end of the kidney tapers to a point. The anterior end also tapers a little, but is rounded. The ureter enters the under surface of the gland and terminates by opening into the general cavity which exists along the median line of the organ. Along the upper angle of this cavity and elsewhere are the openings of small canals bringing the secretion from the uriniferous tubules. These last can be readily seen with a common magnifying glass.

The supra-renal glands, fig. 3 *p*, are two small ovoid bodies, much paler than the kidney, partially imbedded in that organ on its upper surface at a distance of 2 inches from its posterior extremity. There is no trace of air-bladder.

The heart, which is double the size of that of an ordinary cod-fish, occupies a spacious triangular cavity. Its ventricle is large, firm and triangular. The bulb of the aorta is smaller than that of the cod. The auricle is capacious and of irregular form.

The blood-vessels beyond were not examined, and we could not investigate the nervous system.

In a little blood obtained from the heart, the blood-discs, Pl. I. fig. 5, are found to vary much in size, and also in form from subcircular to elliptical and even fusiform, having their extremities or poles somewhat pointed. The nucleus is generally large and distinct, and presents several nucleoli of different sizes, giving it in many instances a granular appearance.

General remarks.—Having referred to what we have been able to find recorded respecting the genus *Gymnetrus*, we found that the figures as well as the descriptions of the external parts were very imperfect and the anatomy little known; hence we thought it desirable to make the above description fuller than otherwise.

would have been necessary. Seven or eight species only have been recorded. Cuvier and Valenciennes, in vol. x. p. 365 of their ‘*Histoire Naturelle des Poissons*,’ describe one species from a manuscript in the library of Sir Joseph Banks, which is probably identical with ours, and to which they have given the name of *G. Banksii*. It was thrown up at Filey Bay, March 18, 1796, and taken to York market on the 21st. The description is as follows :—“La queue lui manquait aussi. Sa longueur était de treize pieds, son épaisseur de trois pouces, la longueur de sa tête de sept. Ses flancs étaient garnis de petites protubérances argentées disposées en séries longitudinales. La dorsale, qui s’étendait depuis la tête jusqu’à l’autre extrémité, était rouge, et avait deux cent quatre vingt dix et treize rayons (les treize rayons sont sans doute ceux de la nuque) ; la pectorale en avait douze ; la ventrale un seul. Il n’y avait point d’anal ; on ne voyait point de dents ; l’intérieur de la bouche était noir ; la distance de l’anus à la bouche était de quatre pieds. Toutes circonstances qui, comme on voit, se rapprochent beaucoup de ce que nous avons observé dans nos Gymnètres de la Méditerranée*.”

This description, though not conclusive, is sufficient to warrant us in adopting the name given by the French naturalists, and thus to avoid running the risk of adding uselessly to the list of synonyms.

Another species is described in the same work, vol. x. p. 298, under the name *Gymnetrus Gladius*, which very much resembles our specimen ; besides however some minor differences, the upper border of the operculum differs materially—in the former it is convex, and presents three angular points ; in the latter it is smooth and concave†.

There are two Norwegian species which appear generally to precede or accompany the shoals of herrings, and hence are called “King of the Herrings.” Of these, the *Regalecus Glesne* of Ascanius (*G. Ascanii* of Shaw) seems to be the most nearly allied to our fish, but it is distinguished from it by the following marks. It is 10 ft. long and 6 in. deep ; its length is therefore to its depth as 20 to 1. From the measurements given in the former part of this paper, it will be seen that our fish is 13 times longer than it is deep. This has 268 rays in the dorsal fin ; that 120.

Again, the *G. Ascanii* is devoid of the transverse dusky streaks

* It has not been in our power to refer to the work here mentioned ; but to the kindness of Mr. Adam White of the British Museum, who called our attention to the above record, we are indebted for this extract, and also for another relative to *G. Gladius*.

† The *G. Telum* of the same authors is also different from our fish, this having 268, that 398 rays in the dorsal fin.

on the anterior part of the body so characteristic of our species, but is furnished with longitudinal rows of minute dusky spots, and has moreover three broad dusky bands across the posterior part of the body behind the anus, and its forehead is white; it is also described as having teeth; the crest also probably differs, if the figure given in the 'Encyclopédie Méthodique' be correct; the dorsal fin is continued round the caudal extremity for a little distance along the ventral line, being somewhat elongated at the extremity, forming a kind of caudal fin. The gill-membrane has only four or five rays. Thus, though there is a striking general resemblance, there are several important points of distinction between the *G. Ascanii* and the *G. Banksii*.

The other Norwegian species named *G. Grillii* (Lindroth, Nouvelles Mémoires de Stockholm, xix. pl. 8) is noticed in Griffith's 'Cuvier' as being 18 ft. long, and having upwards of 400 rays in the dorsal fin, and we conclude therefore that it also is distinct from our species*.

Of the so-called Indian species, one, the Russellian, described as a probable variety in vol. iv. pt. 2 of Shaw's 'Zoology,' is only 2 ft. 8 in. long, and has 320 rays in the dorsal fin, and differs in several other respects.

The other is the Blochian *Gymnetrus* of Shaw, the *G. Hawkenii* of Bloch, the figures of which are incorrect. This however in all probability ought not to be considered as an Indian species. The history of it, as far as we can gather, is as follows:—

It appears that on the 23rd February, 1788, a species of *Gymnetrus* was drawn on shore in a net at Newlyn in Cornwall, and all that is really known of it is obtained from a figure with notes which was in the possession of the late Mr. Chirgwin of Newlyn, who freely granted permission to Mr. Couch of Polperro to have a copy taken of it. Through the kindness of Mr. Couch we have been favoured with a reduced copy of the above figure made by Mr. Thomas Q. Couch; and in the letter accompanying the drawing Mr. Couch states that Mr. Chirgwin assured him that his figure was the only true original, the fish having been drawn ashore not far from his house; that however they might differ, all other figures were copied from his, and that the note written on his figure is the only one originally made from the specimen. Mr. Couch further says, that he has no doubt, from circumstantial evidence, that the figure and account of the *G. Hawkenii* were communicated to Bloch by a Mr. John Hawkins, brother of the late Sir Christopher Hawkins, Bart. Mr. Hawkins himself, as Mr. Couch concludes from Mr. Chirgwin's remarks, did

* We have since been informed by Mr. J. E. Gray that *G. Grillii* has the same number of rays and the same dark cross bands on the anterior part of the body as the Cullercoats fish.

not actually inspect the fish. The copier of the figure sent to Bloch appears to Mr. Couch to have committed a great mistake by attempting to correct one which he supposed to have been made by the original draftsman, and the mistake consists principally in his having removed the two filaments in front of the dorsal fin to the situation of the ventral fin, thus making four filaments there instead of two. The same mistake appears to have been made with regard to the figure of the *G. Hawkenii* in Yarrell's 'Fishes,' that figure being, as Mr. Yarrell informs our friend Mr. Alder, incorrect as regards the number of ventral filaments, and the addition of the caudal fin.

It appears therefore that the *G. Hawkenii* of Bloch is simply the fish caught at Newlyn incorrectly copied. In the notes appended to the drawing sent us by Mr. Couch, and which are copied from the original, are merely mentioned the date of the capture as above and the measurements; "its length without the tail, which it wanted, was $8\frac{1}{2}$ ft., its extreme breadth $10\frac{1}{2}$ in., and its thickness but $2\frac{3}{4}$ in."

Its proportions therefore, allowing the tail to be somewhat deficient, come pretty near to those of our fish; if the drawing however is to be relied on, it differs from ours in having only two filaments from the head with expanded feather-like extremities, and in having the ventral processes like those of the head. The fins also are crimson, and the body is marked all over by delicate roundish spots, and has a few obscure streaks obliquely placed below the lateral line.

On the whole then we are inclined to believe the Cornish specimen distinct from the *G. Banksii*, though, from the evident want of knowledge of the draftsman, much reliance cannot be placed on his details.

Notwithstanding the rarity of the genus *Gymnetrus*, there is every reason to believe that specimens of it have been taken from time to time off the north-eastern coast of England. It appears by the 'Annual Register' that a fish was captured off Whitby, January 22, 1759, closely related to, if not identical with our species. The account, which may be interesting, we here reproduce. It is by Lionel Charlton, author of a 'History of Whitby':—

"Yesterday (Jan. 22) a very extraordinary fish was brought here by our fishermen, which broke into three pieces as they were hauling it into the coble. It was 11 ft. 4 in. long, exclusive of the tail, had a head like a turbot or brat, was about a foot broad near its head, but not above 4 or 5 in. near the tail, and not anywhere more than 3 in. thick. The thickest part was its belly, and it gradually diminished away towards the back, which was sharp, and had all along it one continued fin from the head to the tail. It was covered with an infinite number of white scales which stuck to

and dyed everything that it touched ; and might be said in some sort to resemble the quicksilvered back of a looking-glass. It appeared when laid on the sand like a long oak plank, and was such a fish as nobody here ever saw before, which caused a vast concourse of people round it the whole day."

The breaking of the fish was owing to its great delicacy of structure, and probably its little capacity for lateral motion. It was necessary to take great care in removing the Cullercoats fish for fear of fracture from the same causes.

We are informed by Mr. Stanton of Newcastle, that upwards of fifty years ago a silvery fish resembling in its general characters the subject of this paper was exhibited here, and we have been favoured by Mr. Robert Bewick with a copy of a hand-bill relating to a fish shown in this town March 27, 1794, undoubtedly referring to the specimen seen by Mr. Stanton. It is as follows :—" To be seen at Moses Hopper's, Flesh Market, a most curious fish taken at Newbiggen by the Sea, 10 ft. long, 1 ft. broad, 2 in. thick, and is thought to be the greatest curiosity that was ever seen in the kingdom before."

This fish was sketched by our celebrated townsman Thomas Bewick, but unfortunately the sketch has been mislaid.

We have lately been favoured with a letter from Mr. George Tate of Alnwick respecting a fish of this genus, from which we make the following extract :—" A fish was exhibited in January or February of the year 1845, similar in its general form to that, a drawing of which you showed me when I was last in Newcastle. One of the Preventive Service men observed this fish lying in a shallow pool in the sands about a mile south of Alnmouth, where it had been left by the receding tide. Its great length and unusual appearance at once raised the man's curiosity and excited his fears. On approaching it the creature bent itself round so as to appear like the rim of a coach-wheel, and the man supposing it was about to dart upon him drew his sword and struck it on the head. The fish struggled much, but the man striking it repeatedly at length succeeded in cutting off its head.

" This fish was 16 ft. long, 11 in. deep, and about 6 in. thick at the thickest part, from which it very gradually diminished both in thickness and depth. The eye was large, measuring about 5 in. in circumference. The teeth very small and very acute. The skin was smooth, and no pustulations or hard points were observed, neither were any transverse streaks noticed ; but there were a few longitudinal ridges or corrugations about half an inch apart along the sides. The colour was a silvery gray, and the skin was covered by minute silvery-looking scales or particles, which were in such great quantity, that in the course of the struggles the creature made after being struck, the spot where it

was found was covered over with them. There were no pectoral or ventral or anal or caudal fins, neither was any crest observed. These however may have been broken off, as the head was much injured by the blows which it has received. One fin, of a rich dark crimson colour, extended uninterruptedly from the neck along the back to within a few inches of the tail, which ended in an obtuse point. The fish was very beautiful ; the large eye, the rich, crimson, rayed fin cresting its back, and the bright silvery hue of its body rendered it a striking and attractive object." The fish thus described by Mr. Tate, it will be seen resembles rather the *Regalecus Glesne* in its having teeth and being devoid of the transverse streaks.

The following account of the capture of two fish of this genus has been taken down by us from the oral relation given by John Blackett Anderson, of Walker near Newcastle. He states he recollects the taking of two fish about fifty years ago at the outer Fern Islands. They were left by the tide in a shallow pool, and a signal being made by the keeper of the lighthouse, a boat went from the shore and brought them to Bambrough. They were sick when taken. One was about 4 ft. longer than the other, the larger specimen was 18 ft. long. It could not be less, for it was as long as the breadth of a house-end which measured 18 ft., and against which it was laid out on a bench. The fish were about a foot deep, and were flat ; their colour was silvery, like a silver fish, but not so white. There were four processes about 18 in. long from the head, of a red colour, like the feelers of boiled lobsters ; they tapered gradually towards their ends, which were enlarged to the form and size of a large button. Thinks these specimens occurred in spring. They were kept till putrid, and then thrown away. They excited much interest throughout the neighbourhood. Recollects them well, for he was living then on the spot. Has not seen the Cullercoats fish.

We have moreover learnt from a Norwegian captain who frequents this port and has traded to Archangel, that in the White Sea, fish closely resembling the Cullercoats one are occasionally seen, the silvery colour, long attenuated form, and rapid undulating motion being their chief characteristics. They are there called Stone Serpents.

It has occurred at once to many here and to ourselves also on first viewing this *Gymnetrus*, that it may possibly have been taken for the famous Sea Serpent. The Archangel name of the fish seen there, strengthens the idea that it may at times have deceived the eye of some credulous mariner, from its rapid undulating motion, linear form, and from its occasionally appearing at the surface, and leaving a lengthened wake behind it, thus creating an exaggerated idea of its extent.

On consulting however the accounts which have appeared of the Sea Serpent, we find that they relate in most instances to creatures widely different from the Ribbon Fish, such as whales, seals, sharks, &c. seen under disadvantageous circumstances or imperfectly observed. Still, though the *Gymnetrus* may not have originated the idea of the existence of a marine serpent, we think it not improbable that the occasional appearance of this fish may very materially have tended to keep up among the Norwegian fishermen that faith which they are stated to hold in the existence of such a monster.

Of the habits of the *Gymnetrus* little can be said. The delicate general conformation of the body, the smallness and tenderness of the mouth, the absence of teeth, the delicacy of the fins, show clearly that it is a fish not organized for attack—the dorsal crest and the ventral processes being obviously for the purpose of balancing the body, and not for either attack or defence. Its means of defence may consist partly in the bone-studded skin, but chiefly in the adaptation for flight, evidenced in the compressed form of the body and in the great length and power of the tail. The small amount of half-digested food found in the stomachal caecum goes so far to prove the non-rapacious habits of the *Gymnetrus*, and make it probable that its habitual food is confined to the spawn of other fish, and the soft, small, and defenceless inhabitants of the deep. The absence of air-bladder seems to indicate the sea-bottom as the natural resort of this fish, where its food would be most abundant.

The only evidence of its being indigenous on the north-eastern coast rests in its having been observed six times since 1759. There is little doubt of the remarkable circumstance that all the six have been captured during the spring months.

In conclusion, we have only to state, that the fish is now in the possession of Mr. Edward Whitfield of Newcastle, who kindly granted us permission to make the necessary examinations, and we are happy in being able to state that that gentleman has expressed his intention of presenting this rare fish to the museum of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne.

Since writing the above we have received a pamphlet entitled “An Account of the Rare Fish, *Regalecus Glesne*, caught off Cullecoats,” &c. In it we find a copy of a figure of a *Gymnetrus* taken at Newlyn in Cornwall on Saturday 23rd day of February 1788. This figure, with descriptive notes appended, is bound up at the end of a copy of Pennant’s ‘British Zoology’ in the Banksian library. Mr. J. E. Gray supposes this figure and notes to be the authority for the various descriptions and figures of the

Cornish specimen of *G. Hawkenii*. The Banksian figure, though possessing a good general resemblance to a *Gymnetrus*, differs so widely from the figure we have been favoured with by Mr. Couch, that we believe neither of them to have been a copy of the other, and the differences in the measurements that accompany the figures are such as to strengthen this belief; the length of the Banksian specimen is said to be 8 ft. 10 in., Mr. Couch's 8 $\frac{1}{2}$ ft. The depth of the former is 10 in., of the latter 10 $\frac{1}{2}$ in.; the thickness of the former 2 $\frac{1}{4}$ in., of the latter 2 $\frac{3}{4}$ in. These discrepancies could scarcely have arisen from errors of copying, but are more likely to be the result of examinations by different observers. It would therefore appear that there must either have been more than one fish caught on the Cornish coast, or else that different drawings and descriptions have been made of the same specimen.

The figure in the pamphlet does not appear to us materially to elucidate the species of the Cornish fish; indeed the details both of the figures and descriptions are so imperfect that they may quite as readily be taken for the *G. Gladius* as for the *G. Banksii*; the spotting of Mr. Chirgwin's drawing brings strongly to mind the markings of the *G. Gladius*.

We are glad to be able, from a letter of Mr. Yarrell in the above pamphlet, to add to the list of specimens now put on record one which was cast on shore alive at the village of Crovie near Macduff, after a severe north-easterly gale in March 1844. It is thus described:—"Length without the tail, which was wanting, 12 ft., greatest depth 12 in., greatest thickness 2 $\frac{3}{4}$ in. The dorsal fin was 2 $\frac{1}{2}$ in. in height, and extended to the back of the head to a point near the tail. Rays in the dorsal fin apart from its anterior elongation on the head 264. Filaments rising from the head 15; the longest measuring 27 inches. They were connected at the base by a thin membrane similar in consistency to that which connects the rays of the dorsal fin, and are evidently a continuation of that fin. The pectoral fin is 2 $\frac{1}{2}$ in. long, the rays 12 in. The ventrals consisted of two filaments 3 ft. in length. They were fringed with a thin membrane on two sides, and had evidently been broken. The head was 9 in. long from the point of the lower jaw to the end of the operculum. The whole body was covered with a delicate silvery white membrane, under which appeared a series of tuberculated and smooth bands extending over the whole length of the body; twelve of these bands occupied the space above the lateral line. When the fish was in a fresh state these bands did not appear distinctly, but when the skin was taken off they appeared distinct enough. Behind the pectoral fins appeared a few narrow dark bands extending across the fish; these were quite distinct when the fish was in a fresh state,

but the skin does not retain a trace of them. The dorsal fin had an orange tinge, and the lateral line extended along the lower third of the body. The distance of the vent from the end of the operculum was 46 inches."

We agree at once with Mr. Yarrell in pronouncing this to be the same species as the Cullercoats fish, and it is confirmatory of our opinion that the crest was really a continuation of the dorsal fin. This Scotch specimen, like the English ones, was caught in the spring, and makes the eighth British example of this fish, which is therefore not so extremely rare as has been supposed.

We observe that in the last Number of the 'Annals' Professor J. Reid of St. Andrews has given a highly interesting description of what he believes to be the first British example of the Deal fish, and we take the present opportunity of stating that in the Newcastle Museum there is a specimen which was taken at Newbiggen on the Northumberland coast, June 18th, 1844. This specimen is 5 ft. 5 in. long, and has 1 ft. maximum depth. The body was of a silvery gray, the dorsal fin and tail red.

EXPLANATION OF PLATES I. AND II.

PLATE I.

- Fig. 1.* Anterior portion of *Gymnetrus Banksii*, the jaws being slightly protruded; the dotted lines on the crest and ventral processes represent these parts as they are believed to have been originally, the continuous lines represent them as they were seen by us.
Fig. 2. Outline of section of body at part of greatest thickness, showing the relative depth and thickness.
Fig. 3. Outline of section of ditto, showing ditto ditto at 3 or 4 in. from tail.
Fig. 4. Two of the radiated scale-like bodies from the silvery matter of the skin.
Fig. 5. Different forms of blood-globules, some shown on edge.

PLATE II.

- Fig. 1.* Side view of *G. Banksii* in outline.
Fig. 2. Side view of ditto, abdomen laid open, showing the viscera *in situ*:
 a, œsophagus; c c, cæcal prolongation of stomach; e, pancreatic cæca covering duodenum; f, intestine; g, anus; i, liver; l, ovaria; m, ureter.
Fig. 3. Plan of viscera removed from body: a, œsophagus; b, stomach; c c, stomachic cæcum; d, pylorus; e, pancreatic cæca surrounding duodenum; f, intestine; g, anus; h, spleen; i, liver; j, gall-bladder; k, ductus communis choledochus; l, ovaria; m, ureter; n, vesical dilatation of ditto; o, kidney; p, supra-renal bodies.

II.—*Ornithological Notes.* By JOHN BLACKWALL, F.L.S.

[Continued from vol. xix. p. 379.]

THE GREAT GRAY SHRIKE, *Lanius excubitor.*

REMARKABLE for the boldness and fierceness of its disposition, this species of shrike is sometimes troublesome to birdcatchers

by its daring attempts to carry off their call-birds. Early in the spring, a young man, who was intent upon obtaining for sale a supply of that minute but docile linnet the lesser redpole, *Linota linaria*, which is a summer visitor in Lancashire, where it breeds, proceeded to Gorton, near Manchester, and having arranged the cage containing his call-bird, and placed his twigs well-smeared with birdlime in the manner best adapted to attain his object, he patiently awaited the result. After having successfully followed his insidious occupation for a considerable time, a gray shrike flew to the cage, most likely for the purpose of devouring the decoy-bird, and perching upon the twig attached to its summit became entangled in the viscid material which covered it. The agitated bird made vigorous efforts to disengage itself from the unpleasant situation in which it was placed, but without avail; its struggles only tended to involve it more completely in the tenacious toils with which it was encumbered. At length it was secured and placed in a dark cage with the redpoles which had been previously captured; but the surprise and mortification of the birdeatcher may be imagined, when, on his arrival at home, he found that the shrike had killed all its companions in captivity. A friend of mine, who was actively engaged in collecting specimens of rare British birds, happened to hear of the circumstance, and succeeded in purchasing the shrike, which, when preserved and mounted, occupied a place in his cabinet.

Though irregular in its visits to this country, and though seldom seen except in the colder months, yet the gray shrike has been observed, in more than one instance, to prolong its stay among the mountains of North Wales till late in May, and it is not improbable that it may sometimes breed in the principality. Like the cuckoo and birds of prey in general, this species and the red-backed shrike, *Lanius collurio*, are occasionally pursued and persecuted by small birds, which, from the excited feelings they manifest, evidently have some cause for regarding them as enemies.

Possessing greater compass of voice than is commonly supposed, the red-backed shrike is capable of giving utterance to a few low soft notes which constitute a short song; but let it not be thought that they represent the calls or lays of other birds, artfully acquired for the purpose of luring them to destruction, as some persons have insinuated, for they are delivered by the shrike in a subdued tone and without the least attempt at concealment, the station usually occupied by it on such occasions being the loftiest twig of a tall hedge or bush; and I have never succeeded, by the most careful and prolonged observation, in wit-

nessing the fascinating effects ascribed to the music of this imaginary siren.

The red-backed shrike may frequently be seen to take insects when on wing, like the *Muscicapidae*.

The Whinchat, *Saxicola rubetra*.

In Denbighshire this pretty migratory bird arrives about the end of April, when the song of the male, which is sometimes delivered on the wing, may be heard repeated at short intervals. After the female has hatched her eggs, both sexes commence the call from which the species receives in Lancashire, where it is abundant, the provincial name of *útick*; the accent falls on the note supposed to resemble the first syllable of the word, and the second note of the call is sometimes repeated; thus,—útick tick.

I have seen the whinchat pursue the red-backed shrike with cries and gesticulations expressive of extreme animosity.

The Sedge Warbler, *Sylvia phragmitis*.

The late cold spring of 1847 exercised a very marked influence upon the vocal powers of our migratory warblers; the notes of the sedge warbler, which were not heard in the neighbourhood of Llanrwst till the 14th of May, were so defective in tone that this species found it quite impracticable to execute its song, being enabled by the most strenuous efforts to perform a few passages only, and those in a very imperfect manner; even the high powerful strain of the black-cap, *Sylvia atricapilla*, and the deep rich melody of the garden-warbler, *Sylvia hortensis*, were reduced to a few short, abrupt, feeble sounds without any apparent connexion or modulation; our resident singing birds also were sensibly affected by the severity of the season, all attempts to deliver their lays with their accustomed vigour and facility being totally unavailing. As the temperature increased with the advancing year, a corresponding improvement was perceptible in the wild music of the fields and woods, until the full flow of song announced the pleasing intelligence that the summer was at last confirmed. Now as it is evident, from the facts already stated, that a relation must exist between the singing of birds and the temperature of the atmosphere, I shall briefly advert to some of the circumstances which appear to constitute that relation.

An idea seems to have been entertained by the Honourable Daines Barrington that the periodical cessation of the songs of birds may possibly be caused by some physical impediment, as indicated by the following paragraph extracted from the fifth letter addressed to that gentleman by Mr. White in his 'Natural History of Selborne':—“ Your supposition that there may be

some natural obstruction in singing birds while they are mute, and that when this is removed the song recommences, is new and bold. I wish you could discover some good grounds for this suspicion."

More than twenty-six years have elapsed since my attention was first particularly directed to this interesting subject, and I am inclined to believe that if the candid and intelligent natural historian of Selborne had been made acquainted with the remarkable facts which then presented themselves to my observation, he would have ceased to view the suggestion of Mr. Barrington merely in the light of a plausible hypothesis*.

It is a matter of general notoriety that very few of our feathered songsters, in a state of liberty, continue their delightful warbling beyond the end of July, or the beginning of August, the latter, as Mr. White has remarked, being "the most mute month the spring, summer and autumn through;" but whether this silence is constrained or voluntary can only be determined by a careful examination of the evidence bearing upon the case.

Ornithologists almost universally attribute the singing of birds to the excitement induced by the passion of love, regarding it as an act of volition, which, without any absolute necessity, ceases to be practised when the predisposing stimulus is no longer felt; but it cannot be denied that the songs of many species may frequently be heard after they have done breeding, and that the woodlark, redbreast, wren and dipper sing even during frosty weather in winter when the sun shines brightly. Besides, persons who have the management of birds in captivity are well-aware that they continue to exert their musical powers much longer than birds at large, and that those powers may be circumscribed, or called into full activity at pleasure by regulating their supply of food and the temperature of their domicile; female birds also, when in high condition, are known, occasionally, to assume a song somewhat resembling that of the male. These circumstances, together with the early age at which young birds begin to practise their songs, and the facility with which some species may be taught in confinement to substitute an artificial tune for their natural notes, have led me to suppose that a partial coincidence in the periods during which birds of song exercise their reproductive and musical functions may have been mistaken by ornithologists for a relation of cause and effect.

From observations and experiments made with the greatest care on several species of British singing birds, I have no hesitation in asserting that the song peculiar to each is the result of

* See the Memoirs of the Literary and Philosophical Society of Manchester, second series, vol. iv. pp. 312, note †, 465, 466, and vol. v. p. 261.

an instinctive impulse, liable to be brought into operation by the agency of various stimuli, combined with a suitable state of the vocal organs*; and this latter condition deserves especial attention, for most of our songsters manifestly become mute in autumn from inability to continue their melodious strains; their persevering but ineffectual efforts to prolong them, and the difficulty they experience in recommencing them in spring, proving to demonstration that their pleasing lays depend upon the energy of those muscles which contribute to form the voice; an energy which is influenced chiefly by food, temperature, health, and the exercise of the reproductive function.

The moulting of birds speedily follows the exhaustion consequent on the propagation of their species, and an attendant relaxation of the vocal organs, which renders them incapable of obeying the dictates of the will, is, I conceive, the true cause of the periodical silence of singing birds. To this state of things succeeds a gradual reduction in the temperature of the atmosphere and in the supply of animal food, so that, with a few exceptions already noticed, and those dependent in all probability upon some constitutional peculiarity, the enfeebled organs of voice do not recover their tone till the ensuing spring, when innumerable animated beings, excited to activity by the genial warmth of the season, afford abundance of stimulating nutriment to the feathered songsters, which, with the concurrent restoration of their physical energies, enliven every copse with their sweet and unsophisticated music. Such I apprehend is the real nature of the connexion which subsists between atmospheric temperature and the singing of birds.

Many birds are endowed with an extraordinary capacity for imitating sounds, and under the careful tuition of skilful instructors readily learn to pipe long and difficult tunes, to articulate words, and even to repeat short sentences with surprising precision. Among our native species, the jay, magpie, starling and bullfinch afford familiar instances of the truth of this assertion; but I am impressed with the belief that the spontaneous employment of this faculty by individuals which have never been removed from their natural haunts is much more limited than is commonly supposed. If the term "mimic" be strictly applicable to any British bird in the wild state, the sedge warbler may be thought pre-eminently to merit that appellation, and, indeed, its song is usually described in ornithological works as being composed, in a great measure, of passages borrowed from the lays of other songsters; yet I feel thoroughly satisfied that this reiterated

* For particulars consult an essay on the notes of birds published in the Memoirs of the Literary and Philosophical Society of Manchester, second series, vol. iv. p. 289.

accusation of plagiarism is erroneous, for those fancied imitations are merely resemblances, and are common to the songs of the entire species, which certainly would not be the case if they were factitious. In short, from the general character of the localities habitually frequented by the sedge warbler, it can seldom have an opportunity of hearing some of the birds whose notes it is supposed to mimic, while those of the black-headed bunting, *Emberiza schaniclus*, which is frequently associated with it, are never introduced into its song, that I am aware of, though from their style and tone they appear to be perfectly well adapted to its vocal powers and particularly easy of acquisition, being few in number and often repeated.

When resident in Lancashire I enjoyed excellent opportunities of minutely investigating the habits of the jay, the magpie and the starling, species whose talent for mimicry is susceptible of a high degree of cultivation, the last possessing this faculty in a more perfect state of development perhaps than any other British bird; but, with the exception of individuals educated in captivity, I never detected the slightest display of their imitative powers; and this remark applies with equal force to the bullfinch, which has very few natural notes, can scarcely be said to sing at all, and, while it retains its liberty, is not known to mimic any sound whatever; yet whose great docility, retentive memory and flexibility of voice render the acquirement of artificial tunes an easy task.

That persons of lively imagination should mistake the singular tones comprised in the song of the starling for imitations of various inarticulate sounds; the imperfect notes of the blackbird for endeavours to rival the crowing of the domestic cock; or one of the spring-calls of the great titmouse for a successful effort to counterfeit the noise made in sharpening a saw, may cease to be regarded with surprise, when the attempts of some ornithologists to convey to the minds of their readers ideas of the songs of birds by the arbitrary arrangement of vowels and consonants are taken into consideration.

A blackbird, after numerous unsuccessful endeavours to execute its song, which it was prevented from doing by some organic defect, abandoned the undertaking, and continued throughout the entire season to repeat, at intervals, two notes in quick succession, the only musical tones apparently to which it was capable of giving expression. The bird usually took its stand on a branch of a large Portugal laurel nearly opposite to my sitting-room window, and the frequent recurrence of these two notes soon suggested a familiar name to which they bore a resemblance sufficiently close to excite a momentary suspicion that it might be the result of imitation. That name I shall abstain from

writing, having no inclination to lay myself open to the sarcasm contained in the well-known distich,

"As the fool thinks
So the bell clinks."

The Gray Wagtail, *Motacilla boarula.*

This beautiful species, remarkable for elegance of form, nice distribution of colours and graceful agility of movement, though observed to remain in Denbighshire and Caernarvonshire throughout the year, is certainly much more numerous in the summer than in the winter. It usually constructs its nest on the banks of brooks and rivers and the margins of pools and lakes ; but as it does not appear to increase perceptibly in those counties, notwithstanding the number of young birds brought up in them annually, it is evident that many individuals which withdraw from that part of Wales in autumn do not return to it ; the influences which regulate the geographical distribution of birds are, however, involved in much obscurity.

The yellow wagtail, *Motacilla flava*, so common in Lancashire during the summer season, I have not yet seen in the valley of the Conway.

The Goatsucker, *Caprimulgus europaeus.*

White, in his 'Natural History of Selborne,' letter xxii., addressed to Thomas Pennant, Esq., states that the goatsucker sometimes makes a small squeak, which it repeats four or five times ; and that he has observed this to happen when the cock-bird has been pursuing the hen in a toying manner through the boughs of a tree. He asserts also, in his 'Observations in various branches of Natural History,' that when a person approaches the haunts of goatsuckers in an evening, they continue flying round the head of the obtruder, and by striking their wings together above their backs, in the manner that the pigeons called Smiters are known to do, make a smart snap ; adding, that on such occasions they are probably jealous for their young, and that their noise and gesture are intended by way of menace.

My own observations mostly serve to confirm the accuracy of those made by Mr. White ; nevertheless, I may remark that I have heard this species utter its squeaking note when it was alarmed for the safety of its progeny ; and that I have seen the male strike its wings together above its back, and by that act, repeated several times in quick succession, produce a series of snapping sounds, when it was in eager pursuit of the female, at the commencement of the pairing season in the month of May.

The habit which the goatsucker has of frequently alighting on roads in the dusk of evening is alluded to by Mr. Yarrell in

his 'History of British Birds,' and the cause of this occurrence is conjectured to be the desire to rub itself in the dust, like the *Gallinæ*. That such may be the case I will not dispute, but I have never been able to detect the bird in the fact, though I have watched it on such occasions with the closest attention, and I have known it, in numerous instances, alight on a damp road or a compact gravel-walk, where there was no dust, and after having been repeatedly disturbed return to it again.

It is probable that the circumstance of nestling goatsuckers having been mistaken for young cuckoos by unskilful ornithologists may have contributed in a considerable degree to promote the erroneous opinion that the cuckoo sometimes takes charge of its own offspring; the two species, however, may readily be distinguished from each other, even when recently disengaged from the egg, by the structure of the beak and feet.

With reference to its ordinary call, usually consisting of two prolonged tremulous notes, the latter of which is the lower, the Welsh have named this species *troellwr* or the spinner.

The Ring Dove, *Columba palumbus*.

In seasons when acorns are unusually abundant, the oak woods in the valley of the Conway are resorted to by large flocks of ring doves, comprising a very much greater number of individuals than have been bred in the neighbourhood, evidently attracted to the locality by the plentiful supply of food to be obtained in it. Whence they come, and by what means they acquire a knowledge of the fact that induces them to visit the district, I am at a loss to conjecture, as they do not assemble gradually, but arrive in large bodies almost simultaneously.

The autumn of 1844 was a remarkably favourable season for the production of acorns, and ring doves were proportionately numerous. In the winter, the birds procured them by turning over the fallen leaves under which they lay hid; and some idea may be formed of the immense consumption of nutriment of this kind by the doves, from the circumstance that on opening the craw of a specimen brought to me on the 26th of January 1845, it was found to contain forty-five acorns of various sizes.

The Common Sandpiper, *Totanus hypoleucus*.

Sandpipers of several species, more especially the common one, are prevented from increasing so rapidly as they otherwise would in the county of Caernarvonshire, where numerous streams and lakes constitute favourite resorts of those birds, by the shepherds' dogs, which habitually prowl about their haunts in quest of their nests, and devour indiscriminately both eggs and young.

III.—*A few remarks upon a species of Zoophyte which has been discovered in the New Docks of Ipswich.* By Mr. EDWIN GILES and Dr. W. B. CLARKE.

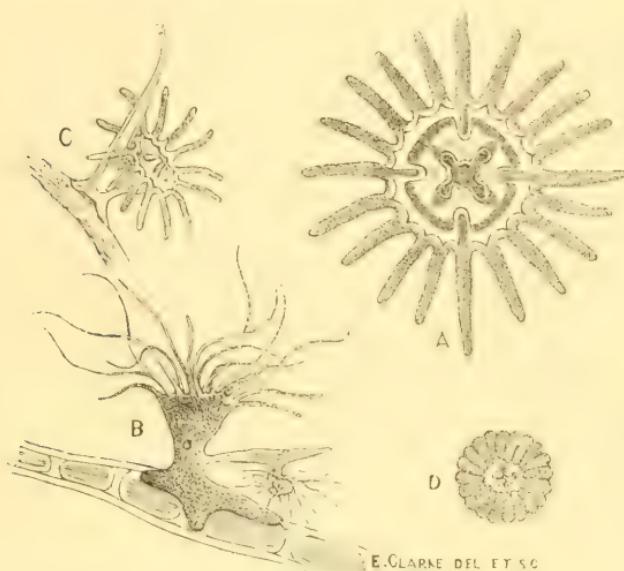
To the Editors of the *Annals of Natural History.*

GENTLEMEN,

14 Berners Street, Ipswich, Suffolk.

THE Zoophyte which is the object of the following remarks was discovered in the New Salt-water Docks of Ipswich in Suffolk, and brought under my notice by Mr. Edwin Giles, who was then in possession of several fine and vigorous specimens. The animal appears white, or of a delicate flesh-colour and semitransparent; of an obconical form; from a quarter to half an inch in length, exclusive of the tentacula, which are about three or four times the length of the body. The base is furnished with a more or less extensive disc for attachment; the tentaculiferous extremity is circular and provided with from sixteen to twenty-one long tentacles and a subquadangular central aperture or mouth, capable of rapid and very considerable expansion and contraction. The circumference of the disc is bordered by an apparently roundish and slightly thickened margin from which the tentacula proceed; whilst the disc is furnished with four subovate bodies, each placed diametrically opposite to another having an orifice-like appearance and extending to the base of the tentacle which is nearest to it: these bodies are also coincident each with one of the sub-bifid lobes of the mouth, as seen in the woodcut. These animals are extremely interesting from the elegance of their form and the rapidity and peculiarity of their movements. We had an opportunity of observing them whilst busily engaged in securing their prey, probably consisting of infusorial animals, which however were so small that we could not ascertain what had passed within their influence; but we repeatedly observed a tentaculum rapidly contracted curved upon itself, and the extremity introduced into the mouth, as in fig. E, which had suddenly been expanded into its quadrangular form for its reception, and as suddenly contracted, so that the four bifid lips grasped the introduced feeler, which remained a few seconds within the stomach, and was then gradually withdrawn and again extended to secure another victim. Not only was the extremity of the tentacle occasionally introduced; but when the creature had secured an object by some of the lower discs, with which the whole extent of its surface appeared to be furnished, the feeler was doubled upon itself, as seen on the opposite side of fig. E, the mouth suddenly and widely expanded, and the reduplication introduced into it, when it again closed upon the tentaculum, and, as in the first instance, it remained a few seconds in the stomach and was then gradually withdrawn again: in these movements the mouth so closely grasped the tentacle that it ap-

peared to strip off every extraneous body that might be adhering to it. The above evolutions were continually exhibited whilst we had it under observation, and in some instances two tentacles were introduced into the mouth at the same time.



E. CLARKE DEL ET SC

The figs. A. B. C. D. have been engraved on wood by Dr. Edward Clarke, who very kindly offered his services in illustration of this paper. They are taken from some beautiful little drawings made by Mr. Edwin Giles of this zoophyte whilst living in his possession.

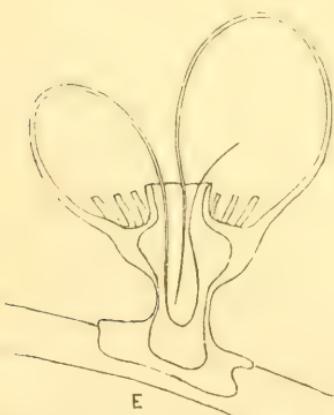
A. represents a considerably magnified view of the tentaculiferous disc with the tentacles contracted.

B. is a side view, showing the spur-like gemmation with the young polype proceeding from it.

C. is a side view of another specimen showing the pistil-like gemmation and destitute of the polype.

D. is a front or upper view of the zoophyte as it appeared when in its dying state: the tentacles were all incurved, and particles floating over the disc, when in this condition, were observed to have a rotatory motion communicated to them.

E. is a fig. also engraved by Dr. Edward Clarke, and taken from a little diagram showing the position of the tentacles when introduced into the animal's mouth.



Subjoined is a note from Mr. Edwin Giles upon this beautiful little animal.

Believe me to remain, &c.,

W. B. CLARKE, M.D.

DEAR SIR,

Tavern Street, Ipswich, Suffolk.

We have in our Wet Salt-water Dock a species of Hydroid Polype which I have not met with in any publication that I have had an opportunity of referring to. It differs materially from the common species of our freshwater ponds in its body being less capable of extension, and in its having when mature from sixteen to twenty-one extensile tentacles around its disc, in the centre of which, and rising considerably above the surface, when protruded, is a singularly and beautifully organized four-lobed mouth: the instant adaptation of its opening to the incurving tentacles, and its effective closing thereon when they are introduced into the cavity, are operations of the most interesting character. Around the base of the mouth, and equidistant from each other, are four oviform orifices, corresponding with the four projecting lobes of the mouth and extending to the base of the nearest tentacle, giving to the disc somewhat the appearance of a flower with a four-cleft corolla.

The incipient gemmation of this polype is spurlike and acute, upon which the young polype is formed: in some instances this spur or offshoot terminates in a little bulb, presenting the appearance of a simple pistil of a plant having its stigma at the extremity and the germen at its base: upon offshoots of this latter form we have not at present noticed any young.

I observed, previous to the death of this little creature, that the tentacles became incurved, and, at such times, substances floating over the orifice of the disc obtained a rotatory motion as if operated upon by cilia.

Believe me to remain, &c.,

EDWIN GILES.

IV.—*On Odontites rubra, Pers., and the allied forms, including a notice of a new species.* By JOHN BALL, M.R.I.A.

THIS attempt to clear up the confusion which seems to exist as to the forms of the group of plants which were known to the older botanists under the name of *Euphrasia Odontites*, L., is subject to great disadvantage, being chiefly founded upon the examination of dried specimens, from which it is very difficult to determine the true form and structure of the corolla and anthers, the organs from which the most important specific characters are derived. I may observe in the first place, that some of the characters used by authors appear to me altogether fallacious; thus I find the relative length of the floral leaves, and the breadth of the segments of the lower lip of the corolla to vary in all the forms of this group. I proceed to point out by brief diagnostic characters the forms with which I am acquainted.

Odontites verna, Reich. (*O. rubra*, Pers. and Benth. in D.C. Prod.)—Stem erect, branching, obsoletely tetragonal, hispid with reflexed hairs, from 6 to 20 inches in height; leaves *sessile*, lanceolate, narrowed from near the base, and usually blun-*ish*, remota*l*y serrate, lower leaves elongated, those of the secondary branches and flowering spike with few—2—4—teeth, the last remote from the upper extremity of the leaf; flowers shortly pedunculate, usually shorter than the floral leaves; calyx segments equal to the tube in length, lanceolate, rather acute; corolla about twice as long as the calyx, pubescent, upper lip slightly convex, suberose, lower lip with three roundish oblong obtuse lobes, the middle lobe somewhat longer and broader than the others; filaments hairy, nearly equaling the length of the corolla; anthers transverse, with a few glandular hairs, included in or slightly protruding from the upper lip of the corolla; capsule oblong, hairy, when ripe equaling or slightly exceeding the calyx; style filiform; stigma minute, capitate, hairy; seeds oblong furrowed.

Common throughout Europe.

O. verna var. *elegans*, nobis. (*O. serotina*, Reich. non Bert.)—Leaves narrowed at the base, almost linear; flowers with longer peduncles; corolla rather smaller, lower lip with three linear-oblong, nearly equal segments; anthers slightly exserted.

I possess this form from Buda in Hungary, and from Persia (Kotschy, Plantæ Persiae Borealis, 693). I gathered it on the Wynd Cliff near Chepstow, on the 30th of August, 1848. From the observations of Reichenbach it is clear that this and not the following form is that intended by him (Flora Exe. num. 2450). It is probable that this is likewise the plant known to Mr. Bentham: I altogether concur in the propriety of uniting it to the preceding, as has been done by that eminent botanist (D.C. Prod. x. 551).

Odontites Bertolonii, nobis. (*Bartsia serotina*, Bert.)—Stem as in *O. verna*, seldom exceeding 12 inches in height, branches usually more numerous and shorter; leaves very shortly petio-*late*, much smaller than in *O. verna*, ovato-lanceolate, teeth more acute and much more approximate; calyx rather less deeply divided; corolla with a rather shorter tube, lobes of the lower lip nearly equal; anthers slightly exserted; ripe capsule much smaller than in *O. verna*.

Though perhaps rather difficult to define by written characters, this form appears to me fully entitled to specific distinction, in which opinion I am confirmed by the positive statements of the accurate Bertoloni. The shape and size of the leaves, the

denser and more uniform inflorescence, and the constantly smaller fruit appear to supply constant characters. The exserted anthers and the shorter floral leaves are sometimes found in *O. verna* var. *elegans* above described. I have specimens from Tuscany, Umbria, Rome and Naples, the latter gathered by myself at the end of September 1845; but I have never seen any other than Italian specimens, and the plant appears to be unknown in central Europe.

In consequence of the confusion that exists as to the identity of the forms which have borne the names *Euphrasia serotina*, it appears necessary to abandon that specific name, though highly appropriate, and in that case the Italian plant cannot bear a more suitable name than that of the only author who has clearly distinguished it from its allies.

Odontites rotundata (n. sp. ?), nobis.

About ten years ago I received from Professor Henslow a specimen marked *Bartsia Odontites*? gathered near the Hague, and about the same time I was favoured with an imperfect specimen gathered on Bepton Common, Sussex, by Miss Plowden, and a specimen marked Cambridgeshire without the name of the collector. These plants appeared to me at the time to differ in many respects from the common English plant, but I was unwilling to describe them without a fuller acquaintance with the continental forms. I am now induced with some hesitation to assign to this form a distinct specific name, being unable to identify it with any of the described species. I subjoin a short description:—

Odontites rotundata.—Stem with numerous elongated branches from near the base, (in my specimens) 6–9 inches in height; leaves sessile, lanceolate, *crenato-serrate*, teeth less acute and fewer than in *O. verna*, floral leaves almost entire, equaling or (in my English specimens) shorter than the flowers; segments of the calyx one-third of its length, broadly triangular; corolla rather shorter than in *O. verna*, upper lip broad, convex, *including the anthers*, lower lip with three broadly rounded, nearly equal segments; filaments nearly glabrous; anthers transverse with scarcely any glandular hairs; style and stigma nearly glabrous; capsule broadly oral, almost rounded, when ripe longer than the calyx.

Hab. England and Holland.

In my specimens the whole plant is less hispid, with a softer pubescence than in *O. verna*. The form of the calyx and capsules, and the nearly glabrous filaments, anthers, style and stigma bring this form near to *O. lanceolata*, Reich.; but that plant, of

which I possess specimens from Bonjean the original discoverer, differs by its rigid habit, with prominent hispid nerves to the leaves and calyces, by its erect anthers, and by the form and colour of its corolla, which in the present species scarcely differs from that of *O. verna*. As far as I can judge from dried specimens, the seeds of *O. rotundata* are considerably broader than those of *O. verna*: on the whole, the characters assigned appear to justify me in proposing this well-marked form as a new species, which like so many others must await the result of continued observation and experiment before it can be finally adopted by naturalists.

V.—*Contributions to the Botany of South America.*

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

[Continued from vol. iii. p. 451.]

ACNISTUS.

To this genus, as defined on a former occasion (Lond. Journ. Bot. iv. p. 335), I have to add another species. Subsequently (*ibid.* vii. p. 338) I alluded to the great proximity which this genus offers to *Dunalia*, and I may also add that it touches likewise upon the section *Chænesthes* of *Iochroma* on the one hand, in a manner that renders it difficult to determine whether one species of *Aenistus* belongs to this or to the former genus; on the other hand again it osculates closely upon *Brachistus*, so that *B. oblongifolius* from the length of its corolla (being twice that of its calyx) might almost be considered as an *Aenistus*: in this latter case however, as the plant has very dissimilar geminate leaves, a character peculiarly remarkable in most species of *Brachistus*, and as it presents only two, rarely more flowers in each axil, it cannot be considered as an *Aenistus*.

14. *Aenistus confertiflorus* (n. sp.);—ramulis glabris, striatis; foliis fasciculatis, oblongis, basi cuneatis, in petiolum longum gracilem attenuatis, apice obtusiœculis, supra pubescentibus, subtus fuscotomentosis: floribus umbellato-fasciculatis, pedunculis apice incrassatis, calyceque pilosiusculis, corolla lutea, glabra, lobis acutis, marginibus tomentosis, staminibus styloque subexsertis.—Peruvia, *v. s. in herb.* Lindley (Lobb. n. 328).

In this species the leaves (including a petiole of $\frac{5}{8}$ inch long) are $2\frac{1}{4}$ inches in length and $\frac{3}{4}$ inch broad; the peduncle is 9 or 10 lines, the corolla 8 lines long: each axil usually presents four to five or six flowers, fasciculated with two to three or four young leaves, all growing out of the cicatrix of a fallen leaf of the pre-

vious year : it is probable therefore that the leaves grow to a much larger size than are seen in the above specimen. It comes very near *Acnistus cauliflorus*.

DUNALIA.

Since the last species of this genus were described, I am glad to have had an opportunity of seeing a new and very distinct species belonging to the section *Paucifloræ*, which I found cultivated at Kew, under the name of *Lycium obovatum*. It confirms the views before taken of its structure, founded on an examination of the dried specimens described in the 'Lond. Journ. Bot.' vol. iv. p. 333, and vol. vii. p. 337.

7. *Dunalia lilacina* (n. sp.) ;—fruticosa, inermis, ramulis striatis ; foliis in axillis fasciculatis, spatulato-oblongis, apice obtusiusculis aut vix acutis, in petiolum elongatum gracilem attenuatis, utrinque glaberrimis, margine revolutis, venis superne immersis subtus coloratis ; floribus in fasciculis axillaribus solitariis, nutantibus, pedunculo gracili, 1-floro, calyceque brevi campanulato 5-nervio glabro, dentibus 5, rotundatis, mucronatis ; corolla infundibuliformi, lilacina, calyx 6-plo longiore, extus vix puberula, intus superne glabra, imo pubescente, limbo brevissimo, tomentoso, fere integro, dentibus 5–6, acutis, cum alteris fere obsoletis glabris interjectis ; staminibus 5–6, inclusis, quorum 3 paulo brevioribus, filamentis glabris, supra basin insertis, appendicibus brevibus, utrinque bifidis, cano-pubescentibus ; stylo glabro, incluso.—*Patria ignota, v. s. in hort. Kew. cult.*

This species approaches very near to *D. ramiflora* : the internodes are closely approximated, with four to six leaves crowded in each axil ; the leaves are $1\frac{1}{2}$ inch long, tapering gradually from near the apex into a slender petiole of $\frac{5}{4}$ of an inch, being altogether $2\frac{1}{2}$ inches in length, and they are 5 lines in breadth ; the peduncles are only $\frac{1}{2}$ inch long, scarcely thickened at the apex ; the calyx is 2 lines long ; the corolla 1 inch in length, 2 lines in diameter from the base to the middle, whence it gradually enlarges to nearly 4 lines in the mouth ; the filaments are quite glabrous, arising from fleshy oblong cano-tomentose processes, with free margins, adnate to the base of the corolla for the length of $1\frac{1}{2}$ line ; the appendages, which are a continuation of the free margins of the processes, instead of being single and glabrous on each side of the filaments, as in all the other species, are here each bifid, very cano-tomentose, and scarcely a line in length ; the anthers are below the mouth of the corolla, as is also the clavate stigma, which is crowned with two greenish viscid glands.

PHRODUS.

Among the collections made by Bridges in the arid districts of the province of Coquimbo in Chile, are three plants that bear quite the aspect of some of the singular Nolanaceous species which I noticed on a previous occasion as belonging to the genera *Alona* and *Dolium* of Dr. Lindley. One of these same plants was formerly described by me (Lond. Journ. Bot. iv. p. 501) under the name of *Alona microphylla*, because it possessed the same general habit, with flowers similar to those of *Alona ericifolia* and other Nolanaceous plants from the same locality, and being without fruit I concluded it must belong to that genus.

The plants now to be described, though evidently referable to the tribe *Solanaceæ* of Endlicher, do not correspond with any recorded genus: from *Salpichroma* they differ in having a more tubular calyx, and a much shorter and broader corolla, which does not become black in drying: they approach *Dunalia* in the structure of their flowers, and somewhat in their Lycium-like habit, but their filaments are simple and more exserted. They greatly resemble at the same time many species of *Lycium*, but they differ from that genus in having much larger and more campanular flowers with a very different aestivation. The generic name now proposed for these plants is derived from φροῦδος, *evanidus*, because of their shabby stunted habit.

PHRODUS (gen. nov.).—*Calyx* urceolato-tubulosus, usque ad medium 5-dentatus, dentibus acutis, persistens. *Corolla* infundibuliformis, tubo imo contracto, superne ampliore, limbo 5-partito, laciniis oblongis vel rotundatis, expansis, aestivatione induplicato-valvatis. *Stamina* 5, subinaequalia, longe exserta; *filamenta* filiformia, in coarctationem tubi aduata, imo villosa, hinc glabra; *antheræ* ovatæ, 2-lobæ, sine connectivo apicifixæ, lobis adnatis, rima laterali longitudinaliter dehiscentibus. *Ovarium* ovatum, imo glandula annulari cinctum, 2-loculare, pluri-ovulatum, placentis incrassatis dissepimento utrinque adnatis. *Style* filiformis, longitudine staminum. *Stigma* clavatum, obsolete 2-lobum. *Bacca* globosa, apice conica, calyce distensa arete inclusa, 2-locularis, polysperma. *Semina* compressa, reniformia. *Embryo* in albumen carnosum teres, arcuatus, *radicula* ad angulum basilarem spectante, *cotyledonibus* semiterratis fere æquante.—Fruticuli Chilenses ramosissimi; folia minima, ericoidea, carnosula; flores solitarii, axillares, pedunculati.

1. *Phrodus microphyllus*. *Alona microphylla*, Lond. Journ. Bot. iv. 501;—fruticulosus, nodoso-flexuosus, implexo-ramosus, ramiculis junioribus brevibus divaricatis, vel deflexis, abortu apice saepe spinescentibus; foliis subsessilibus parvulis, subfasciculatis, spatulato-oblongis, carnosis, superne canaliculatis, sub-

tus convexis, utrinque glanduloso-pubescentibus, imo callo tumido persistente suffultis, callibus agglomeratis et axillis demum nudis hinc nodosis; floribus breviter pedunculatis.— Chile, prov. Coquimbo, v. s. in herb. Hook. (Bridges, no. 1330), in herb. Lindl. (Bridges, no. 1331*).

This appears to be a low bushy stunted shrub, with close, short, flexuose, knotty branchlets, frequently spinescent at the apex, or often reduced to a short spine: the older branches are generally quite bare of leaves, but the younger ones are closely invested with minute fleshy fasciculate semiterete leaves, scarcely more than 1 or 2 lines in length, and barely half a line in thickness; these soon fall off, leaving the axils bare, the sterile appearance of which is increased by the knotty accretions formed by the persistent tumid bases of the fasciculate leaves; the peduncle is 2 lines in length; the calyx, 3 lines long, is somewhat campanular, being 2 lines broad, cleft full one-third of its length into five erect equal teeth: the corolla seldom exceeds 6 or 8 lines in length, the portion within the calyx being cylindrical, but it swells above and becomes funnel-shaped, with an expanded border consisting of five obtusely triangular equal lobes; the stamens are inserted in the contracted portion of the tube, where they are very hairy, above they are quite smooth, slender, erect, and extend 2 lines beyond the mouth of the tube; the style is exserted to the same length†.

2. *Phrodus Bridgesii* (n. sp.) ;—fruticosus, ramulis elongatis, teneris, subadscendentibus; foliis fasciculatis, spathulato-linearis, subcarnosis, superne canaliculatis, subtus convexis, utrinque viscoso-pubescentibus; corolla calyce 3-plo longiore; staminibus subinæqualibus, longe exsertis, stylo æquilongis.— Chile ad Coquimbo. v. s. in herb. Hook. et Lindl. (Bridges, no. 1332).

* There is evidently a confusion here in the numbers, which is not unfrequent in many of Bridges's Chile plants, in consequence of two or more specimens having been distributed on the same sheet without attached labels. Owing to this same cause, I have described his no. 1331 as the *Dolia vermiculata*; it should have been no. 1330, these numbers having been respectively interchanged. Under no. 1332 two very different plants have been distributed; in Dr. Lindley's herbarium that number corresponds with his *Alona baccata*, and in Sir Wm. Hooker's herbarium the same number refers to a very distinct plant, which I have correctly described under the name of *Sorema acuminata*. I may here also observe, that there exists another error connected with some of Bridges's plants formerly described by me, inasfar as regards their locality: thus *Sorema acuminata* (Lond. Journ. Bot. iv. 370), *Sorema linearis* (id. 499), *Alona ericifolia* (id. 501), and *Dolia clavata* (id. 508), are all from the neighbourhood of Coquimbo, and not from Concepcion, as I found inscribed in mistake on the specimens referred to.

† This plant with generic details will be figured in the ' Illustr. South Amer. Plants,' plate 42 A.

The habit of this species is somewhat different from the preceding, the branchlets being much longer, straighter and more slender; the leaves are also larger and more linear, being 4 lines long by $\frac{3}{4}$ line broad, and after their fall the axils do not become enlarged by callous knots, as occurs in the two other species; the peduncle is 4 lines long; the calyx, 5 lines in length, is more funnel-shaped, and divided nearly halfway down into five acute teeth; the corolla is 9 lines long, spreading above to a diameter of 6 lines, with a border of five short lobes, and is apparently of a pale yellow or whitish colour; both it and the calyx as well as the peduncle, the stem and the leaves are thickly clothed with short glandular pubescent down: the style, thickened at its apex, is considerably farther exserted than the stamens: the berry, closely invested by the calyx, is globular, with a conical apex, and is 5 lines in diameter*.

3. *Phrodus nodosus* (n. sp.) ;—fruticosus, ramiculis nodoso-flexuosis, subadscendentibus; foliis fasciculatis, spatulato-linearibus, carnosis, eveniis, superne canaliculatis, ino callo tunido persistente suffultis, axillis hinc demum nodosis: corolla obscuriore, calyce campanulato duplo longiore, staminibus vix exsertis; stylo istis multo longiore.—Coquimbo, v. s. in herb. Hook. et Lindl. (Bridges, no. 1333).

The habit of this plant is intermediate between the two former, the branches being flexuous and knotty as in the first species; its leaves are similar in size and shape to those of *P. Bridgesii*, but the agglomerated persistent callous bases of the leaves, after they have fallen, give to the branches, which are more flexuous and crooked, the same knotty appearance as in *P. microphylla*, a character quite wanting in the second species †.

PHYSALIS.

Having spoken so frequently of this genus in relation to other approximate genera, it is desirable that its limits should be defined with more accuracy than heretofore. Its distinction from *Saracha* has been already marked by its inflorescence offering always a solitary axile flower, by its greatly increased vesicular reticulated calyx in fruit wholly inclosing the berry, and by its more deeply campanular and less rotate corolla with a border not so deeply cleft. In its enlarged vesicular calyx it offers much analogy with the genera *Nicandra*, *Cacabus*, *Thinogeneton*, *Anisodus*, *Withania* and *Hypnoticum*, but the former has a longer

* This species will be figured in plate 41 of the 'Illust. South Amer. Plants.'

† This plant will be shown in plate 42 B. of the same work.

and larger campanular corolla, with an erect almost entire margin, and a calyx with five deeply carinated angles, and five spur-like extensions at its base ; the second has a more decidedly infundibuliform corolla, resembling that of a *Nolana*, and an almost transparent calyx marked with dark green lines ; the third has a still more tubular corolla with an enlarged thickened calyx : *Anisodus* has a large deeply bell-shaped flower with rounded lobes, and a vesicular thickened calyx with five large prominent nervures which become woody : in *Withania* the corolla is narrow and deeply cleft, and the fructiferous calyx is broad and not contracted in its mouth : *Hypnoticum* has a small corolla with an extremely short tube, and a small erect five-cleft border.

In *Physalis*, on the contrary, the corolla is broadly campanular, with a spreading pentangular border more or less entire, and generally with five large coloured spots at its base. All possess a swelling calyx enveloping the fruit, and *Hypnoticum* agrees with *Physalis* in having stellate or brachiate pubescence. The following is its emended generic character :—

PHYSALIS (char. reform.).—*Calyx* brevis, tubulosus, in lobis 5 acutis semifissus, tubo in fructu valde aucto vesiculoso 5 anguloso, persistens. *Corolla* late campanulata, sœpissime maculis magnis 5 colorata, imo breviter coaretata, limbo subrotato, 5-angulato, rarius in lobis 5 triangularibus partito, aestivatione plicato-valvata. *Stamina* 5, imo corollæ inserta, e squamis 3-dentatis basi corollæ adnatis et fere in annulum sistentibus orta; *filamenta* teretia, erecta; *antheræ* oblongæ, basifixæ, circum stylum conniventes, loculis 2, parallele connexis, rima marginali longitudinaliter dehiscentibus. *Ovarium* ovatum, imo disco carnoso impositum, 2-loculare, *placentis* e dissepimento cruciatim partientibus, tunc bifidis, lunularibus, undique ovuligeris. *Stylus* simplex, longitudine staminum. *Stigma* capitatum, 2-lobum. *Bacca* globosa, calyce vesiculoso, membranaceo, reticulato, eclata. *Semina* plurima, parva, in pulpam nidulantia, reniformia, testa serobiculata. *Embryo* intra albumen carnosum hemicyclicus, teres, radicula infera hilo laterali evitante cotyledonibus semiteretibus duplo longiore.—*Herbæ suffruticosæ, radice perennente, totius orbis undique indigenæ, procumbentes, dichotomo-ramosæ, pilosæ; folia alterna, vel gemina, orata, integra, aut angulato-dentata, interdum cordata; flores pedunculati, solitarii, extra-axillares, sœpissime nutantes.*

All the species of *Physalis* are too well known and described to require any observation, but for the sake of illustrating the details of the genus, I have added a species that appears to be unrecorded.

Physalis gracilis (n. sp.) ;—caule gracili, substricto, pubescente; foliis ovatis, acutis, petiolatis, saepe inaequilateralibus, crassiusculis, utrinque pallidis et pubescentibus, petiolo sublongo, piloso; floribus axillaribus, subsolitariis, pedunculo gracili, petiolo aequilongo, 1-floro, flore nutante; calyce campanulato, profunde 5-partito, lobis acutis; corolla cyathiformi-campanulata, lutea, maculis 5 magnis violaceis notata, limbo 5-angulato, angulis obtusis; staminibus corolla brevioribus, filamentis brevissimis.—Real del Monte, Mexico, v. s. in herb. Hook. (Coulter, 1222).

The specimen is scarcely more than 8 inches long, with a single, slim, straight, apparently erect and somewhat branching stem; the internodes are about 1 inch, the leaves 12 to 15 lines long, 8 lines broad, upon a slender petiole 4 lines in length, they are somewhat obtuse and unequal at base; the more slender peduncle is about 6–8 lines; the calyx, 5 lines long, is half cleft into five acute segments, and together with the peduncle is hairy; the corolla is 8 lines broad and 4 lines deep, the filaments are 3 lines, and the anthers nearly 2 lines long*.

LARNAX.

There exists a small group of plants in several respects approaching *Physalis* as defined in the preceding page, but which differ in having fasciculate flowers, a corolla deeply 5-cleft, and in being herbaceous, erect, not prostrate plants. They vary from *Cacabus* and *Thinogenon* in the structure and colour of their corolla. The type is the *Physalis subtriflora* of the ‘Flora Peruviana,’ tab. 176, and two other plants described by Prof. Kunth are evidently congeneric with it. They differ from *Saracha* in their flowers being fasciculate, not decidedly umbellate, and in their inflated calyx, which subsequently incloses the fruit, as in *Physalis*. They approach *Margaranthus* very closely, but they do not accord with that genus in the form of their corolla. The generic name proposed for this group is derived from λάρψαξ, *capsa*, because the fruit is encased by the swollen calyx.

LARNAX (gen. nov.).—*Calyx* tubulosus, angulatus, tenuis, 5-dentatus, demum augesens et vesicarius. *Corolla* tubo brevissimo, campanulato-infundibuliformi, limbo 5-fido, lobis acutis, subpatentibus. *Stamina* 5, brevia, tubo inclusa, aequalia, *filamenta* brevissima, *antheræ* 2-loculares, loculis adnatis. *Ovarium* ovatum, 2-loculare. *Style* brevis, erectus, apice sub-uncinatus. *Stigma* sub-2-lobum. *Bacca* pisiformis, 2-locularis,

* A figure of this species will be given in plate 39 B. of the ‘ Illust. South Amer. Plants.’

calyce globoso, urceolato, vesicario, membranaceo inclusa. *Semina* plurima, reniformia. *Embryo* ignotus.—Herbae Peruvianæ et Mexicanæ, annuae, erectæ, dichotome ramosæ; folia alterna, solitaria aut gemina, petiolata; flores axillares, subsolitarii, aut plurimi fasciculati; pedunculi 1-flori, floriferi erecti, fructiferi cernui; corolla lutea.

1. *Larnax subtriflora*. *Physalis subtriflora*, R. et P. *Flora Peruv.* ii. 42. tab. 176 a;—caule angulato; foliis ovatis, acutis, solitariis, vel geminis, venosis, utrinque villosis, pilis mollibus articulatis; pedunculis 2–3nive, gracilibus, erectiusculis; corolla lutea, venosa; bacea pisiformi, lutescente.—Peruvia, ad Obragillo.

This is an annual, growing to the height of 2 feet; the leaves are represented as being 3 inches long, $1\frac{1}{2}$ broad, on a petiole of 4 or 5 lines, they are somewhat unequal at base, and covered with long soft pubescence; the peduncles are from 6 to 9 lines long, the calyx scarcely 2 lines in length, the tube of the corolla 2 lines long, campanulate above, and the lobes of the border, of the same length, are somewhat patent.

2. *Larnax Orinocensis*. *Physalis Orinocensis*, H. B. K. iii. 12;—caule herbaceo angulato, dichotome ramoso; foliis ovatis, subacuminatis, basi inæqualibus, et in petiolum decurrentibus, supra glabris, subtus pallidioribus, nervo venisque hirtellis; floribus geminis, pedunculatis, pendulis; calyce urceolato-globoso, piloso, 5-dentato, dentibus acutis, pilis articulatis; corolla infundibuliformi-campanulata, pilosiuscula, limbo 5-fido, lacinias obtusis æqualibus; bacea globosa, pisiformi, calyce vesicario aucto reticulato tecta.—Orinoco.

Neither this plant nor the following, from their inflorescence or general appearance, accord with *Physalis*, and so much was Prof. Kunth impressed with this idea, that he adds respecting them, “species anomalaæ, an genus distinctum?” They appear to agree in all essential respects with the characters of the plant last described. The leaves are from 3 to $3\frac{1}{2}$ inches long, 19 to 20 lines broad, on a pubescent petiole of 8 to 10 lines in length. The flowers are 5 lines long; the peduncles 2 lines in flower, 4 lines in fruit. The stamens are included within the corolla and are glabrous.

3. *Larnax Xalapensis*. *Physalis Xalapensis*, H. B. K. loc. cit. p. 13;—caule herbaceo, angulato, subdichotome ramoso; foliis oblongis, acuminatis, basi angustatis et æqualibus, integris, ciliatis, pilis minutissimis utrinque conspersis; floribus plurimis, subfasciculatis, pedunculis pilosis, calyce, corolla, fructuque ut in præcedente.—Mexico, ad Xalapam.

This species differs only from the former in its more acuminata leaves, equal at base and pilose on both sides, and in its fasciculate flowers. The leaves are from 4 to 5 inches long, 20 to 21 lines broad, on a petiole of 12 to 15 lines in length. The flowers resemble those of the former species in size and shape; they are probably fasciculate, as in the first-mentioned species, and not umbellate, a mode of expression often used by Professor Kunth in that sense, which is the more evident, as he makes no allusion to any general peduncle.

VI.—*On the Identification of a Genus of Parasitic Hymenoptera.*
By J. O. WESTWOOD, F.L.S.

To the Editors of the Annals of Natural History.

GENTLEMEN,

Hammersmith, June 5, 1849.

As I have neither leisure nor inclination to answer in detail Mr. Newport's reiterated attacks upon me, I shall merely observe—

1st. That I again deny having expressed a single word of doubt as to Mr. Newport's having found the insects in question in 1832, or that I asserted that his knowledge of them was derived from my communications. I said that Mr. Newport must have known from those communications that his insects were identical with those reared by Audouin and exhibited by me.

2nd. The notices published by me in 1845 and 1847 are sufficient to identify my insect and to distinguish it from every known species of *Chalcididæ*, and ought (even if Mr. Newport had not been present when I exhibited my specimens and drawings, and gave a *vivæ voce* description of the insect) to have satisfied him of their identity. My notices, although not drawn up in a technical manner, indicate the chief essential peculiarities of the insect, viz. 1st, its minute size; 2nd, its parasitism in the nests of mason bees and wasps; 3rd, the impregnation of the female within the cell of the bee; 4th, the habit of the female of using her wings, and seeking other cells in which to deposit her eggs; 5th, its position in the family *Chalcididæ*; 6th, the singular distorted* antennæ of the males; 7th, the minute size of the wings of the male, and 8th, the full size of the wings of the female.

3rd. I reaffirm the identity of the insects, and having seen Mr. Newport's drawing made seventeen years ago, I do not hesitate to state that his description has been drawn up from this

* The antennæ of *Elasmus*, &c., are not distorted in form; they are simply furnished with long lateral branches.

imperfect sketch, and that seven out of the nine generic characters given by him in the 'Gard. Chronicle,' p. 183, are erroneous; namely, 1st, the size of the head of the female; 2nd, the description of the female antennæ; 3rd, description of the wings of the female; 4th, description of the tarsi of the female; 5th, description of the antennæ of the male; 6th, description of the eyes of the male; 7th, size of the insects. Some of these characters, namely the veins of the wings and the 5-jointed tarsi, neither belong to the family nor subfamily to which the insect is to be referred, whilst the possession of stemmatous eyes by the male is disproved by every known species of winged insect, whereas it is as essentially a character of some of the Ametabolous tribes. Mr. Newport admits it to be possible, but not probable, that he has made these mistakes (Gard. Chron. May 26th), and brings forward his own and my descriptions of the male antennæ to show the improbability; but on examining his drawing I find the space for the joints he has overlooked indicated by an increased length of the base of the following joint. The proper way to disprove my assertions is to produce his specimens for the examination of competent entomologists.

4th. Respecting the physiology of Mr. Newport's paper it is to be observed, that finding two species of larva in the nests of *Anthophora*, both of which produced species of *Chalcididae* (a family hitherto known only as insectivorous parasites), and finding moreover on dissection that both these larvæ possessed the same forms of the digestive organs, Mr. Newport arrived at the conclusion that one was insectivorous, and the other pollinivorous! Driven however from this ground by the direct observation of the parasitism of *Monodontomerus* by Mr. F. Smith (who, notwithstanding Mr. Newport's attempt to deprive him of the credit thereof, was the first who discovered the parasitic larvæ of that insect, and directed Mr. Newport to the spot), Mr. Newport tells us (Gard. Chron. p. 231), that "what he had chiefly dwelt upon in his paper was the circumstance of its being an external feeder, as proved by the hairs on its body, although he had advocated the opinion that it fed on pollen; but as to whether this was the case or not, he considered that it mattered but little with reference to the anatomical facts he had described :" in other words, that it was immaterial whether the insect were carnivorous or pollinivorous, its peculiar anatomy being equally suited for either condition! But even here Mr. Newport has arrived at a wrong conclusion, for the hairs on the outside of the body of the larva are not characteristic of external feeding parasite-larvæ, since those of *Eulophus Nemati*, which feed on the surface of the body of the larva of *Nematus intercus*, are destitute of hairs.

As the paper which I read at the Linnaean Society on the

1st of May last contains all that I have to say on this subject, I shall not reply to any further comments which Mr. Newport may think proper to publish unsupported by the production of the specimens which he professes to have described.

I am, Gentlemen, your very obedient servant,
J. O. WESTWOOD.

VII.—*Descriptions of Aphides.* By FRANCIS WALKER, F.L.S.

[Continued from vol. iii. p. 304.]

66. *Aphis Urticaria*, Kaltenbach.

Aphis Urticaria, Kalt. Mon. Pflan. 57. 39.

This is a clustering species, and feeds on *Urtica dioica*, *U. urens*, *Rubus fruticosus*, *R. Ideaeus*, and on *Stachys sylvatica*?

The viviparous wingless female. It is small, dark green, elliptical or oval, convex, and velvet-like, with a rim on each side: the front is slightly convex: the feelers are black, dull yellow towards the base, and hardly half the length of the body; the first and the second joints are not angular; the fourth is much shorter than the third; the fifth is shorter than the fourth; the sixth is much shorter than the fifth; the seventh is nearly as long as the third, and much more slender than the preceding joints: the mouth is dull yellow; its tip and the eyes are black: the nectaries are pale yellow with black tips, and about one-twelfth of the length of the body: the legs are pale yellow; the knees, the feet, and the tips of the shanks are black. When young it is sometimes pale greenish or yellowish red, with white limbs.

1st var. The body is dark grayish red.

2nd var. Dark green mixed with pale green.

3rd var. Green, with a yellow head.

4th var. Dark yellow.

5th var. Pale yellow.

6th var. Dark green, mottled with pale yellow and with black.

7th var. Very dark green, or almost black: the feelers are rather more than half the length of the body: the nectaries are dull green with black tips, and about one-eighth of the length of the body.

8th var. ? Dull green with a white bloom: the feelers are brownish, pale yellow at the base, and not near half the length of the body: the mouth is dark green: the tip of the abdomen is almost black: the nectaries are very dark green, or almost black, and one-eighth of the length of the body: the legs are pale yellow; the tips of the thighs are darker; the feet and the

tips of the shanks are brown. On *Stachys sylvatica* at the end of April.

The viviparous winged female. Is black : the abdomen is dark green ; the segments have black borders : the feelers are much shorter than the body : the mouth is paler towards the base : the nectaries are hardly more than one-twelfth of the length of the body : the legs are black ; the shanks excepting their tips are yellow : the wings are colourless and very much longer than the body ; the wing-ribs and the rib-veins are pale yellow ; the wing-brands and the veins are pale brown ; the second vein diverges a little more from the first than it does from the third ; the first fork of the latter vein usually begins after one-third, and the second long after two-thirds of the length of the vein ; the fourth vein is moderately curved, and the angle of the vein whence it springs is extremely slight. In the autumn.

1st var. The mouth is dull green with a black tip : the nectaries are about one-sixth of the length of the body : the thighs are yellow towards the base : the wing-ribs are pale green ; the veins are brown. At the end of May.

2nd var. The abdomen is very dark green : the feelers are as long as the body : the mouth is dull yellow, but black towards its tip : the nectaries are hardly one-sixth of the length of the body : the fore-thighs are dark yellow towards the base. In the middle of October.

3rd var. The body is black : the borders and the underside of the fore-chest and the abdomen are dark green : the feelers are as long as the body : the mouth and the nectaries are dull yellow with black tips, and the latter are as long as one-fourth of the body : the thighs are pale yellow at the base : the wing-veins are brown.

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

When it feeds on the bramble it is larger and paler than when it feeds on the nettle, and is much resorted to by *Formica fusca*.

67. *Aphis tetrarhoda*, n. s.

The viviparous wingless female. This species feeds on the rose, and when full-grown is deep green, oval, very convex and plump, and covered beneath with a white bloom ; it is bristly and has six rows of tubercles on the back, and the middle rows are very distinct : the front is hardly notched : the feelers are nearly half the length of the body : the eyes are dark red : the nectaries have brown tips, and are about one-eighth of the length of the body : the legs are dark green, and rather long ; the feet and the tips of the shanks are brown. When young it is pale grass-green, slightly convex, and has a rim on each side, but its tubercles are indistinct : the feelers are about half the length of the body.

1st var. The body is red.

2nd var. The body is lilac.

3rd var. The body is blackish.

The viviparous winged female. Unfolds its wings in the middle of May: it is black and rather stout: the abdomen is dark green with a row of black spots on each side: the feelers are rather thick, and a little shorter than the body: the first and the second joints are slightly angular on the inner side of their tips; the fourth joint is but little more than half the length of the third; the fifth is a little shorter than the fourth; the sixth is about half the length of the fifth; the seventh is as long as the fifth: the tip of the mouth and the nectaries are black, and the latter are as long as one-fourth of the body: the legs are long; the thighs are yellow towards the base: the wings are colourless, and nearly twice the length of the body; the wing-ribs and the rib-veins are pale yellow; the wing-brands and the veins are brown; the second vein diverges much more from the first than it does from the third vein; the forks of the latter usually have their respective sources at one-third and at two-thirds of the length; the fourth vein is much curved near its beginning, but nearly straight in the latter part of its course; the angle whence it springs is slight.

Length of the body $\frac{5}{4}$ line; of the wings $2\frac{1}{2}$ lines.

68. *Aphis Cerasi*, Fabr.

Aphis Cerasi, Fabr. Ent. Syst. iv. 211. 6; Syst. Rhyn. 295. 6; Kalt. Mon. Pflan. i. 45. 31.

Cerasaphis, Amyot, Ann. Soc. Ent. Fr. 2^{me} série, v. 477.

It feeds on the wild and on the cultivated *Cerasus Avius* from April till November, and its large swarms on the shoots of this tree are sometimes injurious to the fruit; it occasionally dwells on the peach, and its colour is then rather paler, especially towards the head.

The viviparous wingless female. The eggs are hatched in April, and the young Aphides are red or reddish brown, but as they grow they acquire a darker colour, and are convex, plump, and shining, and have a brassy tint on the back: the limbs are brown: the feelers are black at the base, and about one-third of the length of the body: the eyes are dark brown: the suckers of the mouth are red, and can be thrust out to some distance: the legs are rather short and thick. When full-grown it is coal-black: the body is exceedingly plump and nearly round; the punctures on each side are very distinct: the feelers are yellow towards the base, and nearly as long as the body: the nectaries are straight, and as long as one-sixth of the body, and have sometimes pale tips: the thighs at the base and the shanks except their tips are

more or less yellow, and the latter are sometimes white. It swarms on the young shoots, which may be easily cut off and removed with all their inhabitants: the leaves which it infests become twisted, curled, and glutinous, and are often shed. It is infested by an *Aphidius* and by an *Allotria*. The front is nearly straight with a very distinct tubercle on each side: the feelers are sometimes about half the length of the body; the fourth joint is more than half the length of the third; the fifth is much shorter than the fourth; the sixth is much shorter than the fifth, though more than half its length; the seventh is about thrice the length of the sixth.

The viviparous winged female. This while a pupa is dark red: the feelers, the feet, and the tips of the four hinder thighs and of the shanks are brown; the feelers at the base and the legs with the above exceptions are yellow. The wings are unfolded in the beginning of June, and the insect is then black and shining: the borders of the fore-chest are dark red: the abdomen is dark brown: the feelers are as long as the body, and the nectaries are equal to one-sixth of its length: the mouth is pale yellow with a brown tip: the thighs towards the base and the shanks are yellow: the wings are colourless, and much longer than the body; the wing-ribs are pale yellow; the wing-brands are pale brown, and the veins are darker; the second vein diverges more from the first than it does from the third; the first fork of the latter begins before or at one-third, and the second fork at or after two-thirds of its length; the fourth vein is much curved near its source, but nearly straight in the latter part of its course; the angle whence it springs is very slight. The wings are milk-white for a while after they have been unfolded, and then the other limbs are also white, and the body is pale reddish brown. The fore-legs are considerably shorter than the hind-legs; the shanks are straight.

Variation in the wing-veins. The lower branch of the second fork is wanting.

The oviparous wingless female. This occurs in the middle of November: it is black, elliptical, and much smaller and narrower than the viviparous female: the feelers are rather more than half the length of the body; the fifth joint is hardly shorter than the fourth; the seventh is nearly twice the length of the sixth: the abdomen is slightly produced at the tip, and has two plates beneath like those of *A. Tiliæ*: the legs are rather short and stout; the hind-shanks are not dilated. The glutinous matter which covers its body when mixed with Canada balsam acquires a delicate green colour.

The winged male. This resembles the winged female, but pairs with the oviparous female in November. The sixth joint of the

feelers is about half the length of the fifth ; the seventh is about thrice the length of the sixth : the rib-vein begins to widen soon after the middle of the length of the wing, and emits the fourth vein near its tip ; the third vein is forked a little before one-third of its length, and forked again just after two-thirds of its length.

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

69. *Aphis trirhoda*, n. s.

This species, which has a very quiet disposition, abounds on the rose in the spring, and having acquired wings in May, it emigrates thence to the columbine, where it feeds equally on the upper surface and on the under surface of the leaf, which often becomes red or purple from its injuries. It continues on that plant till the end of October.

The viviparous wingless female. It is elliptic, slightly convex, not shining, whitish green, covered with a white bloom, and remarkable for the peculiar softness and velvety appearance of its skin : the front is straight : the feelers are white, and about half the length of the body ; the first and the second joints are not angular ; the fourth is less than half the length of the third ; the fifth is shorter than the fourth ; the sixth is much shorter than the fifth ; the seventh equals the fifth in length : the eyes are dark brown : the mouth is white with a brown tip, and hardly reaches the middle hips : the tip of the abdomen and the nectaries are white, and the latter are one-twentieth of the length of the body : the legs also are white.

1st var. Pale yellowish green.

2nd var. ? or a distinct species. The body is elliptical, convex, dull, grass-green, with a very slight white bloom : the feelers are brownish green, and about one-fifth of the length of the body : the eyes are black : the mouth is dull green with a black tip, and does not reach more than half way between the fore and the middle legs : the nectaries do not rise above the surface of the body : the legs are dark brownish green, and rather short.

The viviparous winged female. This unfolds its wings at the end of May : it is pale greenish yellow : the head and the discs of the fore-chest, of the middle-chest and of the middle-breast are black : there is a large black spot on each side of the middle-chest : some short confluent black bands form a large irregular spot on the disc of the abdomen, on each side of which there is a row of black dots : the feelers are black, and a little shorter than the body : the mouth is pale yellow ; its tip and the eyes are black : the nectaries are pale yellow, and one-twentieth of the length of the body ; the third joint is rather stout ; the fourth is very slender, and less than half the length of the third ; the fifth is a little shorter than the fourth, and the sixth than

the fifth ; the seventh is much shorter than the sixth : the legs are also pale yellow ; the feet and the tips of the thighs and of the shanks are black : the wings are colourless, and much longer than the body ; the wing-ribs are pale yellow ; the brands and the veins are brown, and the tips of the latter are slightly clouded ; the second vein diverges much more from the first than it does from the third ; the first fork of the latter begins a little before one-third, and the second a little after two-thirds of its length ; the fourth vein is moderately curved, and the angle whence it springs is very slight. The pupa is pale yellow, and the wings when just unfolded are milk-white as usual.

1st var. The body, the mouth and the nectaries are green : the wing-ribs are pale green ; the brands are pale brown.

2nd var. The head, the discs of the fore-chest, of the middle-chest and of the middle-breast are brown, and so also are the spots on the middle-chest.

3rd var. The body is dark green.

4th var. The abdomen is without black dots.

5th var. The feelers are much shorter than the body.

6th var. Some of the latter joints of the feelers are pale with black tips.

7th var. The nectaries are one-twelfth of the length of the body.

8th var. The head, the discs of the fore-chest, of the breast, of the middle-chest, and a large spot on each side of the latter are brown : there are some short black confluent bands that form a large irregular spot on the disc of the abdomen, on each side of which there is usually a row of very small black dots.

9th var. Dark green : the head, the disc of the chest and that of the breast are black : the mouth, the nectaries, the wing-ribs and the wing-brands are green.

The winged male. It appears in the autumn and is much smaller than the winged female : the third joint of the feelers is rather stout ; the fourth is slender, and less than half the length of the third ; the fifth is a little shorter than the fourth, and the sixth than the fifth ; the seventh is much shorter than the sixth.

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

70. *Aphis Brassicæ*, Linn.

Aphis Brassicæ, Linn. Syst. Nat. ii. 734. 12 ; Faun. Suec. 2205. 985 ; Fabr. Syst. Ins. ii. 388. 36 ; Ent. Syst. iv. 218. 41 ; Syst. Rhyn. 300. 41 ; Gmel. ed. Syst. Nat. i. 2209 ; Harr. Ex. 66. pl. 18. f. 3-6 ; Frisch. Ins. xi. 10. t. 3. f. 15 ; Berk. Syn. i. 120 ; Stew. El. ii. 110 ; Turt. ii. 207 ; Swammerdam, Ins. v. 535 ; Schrank, Faun. Boie. ii. 1. 119. 1228 ; Kalt. Mon. Pflan. i. 106.

81 ; Harris, Ins. New Engl. 190 ; Curtis, Journ. R. Agric. Soc. iii. 54. t. C. f. 5, 6.

A. Raphani, Schrank, Faun. Boic. ii. 1. 119. 1229.

A. Isatidis, Fonseca, Ann. Soc. Ent. x.

A. Floris-Rapæ, Curtis, Journ. R. Agric. Soc. iii. 55. t. C. f. 7, 8.

Cinara Raphani, Sir Oswald Mosley, Gard. Chron. i. 827.

C. Brassicæ, Sir Oswald Mosley, G. C. i. 827.

Crambaphis, Amyot, Ann. Soc. Ent. 2^{me} série, v. 478.

This *Aphis* abounds on the cabbage, *Brassica oleracea*, from the beginning of June to the beginning of November, and is found both in Europe and in North America. The matriarchs of the species dwell on wild plants, and their winged offspring fly to the cabbage, repose there on the underside of the leaf, and are soon surrounded by groups of wingless little ones.

The viviparous wingless female. This when very young is linear, pale green, and slightly powdered with white; the limbs are white: in the middle of June when full-grown it is pale yellowish green, slightly oval, very plump and convex, and most thickly covered with white powder: the front is convex: the feelers are pale yellow with brown tips and much shorter than the body; the first and the second joints are not angular; the fourth is less than half the length of the third; the fifth is a little shorter than the fourth; the sixth is much shorter than the fifth; the seventh is longer than the fourth: the eyes are black: the mouth is pale yellow with a brown tip: the nectaries are yellow, and hardly more than one-twentieth of the length of the body: the legs are pale yellow; the knees, the feet, and the tips of the shanks are black. It is extremely numerous and most abundantly powdered in the beginning of July: the limbs are almost black, and the nectaries are about one-twelfth of the length of the body: its colour when it sheds its skin is soft fresh velvet-like green, but it soon again assumes the dull dusty hue which harmonizes so well with the underside of the cabbage-leaf. The part which it infests becomes discoloured; it often emits a colourless honey-dew, is the prey of *Aphidius (Trionyx) Rapæ*, Curtis, and of an *Allotria*, and is much infested by *Leptus Aphidum*.

1st var. The body is dull olive-green, oval, short, and plump: the feelers are white with black tips, and nearly half the length of the body: the mouth is white; its tip and the eyes are black: the nectaries are black, and as long as one-twelfth of the body: the legs are white and moderately long; the feet and the tips of the shanks are black. In summer on *Spinacia oleracea*.

2nd var. The body is green, yellow towards the head, and covered with a whitish bloom: the feelers are yellow with black tips, and more than half the length of the body: the legs are yellow; the feet are black; the hind-shanks are green.

The viviparous winged female. While a pupa it much resembles the wingless female in colour, but is comparatively flat; when the wings are unfolded it is dark brownish green, and very often slightly covered with white powder: the abdomen is pale green with a very slight pearly tint on its disc; it has also a black line across each segment, and a row of black spots on each side: the feelers are black, and a little shorter than the body; the third joint is long and thick; the fourth is less than half the length of the third; the fifth is a little shorter than the fourth; the sixth is shorter than the fifth; the seventh is about twice the length of the fifth: the eyes are dark brown: the mouth is dull yellow with a brown tip: the nectaries are black, and as long as one-twelfth of the body: the legs are black; the thighs are pale green towards the base: the wings are colourless, and very much longer than the body; the wing-ribs are pale yellow; the wing-brands are very pale brown, and their tips are very slightly clouded; the second vein diverges more from the first than it does from the third vein; the forks of the latter usually begin respectively before one-third and before two-thirds of the length of the vein; the fourth vein is curved moderately and equally throughout its length; the angle of the brand whence it springs is distinct.

1st var. Greenish yellow varied with brown.

2nd var. The feelers are as long as the body.

3rd var. The mouth is green with a black tip: the thighs are wholly black.

4th var. The thighs and the middle shanks excepting the tips are pale yellow.

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

Most of the winged race die during the growth of their progeny, and adhere to the leaf at a short distance from the groups of the wingless insects. This species feeds also on *Brassica Rapa*, *B. campestris*, *B. Napus*, *Sinapis arvensis*, *S. alba*, *S. nigra*, *Crambe maritima* (on this plant, especially in a wild state, it occurs in great profusion), *Raphanus sativus*, *R. Raphanistrum*, *Capsella Bursa*, *Diplotaxis tenuifolia*, *Lepidium sativum*, *Thalictrum minus*, *Spinacia oleracea*.

[To be continued.]

VIII.—On the Animal of *Kellia rubra*.

By JOSHUA ALDER, Esq.

To Richard Taylor, Esq.

DEAR SIR,

Newcastle-upon-Tyne, 18th June 1849.

My remarks on the animal of *Kellia rubra* have unfortunately brought me into a controversy with Mr. Clark, a gentleman with whom it would have given me much greater pleasure to have

found myself in agreement. Our opinions, however, appear to differ more widely than I at first expected.

In my last letter I ventured to lay down, perhaps more broadly than usual, the theory of the branchial currents in the Conchifera as generally received*; and confirmed, as far as my experience goes, by my own observations. This theory of ciliary currents, received and expelled by separate apertures, Mr. Clark entirely denies, and thinks, if I understand him rightly, that no apertures are specially set apart for this purpose, but that the water for branchial purposes flows in and out of all the openings of the mantle indiscriminately;—whether by ciliary action or not, is not stated.

To enter into a review of this process as applied to the whole of the bivalves would greatly extend a discussion already, I am afraid, encroaching too much upon your pages; and as I do not feel that I shall be able to throw any new light upon it from my own observations, I shall waive the general subject for the present and confine myself to the consideration of Mr. Clark's objections to my views on *Kellia rubra*, which he thinks it not difficult to show are wrong. Let us, then, carefully examine the arguments by which this position is to be established.

The first is thus stated:—"It must be borne in mind that the mantle of *Kellia rubra* is open from the posterior branchial slit to its anterior termination. The open fold in question is merely a prolongation of that membrane; and when the animal *opens its valves*†, it must receive, like the *Mactræ* and *Veneres*, or any other bivalve with an open mantle, the currents of sea-water; and *in closing them*, a great part thereof, after bathing the branchiæ, is ejected from the aperture of *ingress*, and only a portion of it passes out of the posterior orifices." This I admit to be the natural effect of the *opening and closing* of the valves, but surely Mr. Clark does not mean to say that the branchial currents are produced by this means? According to my views this is an occasional action entirely independent of the regular branchial currents, and should not be confounded with them, as these latter go on when the valves are entirely at rest, and when consequently no such effect as here described could possibly be produced by them. As to the siphonal fold being merely a prolongation of the mantle, this is the case with the siphons of all the Conchifera; the only difference being, that in the present instance the tube is formed by a fold of the mantle, while in other genera, and in

* See Lamarck, Anim. s. Vert. 2nd ed. vol. vi. p. 7; Grant, Comp. Anat. p. 539; Owen, Lectures on Comp. Anat. vol. i. p. 282.

† These words are here put in italics, though not so in Mr. Clark's letter, to draw particular attention to them. I have taken the liberty of doing the same in other places.

another species of the same genus, the walls are closed; yet their functions are surely analogous. A similar siphonal fold, though less perfect, may be seen in some of the *Modiolæ*: but the case most in point is the siphon of the zoophagous gasteropods, which is a prolongation and fold of the mantle similar to this, yet no one that I am aware of has argued that it cannot be for the supply of water to the branchiae because it is continuously open with the other parts of the cloak*.

Mr. Clark thinks my views incorrect: "As in those bivalves with open mantles the currents of water enter by the great pedal orifice or *rima magna* of the mantle *to aërate the branchiæ*, and the greater part of the impure fluid is expelled by the aperture of *ingress*, a small portion, as before stated, passes out by the posterior siphonal apparatus." Is this any more than a repetition of the former statement, leaving out the *opening and shutting of the valves*, and defining the purpose more distinctly to be, "to aërate the branchiæ"? That it has reference to the same action is evident from the words "as before stated." Mr. Clark must therefore either think that the branchial currents are produced by the opening and shutting of the valves, or he is confounding two things that are distinct. If the pedal orifice is the principal one by which the true branchial currents are received and expelled, of course my observations, and the views of almost every author who has written on the subject must be wrong, but the proof requires to be brought forward in some more definite form than this.

Again, Mr. Clark says, "In the mollusca with nearly closed mantles, only a small portion of the fluid can enter by the restricted pedal orifices; the far greater portion must be inhaled by the posterior siphons" (not necessarily by both), "and is often expelled simultaneously at both orifices, as I have observed in *Pholididea papyracea*, the most closed of all the bivalves." This fact of the occasional simultaneous expulsion of water at both orifices seems to be the only one that Mr. Clark has satisfactorily ascertained from observation in this species; he might perhaps have added that it was accompanied by *a closing of the valves*;—at least such is the case with the allied *Pholades* as I have myself witnessed. But this sudden ejection of water is only occasional, and caused by other means than the regular ciliary currents. It is probable that in the *Pholades* and some other bivalves with

* I am sorry to have misunderstood Mr. Clark with respect to the sense in which he took the words branchial and anal. I did not say, however, that he *used* the words, but that he appeared to *take* them (as used by others) in too restricted a sense. My reason for thinking so was, that he said the posterior opening had "passed for the *anus*," and took some trouble to show that the true *anus* is distinct from it.

long siphons (*Mya*, *Lutraria*, &c.), the branchiæ, being situated at a great distance from the apertures, may require from time to time the assistance of muscular contraction for a thorough cleansing out of the branchial cavity, and in this case the water will be discharged out of both siphons from the stronger force overcoming the action of the cilia*.

Mr. Clark takes some pains to prove that the water does not make a circuit through the intestines, which position, being undisputed and apparently unconnected with the argument, I should not have noticed but for the conclusion drawn from it; which is, "that the water therefore" (on account of not passing through the intestine?) "for the branchiæ and sustentation must pass into the great branchial cavity, and issue therefrom by *both the ducts at which it entered*." How is this? The conclusion appears to be a *non sequitur*: but possibly I may misunderstand the meaning of the paragraph, though I have read it over carefully more than once.

With respect to my statement of having seen, under the microscope, a *continuous* current of water flowing into the anterior tube of *Kellia rubra*, Mr. Clark observes, "All must admit this fact: as the fold is a part of the open mantle, no microscope is here required, as in every open-mantled bivalve of adequate size this action is instantly made apparent by a common lens, and is the invariable result of *the animal opening its valves*." In Mr. Clark's former letter he says, "No currents, at least branchial ones, enter therein or issue therefrom; it is a fold merely subservient to locomotion." The flow of a continuous current into this tube-like fold is now treated as an admitted fact, requiring no microscope for its demonstration;—but it is attributed to the *opening of the valves*. It may be necessary therefore to state that the operation goes on when the valves are perfectly at rest, and cannot in that case be produced by their means. That I could see a current passing out at the posterior aperture is however to Mr. Clark a matter of the "gravest difficulty," only to be got over by supposing that I was deceived by the "aberration and well-known great deceptions involved in the use of high microscopic powers." It will be a satisfactory answer to this to state that I was able to see it with the lowest power of my microscope, where there could be no aberration. The advantage of a microscope over a pocket-lens in this case is the greater facility it affords in managing the light, which requires to be transmitted

* The internal surface of these siphons is usually (perhaps always) covered with vibratile cilia, more minute than those of the branchiæ, but acting in conjunction with them in producing the currents. Mr. Cocks informs me that he can see the cilia inside the anterior tube of *Kellia suborbicularis*, with a lens of $\frac{1}{4}$ -inch focus.

through the fluid to show the floating particles ; for it is the size of these, and not that of the aperture, which enables an observer to distinguish the direction of a current. Mr. Clark could see the excrements pass out of this small opening. What then should prevent our seeing other bodies, if sufficiently visible under the microscope, float in or out ?

For argument, Mr. Clark would assume that the posterior slit, as I state, shows no sign of an ingress-current. Yet no argument is founded upon it, for in the very next sentence the contrary fact is stated to be proved "by the contraction and dilatation of the slit" (my dissent from this *proof* is already on record) ; "especially," that gentleman adds, "as I have shown that the analogous tubes" (the anal ones ?) "of the close-mantled mollusca . . . must of necessity receive and discharge the fluid necessary for the branchial œconomy." Is this shown ? and where ?

We have next an assumed case which is also called a *proof*, put in these words : "Suppose *Kellia rubra*, instead of being an open-mantled animal, is one of the closed mollusca,—where, in this case, is the entrance to the branchial currents ?" All the known closed mollusca have at least two if not three apertures. A closed mollusk with a single aperture, if such did exist, would be an anomaly, and its branchial arrangement might also be expected to be an exception to the general rule. But what argument can be founded upon this ? That where there are two or more apertures, they cannot be set apart for different purposes ? Certainly not ;—any more than we could argue that because some animals exist where the alimentary and excretory functions are performed through the same orifice, that in other animals where two orifices are found they cannot perform different functions.

"It may be asked," says Mr. Clark, "why has nature departed from her usual scheme only in *Kellia rubra* and *K. suborbicularis*?" The only way in which the usual scheme is departed from in this genus, is, not in giving the species a special inhalant siphon, but in placing it before instead of behind : and perhaps for this some reason might be found. Most bivalves live in sand, and they require to have both tubes placed at that end of the shell which usually communicates with the surface. The *Kelliae*, on the contrary, never burrow in sand, but inhabit the sinuosities of rocks, sea-weeds, and old shells : a simpler arrangement, by which the water can be admitted direct to the mouth and anterior part of the gills, is therefore not incompatible with its habits. But it is added, "We will now inquire into the 'eui bono' of this fold of the mantle, considered as a branchial appendage. It is well known that nature never acts by way of surplusage ; and having given *Kellia rubra* an open mantle by which the currents can enter, as in other analogous open bivalves, we must conclude

that she has not departed from her usual scheme, and that this fold is not a special branchial organ, but is intended to fulfill other functions." Is this a legitimate conclusion to arrive at? Mr. Clark here argues as if the departure from the usual scheme in *Kellia rubra* was in having a special branchial orifice; but this is not the point of difference, as I have before stated, and these objections, if they have any weight, must apply equally to the posterior branchial siphons of all the open-mantled bivalves. They all have a pedal aperture through which the currents *can* enter. What then is the use of the so-called branchial siphon? Or why are there three apertures performing the same function? Surely there is something very like superusage here. The "*cui bono*" may well be asked of Mr. Clark's views, but not of mine, as I assign a separate function to each orifice: the branchial one being kept apart from the opening for the foot in order that the currents may not be interrupted by the action of that member.

But Mr. Clark says, the foot does intrude itself occasionally into the folded siphon of *Kellia rubra*; and this is the last and "conclusive proof" by which I am to be put *hors de combat*. "The animal very often thrusts its foot into the fold, and by the withdrawal of which it is opened and the edges separated. How then can a fold, whose form by this action is continually changing, and is subject to *momentary interruption*, be the conduit of regular, delicate, and uninterrupted currents?" I would ask, does not this objection tell more strongly against the true pedal opening of this and other bivalves, which Mr. Clark wishes to make out is the principal one for the entrance and exit of branchial currents? Let any one look at this little animal with its siphonal fold stretched out in front, and frequently expanded almost into a cup-form, as if courting the entrance of the vivifying stream, and then say whether the basal part through which the foot is constantly protruded when in action, or the siphonal fold into which it not unfrequently makes a *momentary incursion*, is most free to supply the currents necessary for respiration and food. Mr. Clark calls these currents "regular, delicate, and uninterrupted." I have said that they are continuous, and pretty regularly sustained, but never contemplated asserting that they were not liable to occasional or accidental interruption.

I shall now briefly advert to the curious use which Mr. Clark has found for the siphonal fold as a prehensile organ, and the no less curious terrestrial habits which he supposes this little bivalve to possess. For both I think that gentleman is greatly indebted to a lively imagination. Probably he will also find, on a more careful examination, that its *habitat* beyond tidal range has been rather overstated. I have never found it but within tide-marks, and cannot conceive how a bivalve mollusk, whose

structure disables it from procuring any food but what is floated into its shell by the agency of water, can possibly live permanently out of that element. It is true that oysters and several other bivalves can endure a sort of torpid existence out of water for some time when the valves are closed to prevent the evaporation of moisture from the gills; but Mr. Clark supposes this little *Kellia* able to walk abroad beyond tide-marks, notwithstanding the desiccation of the branchiae which the opening of the valves might cause.

Should I have succeeded in showing that the impossibility or even improbability of my views being correct has not been established, the following interesting letters from Mr. Cocks, detailing a series of observations kindly undertaken at my request, will go far to prove my original statement, that the anterior siphon in *Kellia rubra* is the ingress channel through which water is supplied to the branchiae and to the mouth. The mode by which it makes its exit has not been so satisfactorily made out, but I have great confidence that my views and observations on this point will also ultimately be confirmed. However that may be, if one fact has been established in the animal oeconomy, something has been gained. Mr. Cocks's observations appear to have been more especially directed to the anterior siphon.

I am, dear Sir, very truly yours,
JOSHUA ALDER.

My DEAR SIR,

Falmouth, June 8, 1849.

I have repeated the experiments on *Kellia rubra* and *K. suborbicularis*, and the results confirm my former statements*. I witnessed the ingress of water, atoms, crustacea, &c., very distinctly into the anterior siphon of both species, and also the expulsion of faeces from the posterior siphon, but have failed *in toto* to prove the current of water posteriorly in either, or the expulsion of water from the anterior siphon of *K. rubra*, although in *K. suborbicularis* it takes place: viz. a *K. suborbicularis* that had been confined several months in one of my experimental bottles, was put into a watch-glass of fresh salt water. It sent forth the anterior siphon: the orifice expanded, and the water, atoms, &c. flowed freely into it for a few seconds: it then closed the aperture, contracted in length, and with a slight convulsive jerk of the animal and a partial closing of the valves, sent forth a jet of water, apparently free from any admixture, through the anterior tube. The operation was performed twice or thrice in a minute†.

* Mr. Cocks's first letter is not inserted, as the contents of it are sufficiently illustrated in the sequel.

† This action, according to Mr. Cocks's description, appears to take place more decidedly and frequently when the animal is removed from impure

May 31st.—I procured from Gwylllyn Vase several fine and healthy specimens of *K. rubra* and *K. suborbicularis*. The *K. rubra* protruded its siphons, and the ingress of water, &c. was very apparent, as also the ejection of faeces per posterior siphon, within a few minutes after immersion.—*K. suborbicularis*: ingress of water per anterior siphon and egress of faeces per posterior siphon:—at intervals a slight spasmodic twitch of valves, but unable to detect a discharge of water per anterior siphon. [Here follows a register of observations daily made from the 1st to the 8th of June with the same result, excepting that on the 7th, when the water was changed, *K. suborbicularis* showed “a discharge of water per anterior siphon.”] 8th. *K. suborbicularis*: this action “subdued—flow of water per (into) anterior siphon regular.”] From the 4th to the noon of the 7th they were allowed to remain in the glass without changing the water: in the evening of that day I put them into fresh water. The *K. rubra* absorbed the water and its contents freely and ejected faeces; and although I employed powerful glasses, was unable to detect any (egress) current either anteriorly or posteriorly. Not so with *K. suborbicularis*. It imbibed water freely and ejected faeces sparingly; as well as passing a stream from the anterior siphon. I believe that the operation of ejecting water anteriorly by *K. suborbicularis* (with all my tact I have not been able to detect a current from the anterior siphon of *K. rubra*) is performed by the animal in health with little muscular effort; but when in confinement, poorly supplied with food, and that not to its taste, it becomes atrophized and feeble, consequently every effort of the will is demonstrable.

The *Lichina pygmaea* is very common with us on the rocks, and is covered twice a day by the tide to the height of several feet. It forms a good retreat for *K. rubra* and *Turtonia minuta*. The *Lichina confinis* is also plentiful on our rocks, but is generally out of the reach of the waves, although it sips the spray often. I have gathered a great deal of *L. confinis*, but never found a univalve or bivalve shell attached to it or near it. The *Kellia rubra* with us is found in situations within tide-marks, covered twice a day with the sea.

I am, dear Sir, yours very truly,

J. Alder, Esq.

W. P. Cocks.

My DEAR SIR,

Falmouth, June 16, 1849.

The *Kellia rubra* and *K. suborbicularis* imbibe water freely; and constantly by their anterior siphons. We have had with us

into fresh sea-water, and is probably a means of cleansing the branchial cavity from the effete water and bathing those organs more completely in the purer element.—J. A.

for the last three weeks Dr. Busch of Berlin, who is making a scientific tour of Great Britain, with a view of pursuing anatomical researches among our marine animals. He left for Dublin last night. His microscope was a magnificent machine. I availed myself of its powers, and placed the bivalves under its magic influence. The sight was delightful. I could see the ingress of water into the anterior siphon of *K. suborbicularis* and *K. rubra*, the ejection of fees from both distinctly. The alternate spasmodic action and forcing of water through the anterior tube of *K. suborbicularis* free of any admixture was distinctly seen. The power employed was very great. The animal, one that *had been in confinement for some time*. This creature was removed from the field and a *K. rubra* substituted; the same power being employed. The anterior siphon was in constant motion; and the water, crustacea, and minute atoms floating on its surface were distinctly seen to enter it: no regurgitation took place anteriorly. I kept my eye to the instrument watching the creature's movement until my retina was nearly paralysed, without detecting the "placid stream." I have daily during the last six weeks examined a score of *K. rubra*, both recent specimens and old prisoners, with lenses of different powers,—employed various contrivances with compound mirrors, lenses, &c., *without detecting the current of water passing out of its anterior siphon.*

Believe me, my dear Sir, yours very truly,
J. Alder, Esq. *W. P. Cocks.*

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 13, 1848.—Harpur Gamble, Esq., M.D., in the Chair.

3. DESCRIPTION OF NEW SPECIES OF THE GENUS CYPRÆA. BY J. S. GASKOIN, ESQ.

- CYPRÆA THERSITES** (High-backed Cowrie). *Cyp. testa ovata, gibbosæ, dorso elevato, basi latâ planâque, saturatè rufescente-fusca; anticè posticèque depresso-undulata, aperturâ angustata, posticè recurvâ; dentibus albis, distinctis, labii externi validis, columellari minùs prominentibus; sulco columellari anticè profundo, lato; extremitatibus valde productis, canali antico pleno.*

Shell ovate, very gibbous and high-backed, of a very dark, reddish-brown colour, not uniformly equal in intensity; a curved whitish mark exists over both the anterior and the posterior extremities, at which places there is a depression, as though the mantle had not deposited any substance there after it had begun to secrete the colouring-matter, particularly that at the last whorl of the spire;

aperture narrow, much curved at the posterior third of its length, the other two-thirds nearly straight; teeth white, distinct, even, about twenty-seven on the outer side, extending but slightly over the lip; on the columellar side about twenty-four, broader at the anterior end, while along the continued edge of the aperture to its posterior extremity are mere indications of teeth; columellar sulcus deep and broad, not extending beyond the more prominent teeth; base broad and flat, its entire circumference of an uniform dark, reddish-brown colour, or spots of a similar colour, the colour lessening in intensity towards the middle portion of the base, which is white, as is also the interior of the shell; margins project, especially that of the lip: extremities produced, the posterior forming sharp or thin edges, and extending much upwards; that on the columellar side terminating at the apex of the spire; the anterior extremities also thin, and the channel upright.

I have seen this shell only in the adult state. It has no general characteristic in common with any known species; the extremities however have much similitude to *Cypraea Scottii*; but it is a much shorter, more gibbous, heavier and thicker shell.

Long, $2\frac{7}{10}$ inches; high, $1\frac{5}{10}$; wide, 2.

Hab. —?

Cabinets of British Museum, Saul, Cuming, &c.

2. *CYPRÆA MARGINATA* (Broad-margined Cowrie). *Cyp. testud ovata, anticè subacuminata, posticè et medianè valde gibbosæ; colore floris lactis, maculis fulvis, paucis irregulariter sparsis; basi valde plana et latâ; marginibus externis medianè fulvo-brunneo punctatis, punctis discretis; aperturâ latâ, subspirali; columellâ posticè gibbosâ, sulco parvo antico; dentibus lateris columellaris circa viginti, latè distinctis; lateris externi æqualibus paululum extensis, anticè minoribus, circa viginti-novem; extremitatibus, posticâ productâ, planâ, canalem latam sursum formante, anticâ minùs productâ, convergente, canalem brevem sursum formante; spirâ valde conspicuâ; marginibus planis, tenuibus, valde extensis.*

Shell ovate, anterior end rather pointed, the posterior and middle very gibbous; of a cream-colour, a few fulvous spots are irregularly scattered over the entire back and sides of the shell, apparently the commencement of the deposition of colouring-matter; base flat and very broad, on the outer edges are discrete fulvous brown spots, the rest of the base, the teeth, and the interior of the shell are of a clear cream-colour; aperture wide, spiral; columella gibbous posteriorly, a slight sulcus at the anterior end; teeth form, on the columellar side, a single angular serrated edge, about twenty in number, wide apart and not very prominent; on the other side they are more regular and even, extending, slightly prominent, half across the lip; they are smaller and more perfect towards the anterior extremity, and about twenty-nine in number; the extremities are produced, flat, form a broad channel, passing upwards at the posterior end of the shell, and terminate at the outer side of the apex of the spire; the anterior extremities are much less produced, and converge, forming a

short channel running upwards; spire very prominent; margins flat and thin, extending much outwards; the angle formed by the attachment of the outer margin to the shell is of a light brown colour, from which anteriorly radiate lines of the same colour over the upper surface of the margin.

Differs from *Cyp. Scottii* in its short and gibbous form, in the remarkable flat and broad cream-coloured base, in the very extended, flat and thin margins: the posterior channel has much the form of that of *Scottii*, but terminates at the apex, and not, as in *Scottii*, at the base of the spire.

Length, $2\frac{2}{10}\frac{5}{10}$ inches; altitude, $1\frac{2}{10}\frac{0}{10}$; breadth, $1\frac{5}{10}\frac{0}{10}$.

Hab. —?

The only specimen I have seen of this peculiar shell is in the British Museum, and may not be an adult.

3. **CYPRÆA BICOLOR** (Two-coloured Cowrie). *Cyp. testa pyriformi, colore floris laetis; fasciis latis, interruptis, brunneis, centrali latiori; basi latiuscula, rotundata; apertura subspiralis, latiuscula; dentibus numerosis, prominentiusculis, columellaribus crassis, supra sulcum columellarem extensis; margine externo crasso, punctato, punctis brunneis discretis; extremitatibus brevibus, obtusis; canali antico pallide rufescente-flavo.*

Shell pyriform, when young more ovate, smooth and shining; of a light cream-colour, having three broad, irregularly interrupted bands of a brown or fawn colour, extending entirely across the shell, the middle one being the broadest, the posterior the next so; base broad, rather convex, pale cream-colour; aperture subspiral, rather wide; teeth numerous, rather prominent, on the lip about thirty curving round its edge, and extending about one-third over the lip; on the columellar side teeth about seventeen, extending from the edge of the aperture over the columellar groove to end on its inner ridge, diminishing on that ridge in prominence towards the posterior extremity, where the denticulation is scarcely observable; the columellar groove of equal width the whole length; margin, external very thick and prominent (not crenulated), somewhat angular at its outer edge, along which are many small brown distinct spots; similarly coloured spots, but a little larger, are also on the columellar side, where a slight margin exists, and which becomes prominent only to form the anterior extremity; extremities short, obtuse; the anterior channel has a very faint orange tinge.

Long, $\frac{9}{10}\frac{0}{10}$ ths of an inch; high, $\frac{5}{10}\frac{5}{10}$ ths; wide, $\frac{5}{10}\frac{5}{10}$ ths.

Hab. Australia, New Holland.

Cabinets of Metcalfe, Saul, Gaskoin.

Differs from the *Cyp. piperita* of Gray in not being cylindrical, but of a pyriform shape; in being very gibbous, and a much heavier and thicker shell; in having only three bands, which are very broad and conspicuous; *Cyp. piperita* having four, which are generally narrow and obscurely visible in the adult shell, and on the later-formed part of the shell uninterrupted.

4. **CYPRÆA GRACILIS** (Slender Cowrie). *Cyp. testa oblongo-ovata, anticè gradatim acuminata, pallide flavescente-brunne, maculis dorsalibus irregularibus pallidè brunneis, lateribus basalibus brunneo punctatis, punctis paucis distinctis; basi pallescente; latere postico columellari subgibboso; apertura latiuscula, subspirali; dentibus labii externi prominentibus æqualibus, circa octodecim, labii columellaris æqualibus, anticis paululum majoribus, pariter circa octodecim; sulco columellari antico depresso, postico inconspicuo depresso; extremitatibus canalibus latisque prominentibus; spiræ conspicuæ, profundè umbilicata.*

Shell oblongo-ovate, gradually tapering towards the anterior end, smooth and shining, of a light fawn-colour, with very light brown irregular markings about the back, and a few distinct dark brown dots on the edges of the base of the shell on both sides, bands indistinct; inside of shell milk-white; base somewhat lighter in colour than the back; posterior half of the columellar side rather gibbous, outer side of base somewhat depressed in the centre portion; aperture subspiral, rather wide; teeth of the lip prominent and even, extending in no degree on to the lip (only denticulating its edge), about eighteen in number, and about as many also on the columellar side, which are larger anteriorly, even, terminating externally in a line at the edge of, or rather just within the aperture, and internally, proceeding straight across the columellar groove to terminate at its inner edge the anterior half of the shell, and on the columella in points, the posterior half, there being mere small projections indicating the continuance of the inner edge of the columellar groove, which extends the whole length of the columella, diminishing in depth in the middle of the shell, and deepening at the posterior end to form a part of the channel; margins slightly prominent, thick on the outer side only, not crenulated; extremities of a light brown colour externally, much produced and thick; both the anterior are marginated and flattened externally; channels wide and protrude beyond the body of the shell; spire visible, deeply umbilicated.

Long, $\frac{86}{100}$ ths of an inch; wide, $\frac{50}{100}$ ths; high, $\frac{40}{100}$ ths.

Hab. —?

The only specimen I have seen of this elegant shell is in my collection, and was brought to this country by Sir E. Belcher in the ' Samarang.'

The only species with which this shell has any affinity is the *Cyp. Sauli* of Gaskoin; and differs from it in the teeth being finer, and in being rather within the aperture, in having a columellar groove, in the absence of colour between the teeth, in being more ventricose, the wanting the characteristic dark blotch on the dorsum of *Sauli*, and difference of general coloration.

I have thought it proper to add to this description the following note:—

" My dear Sir,—I have carefully examined the little Cypræa which you left with me yesterday, and which you proposed to name *Cyp. gracilis*. It appears to me to be in perfect condition, and to

possess several characters by which it is most easily distinguished from all other described species with which I am acquainted.

"In its teeth, which are not elongated over the columellar side, in the internal columellar groove, in its apical umbilicus, and in the much-produced posterior extremities, as well as in other characters, it differs essentially from *Cyp. Walkeri* of Gray; and it has not the slightest appearance of malformation or monstrosity of form. I am therefore of opinion it is a perfectly distinct species, and ought to be described as such.

"Yours, &c.,

"G. B. SOWERBY."

"30th March, 1848."

"To J. S. Gaskoin, Esq."

5. *CYPRÆA OBSCURA* (Dusky Cowrie). *Cyp. testá ovatá, albicante, maculis duabus dorsalibus nigricantibus inconspicuis; costellis rudibus, prominentibus, ad dorsum concoloribus, ad margines et ad basin albis; dentibus labii externi circa viginti, labii interni distantibus circa duodecim; sulco columellari lato, margine interno dentibus serrato; extremitatibus albis, crassis, productiusculis.*

Shell ovate, of a dingy white colour, having two remarkable small, blackish, undefined spots or markings on the dorsum, one a little less than a third the length of the shell from each extremity; ribs coarse and prominent, on the back of the same colour as the shell, but on the margins and base of a pure white; they traverse the shell from one side of the aperture to the other, having a slight curving at the centre of the dorsum; on the outer side several terminate on the side of the shell, fewer terminate on the columellar side, where some float; base white, rather round; aperture straightish, curved at the posterior end, rather narrow; teeth even, formed by the costæ, about twenty on the lip and about twelve on the columellar side, where they are distant and extend over a broad columellar groove to serrate its inner ridge; margin on the outer side thick and white, none on the columellar side; extremities white, thick, and somewhat produced. No dorsal impression.

Length, $\frac{3}{10} \text{ ths}$ of an inch; altitude, $\frac{2}{10} \text{ ths}$; breadth, $\frac{2}{10} \text{ ths}$.

Hab. North-west Australia; Dupuch's Island (under stones, low water), collected by J. E. Dring, Esq., R.N. Abrolhos Island (under coral), by ditto.

Cabinets of Gaskoin, Saul, &c.

This shell is perhaps nearest in form to *Cypraea puler*, Gray, but cannot be confounded with any known species. I have had for several years specimens of this shell, and the locality given me with them was Senegal; but as Mr. Dring has lately brought others to this country, I have thought it right to give so authenticated a habitat as we have received from him.

This manuscript description having been written for a few years, I send it for insertion in the 'Proceedings,' although Kiener appears to have described it in his work, 'Spécies Général,' &c., under the name of *Cyp. Napolina*, a name ascribed to Duclos; but Kiener does not say by what authority, yet I conclude that that appellation should stand. Kiener's figures, pl. 53, figs. 3 and 3, are no repre-

sentations of his description. I was not aware until lately that this shell had already been described, but my English characters of the species may not be unacceptable, as they are more minute.

6. **CYPREA SULCATA** (Grooved Cowry). *Cyp. testa ovato-globosa, ventricosa, alba; basi rotundata, apertura latiuscula, postice incurva, canalibus profundis et latis; dentibus aequalibus, labii externi circa triginta, lateris columellaris viginti, supra columellanam continuis marginem internam serratam formantibus; costellis prominentibus plerumque ad impressionem dorsalem terminantibus, pseudo-costellis ad utramque extremitatem circa decem; sulco columellari lato, profundo, margine externo prominente, acuto; extremitatibus obtusis, crassis; spirâ conspicua; impressione dorsali conspicua.*

Shell globoso-ovate, ventricose; entirely of a clear white colour; base convex, aperture rather wide, curved inwards at the posterior end, channels deep and broad; teeth numerous and even, about thirty on the lip and twenty on the columellar side, which traverse the columellar groove to terminate at an inner serrated edge; the ribs are continuations of the teeth, are prominent, and almost all terminate at the dorsal impression, a few only on the sides of the shell; false ribs at each end about ten, interstices between the ribs minutely striated longitudinally; columellar sulcus broad and deep, the outer edge, sharp and prominent, occupies the anterior third of the length of the columella, the other portion of the inner part of the columella flat (not grooved); extremities obtuse, thick, those of the lip longer than the body of the shell, the posterior one in a marked degree, which, passing round to form the channel, ends somewhat abruptly in a prominent sharp edge on the columella, which sharp edge constitutes the inner extremity; spire perceptible, the false ribs pass over it; dorsal impression well-pronounced, extends the length of the back to the false ribs at each end; margins none.

It is nearest in general form to *Cyp. formosa* of Gaskoin, but differs from it in having a dorsal impression, much coarser ribs, in the sharp outer edge of the columellar sulcus, the peculiar position and form of the inner and projection of the outer posterior extremities, in its pure white colour, &c.

Hab. Manilla.

Length, $\frac{4}{10}$ ths of an inch; width, $\frac{3}{10}$ ths; height, $\frac{3}{10}$ ths.

Cabinets of Gaskoin, Cuming.

7. **CYPREA VITREA** (Glass-like Cowry). *Cyp. testa ovato-globosa, albâ, nitida, semivitræ; basi rotundata, apertura angustiori paululum incurva, marginibus crassis; dentibus aequalibus, numerosis, prominentibus, labii externi circa triginta, columellaris viginti supra sulcum columellarem continuis; sulco columellari lato, longitudinem aperturæ aequante, margine interno subrecto, serrato; costis magnis, aequalibus, prominentibus, cum dentibus continuis ad dorsum terminantibus; linea dorsali impressa; extremitatibus obtusis, crassis brevibus; margine externo crasso; spirâ inconspicua.*

Shell ovato-globose, almost round, of an uniform, semivitreous, shining, white appearance; base convex, aperture rather narrow, slightly curved inwards its whole length, edges thick; teeth even, rather thick, prominent, about thirty on the lip and twenty on the columellar side, where they traverse the columellar groove and serrate its nearly straight inner edge; the groove is broad and very shallow, and nearly equal in width and depth the whole length of the aperture; the teeth continue to form the ribs, which are large, even and prominent, and terminate at the dorsal impression, with the exception of two or three on each side; the false ribs all form denticulations; dorsal line impressed, extending from the apices formed by the joining of the false ribs; extremities obtuse, thick and short; margin very thick, none on the inner side; spire not perceptible in the adult shell, being thickly covered by the false ribs.

Hab. Philippines.

Length, $\frac{2}{10} \frac{5}{10}$ ths of an inch; width, $\frac{2}{10} \frac{1}{10}$ ths; height, $\frac{2}{10} \frac{0}{10}$ ths.

Differs from *Cypræa globosa* of Gray in the anterior extremities being of an equal length, aperture much narrower and less curved, base rounder, its semivitreous shining appearance, &c.

Cabinet of Gaskoin.

8. **CYPREA GRANDO** (Hail-stone Cowry). *Cyp. testd ovato-globosd, nitidd, nived; basi rotundatd, sine varice; aperturd latiusculd anticè latiori, subspirali; sulco columellari longitudinem columellæ æquante, lato et profundo; dentibus minimis, æqualibus, labii circa quadraginta-octo, columellæ circa triginta-quatuor; costellis tenuibus et æqualibus, e dentibus continuis; interstitiis longitudinaliter tenuiterque crenulatis; lined dorsali impressa; extremitate posticâ valdè productâ; spirâ prominente et flavescente.*

Shell ovato-globose, shining, of a clear snow-white colour; base round, being a continued convexity with the body of the shell, there being no margin on either side; aperture widest at its anterior half, rather wide generally; the columellar side spiral, edge of the lip but very slightly so; columellar groove extends the entire length of the columella, and is continuous at both ends with the channels; it is broad and deep, particularly at the anterior half; its outer and inner edges spiral, the outer edge angular and somewhat projecting; teeth very minute, numerous and even, about forty-eight on the lip, and about thirty-four on the columellar side, which traverse the columellar groove to notch its inner edge; the ribs delicate and even, and are continuations from the teeth; many terminate on the sides of the shell (the teeth being so numerous, the outer portion could not contain their prolongation), the rest end mostly in fine points at the dorsal impression, alternately from either side; a few are united with those of the opposite side; interstices between the ribs finely crenulated longitudinally; dorsal line impressed; extremities, the anterior very slightly, the posterior much produced; spire prominent and tinged with a light yellow colour; margins none.

This shell differs from the *Cypræa vitrea*, just described, in the minuteness and number of the teeth and delicacy of the ribs; in the

unequal width of the aperture, and the spiral form of its inner side; in the broad, deep and unequally wide columellar groove, prominent apex, absence of margin, &c.

Length, $\frac{2}{10}$ ths of an inch; width, $\frac{2}{10}$ ths; height, $\frac{1}{10}$ ths.

Hab. Manilla.

Cabinet of Gaskoin.

9. *CYPRÆÆ FLAVEOLÆ, varietas labro-lineata.* *Cyprææ flaveolæ varietas, lineis brunneis e dentibus labii externi supra basin continuis.*

Shell same form and size as *Cyp. flaveola*: differs from it in being much paler in colour, and the white dottings are therefore less conspicuous; in the teeth being smaller and more numerous, and in there being elevated lines of a brown colour on the lip, continued from each tooth, and at the anterior end projecting beyond the margin; in the anterior teeth of the columellar side being bifurcated, and in the dark brown dottings of the margins being more numerous, and extending a little on to the base.

Cabinets of Cuming, Saul.

Hab. —?

10. *CYPRÆÆ QUADRIMACULATÆ, Gray—varietas pallidula* (Palish Cowry). *Cyp. sine maculis nigris; dentibus lateris columellari majoribus, prominentioribus et paucioribus; labii minoribus et numerosioribus; basi nitente.*

This shell possesses characters, especially in colouring and general form, much in common with the former shell, but is destitute of the large black spots on the outsides of the extremities and on the spire; there is in some individuals a thin dark line across the outer surface of the anterior channel; the teeth on the columellar side are larger, more prominent, more even, and fewer in number; while those on the lip are smaller and more numerous; it never attains the size of *quadrимaculata*, the teeth and base of which are always dull, while those of the variety are always polished (shining).

11. *CYPRÆA PULLA*.—The small “*Trivia*” I described under that appellation (Proc. Zool. Soc., March 10, 1846), I am enabled now to state the *habitat* of;—the Galapagos Islands, and the Bay of Guayaquil; Cuming. When I named this shell “*pulla*,” I was not aware it was a synonym of *Cypræa adusta* of Chemnitz and Lamarck, by Gmelin,—*Cyp. onyx* of Gray; but as Chemnitz’s name “*adusta*” was the prior, and therefore the proper one, I do not consider it necessary to alter mine.

12. *CYPRÆA PULICARIA*.—Reeve, in his description of this shell (Proc. Zool. Soc., March 10, 1846), remarks, that it differs from *Cyp. piperita* of Gray in *not being banded*; but most of the specimens that I have seen have four distinct, narrow, interrupted, light brown bands, nearly equidistant. Nine individuals, of thirteen in my collection, have these four very conspicuous bands; that described by Reeve was one of the remaining four shells whose bands are covered. I will take the liberty to add to the distinctions from *Cyp. piperita*, the broad and projecting sulcus at the anterior portion of the co-

lumellar groove ; and the convergence of the anterior extremities, rendering the channel so much narrower than in *piperita*.

13. *CYPRÆA NIVEA*.—The shell described under that appellation by Gray, the original type of which, pierced with its two holes, is now before me, is a white variety of *Cypræa turdus* :—vide Gray's Monograph (Zool. Jour. i. 511). The figures, however, of *Cypræa nivea* of Gray, in Sowerby's Conch. Illus. and in Reeve's Conch. Iconica, are representations of the *Cypræa oryza* of Gray (Zool. Jour. iii. 369) ; this same error seems to pervade in the arrangement of most of the collections I have seen. The *Cypræa nivea* figured in Wood's Supplement to the Index Testaceol. is a young *Cyp. Humphreysii* of Gray.

14. *CYPRÆA PRODUCTA*.—I am able at length to refer conchologists to other specimens of this species than that described by me December 22, 1836, in these 'Proceedings,' which have been brought to this country by Capt. Sir Edward Belcher, and collected during the voyage of H.M.S. the Samarang. They are distributed into the cabinets of Miss Saul, Messrs. Cuming, Gaskoin, &c. The original shell, the type of this species, is well-represented in Sowerby's Conchological Illustrations, fig. 155 ; in Reeve's Conchologia Iconica, pl. 24, fig. 137 ; and in Kiener's Spécies Général, et Iconographie des Coquilles vivantes, fol. 53, figs. 5 and 5 :—this last is copied from Sowerby.

June 27.—William Yarrell, Esq., V.P., in the Chair.

1. ON THE HABITS OF CYCLURA LOPHOMA, AN IGUANIFORM LIZARD.
By P. H. GOSSE.

The subject of the present paper seems to be as yet unknown to science ; it may be thus described :—

CYCLURA LOPHOMA, mihi—(*λόφος*, a crest, and *ωμός*, the shoulder). Shields on the muzzle separated by small scales ; muzzle with four many-sided, convex, unkeeled plates on each side, the anterior and posterior very large, the intervening two smaller, short, but wide. General head-shields irregular in size, a largish one near the middle of the head ; lower jaw with one (posteriorly two) series of large, rhomboidal, keeled plates, with none between them and the labial plates. Dorsal crest high, continuous over the shoulders, interrupted over the loins.

Length about 3 feet, of which the tail measures 21 inches. Colour (in a dried state) greenish-grey, with obscure blackish spots, confluent, so as to form a rude reticulation.

This very distinct species may be at once recognised by the number, form and arrangement of the plates of the muzzle, and particularly by the serrated crest not being interrupted over the shoulders. I have never met with it alive in Jamaica ; the specimen from which the above description is taken, now in the British Museum, was one of many zoological treasures presented to me by my kind and valued friend, Richard Hill, Esq., of Spanish-town. It is to the same gentleman that I am indebted for the whole information, concerning the

economy of this Saurian, which I now submit to the Zoological Society.

The following memoir from the pen of my friend was communicated to me in the beginning of the year 1846; the animal, though spoken of by the name *Iguana*, is the identical specimen above described, and which Mr. Hill had noticed to differ from *I. tuberculata* by its lacking the dentelations on the gular pouch.

"Our Iguana is considered to be entirely herbivorous. It is found only in particular parts of the island. The low limestone chain of hills, along the shore from Kingston Harbour and Goat Island, on to its continuation in Vere, is its ordinary haunt; and it is not unfrequently taken in the plains between those sea-coast hills and the more inland mountains, being found in hollow trees in the pastures, where they congregate, several of them together.

"The labourers in clearing and burning off some of the savannas between Spanish-town and Passage-fort the other day (March 1844), surprised in a hollow bastard-cedar tree (*Guazuma ulmifolia*) some five Iguanas of the largest size. The one I sketched measured forty-five inches long, and it was said not to have been the largest. It was extremely fat and muscular. A russet-green, here and there graduating into slaty-blue, is the general colour of the body and limbs; some oblique lines of dark olive-green are traceable on the shoulders, and three broad dark triangular patches descend from the dentelations of the back down to the belly, with zigzag spots of dark olive-brown dispersed about. At very regular intervals, the tail is alternately of a lighter and darker olive-green. A bluish-green colour, more decided than on the body, prevails in the dentelations of the back, and on the legs.

"Succulent herbs, growing in the forests of the limestone hills I have referred to, supply food for the Iguana. These hills, however, are so little suited for this sort of vegetation, that hardly anything more than aromatic and resinous trees and balsamic plants grow there. The lignum-vitæ (*Guaiacum*), the *Acacia nilotica*, and cactoid plants,—particularly the torch and melon thistles (*Cactus repandus* et *peruvianus*, et *Cactus melocactus*),—the *lantana*, and the *varronia*, with many balmy mallows (*Sida althæifolia*, *urens*, *capillaris*, et *viscosa*), and the vervain (*Stachytarpheta*), seem to comprise almost the whole catalogue of trees, shrubs and herbs. These hills are, however, inhabited by several domestic animals, which have run wild. Goats and hogs, derived from the common domestic breeds, have become feral; and even the common domestic poultry, cocks and hens, have taken to the woods as jungle-fowl, with the pintado. Quails and doves find here a safe breeding-place. These hills are also the special resort of the musteline thrush, the wood-thrush of the North Americans, which more than divides with the mockingbird the credit of a songster. It has a louder and more brilliant note, though its song be greatly less varied and melodious. The fruit of the torch-thistle seems the great attraction of the wood-thrush, but it is not easy to perceive the resource of the granivorous birds. The aromatic herbs suit the wild goats; but the hogs can

find but few edible roots among rocks, but very thinly interspersed with soil. In the occasional hollows a little mould has been collected from decayed leaves, mingled with marl, extremely stony and sterile; and here a little more succulent herbage may prevail, and a few of the edible roots of the country may be found growing. The rocks have numerous caverns, and the springs that break out at the foot of the cliffs are an impure brackish water, though extremely transparent. Yet this district is almost exclusively the haunt of the Iguana. The occasional ones taken in the savannas are considered to be stray visitants from the neighbouring hills; they are not permanently established in the plains in which they are found.

"I have noticed the particular kind of locality which the Iguana inhabits in this part of the country, because it presents very different features from the haunts usually assigned to this lizard elsewhere. Forests on the banks of rivers, and woods around springs, where it passes its time in the trees and in the water, living on fruits, grains and leaves, are said to be the places in which the hunters find it on the American continent"

After referring to some notes of Sir R. Schomburgk made in Guiana, and to Goldsmith's graphic picture of noosing the Iguana, probably derived from Labat, which I do not here quote, because they refer to an animal *generically* distinct from ours,—my friend reverts to his own observations:—

"The gular pouch which hangs like the dewlap of a bull beneath its throat can be inflated*, but it is not exactly known under what circumstances, ordinarily, it has recourse to this power of inflation. When filled with air it would give breadth and buoyancy to the body, and if its habits are as aquatic as some accounts make them [those of *Iguana* proper] to be, it would afford to an herbivorous animal no unimportant aid while swimming and cropping 'its flowery food.' When excited it assumes a menacing attitude, and directs its eye to the object of attack with a peculiarly sinister look. At this time it inflates the throat, erects the crest and dentelations on the back, and opens the mouth, showing the line of those peculiarly-set white teeth, with serrated edges, so excellently made to illustrate the remains of the gigantic fossil *Iguanodon*. The principle of their construction is so precisely similar, as to leave no doubt of the genuine connexion of the extinct with the existing herbivorous lizard. The adaptation of both is for the cropping and cutting of vegetable food."

"In defending itself from attack, the Iguana converts its long flexible tail into no unimportant weapon. The dentelated upper edge, drawn rapidly over the body and limbs of an enemy, cuts like a saw. The twisted attitude which it assumes when approached is converted into a quick turn, in which movement the tail is nimbly struck by an overblow from one side to another, and then jerked

* I believe my friend has fallen into a common error here. If I may judge from analogy in the genera *Anolis* and *Dactyloa*, the gular pouch in the *Iguanidæ* is extensible but not *inflatable*, as I hope to show in a future paper on the habits of these genera.—P.H.G.

round. I have observed the same application of the tail to purposes of defence in the crocodile, and there can be little doubt that the dentelated crest upon this part of the body of lizards is for the infliction of serrated wounds. The lacerations which dogs suffer in attacking the Iguana are remarkably severe.

"There can be no doubt that the Iguana voluntarily takes to the water; but whether it delights to refresh itself in that element, as we should be led to suppose by the observation that it sports in it, I cannot learn from any of our people here. The one kept in the Zoological Gardens in the Regent's Park was seen to enter and cross a small pond, the fore-feet being motionless during the animal's progress through the water. It is curious, however, that whilst the dry, sterile hills near us abound with Iguanas, the banks of the Rio Cobre, a river so near its haunts, are scarcely ever visited by them."

After my arrival in England, the above notes coming under review, in my study of the Saurians I had brought home, I was induced to make further inquiry of Mr. Hill, whether in describing the inflation of the pouch, and the defensive action of the tail, he spoke from his own observation. From his reply I extract the following remarks:—

".....The purposes of defence, to which I represented it as applying its long tail with its armature of pointed and triple-edged scuta, were suggested to me by the negroes, who were present when I was examining the specimen I mentioned as forty-five inches in length. They warned me to stand out of the reach of its tail, for they saw it was going to turn itself rapidly round to strike. I observed a peculiar sinister look it had, derived not from the eye being turned within the socket, so as to indicate the object it was regarding, but from the peculiar turn of the head, as if listening and observing. The negroes remarked that in the position in which its tail then lay, it was preparing to strike at me, and that dogs generally in setting upon them received desperate punishment, from the gashes and lacerations that were made into the thick muscles of the legs by the rapid flinging round of the Iguana in defending itself. The sudden jerk with which it drew back its tail was said to enable it to rasp the very flesh off the bone. The notion expressed about the inflation of the gular pouch was the consequence of seeing two very large Iguanas from Cuba, which distended this appendage, and let it collapse again. The skin of these animals hung about them, as if they had been fat, and were, at the time I saw them, emaciated

"An acquaintance has promised to supply me with notes of a pair of *Cycluras* that inhabited a hollow acacia-tree in his fields (*Prosopis juliflora*) for some sixteen months. He supposed them male and female. They differed in size and in tint; and were never, during the whole period of his acquaintance with them, seen on the outer tree both together. Like the pair of weather-indicators in the Dutchman's hygrometer, if one was out, the other was in. For a certain time every morning, one or other would be seen on some extreme eastern branch of the tree sunning itself, by basking at its length in the slant sunbeams that shot within the foliage. Their size and the nimble movement of the tail gave them so much the

appearance of the ring-tailed monkey, when climbing, that a near-sighted observer, like myself, would mistake them for some Sapajou scrambling up the bark."

The intelligence thus promised has just been communicated to me, contained in the following letter from Stephen Minot, Esq., of Worcester Lodge, to Richard Hill, Esq.

" February 1848.

" Dear Sir,—In accordance with your request, I send you a few particulars relative to the two Guanas that were seen during a period of nearly two years, at Worcester Lodge, in the parish of St. Catherine.

" About the beginning of September 1844, a friend of mine, riding into the property, observed, as he thought, a large green lizard basking in the sun on a hollow cashaw-tree (*Prosopis juliflora*), close by the road. He struck at it with his riding-whip, and immediately the animal disappeared with great swiftness into the tree. For several weeks after this it was occasionally seen, but was extremely shy, always disappearing the moment any one approached the tree. I gave orders that no one should, under any pretence, frighten it again, as a servant who had seen it informed me it was a Guana. By degrees it got tamer; and when I first saw it, it was, I should think, from 10 to 11 inches long, including the tail. About a year after this period it was always visible as soon as the sun became a little warm, clinging to the bark of the tree, or crouching (if I may use the term) along a small dry branch. I never saw it attempt to catch flies, or ants, or any insects; and the only time I ever detected it feeding was about this period. One day after heavy rain, the sun having broken through the clouds, shining very bright, it was then eating the guinea-hen-weed (*Petiveria*), growing about ten yards from the root of the cashaw. I watched it a few moments, unperceived, and observed it walk very slowly, moving one leg at a time, —cropping, and apparently swallowing without any further process, a mouthful of leaf; and leaving an indenture on the plant of the size of his mouth. Immediately on seeing me, by a succession of rapid springs, neither running nor walking, nor was it like the hopping of the frog, it regained the tree, and in a second was out of sight. The hollow part of the tree is about seven feet from the ground. It evidently did not object to the water, as there was a small lodgement of water close by where it was feeding, through which it bounded without a moment's hesitation, though it might have regained the tree, if it had disliked the water, by going round the small swamp, which was only say three or four yards in diameter. I mention this circumstance of the water, as we had previously had dreadful dry weather, and I often wondered how the animals of this description lived for want of it; and it was never visible during or immediately after rain.

" It was, as you are aware, foolishly shot, in my absence, by young N—, under the false impression that it ate chickens. I have spoken of it in the singular number, as we were not aware there were two, until Mr. N— shot a second one on the same tree about

two or three hours after he killed the first. This discovery, that there were two instead of only one, accounted for what had previously often surprised me, namely that sometimes the animal was of a brownish-green hue, and when of that colour always appeared larger than when it looked blackish. It therefore appears plain that they must have been male and female; and, if that is correct, the male was by far the larger and handsomer.

"The male, as I consider it, was the one I saw dead after it was shot. It was about from 22 to 24 inches long, but the tail did not appear so long in proportion, as it grew older, as it seemed when first discovered. I opened the animal, and found it full of pieces of guinea-hen-weed, some digested, some half-digested, and a large quantity quite fresh, which is accounted for by its being early in the morning, say nine o'clock, when it was shot. I may mention that I put the carcass into three or four different sorts of ants' nests,—the common, the stinging black, and the large red ant,—not one of which would touch it; and when I forced them into the carcass, and put part of their nests in it, they ran away from it as quickly as possible. I did this under the hope of getting his skeleton."

To this last observation Mr. Hill has appended the following note:—"This dislike for the flesh of the lizard may have resulted from the odour of the guinea-hen-weed, on which it had recently fed. The whole flesh would be imbued with the intolerable garlic-like scent."

2. DESCRIPTIONS OF TWENTY-THREE NEW SPECIES OF VITRINA, FROM THE COLLECTION OF H. CUMING, ESQ. BY DR. L. PFEIFFER.

1. **VITRINA CUMINGII**, Beck MSS. *Vitr. testū depresso-globosd, tenuissimd, subtiliter striatd, nitidd, albido-corned; spirā brevisimd, obtusd; suturd levi, lined impressd marginatd; anfractibus 4 vix convexiusculis, ultimo inflato, subdepresso, medio lined rufd cingulato; aperturd parū obliquū, lunato-rotundatd; peristomate simplice, marginibus remotis, columellari subverticali, leviter arcuato, supernè reflexiusculo, perforationem punctiformem simulanter, supero antrorsum vix arcuato.*

Diam. 20, altit. 12 mill.

Hab. The island of Bohol; collected by Mr. Cuming.

2. **VITRINA MARGARITA**, Beck MSS. *Vitr. testū depresso-globosa, tenuissimd, striatulā, nitidū, pellucida, carneo-hyalind; spirā parvuld, planiusculd; suturd linearī; anfractibus 3½ sub-planis, rapide accrescentibus, ultimo magno, inflato; aperturd obliquū, lunato-subcirculari; peristomate tenuissimo, margine supero antrorum dilatato, columellari leviter arcuato.*

Diam. 14, altit. 8 mill.

Hab. The island of Guimaras; collected by Mr. Cuming.

3. **VITRINA SMARAGDULUS**, Beck MSS. *Vitr. testū depressiusculd, tenui, vix striatulā, non nitente, diaphand, aureo-virente; spirā parvuld, planiusculi; suturd leviter impressd, angustissimè marginatd; anfractibus 3½ planiusculis, rapide accrescentibus, ultimo*

utrinque planiusculo, basi lato; aperturā parūm obliquā, rotundato-lunari, latiore quam altā; peristomate tenui, subinflexo, margine supero antrorsum dilatato, columellari vix recedente, leviter arcuato.

Diam. 12, altit. 7 mill.

Hab. The island of Negros; collected by Mr. Cuming.

4. *VITRINA BICOLOR*, Beck MSS. *Vitr. testā subglobosā, tenui, sublævigate, nitidissimā, carneo-albida; spirā brevi, convexā, obtusa; suturā impressā; anfractibus 3½ rapidē accrescentibus, ultimo inflato, anticē hyalino, basi angustiusculo, membranaceo-marginato; aperturā vix obliquā, lunato-rotundatā; peristomate tenuissimo, margine dextro regulariter rotundato, columellari recedente, perarcuato.*

Diam. 18, altit. 10 mill.

(Body of the animal white, apex black.)

Hab. Isle of Guimaras; collected by Mr. Cuming.

5. *VITRINA GUIMARASENSIS*, Pfr. *Vitr. testā depresso-semiglobosā, tenui, striatulā, subdiaphana, virenti-carnea; spirā parvula, parūm elevata; suturi marginata; anfractibus vix 4 subplanis, rapidissimè accrescentibus, ultimo inflato, subdepresso; apertura obliquā, lunato-subcirculari, æquè altā ac latā, intus submarginated; peristomate tenuissimo, margine dextro regulariter arcuato, columellari recedente, perarcuato.*

Diam. 15, altit. 8 mill.

Hab. Isle of Guimaras; collected by Mr. Cuming.

6. *VITRINA BECKIANA*, Pfr. (*Vitr. peraffinis*, Beck MSS.) *Vitr. testā depresso-globosā, circuitu ovali, tenuissimā, striatulā, pellucida, nitida, pallidissimè rubello-corned; spirā mediocri, brevi, obtusa; anfractibus ferè 4 vix convexiusculis, celeriter accrescentibus, ultimo subdepresso, basi lato; apertura parūm obliquā, lunato-rotundata, latiore quam altā; peristomate simplice, marginibus remotis, supero regulariter arcuato, columellari supernè reflexiusculo, basi recedente, perarcuato.*

Diam. 16, altit. 8 mill.

Hab. The Philippine islands of Negros, Siquijor and Guimaras; collected by Mr. Cuming.

7. *VITRINA POLITISSIMA*, Beck MSS. *Vitr. testā globoso-depressā, solidulā, lævigate, politissimā, diaphana, corned, saturatiū radiatā; spirā mediocri, convexā; suturā impressā, submarginata; anfractibus 4 convexiusculis, celeriter accrescentibus, ultimo depresso-rotundato, basi lato; apertura obliquā, lunato-rotundata, æquè altā ac latā; peristomate simplice, margine superiore antrorsum arcuato, columellari leviter arcuato.*

Diam. 14, altit. 7½ mill.

From the island of Zebu; collected by Mr. Cuming on the leaves of small trees. The entire animal is black.

8. *VITRINA LEYSENSIS*, Beck MSS. *Vitr. testā depresso, circuitu ovali, tenuissimā, lævigate, nitidissimā, lutescenti-carnea; spirā*

planiusculd, vix elevata; suturd leviter impressa; anfractibus 3 rapide accrescentibus, ultimo supernè subplano, basi convxiore, latiusculo; aperturā parū obliqua, rotundato-lunari, latiore quam altd; peristomate tenuissimo, margine supero parū arcuato, columellari supernè reflexiusculo, basi cum inferiore angulum obtusum formante.

Diam. 13, altit. 7 mill.

From the island of Leyte. A larger variety, more opake, yellowish-whitish, from Siquijor. Collected by Mr. Cuming.

9. *VITRINA GUTTA*, Pfr. *Vitr. testd depresso-globosá, tenuissimá, glaberrimá, nitidissimá, hyalind; spirá vix elevatusculd; suturd lineari, angustè marginatd; anfractibus 3½ planiusculis, rapide accrescentibus, ultimo magno, depresso-rotundato, basi latiusculo; aperturā parū obliqua, lunato-circulari; peristomate simplice, undique regulariter arcuato, margine columellari intrante, supernè reflexiusculo.*

Diam. 11, altit. 6 mill.

From Sorsogon, isle of Luzon; collected by Mr. Cuming.

10. *VITRINA RUFESCENS*, Pfr. *Vitr. testd depresso-globosd, tenuissimd, plicatuld, nitida, pellucida, rufescente; spird breviter conoided, obtusiusculi; suturā impressd; anfractibus ferè 4 convexiusculis, celeriter accrescentibus, ultimo ventroso; aperturā vix obliqua, lunato-subcirculari; peristomate tenui, subinflexo, marginibus remotis, supero regulariter, columellari leviter arcuato.*

Diam. 13, altit. 8 mill.

From the isle of Mindoro; collected by Mr. Cuming.

11. *VITRINA CRENUALARIS*, Beck MSS. *Vitr. testd depressd, tenuissimd, glabrd, nitidá, pellucidd, aurea; spirá planá; suturd leviter impressa; anfractibus 3½ planiusculis, juxta suturam plicato-crenulatis, rapide accrescentibus, ultimo depresso, basi lato; aperturā obliqua, rotundato-lunari, latiore quam altd; peristomate tenui, subinflexo, margine supero antrorsum dilatato, columellari leviter arcuato, basali strictiusculo.*

Diam. 13, altit. 7 mill.

From the Philippine islands of Negros and Zebu; collected by Mr. Cuming.

12. *VITRINA RESILIENS*, Beck MSS. *Vitr. testd depressá, tenuissimá, subtilissimè et confertim plicatulá, nitida, pellucida, virentistraminet; spirá planiusculd; suturd leviter impressd; anfractibus 3½ subplanis, ultimo lato, depresso, basi ferè omnino membranaceo; aperturā obliqua, lunato-ovali; peristomate simplicissimo, margine columellari statim procedente, leviter arcuato.*

Diam. 11, altit. 6½ mill.

From Sibonga, island of Zebu. Found on leaves of small palms in dark woods. The body of the animal is white, the apex black (H. Cuming).

13. *VITRINA PAPILLATA*, Pfr. *Vitr. testd depressd, tenui, laeviusculd, nitida, pellucida, pallide cornet; spirá planiusculd, medio*

papillatd; suturd profundè impressá, marginatd; anfractibus 3 $\frac{1}{2}$ convexiusculis, prope suturam striatulis, ultimo depresso, lineis obsoletis spiralibus interdum sculpto, peripherid rotundato, basi latiusculo; aperturd perobliquud, amplá, rotundato-lunari, latiore quam altd; peristomate tenui, margine supero antrorsum dilatato, columellari recedente, perarcuato.

Diam. 10, altit. 5 mill.

From Calauang, isle of Luzon ; collected by Mr. Cuming.

14. VITRINA PLANULATA, Pfr. *Vitr. testd depressissimad, subdiscoidé, læviusculd, nitidd, carned; spird planiusculd; suturd impressd; anfractibus 3 vix convexiusculis, rapidissimè accrescentibus, ultimo depresso, basi angusto; aperturd amplissimad, perobliquud, lunari, transversè dilatatd; peristomate tenui, margine supero antrorsum dilatato, columellari valdè recedente, arcuato.*

Diam. 11, altit. 4 $\frac{1}{2}$ mill.

From Calauang, isle of Luzon ; collected by Mr. Cuming.

15. VITRINA APERTA, Beck MSS. *Vitr. testd depressissimad, supernè convexiusculd, basi aperta, lævigate, subopacá, virenti-albidd; spird minutd, lateralí; suturd levi; anfractibus 2 $\frac{1}{2}$ convexiusculis, basi angustissimis, apertis, ultimo permagno, planè fornicato; aperturá horizontali, auriformi, usque in verticem aperta; peristomate simplicissimo.*

Diam. 11, altit. 3 mill.

From San Juan, isle of Luzon ; collected by Mr. Cuming.

16. VITRINA MONTICOLA, Benson MSS. ? *Vitr. testd depressá, tenui, striatuld, nitidd, pellucidá, lutescenti-corned; spird pland, medio vix prominulá; suturd leviter impressá; anfractibus 4 celeriter accrescentibus, planiusculis, ultimo depresso, non descendente; aperturá obliquud, rotundato-lunari; peristomate simplece, marginibus conniventibus, callo tenuissimo junctis, supero antrorsum arcuato-dilatato, columellari cum basali angulum obtusum formante.*

Diam. 18, altit. 7 $\frac{1}{2}$ mill.

From Bengal, Landour, Himalayah, Almorah.

17. VITRINA BENSONI, Pfr. *Vitr. testd depressiusculd, tenui, striatuld, nitidd, pellucidá, pallidè corned; spird vix elevatd, obtusá; suturd impressd, submarginatd; anfractibus 3 $\frac{1}{2}$ convexiusculis, ultimo subdepresso, peripherid rotundato, basi lato; aperturd obliquud, lunato-subcirculari; peristomate simplece, subinfexo, marginibus conniventibus, supero antrorsum subdilatato, columellari recedente, perarcuato.*

Diam. 12, altit. vix 6 mill.

In the Botanic Garden of Calcutta ; collected by Mr. Benson.

18. VITRINA HIANS, Rüppell MSS. *Vitr. testd depresso-globosd, tenui, striatuld, pellucidd, nitidulá, pallidè corned, strigis saturati-oribus radiatid; spird parvuld, conoideo-convexá; suturd impressd, marginatd; anfractibus 4 convexiusculis, rapidè accrescentibus, ultimo rotundato, basi latiusculo; aperturd obliquud, lunato-subcir-*

culari; peristome simple, marginibus convergentibus, columellari subprecedente, leviter arcuato.

Diam. 24, altit. 12 mill.

From Abyssinia; collected by Dr. Rüppell.

19. VITRINA RÜPELLIANA, Pfr. *Vitr. testa subsemiglobosa, tenui, arcuato-striata, pellucida, parum nitida, fulva; spirae brevi, obtusiuscula; sutura impressa; anfractibus 3 convexiusculis, rapidè accrescentibus, ultimo ventroso, basi latiusculo; apertura obliqua, lunato-rotundata; peristome simple, margine supero ferè angulatum antrorsum dilatato, columellari substricte recedente, basi leviter arcuato; margine interno anfractuum inconspicuo.*

Diam. 18, altit. 10 mill.

From Abyssinia; found by Dr. Rüppell.

20. VITRINA SOWERBYANA, Pfr. *Vitr. testa depresso, subauriforme, arcuatim plicatula, tenuissima, nitida, pellucida, brunneofulva; spirae vix emersa; sutura profunde impressa; anfractibus 3, primis convexiusculis, ultimo depresso, peripheria angulata, basi convextiore; apertura ampla, perobliqua, lunato-ovali, marginibus conniventibus, supero vix dilatata, columellari perarcuata, anguste membranaceo-marginata; margine interno anfractuum inconspicuo.*

Diam. 22, altit. 11 mill.

From West Africa.

21. VITRINA GRANDIS, Beck MSS. *Vitr. testa depresso, tenuiuscula, radiatim subtiliter plicatula, diaphana, non nitente, albido-straminea; spirae brevissima, vix emersa, subpapillata; sutura impressa; anfractibus 3½ rapide accrescentibus, subplanatis, ultimo depresso, peripheria obsoleta angulata, basi lato, striatula, nitida; apertura parum obliqua, lat, lunata; peristome simple, margine supero antrorsum subdilatata, columellari subverticaliter descendente, arcuatim in basalem ambiente.*

Diam. 18, alt. 8 mill.

From West Africa, Guinea.

22. VITRINA ABYSSINICA, Rüppell MSS. *Vitr. testa depresso-ovata, sublævigata, diaphana, vix nitidula, sordidè virenti-corned; spirae brevi, convexiuscula; sutura leviter impressa; anfractibus 2½ convexiusculis, celeriter accrescentibus, ultimo peripheria rotundata, basi latiusculo; apertura obliqua, rotundato-lunata, transversè dilatata; peristome simple, margine supero subrepando, columellari recedente, arcuata.*

Diam. 10, altit. 5½ mill.

From Abyssinia; collected by Dr. Rüppell.

23. VITRINA VIRENS, Pfr. *Vitr. testa depresso-ovali, subtilissime striatula, nitidula, corneo-virente; spirae planiuscula; sutura vix impressa; anfractibus 3 vix convexiusculis, rapidè accrescentibus, ultimo subdepresso-rotundato, basi angustè membranaceo-marginata; apertura obliqua, lunato-subcirculari; peristome tenui, subinflexo, undique regulariter arcuato.*

Diam. 16, altit. 8 mill.

Locality unknown.

MISCELLANEOUS.

On the Development of the Purkinjean Corpuscle in Bone.

Schwann, in his 'Mikroskopische Untersuchungen,' considers that the Purkinjean corpuscle of bone is derived from the pre-existing cartilage-cell, and that the canaliculi are prolongations, or protrusions of the cell-wall. Many later authors, among whom are Gerber, and Todd and Bowman, express the opinion that it originates in the nucleus of the temporary cartilage-cell, and Tomes entertains the idea, that after the formation of the osseous tubes, in the process of ossification, the latter are filled up by a deposit of osseous granules, and while this deposit is going on, small cells are left, which are the rudimentary Purkinjean corpuscles. Henle thinks them to be the cavities of cells, the thickened walls of which are pierced by the canaliculi. Hassall confirms the view of Schwann, by stating, "the bone-cells (Purkinjean corpuscles) are to be regarded as complete corpuscles, the canaliculi of which are formed by the extension of the cell-wall, which is proved by watching the formation and development of bone."

The opinion of Schwann and Hassall I can fully corroborate from my own observations upon an ossifying frontal bone, from a human embryo measuring 2 inches from heel to vertex. Each lateral half of the bone is about $3\frac{1}{2}$ lines in diameter, and presents to the naked eye the appearance of a delicate and close network, arising from the numerous areolæ occupied by temporary cartilage. The frontal and orbital plates, it is worthy of incidental remark, at this period are nearly on a plane with each other, or are connected together at a very obtuse angle along a central, transverse, crescentic, raised line, the rudimentary supra-orbital ridge.

The mode of development of the Purkinjean corpuscle, as noticed upon the upper or posterior border of the os frontis, is briefly as follows:—After the primitive ossific rete has been formed from the deposit of the osseous salts, enclosing groups of cartilage-cells in the areolæ, the further deposit takes place in a fibrous or line-like course from the parietes of the areolæ of the primitive osseous rete, in the interspaces of the cartilage-cells nearest to, or in contact with the sides of the areolæ. At this period the cells shoot out or extend their canaliculi between the fibrillæ just formed, and then the cell-wall and continuous walls of the canaliculi fuse with the translucent, homogeneous, or hyaline substance of the cartilage existing between the cells and the osseous fibrillæ, and with the fibrillæ themselves, by the deposit of the osseous salts. The period of the formation of the canaliculi appears to be quite definite, occurring during the deposit of the osseous salts, and not before. To such an extent is this the case, that I noticed in several instances cells which had formed their canaliculi upon the side which was ossified, while upon the other side I could not distinguish any trace of them.

During the whole time of the formation of the Purkinjean corpuscle, the nucleus remains unchanged; at least no change is perceptible in it beneath the microscope; and by applying tincture of iodine to the preparation, which turns the nucleus brown, I was able

to detect it within the perfected Purkinjean corpuscle, not only corresponding to the nucleus of the remaining unossified cartilage-cells in granular structure, but also in its measurements. After the Purkinjean corpuscle has been formed a short time, the nucleus dissolves away or disappears.

The newly-formed Purkinjean corpuscle is about the same size as the remaining unossified cartilage-cells, as indicated in the list of measurements appended to these notes.

Size of cell of temporary cartilage from the unossified os frontis of a human embryo, $\frac{1}{18\frac{3}{7}}$ of an inch; nucleus of ditto, $\frac{1}{31\frac{2}{3}}$ of an inch; nucleolus, $\frac{1}{8\frac{3}{5}\frac{3}{5}}$ of an inch; Purkinjean corpuscle, $\frac{1}{18\frac{6}{5}}$ of an inch; nucleus within the same, $\frac{1}{30\frac{1}{5}0}$ of an inch.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 116.

MODE OF PROGRESSION WITH ANIMALS.

It has been noticed by nearly all naturalists, as one of the peculiarities of the Giraffe, that it moves the two legs on the same side of it together; I have however noticed that most other animals *walk* in that manner, although few run so; among others I will mention the following as verifying my observations:—the Camel, the Lion, the Tiger, and Leopard, and all animals of the Felidæ, the Wolf, and Hyæna, and all the canine race.

Sometimes I have observed the same peculiarity in the Horse and Ass, though rarely; the Camel *runs* so; the other animals which I have mentioned, I have never observed to *walk* in the usual manner.

W. A. PIKE.

Descriptions of new species of the genera Nyctale, Brehm., and Syco-bius, Vieill. By JOHN CASSIN.

Genus NYCTALE, Brehm. *Handb. Nat. Vög. Deuts.* p. 111.

Nyctale Harrisii, nobis.

Front, face, nuchal collar, and under surface of the body yellowish white, or buff colour.

Spot between the eye and the bill, and a broad occipital band, black, the latter covering the greater part of the hind head.

Feathers covering the ear black.

Throat with a few black feathers, and many of the feathers of the ruff on the front neck conspicuously tipped with black.

Upper surface of the back and wings deep reddish brown; wing-coverts with conspicuous round spots of white; all the quill-feathers also irregularly marked and spotted with white on the edges of both webs; scapulars largely edged with white and buff.

Upper tail-coverts brown, spotted with white. Tail black, with about three pairs of rounded white spots on every feather. Tarsi thickly feathered to the toes, and with the whole under surface of the body buff colour.

Total length of skin, from tip of bill to end of tail, about $7\frac{1}{2}$ in.; wing, $5\frac{3}{4}$; tail, $2\frac{2}{3}$.

Hab. South America?

The specimen now described was obtained from Mr. J. G. Bell,

Taxidermist, of New York, who has no accurate recollection of its locality, but is of the opinion that it came from South America.

I have named this singular and beautiful little species in honour of Mr. Edward Harris, of Moorestown, N. J., Chairman of the Ornithological Committee of this Academy, and a distinguished naturalist.

Genus *Sycobius*, Vieillot.

Sycobius scutatus, nobis.

♂ Upper part of the head and neck, broad pectoral band and under tail-coverts bright crimson; the crimson of the breast uniting on the sides of the neck with that of the head.

Throat and ears black, which colour forms a large gular patch extending to, but scarcely including the eyes.

All other parts of the body black.

♀ Broad pectoral band and under tail-coverts crimson; all other parts, including the head, black.

Total length of skin, from tip of bill to end of tail, about $5\frac{3}{4}$ inches; wing, $3\frac{5}{8}$; tail, $2\frac{3}{8}$.

Hab. Western Africa.

Two pairs of this species now described were brought to this country by Robert MacDowell, M.D., Surgeon attached to the colonial government of Sierra Leone, who collected them in Western Africa.

It bears a greater resemblance to the *Sycobius rubricollis* (Swainson), Vieill. Ois. Chant. pl. 43, than to any other species which I have found described; but from this and all others it may readily be distinguished by its under tail-coverts being crimson, and also by its broad pectoral band of the same colour.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 157.

Description of a new species of Salamander from Upper California.

By EDWARD HALLOWELL, M.D.

Salamandra lugubris.

Sp. Char.—Head large; eyes very prominent; tail rather longer than the body, which is cylindrical. Head, tail, extremities, and the rest of the animal dark olive above, lighter beneath; an indistinct irregular row of yellowish spots on each side. Several small spots of the same colour upon the neck and upper part of the tail and posterior extremities.

Description.—Head large, swollen at the temples, depressed in front; snout obtuse and somewhat rounded; eyes large, latero-superior; nostrils latero-anterior, small and distant; the palate is provided with two transverse rows of teeth (situated immediately behind the posterior nares), which are incurvated internally and meet posteriorly. There is also a longitudinal row of teeth, separated from those described by an interval of half a line; tongue long and spatulate, very free at its edges, attached by a pedicle at its anterior extremity; neck somewhat contracted, without a gular fold; body and extremities slender, the posterior larger than the anterior; tail compressed, cylindrical, tapering to a point.

Colour. (From a specimen in spirits in the museum of the

Academy.)—The animal above is of a uniform dark olive colour; an irregular row of small yellowish spots is observed upon the sides of the body near the dorsum; several are also seen upon the neck, the upper part of the tail, and also the posterior extremities in the specimen examined. The under part of the animal is light olive.

Dimensions.—Length of head $6\frac{1}{2}$ lines; greatest breadth 6 lines; length of neck and body to vent 1 inch 11 lines; length of tail 2 inches 1 line; total length 4 inches 7 lines.

Hab. Monterey, Upper California. It is said to be abundant in that region.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 126.

The Pine Tree of the Tenasserim Provinces. By the Rev. F. MASON.

Some twenty years ago the residents of Moulinmain were not a little surprised to find, among the drift wood of the Salwen, a log of some coniferous tree. This was the first intimation that any tree of the pine tribe grew on the borders of these provinces; but whether it were of the genus *Pinus*, or *Abies*, or *Larix*, a pine, a fir, or a larch, did not appear. It was several years after this occurrence that one of our former commissioners told the writer he had offered a hundred rupees to any of the foresters who would bring down a spar of this tree. Spars have been subsequently brought down; but it is believed that Captain Latter, the Superintendent of Forests in these provinces, is the first European who has visited the locality where the tree is indigenous; and from specimens of the foliage and fruit, which he has brought away with him, it appears to be a new species of *Pinus*, that may be characterized thus:—

P. Latteri. Arbor 50–60 pedalis, cortice scabro, foliis geminis 7–8 uncialibus caniculatis serratis* scabriusculis, strobilis 4 uncialibus ovato-conicis, squamis rhombis inermibus.

Hab. In provincia Amherst: in convalli fluvii Thoungeen.

Descr. A tree of from 50 to 60 feet high or more, and from $1\frac{1}{2}$ to 2 feet or more in diameter. Sheaths of the leaves arranged spirally, tubular, membranous, 6 lines long. Leaves two from each sheath, equal, from 7 to 8 inches long, acute with a sharp point, convex on the back, slightly scabrous with eight rows, in pairs, of very minute thorns which produce a striated appearance, hollow on the under surface, serrated; cones ovate-conical, nearly 4 inches long. Scales rhomboid, unarmed.

The flower is unknown; a single ripe cone that had cast its seeds and a small branch being all the materials that have been furnished for description.

Specimens of the wood that have fallen under the writer's notice contain more resinous matter than any other species of Coniferae he ever saw. It appears like woody fibre immersed in resin. The Karen make tar from the wood by a very simple process; and large

* Lindley says of the order, "Leaves entire at the margins;" but these are certainly finely serrated; and I find *P. excelsa* described with leaves "toothleted."

quantities of both tar and pitch might be manufactured in the forests, if a remunerative price could be obtained for the article.

This species has been named after Captain Latter, as the discoverer, because all our acquaintance with the tree has been derived from him, beyond the vague knowledge that a tree of the pine family existed somewhere on the banks of the Salwen. He reports it as growing with the Engben, which is a species of *Dipterocarpus* that is met on the sandy shores of the province of Tavoy, side by side with *Casuarina muricata*. This pine is not found west of the Donaw mountains, a part of an unbroken range of granite mountains that runs down from the falls of the Salwen to the old city of Tenasserim, and which here separates the valley of the Thoungyeen from the region watered by the Gyne and its tributaries. In a note to the writer, Captain Latter adds:—"In the valley of the Thoungyeen it is found growing on the raised central plateau of sandstone, mixed up with Engben trees; and in proportion as the elevation increases the Engben disappears. In the Lower Thoungyeen, towards the remotest parts of the valley, it is found on ranges of hills west of Theglar river. These are its sites on the British side of the Thoungyeen. On the Shan side of the river it is said to be more abundant, and appears to occupy the lower portion of the Toungnyoo range, where the sandstone formation is more prominently developed. From the accounts of Burmese foresters, who have seen the pine forests on both sides of the river, the tree appears to be of a finer growth on the Shan side than on the British, where trees are to be found of nine feet in girth and proportionably tall. I should say that on the British side of the valley the tree ranges at an altitude of 1000 to 15,000 feet above the level of the sea, and that its latitude is about 17° north."

Possibly it may prove to be a known species; but it is not among the *twenty-two* species described by Loudon as the denizens of Great Britain, nor among the *twelve* species described by Michaux in his 'North American Sylva,' nor is it either of the Indian species described by Roxburgh. Should it however be a species described in some other work to which the writer in these "outskirts of civilization" has no means of access, some of the members of the Society will probably be able to point out the identity; and though then this note will be no contribution to science, it will still be a contribution to our knowledge of the resources of the Tenasserim provinces.—*Journal of the Asiatic Society of Bengal*, Jan. 1849.

*Description of a new Helix and Streptaxis, from the Collection of
H. Cuming, Esq. By DR. L. PFEIFFER.*

1. *HELIX STRANGEI*, Pfr. *H. testi latè umbilicatâ, depressâ, solidiusculâ, supernè confertim costulato-striatâ, nitiddâ, castaneo-corneâ, subpellucida; spira parùm elevatâ, obtusiusculâ; anfractibus 5 vix convexiusculis, ultimo subdepresso, basi sublaevigato; aperturâ subobliquâ, lunato-ovali; peristome simplice, recto, tenui, marginibus conniventibus.*

Diam. 24, altit. 10—11 mill.

From Brisbane Water, New South Wales (Mr. Strange).

2. STREPTAXIS UBERIFORMIS, Pfr. *Str. testū profundē rimato-perforatā, subsemiglobosā, basi ferī circulari, supernē obliquē et confertim costulato-striatā, striis subtilissimis subdecussatā, tenui, diaphana, pallidē virenti-cornēd; spirā subconoidea, obtusa; an-fructibus 6 $\frac{1}{2}$ convexiusculis, ultimo deviante, basi subplanulato, lēvigato; aperturā parūm obliquā, lunato-ovali, edentulā; peri-stomate simplice, breviter expanso-reflexo, marginibus remotis, supernē subconvergentibus.*

Diam. 18, altit. 12 mill.

From the Brazils.—*From the Proc. Zool. Soc.* June 27, 1848.

METEOROLOGICAL OBSERVATIONS FOR MAY 1849.

Chiswick.—May 1. Cloudy. 2. Foggy: overcast. 3. Foggy: fine. 4. Very fine. 5. Clear and fine: thunder, lightning, rain and hail in afternoon: cloudy at night. 6. Overcast. 7, 8. Overcast and cold: fine: cloudy. 9. Fine: showery. 10. Overcast: slight rain. 11. Cloudy and cold. 12. Fine: overcast. 13. Very fine. 14. Rain: fine. 15. Cloudy: fine. 16. Rain: cloudy. 17. Cloudy: slight rain. 18. Overcast. 19. Cloudy and fine. 20. Rain throughout. 21. Hazy. 22. Rain: fine. 23. Fine. 24. Very fine: densely overcast at night. 25. Cloudy: very fine. 26. Overcast: very fine. 27. Very fine: cloudy: rain. 28. Overcast: very heavy rain. 29, 30. Very fine. 31. Dry haze: overcast: clear at night.

Mean temperature of the month	55°.19
Mean temperature of May 1848	58°.12
Mean temperature of May for the last twenty-three years ...	54°.22
Average amount of rain in May	1.82 inch.

Boston.—May 1. Cloudy. 2. Cloudy: rain early A.M. and late P.M. 3—5. Fine. 6—9. Cloudy. 10. Rain: rain A.M. and P.M. 11, 12. Cloudy. 13, 14. Cloudy: rain P.M. 15. Cloudy. 16. Rain: rain A.M. and P.M. 17. Fine: rain A.M. and P.M. 18. Rain: rain A.M. and P.M. 19. Cloudy. 20. Rain: rain A.M. and P.M. 21. Cloudy: rain P.M. 22. Cloudy: rain, with thunder and lightning P.M. 23. Cloudy: rain P.M. 24. Fine. 25. Rain: rain, with thunder and lightning early A.M. 26. Fine. 27. Rain: rain early A.M.: rain P.M. 28. Cloudy: rain early A.M. 29. Fine: rain early A.M. 30, 31. Fine.

Applegarth Manse, Dumfries-shire.—May 1. Remarkably fine day. 2. Dull, but fair. 3. Fiery heat: dry and parching. 4. Fiery heat. 5, 6. Fiery heat: heat less. 7. Fiery heat: a few slight drops of rain. 8. Fiery heat. 9. Mild day: wind variable. 10. Mild day: shower on the hills. 11. Chill and piercing: ungenial. 12. Mild and genial: rain at night. 13. Dropping day: most welcome rain. 14. Wet morning: bright afternoon. 15. Mild and damp: showers. 16. Heavy showers. 17. Wet morning: very fine and hot. 18. Slight showers: fine cool evening. 19. Hot forenoon: blowing evening. 20. Heavy showers: dull. 21, 22. Very fine day: damp evening. 23. Showers in forenoon: very fine. 24. Fair, but dull. 25. Fair and clear: cloudy P.M. 26. Fair and very fine. 27. Beautiful day. 28. Beautiful day: still warmer. 29. Fine, though cloudy: showers P.M. 30. Fine: clear bracing weather. 31. Slight rain: wind high P.M.

Mean temperature of the month	50°.5
Mean temperature of May 1848	52°.9
Mean temperature of May for twenty-five years	51°.09
Rain in May for twenty years	1.69 inch.

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

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IX.—*A descriptive Account of the Freshwater Sponges (genus Spongilla) in the Island of Bombay, with Observations on their Structure and Development.* By H. J. CARTER, Esq., Assistant Surgeon, Bombay Establishment.

[With three Plates.]

SINCE my “Notes” on these Sponges were published* I have made many more observations on them, and have extended my inquiries into their structure and development, so as to be able to offer a more accurate account of them than I could formerly. I have also ventured to name four out of the five species I have described, because they either do not appear to have hitherto been met with, or if before noticed, have not had their specific differences described with sufficient minuteness for their present identification. The only species which I think I have recognized is *Spongilla friabilis* (Lam.), that kind so admirably described by Dr. Grant†; but even here the point on which I have founded my distinctive characters, viz. the form of the spicula round the seed-like bodies, has not been mentioned with that minuteness which renders my recognition of it entirely satisfactory. So far as actual observation and the information I have derived from the descriptions of others extend, all the species of *Spongilla* which have hitherto been described appear to be so amorphous, that without a knowledge of their minute structural differences, they are irrecognizable. Had this fact been formerly established, the same course which I have pursued for their specification would in all probability have been adopted from the beginning; but with only two species, *Spongilla fluviatilis* and *lacustris* and their varieties‡, the genus appears to have failed from its insig-

* Trans. Med. and Phys. Soc., Bombay, No. 8. Reprinted in Ann. and Mag. Nat. Hist. No. 4, April 1848.

† Edinb. Phil. Journal, vol. xiv. p. 270.

‡ Johnston's Brit. Sponges, Synopsis, p. 250.

nificance to have obtained that attention which would have led to a description of the minute differences now required.

Not so with the nature of *Spongilla*,—that has been a disputed point ever since it was first studied; its claims to animality or vegetability with those of the other sponges have been canvassed over and over again by the ablest physiologists, and yet remain undecided; still this subject does not appear to me to have been viewed in a proper light, for late discoveries would seem to show that there exists no line of demarcation between the animal and vegetable kingdoms, but that on the contrary the one passes by gentle and at last imperceptible gradations into the other. From the existence of cells as the principal component parts and as the elaborators of the most complicated forms of animal and vegetable structures, and the intimate connection that obtains between these little organisms in both kingdoms in their isolated and independent existences and in their simplest composite forms, of which I take *Spongilla* to be one, the time appears to have arrived for abandoning the question of the animality or vegetability of *Spongilla*, for the more philosophical consideration of the position it holds in that transitional part of the scale of organized bodies which unites the animal and vegetable kingdoms.

Hitherto only five species of *Spongilla* have been found in the island of Bombay; they are the following:—

1. *Spongilla cinerea*, n. s.—Flat, surface slightly convex, presenting gentle eminences and depressions. Vents situated in the depressions, numerous, and tending to a quincuncial arrangement. Colour darkly cinereous on the surface, lighter towards the interior; growing horizontally in circular patches, which seldom attain more than half an inch in thickness. Texture compact, fine, friable. Structure confused, fibro-reticulate; fibres perpendicular, densely aggregated and united by transverse filaments. Seed-like bodies spheroidal, about $\frac{1}{6}\frac{1}{3}$ rd of an inch in diameter, presenting rough points externally. Spicula of two kinds, large and small; large spicula slightly curved, smooth, pointed at both ends, about $\frac{1}{6}\frac{1}{7}$ th of an inch in length; small spicula slightly curved, thickly spiniferous, about $\frac{1}{3}\frac{1}{8}\frac{1}{0}$ th of an inch in length. (Plate III. fig. 5.)

Hab. Sides of freshwater tanks in the island of Bombay, on rocks, stones, or gravel; seldom covered by water more than six months in the year.

Observations.—While the investing membrane of this species remains intact, its surface presents a dark, rusty, copper-colour, purplish under water. It never appears to throw up any processes, and extends over surfaces of 2 and 3 feet in circumference, or accumulates on small objects to the thickness mentioned. It is distinguished from the other species by its colour, the fineness

of its texture, and the smallness of its seed-like bodies and spicula.

2. *Sp. friabilis?* Lam.—Amorphous, surface irregularly convex, presenting low ridges or eminences. Vents situated on the latter, large, crateriform. Colour bright green on the surface, faintly yellow towards the interior. Growing in circumscribed masses on fixed bodies, or enveloping floating objects; seldom attaining more than 2 inches in thickness. Texture loose, friable. Structure confusedly fibrous, reticulate, sometimes radiated. Seed-like bodies spheroidal, about $\frac{1}{29}$ th of an inch in diameter, presenting smooth points externally. Spicula of two kinds, large and small; large spicula slightly curved, smooth, pointed at both ends, about $\frac{1}{67}$ th of an inch in length; small spicula also slightly curved, smooth, pointed at each end, about $\frac{1}{126}$ th of an inch in length. (Plate III. fig. 3.)

Hab. Sides of freshwater tanks in the island of Bombay, on rocks, stones or gravel; or temporarily on floating objects; seldom covered by water more than six months in the year.

Observations.—The colour of this species is bright green when fresh, but this fades after it becomes dry. It seldom throws up projections much beyond its surface; does not appear to be inclined to spread much; and is matted and confused in its structure towards its base and round its seed-like bodies. From the other sponges it is distinguished by the *smooth* spicula which surround its seed-like bodies and the matted structure just mentioned. Its green colour combined with the smoothness of its spicula, both large and small, is useful in distinguishing it from the other species, but without the latter it is deceptive, because *Sp. alba* and *Sp. plumosa* become green under certain circumstances. It appears to be *Sp. friabilis*, Lam., from no mention having been made by Dr. Grant (in his description of this species*) of the presence of any but smooth pointed spicula in it, and the appearance of "transparent points" studding the surface of its seed-like bodies, which is not observable in any of the other species, wherein the small spicula are spiniferous or stelliferous.

3. *Sp. alba*, n. s.—Flat or elevated, surface slightly convex, presenting gentle eminences and depressions or irregularly formed projections. Vents large, scattered. Colour yellow, growing horizontally, in circumscribed masses or in irregular patches, encrusting objects, seldom attaining more than an inch in thickness. Texture coarse, open. Structure reticulated. Investing membrane abounding in minute spicula. Seed-like bodies spheroidal, about $\frac{1}{30}$ th of an inch in diameter, presenting rough points externally. Spicula of two kinds, large and small; large spicula

* Edinb. Phil. Trans. vol. xiv. pp. 274 and 279.

slightly curved, smooth, pointed at each end, about $\frac{1}{5\frac{1}{4}}$ th of an inch in length; small spicula also slightly curved, thickly spiniferous or pointed at each end; the former, pertaining to the seed-like bodies, are about $\frac{1}{200}$ th of an inch in length; the latter, pertaining to the investing membrane, are more slender and a little less in length. (Plate III. fig. 4.)

Hab. Sides of the freshwater tanks in the island of Bombay, on rocks, stones, gravel, or temporarily on floating objects. Seldom covered by water more than six months in the year.

Observations.—This species is frequently found spreading over the flat surfaces of rocks to a considerable extent (like *Sp. cinerea*) without throwing up any processes; on the other hand, it is also found in circumscribed portions throwing up irregularly formed ragged projections, of an inch or more in length. It surrounds floating objects, such as straws, or binds together portions of gravel, showing in this latter state a greater degree of tenacity than any of the other species. In structure it is a coarse form of *Sp. cinerea*, but differs from it in colour as well as in the size of its seed-like bodies and spicula; possessing at the same time that peculiarity which distinguishes it from all the other species, of having numerous small spiniferous spicula in its investing membrane, which, when dry, gives it that white, lacelike appearance, which has led me to propose for it the specific term of *alba*.

4. *Sp. Meyeni*, n. s.—Massive, surface convex, presenting large lobes, mammillary eminences, or pyramidal, compressed, obtuse or sharp-pointed projections of an inch or more in height, also low wavy ridges. Colour yellow. Growing in circumscribed masses, seldom attaining more than 3 inches in height. Texture fine, friable, soft, tomatose towards the base. Structure fibrous, reticulated, radiated. Seed-like bodies spheroidal, about $\frac{1}{4\frac{1}{7}}$ th of an inch in diameter, studded with little toothed disks. Spicula of two kinds, large and small; large spicula slightly curved, smooth, pointed at each end, about $\frac{4}{65}$ rd of an inch in length; small spicula straight, sometimes slightly spiniferous, terminated by a toothed disk at each end, about $\frac{1}{4\frac{1}{2}}$ nd of an inch in length. (Plate III. fig. 1.)

Hab. Sides of the freshwater tanks in the island of Bombay, on rocks seldom covered by water more than six months in the year.

Observations.—I have never observed this species either enveloping floating bodies, or growing anywhere but on rocks, in circumscribed portions. It varies like the other species in being sometimes more, sometimes less firm in texture. No other species resembles the officinal sponges in external appearance so much as this when fully developed and free from foreign substances. It is distinguished from the foregoing by the regularity

of its structure, its radiated appearance interiorly, the form of its small spicula, and the manner in which its seed-like bodies are studded with little toothed disks; and from the following species by the fineness of its texture and the spheroidal form of its seed-like bodies. Probably it is the species alluded to by Dr. Johnston* which was examined by Meyen from the kind and arrangement of the small spicula round the seed-like bodies, which however in this species are not cemented together by carbonate of lime as stated by Meyen, but by an amorphous siliceous deposit. I have named it after Meyen, who has characterized it by the description of its minute spicula.

5. *Sp. plumosa*, n. s.—Massive, surface convex, presenting gentle eminences and depressions, or low wavy ridges. Colour yellow. Growing in circumscribed masses, attaining a height of 2 inches. Texture loose, coarse, resistent. Structure coarsely fibrous, reticulated, radiated, fibres fasciculated, spreading from the base towards the circumference in a plumose form. Seed-like bodies ovoid, about $\frac{1}{2}$ nd of an inch in their longest diameter, studded with little toothed disks. Spicula of two kinds, large and small; large spicula slightly curved, smooth, pointed at each end, about $\frac{1}{3}$ th of an inch in length; small spicula straight, sparsely spiniferous, terminated at each end by a toothed disk, about $\frac{1}{29}$ nd of an inch in length. (Plate III. fig. 2.)

Hab. Sides of freshwater tanks in the island of Bombay, fixed or floating, seldom covered by water more than six months in the year.

Observations.—This is the coarsest and most resistent of all the species. As yet I have only found three or four specimens of it, and these only in two tanks. I have never seen it fixed on any solid body, but always floating on the surface of the water, about a month after the first heavy rains of the S.W. monsoon have fallen. Having made its appearance in that position, and having remained there for upwards of a month, it then sinks to the bottom. That it grows like the rest, adherent to the sides of the tank, must be inferred from the first specimen which I found (which exceeded 2 feet in circumference) having had a free and a fixed surface, the latter coloured by the red gravel on which it had grown. I have noticed it floating, for two successive years in the month of July, on the surface of the water of one of the two tanks in which I have found it, and would account for its temporary appearance in that position in the following way, viz. that soon after the first rains have fallen, and the tanks have become filled, all the sponges in them appear to undergo a partial state of putrescence, during which gas is generated in them, and accumulates in globules in their structure, through which it must

* Johnston's British Sponges, p. 154.

burst or tear them from their attachments and force them to the surface of the water. Since then the coarse structure of *plumosa* would appear to offer greater resistance to the escape of this air than that of any of the other species, it is probable that this is the reason of my having hitherto only found it in the position mentioned. As *Sp. alba*, without its specific differences, is but a coarse form of *cinerea*, so *plumosa* is, without its specific differences, only a coarse form of *Sp. Meyeni*. The point which distinguishes it from all the other species consists in the form of its seed-like bodies, which are *ovoid*. From *Sp. Meyeni* it is also distinguished by its surface being more even, its projections less prominent, and its tendency to spread horizontally more than to rise vertically.

General Observations.—It should be stated that in all these species except *cinerea*, their forms *en masse* are so diversified and so dependent on accidental circumstances, that not one of them can be said to possess any particular form of its own, or to be distinguishable from the rest by it alone.

The measurements of the seed-like bodies and spicula are taken from the average of the largest of their kind; they differ a little from those mentioned in my "Notes*", but this is owing to their having been the means of a larger number of measurements than I had an opportunity of making in the first instance. However great the number of measurements, it is probable that when made at different times and from different sets of specimens, the results will always somewhat differ; but this is a matter of very little consequence, as these points alone are not required for distinguishing characters.

The large spiculum is of the same shape in all the species, and is therefore of no use as a specific character. (Plate V. fig. 2.)

Structure and Development.

The freshwater sponge is composed of a fleshy mass, supported on a fibrous, reticulated horny skeleton. The fleshy mass contains a great number of seed-like bodies in all stages of development, and the horny skeleton is permeated throughout with siliceous spicula.

When the fleshy mass is examined by the aid of a microscope, it is found to be composed of a number of cells imbedded in and held together by an intercellular substance.

These cells vary in diameter below the $\frac{1}{100}$ th part of an inch, which is about the average linear measurement of the largest. If one of them be selected for observation, it will be found to be composed of its proper cell-wall, a number of granules fixed to its upper and inner surface, and towards its centre generally one or more hyaline vesicles.

* *Op. cit.*

The granules are round or ovoid, translucent, and of an emerald or yellowish green colour, varying in diameter below the $\frac{1}{12000}$ th part of an inch, which is the average linear measurement of the largest. In some cells they are so minute and colourless as to appear only under the form of a nebular mass, while in others they are of the largest kind and few in number.

The hyaline vesicles on the other hand are transparent, colourless and globular, and although variable in point of size like the green granules, are seldom recognized before they much exceed the latter in diameter. They generally possess the remarkable property of slowly dilating and suddenly contracting themselves, and present in their interior, molecules of extreme minuteness in rapid commotion.

When living and isolated the sponge-cell is polymorphous, its transparent or non-granular portion undergoing the greatest amount of transformation, while its semi-transparent or granular part, which is uppermost, is only slightly attracted to this side or that, according to the point of the cell which is in the act of being transformed.

The intercellular substance, which forms the bond of union between the cells, is mucilaginous. When observed in the delicate pellicle, which, with its imbedded cells and granules, it forms over the surface and throughout the canals of the sponge, it is transparent; but when a portion of this pellicle is cut from its attachments, it collapses and becomes semi-opaque. In this state the detached portion immediately evinces a tendency to assume a spheroidal form; but whether the intercellular substance participates in this act, or remains passive while it is wholly performed by the habit of the cells which are imbedded in it, to approximate themselves, I have not been able to determine.

Seed-like Bodies.—The seed-like bodies occupy the oldest or first-formed portions of the sponge, never its periphery. They are round or ovoid according to the species, and each presents a single infundibular depression on its surface which communicates with the interior. At the earliest period of development in which I have recognized the seed-like body, it has been composed of a number of cells united together in a globular or ovoid mass (according to the species) by an intercellular substance similar to that just described. In this state, apparently without any capsule, and about half the size of the full-developed seed-like body, it seems to lie *free*, in a cavity formed by a condensation of the common structure of the sponge immediately surrounding it. The cells of which it is now composed appear to differ only from those of the full-developed sponge-cell in being smaller, in the colourless state of their germs, and in the absence of hyaline vesicles; in all other respects they closely resemble the sponge-

cells, possessing also a like but more limited power of motion. [I do not however wish it to be inferred from this close resemblance, that I am of opinion that the seed-like body is but an aggregate of separately developed sponge-cells; on the contrary, there are always present among the cells of a piece of sponge which has been torn to pieces, many which contain within them (developing from their upper an inner surface) a number of transparent cells of various sizes, not unlike the hyaline vesicles in appearance, but all adhering together in a mass. It may perhaps be one of these cell-bearing cells which becomes the seed-like body. They are distinguished from the common sponge-cell by the character I have mentioned, by their containing fewer granules, and by their greater transparency, but in every other respect they are exactly like the sponge-cell.] To resume however the subject of the development of the seed-like body,—it passes from the state just mentioned into a more circumscribed form, then becomes surrounded by a soft, white, compressible capsule, and finally thickens, turns yellow, and develops upon its exterior a firm crust of siliceous spicula.

Thus matured, its cells (Plate III. fig. 6 *b*), which were originally unequal in size, have now nearly all become equal, almost motionless, and a little exceed the average diameter of the largest sponge-cells; while their germs (Plate III. fig. 6 *a*), which in the first instance so nearly resembled the granules of the sponge-cells, are now four or five times larger, and vary in diameter below the $\frac{1}{500}$ th part of an inch, which is the average linear measurement of the largest of their kind.

The capsule (Plate III. fig. 6 *f*) has now passed from its soft, white state into a tough yellow coriaceous membrane, presenting in *Meyeni* and *plumosa* a hexagonally tessellated appearance (fig. 6 *c*), on the divisions of which rest the asteroid disks (fig. 6 *e*) of the vertically-placed spicula (fig. 6 *g*) which surround it.

In the two species just mentioned the spicula are arranged perpendicularly to the surface of the capsule, and the interval between them is filled up with a white siliceous, amorphous matter, which keeps them in position. Each spiculum extends a little beyond this matter, and supports on its free end a toothed disk, similar to the one on its fixed end which rests on the capsule; so that the external surface of the seed-like body in *Meyeni* and *plumosa* is studded with little stellated bodies; while in the other species, where there appears to be no such regular arrangement of these spicula, a number of smooth or spiniferous points is presented.

Development of Spongilla.—When the cells of the seed-like body are forcibly expelled from their natural cavity, under water, they are irregular in form and motionless, but soon swell out (by

endosmose?), become globular, and after a few hours burst. At the time of bursting, their visible contents, which consist of a mass of germs, occupying about two-thirds of the cavity of the cell, subside, and afterwards gradually become spread over the bottom of the vessel in which they are contained. They are of various diameters below the $\frac{1}{3000}$ th part of an inch (Pl. III. fig. 6a), which is the average linear measurement of the largest, and appear to be endowed with the power of locomotion in proportion to their size; that is to say, that while the largest scarcely do more than turn over now and then, as the globules of the blood, the most minute are incessantly moving backwards and forwards, here and there, and assembling in crowds around the larger ones.

If a germ about the $\frac{1}{3000}$ th part of an inch in diameter be selected for examination, it will be observed to consist of a discoid, circular, well-defined translucent cell, which is green or yellowish green at the circumference, but becomes pale and colourless towards the centre. This cell appears to be again surrounded by a colourless transparent capsule, the nature of which is unknown to me, and I am not altogether certain of its real existence.

The green colour is hardly perceptible in germs measuring less than the $\frac{1}{18000}$ th part of an inch in diameter; below this they all appear to be colourless.

A few days after the germs have been eliminated, they for the most part become parcelled out into insulated groups, and united together by a semi-transparent mucilage. In this position the contents of the largest, which resemble the endochrome of the cells of *Confervæ*, undergo a change, becoming nebulous towards the circumference, pellucid in the centre, and then nebulous throughout. The largest germs then disappear gradually, and their disappearance is followed by a successive development of proteans or active polymorphic cells. These proteans for the most part do not exceed, in their globular or passive state, the diameter of the germs which have disappeared, and a successive development of them continues to take place from the contents of the same seed-like body for two or three months after their elimination. There are some proteans present, however, much larger, exceeding even the $\frac{1}{800}$ th part of an inch in diameter, which always make their appearance under the same circumstances, but they are not so numerous; the most numerous are those which average in diameter the $\frac{1}{5000}$ th part of an inch. The form assumed by the latter when in a state of activity is that of the diffluent protean (Plate IV. fig. 1 e), which in progression throws out globular or obtuse expansions of its cells; that of the largest, the denticulated protean (fig. 1 d), which in progression

shoots out digital or dentiform processes ; and that of the smallest, the vermiform protean (fig. 1 *f*), which progresses after the manner of a worm.

They are all (like the cells of the sponge) composed of a cell-wall, within which are round or ovoid, green, translucent granules, varying in size and number ; and one or more hyaline vesicles.

The green granules, although appearing to move over the whole surface of the protean in its active state, are, nevertheless, when it is in its globular or passive state, found to be confined to the upper and inner part of its cell-wall. Sometimes these granules, from their smallness, can hardly be recognized individually, and only appear in the form of a nebular mass ; this is frequently the case in the diffluent proteans and in those inferior to them in size ; at other times they are few in number and all the largest of their kind.

The hyaline *contracting vesicle*, of which there is seldom a plurality in the smaller proteans, appears to be uninfluenced in its presence or development by the state of the green granules, since there is almost always one at least present, and in the enjoyment of great activity.

Such are the changes in the contents of the seed-like body which are witnessed, under this mode of development, with reference to the germs ; we have now to turn our attention to the semi-transparent mucilage, which holds the germs together in their insulated groups, or binds them down singly to the surface of the vessel in which they are contained.

This semi-transparent mucilage appears to be identical with the intercellular mucilage of the sponge ; it exhibits the same phænomenon of ever undergoing a change in shape, but, as I have said before, I am not aware of its possessing this property, independently of the presence of the cells and minute germs which are contained in it ; neither do I know how it comes into existence, *i. e.* whether it be the product of the germs themselves, or whether it be eliminated with them, in a more elementary transparent and invisible form, from the cells of the seed-like bodies. Be this as it may, threads of it soon appear in straight lines extending over the surface of the watch-glass from portion to portion (Plate IV. fig. 1 *h*), and from object to object starting off from different points of an isolated germ—or from any point of a thread of it already formed—sometimes disposed in a flat reticulated structure over a spiculum, or on the surface of the glass—occasionally as broken portions like the ends of threads thrown together without union or order, and not unfrequently bearing minute germs in their course either at irregular distances from each other, or arranged like a string of beads.

It might be as well to notice here that the yolk-like contents of the dried seed-like body, with but slight modifications, undergo the same changes as those of the fresh one. If the former be divided with a sharp knife or lancet, and a portion of its contents picked out on the point of a needle and put into water, it swells out after a few days into a gelatinous mass ; its component parts, *i. e.* its germs and semi-transparent mucilage, begin to evince signs of active life,—a successive development of proteans follows, and threads of the semi-transparent mucilage shoot over the surface of the watch-glass in the manner I have just described.

So far the elements of the sponge are developed from the contents of the seed-like body after forcible expulsion ; we have now to examine them after having issued in their natural way.

If a seed-like body which has arrived at maturity be placed in water, a white substance will after a few days be observed to have issued from its interior, through the infundibular depression on its surface, and to have glued it to the glass ; and if this be examined with a microscope, its circumference will be found to consist of a semi-transparent substance, the extreme edge of which is irregularly notched or extended into digital or tentacular prolongations, precisely similar to those of the protean, which in progression or in polymorphism throws out parts of its cell in this way (Plate IV. fig. 2 *c*). In the semi-transparent substance may be observed hyaline vesicles of different sizes, contracting and dilating themselves as in the protean (fig. 2 *d*), and a little within it the green granules so grouped together (fig. 2 *e*) as almost to enable the practised eye to distinguish *in situ* the passing forms of the cells to which they belong ; we may also see in the latter their hyaline vesicles with their contained molecules in great commotion, and between the cells themselves the intercellular mucilage (fig. 2 *f*).

If this newly-formed sponge be torn up, its isolated cells assume their globular or passive form or become polymorphous, changing their position and their locality, by emitting expansions similar to the proteans or polymorphic cells developed after a forcible expulsion of the contents of the seed-like body, and differing only from them in being more indolent in their movements.

Habits of the Sponge-cell.—In describing the habits of the sponge-cell so far as my observations extend, I shall first confine myself to those which are evinced by it in, or when torn from, the fully-developed structure of the sponge, and subsequently advert to the habits of the polymorphic cells or proteans, which are developed from the contents of the seed-like body when forcibly expelled.

The sponge-cell when *in situ* is ever changing its form, both

partially and wholly ; its granules also are ever varying their position with, or independently of, the movements of the cell, and its pellucid vesicle or vesicles dilating and contracting themselves or remaining passively distended, and exhibiting in their interior molecules of extreme minuteness in rapid commotion. When first separated from the common mass, this cell for a short time assumes a globular form, and afterwards, in addition to becoming polymorphic, evinces a power of locomotion. During its polymorphism it emits expansions of its cell-wall in the form of obtuse or globular projections, or digital and tentacular prolongations. If in progression it meets with another cell, both combine ; and if more are in the immediate neighbourhood, they all unite together into one common globular mass. Should a spiculum chance to be in the course of a cell, it will ascend it and traverse it from end to end, and, subsequently quitting it or assuming its globular form, embrace some part of it and remain stationarily attached to it. The changes in shape and position of the sponge-cell and its intercellular mucilage are for the most part effected so imperceptibly, that they may be likened to those which take place in a cloud. Its granules however are more active ; but there appears to be no motion in any part of the cell, excepting among the molecules within the hyaline vesicle, which in any way approaches to that characteristic of the presence of cilia.

It should be understood however that these remarks are not applicable to every sponge-cell, although fully developed, which appears in the field of the microscope, but rather a statement of what a sponge-cell may evince, than one of what every sponge-cell does evince.

The polymorphic cells or proteans which appear in the watch-glass after the contents of a seed-like body have been forcibly expelled into it under distilled water, are much more active in their movements. Their cell-walls frequently assume the most fantastic figures, spheroidal, polygonal, asteroid, dendritic, &c. Their green granules move backwards or forwards, to this side or to that, with great activity, as the part of the cell to which they are attached is attracted in one direction or another ; while their hyaline vesicle or vesicles (in progression) appear occasionally in every part, not only of the body of the cell, but in its tubular prolongations. The contraction of the hyaline vesicle seems to take place most frequently when it arrives at the posterior extremity, that is, according to the direction in which the cell is progressing ; next in frequency at the sides, seldom in the anterior or central part of the mass. When contraction takes place it is effected more or less completely, more or less suddenly ; if complete, a dark speck or opacity marks the original position of the vesicle, in the centre of which, if watched, it may be observed to

re-appear, and as it is carried forward in the movements of the cell with the portion to which it is attached, it gradually regains its original size, and returning in due course to the point from which it started, again contracts as formerly.

In progression, some of the large proteans developed in the way just mentioned appear to be conscious of the nature of certain objects which they encounter in their course, since they will stop and surround them with their cell-wall. It is not uncommon to see a portion of a spiculum in the latter position (Pl. IV. fig. 3), the larger germs of the sponge itself, the body of a loricated animalecule, the $\frac{1}{900}$ th part of an inch in diameter (fig. 4), on which the pressure exerted by the protean may be seen by the irregular form assumed by the animalecule the moment it has become surrounded. I once saw one of these proteans approach a gelatinous body, something like a sluggish or dead one of its own kind, and equal to itself in size, and having lengthened itself out so as to encircle it, send processes over and under it from both sides (fig. 6), which uniting with each other, at last ended in a complete approximation of the two opposite folds of the cell-wall, throughout their whole extent, and in the enclosure of the object within the duplicature. Even while the protean was thus spreading out its substance into a mere film, to surround so large an object, a tubular prolongation was sent out by it in another direction to seize and enclose in the same way a large germ which was lying near it. After having secured both objects the protean pursued its course rather more slowly than before, but still shooting out its dentiform processes with much activity. It took about three-quarters of an hour to perform these two acts.

Lastly, I have frequently seen it grapple with its own species; when, if the one it meets is near its own size, they merely twist round each other for a short time and then separate; but when it does not exceed the sixth or eighth part of its size, then there is much struggling between them, and the smaller one escapes, or is secured by the aid of the digital prolongations of the larger one, and enveloped as the object before mentioned in a fold of its cell-wall.

On one occasion I witnessed a contest between two proteans, wherein the large one, after having seized the smaller one with its finger-like processes, passed it under its body, so as to cause it to lie between itself and the glass. For a moment the small protean remained in this position, when the cell-wall raised itself over it in the form of a dome, in which so-formed cavity the little protean began to crawl round and round to seek for an exit; gradually however the cell-wall closed in beneath it in the manner of a sphincter, and it was carried up as it were into the inter-

rior of the cell, securely enclosed in a globular transparent cavity resembling a hyaline vesicle, but much larger (Plate IV. fig. 5); it then attached itself to the upper part of this cavity, assumed a globular form, became opake and motionless, and the larger protean took on its course.

Such are a few of the habits evinced by the sponge-cell, developed in its natural way and by the process I have mentioned.

Now, although no doubt may exist in the mind of the reader as to the identity of the sponge-cells developed in the natural way, and most of those developed from the contents of the seed-like body when forcibly expelled; yet it may be a question with him, whether *all* the proteans developed by the latter method come from the contents of the seed-like body, and therefore whether the proteans whose habits I have just been describing, which slightly differ from those of the sponge-cell, taken from its natural structure (only so far as this, however, that I have not seen the like evinced by the latter), have not been developed from some other source.

All that I can say in answer to this question is, that although the proteans, which have evinced the remarkable habits I have described, are larger than the sponge-cell, more active in their component parts, more active as a whole, and appear to possess a greater share of intelligence; yet their general aspect and component parts being the same, their constant appearance in the watch-glass with the other polymorphic cells in the progress of the development of the contents of the seed-like body after forcible expulsion, when they are nearly as numerous as any other form of the protean cells then present, together with the fact, that the sponge-cell *itself* frequently contains pieces of confervæ within duplicatures of its cell-wall, and other foreign matters, just as these proteans include within the duplicatures of their cell-walls the objects I have mentioned, leaves me no conclusion to come to so reasonably, as, that the proteans or polymorphic cells so developed are but a higher condition of the sponge-cell met with *in situ*. How they obtain this condition, whether it be from the peculiar circumstances under which they are developed, or whether it be the development peculiar to a particular class of cells of the same animal, are queries for future inquiry to determine.

Next to the development of the fleshy substance comes that of the horny skeleton and its spicula, of which little more has been made known to me by my observations, than has been published by others who have already directed their attention to the same subjects. I have not had time to continue my investigation beyond the development of the fleshy substance, which is the utmost to which the contents of the seed-like body when forcibly

expelled reaches ; although from my "Notes" it should appear that it went farther, for I have therein stated, that I had seen the semi-transparent mucilage take on an arrangement in form and disposition like that of the spicula in the skeleton ; but this was an illusion, for I afterwards found out that this appearance had arisen from the semi-transparent mucilage having attached itself to a series of minute scratches on the surface of the watch-glass.

My impression however is, that both the horny skeleton and its spicula are formed in the intercellular substance, and not within the cells.

The spicula are membranous, and at an early period of their development pliable ; they afterwards become firm and brittle. If they be exposed to the flame of a blowpipe, many of them swell out towards the middle or one end into a bulb, like that of a thermometer. This is more particularly the case with spicula of *friabilis* than with those of any of the other species. They are hollow, and the form of their cavity corresponds with that of their own form, being widest in the centre and narrow towards each extremity. Sometimes they contain a green matter like the endochrome of cells of *Confervæ*.

Growth.—This only takes place during the time *Spongilla* is covered by water, which in the tanks of Bombay is not more than eight, or at the farthest nine months out of the year, but the duration of its submergence of course again varies with the position it occupies on the sides of the tank. Its increase however appears to be most rapid in September and October, *i. e.* about two months after the tanks have become filled ; subsequently it appears to go on more slowly. During the season of its growth, or while it is under water, it may extend from a portion, not more than a few lines in diameter, over a surface 2 or 3 feet in circumference, or it may evince no disposition whatever to advance beyond its original bulk throughout the whole season. It increases in size by successive additions to its exterior. To whatever extent this increase may reach, either vertically or horizontally, during the first season (assuming that it commenced from a central point or germ), but few seed-like bodies are developed in it, and these few, as I have before said, are found in the centre or first-formed portion. The next year the development of its fleshy substance appears to commence from these seed-like bodies, which a few weeks after it has again become submerged, pour forth their contents over the last year's skeleton, and reaching its circumference develope a new portion ; and in this way, by successive additions, it gradually increases in bulk, while the seed-like bodies accumulate about its centre, till at length it be-

comes based on a mass of them, the lowermost of which merely consist of the refuse of those which have fulfilled the purpose for which they were originally destined*.

Connected with the growth of *Spongilla* is also the following fact, which presented itself to me and which is interesting, inasmuch as it seems to point out, that germs or full-developed cells of it abound in the water of the tanks, independently of those which exist imbedded in their natural structure: viz. one day I observed a few fresh straws floating together on the surface of the water of a tank which abounded with several species of *Spongilla*; they had been accidentally thrown there, but before they began to change colour from putrescence, and therefore but a few days after they had been in the water, a growth of *Spongilla alba* took place around each straw separately, which soon increased to the thickness of half an inch. I do not remember to have seen another instance of such rapid growth, and the freshness of the straw proved this rapidity, for in this country it changes colour after a very few days' immersion.

Although I was perfectly aware that *Spongilla* might be uncovered by water for many months in the year and still retain its vitality, yet I wished to see if this would be the case after the interval of *more* than a year. I therefore placed some portions, which I had kept for this purpose, in tanks supported on bits of cork, and others on stones from which they had been undetached; but from some cause or other, whether from the partial putrescence which its dry fleshy substance subsequently underwent, or from this being present in a larger quantity in sponges taken out of the water in their living state and carefully preserved, than in those exposed to the sun and winds on the dry rocks throughout the greater part of the year, or from both combined, the shrimps and crabs were attracted towards the former and devoured them with rapacity, while they left the latter untouched; so that I was at last compelled to enclose a portion in a gauze-wire case, which was kept 3 or 4 feet beneath the surface of the water for several months. This portion was fixed on a stone, in the position in which it had grown, and when the case was taken up it was found to have exceeded by many times its original bulk, was covered with its natural pellicle, and in the active performance of all its vital functions.

Colour.—This in all, excepting *cinerea*, appears to be yellow.

* Dutrochet has noticed the fact, that in a piece of *Spongilla* which he kept in water for some months, and which contained seed-like bodies, all the soft parts died, became putrid, and dissolved away during the winter, and that in the following spring the fleshy substance became renewed.—*Mémoires pour servir à l'Hist. Anat. et Physiol. des Végétaux et des Animaux*, t. ii. p. 436.

The contents of the dried seed-like body are yellow, and although the new sponge when it first grows from them appears to be white, yet, if its cells be examined under a high magnifying power, their granules will be found to be translucent and yellow, closely resembling, under transmitted light, the colour of chlorine.

Sometimes the green colour of the yellow sponge is evidently owing to the presence of numerous solitary spherical corpuscles, at other times it is as evidently owing to the presence of an *Oscillatoria* or to *Diatomaceæ*, but more frequently it appears to depend on the presence of some colouring matter in or about its cells or granules themselves.

If some fresh cells of *cinerea* be examined under a high magnifying power, they and their contents will present the gray or lilac tint peculiar to the species, and in like manner the cells of yellow sponges which have become green would seem to indicate a similar position of their colouring matter, which in this instance however generally appears to depend on an extra tint of green added to the cell-granules only.

Undoubtedly the sun has the power of turning the yellow sponges green when they are taken from the tank and exposed in a glass vessel to his rays. At the same time the greater part of the sponges are exposed to the sun in their natural habitations throughout the whole year, and yet, with the exception of *fribilis* (which is always green, at least externally), it is only here and there that you find a portion of the others taking on that colour. Exposure to light again does not appear to have this effect on the small pieces of sponge grown from the seed-like bodies, if care has been taken not to admit the presence of other organisms, for they retain their white cotton-like appearance, although exposed to the sun for several days, *i. e.* from the moment they have become perceptible, up to the time that they perish from the want of nourishment in the distilled water in which they have been brought into existence.

It is impossible therefore under these circumstances to say without further research, if the green colour is owing to an additional tint to the colouring matter of the cells or granules themselves, or to the presence of some foreign organism. Bory St. Vincent supposed it to be owing to the presence of *Anabaina impalpabilis**, but when it is due to an *Oscillatoria* or to *Diatomaceæ*, or to solitary organic corpuscles, they are distinctly visible; the green colour however is frequently present when neither can be observed.

Among other experiments I instituted a set to ascertain if each species of *Spongilla* had its peculiar form of *Proteus*; and for this

* Johnston, Brit. Sponges, foot-note, p. 156.

purpose I took small portions of the yolk-like substance from the seed-like bodies of dried pieces of each of the sponges, and after having placed them in separate watch-glasses with distilled water, set them aside for a few days until the proteans made their appearance*. I then began to compare the latter with one another in the different watch-glasses, but instead of finding that each species of *Spongilla* had its peculiar form, I frequently found that the kind of protean I had determined on as proper to one species, was to be seen on the same or on the following day in a watch-glass containing yolk-like substance from the seed-like bodies of another species, and so on throughout all the glasses. It therefore would appear, that in whatever the specific distinctions of the different proteans consist, too much stress must not be laid upon their external forms.

Respecting the position which *Spongilla* holds among organized bodies, I feel incompetent to offer an opinion. All who know anything about the subject are aware that it is closely allied to both the animal and vegetable kingdoms, but it is for those who are best acquainted with that part of the chain which unites these two great conventional divisions, to assign to it its proper link.

I might here state, however, that we are indebted to Dujardin for the earliest notice of the resemblance of the sponge-cell to the *Proteus*†. Ehrenberg's name for the *Proteus* is *Amæba*; he has also applied the same name to the fifth family of his naked *Phytozoaria polygastrica*, Sect. 3, *Pseudopodia*, in which is included the genus *Amæba*.

Finally, I stated in the P.S. to my "Notes‡," that the *Proteus* fed on its like after the manner of the *Hydra*. The fact which induced me to make this assertion has been already mentioned, but the subject requires further investigation before it can be considered conclusive. It is difficult to conceive why the *Proteus* should enclose within its cell-wall one of its own like, if it were not for the purpose of feeding upon it; added to which the constant accumulation of refuse matter, which, issuing from the faecal orifices, settles on the surface of the living sponge, when kept in a horizontal position, shows that there is a continual elimination going on of material which is no longer useful in its œconomy, and in connection with the fact to which I have alluded, would seem to point out the probability that such *ejecta*, to a certain extent, consist of the cast-off parts of organisms from which the nutrient parts have been abstracted.

* Throughout all my experiments distilled water was used, and every precaution taken to preclude as far as practicable the introduction of foreign matter.

† Ann. des Sc. Nat. n. s. x. p. 5.

‡ Ann. and Mag. Nat. Hist. loc. cit.

EXPLANATION OF PLATES III. IV. AND V.

PLATE III.

- Fig. 1.* Section of *Spongilla Meyeni*, natural size.
 a. Small spiculum and seed-like body of the same, magnified.
Fig. 2. Section of *Spongilla plumosa*, natural size.
 b. Small spiculum and seed-like body of the same, magnified.
Fig. 3. Section of *Spongilla friabilis?* natural size.
 c. Small spiculum and seed-like body of the same, magnified.
Fig. 4. Section of *Spongilla alba*, natural size.
 d. Small spiculum and seed-like body of the same, magnified.
Fig. 5. Section of *Spongilla cinerea*, natural size.
 e. Small spiculum and seed-like body of the same, magnified.

As none of these species possess specific forms, it has been deemed advisable to give sections of them, showing their average and relative thicknesses, the form of the projections from their surface, and the peculiarity of their internal structures respectively.

- Fig. 6.* Magnified section of a seed-like body of *Spongilla Meyeni*, showing,
 f, spicular crust; g, coriaceous capsule; h, internal cells, and i, infundibular opening.
 a. Germs of cells magnified,—the largest $\frac{1}{3000}$ th part of an inch in diameter.
 b. Cell of seed-like body containing germs, magnified.
 c. Portion of coriaceous membrane magnified to show hexagonal divisions and transparent centres.
 d. Small spiculum of *Spongilla Meyeni*, magnified.
 e. One of its toothed disks with central aperture, magnified.

PLATE IV.

- Fig. 1.* Disk to show the appearance which is presented on the surface of the watch-glass a few days after the matter of the seed-like body has been forcibly expelled into it under distilled water.
 a. Denticulated proteus in progression, showing its granules and hyaline vesicles, magnified.
 b. Passive state of the same, magnified.
 c, c, c. Germs parcelled out in semi-transparent mucilage, magnified.
 d. Denticulated proteus, magnified.
 e, e. Diffluent proteus, ditto.
 f. Vermiform proteus, ditto.
 g, g. Animalcules about $\frac{1}{1000}$ th part of an inch in diameter, which, to the almost complete exclusion of all other kinds, were generally present with the proteans, magnified.
 h, h, h. Threads of semi-transparent mucilage, ditto.
Fig. 2. A magnified view of a newly-formed portion of *Spongilla*, grown in distilled water from a seed-like body, as seen with Ross's microscope, under a compound power of $\frac{1}{8}$ th of an inch focus.
 a. Sponge-cell with its granules and hyaline vesicles magnified, taken from the same portion.
 b. The same in a passive state, magnified.
 c, c, c. Marginal or thinnest portion of newly-formed *Spongilla*, ditto.
 d, d. Form of its extreme edge, ditto.
 e, e. Hyaline contracting vesicles, ditto.
 f, f. Sponge-cells *in situ*, ditto.
Fig. 3. Magnified view of a denticulated proteus with a portion of a spiculum in a fold of its cell-wall.
Fig. 4. Ditto, with a loricated animalcule and germ in ditto.

Fig. 5. Ditto, showing a small proteus attached to the side of a transparent cavity in ditto.

Fig. 6. Ditto, in the act of surrounding a foreign body.

Fig. 7. Most striking forms assumed by proteans, developed from the matter of the seed-like bodies (seen at various times), magnified.

PLATE V.

Fig. 1. Remarkable forms assumed by proteans, developed from the matter of the seed-like bodies, magnified.

Fig. 2. General form of large spiculum, ditto.

Fig. 3. Magnified view of spiniferous spiculum.

X.—Notice of a Bottle-nosed Dolphin (*Delphinus Tursio, Fabr.*) upon the Suffolk coast. By W. B. CLARKE, M.D.

A SPECIMEN of this Dolphin has been sent to the Ipswich Museum within a few days; it was discovered upon the beach at Bawdsey, which is a village about fourteen miles from Ipswich. The animal was stranded on the shore and left by the retiring tide. There are many regular transverse marks across the anterior edge of the dorsal fin, and across the back posterior to that fin: there was also a deep wound in the underside of its throat, a little anterior to the sternal region, apparently inflicted by a lance, and also various marks upon several parts of the body, as if produced by the blunt hook and point of a "boat-hook." By these I am induced to suppose that the creature was entangled at sea, in the net of some fishing vessel, the crew of which, upon finding it there, exerted their best means of despatching it, and afterwards turned it adrift.

Prof. Bell remarks (in his History of Brit. Quad. including the Cetacea), "Considerable ambiguity appears to have rested upon this rare species of northern Dolphin, which has been gradually removed by Desmarest, G. Cuvier, and particularly by F. Cuvier, in his admirable book already quoted (Fr. Cuv. Hist. Nat. Cet. p. 141)." It now appears certain that the "Nissarnak" of Fabricius and of Bonnaterre, and the first of the two Bottle-nosed Whales figured by Hunter, are identical with the *Delphinus Tursio*. Desmarest and G. Cuvier had at first considered them distinct, but the latter distinguished naturalist afterwards corrected the error, and his brother has subsequently fully established their identity.

The first account which we have of its appearance on our shores is that of J. Hunter, in which he considers it as the common Dolphin, *Delphinus Delphis*. The specimen figured (Hunter, Phil. Trans. 1787, p. 373. t. 18) was caught, says Hunter, upon the sea-coast near Berkeley, where it had been seen for several days following its mother, and was taken along with the old one: the latter was 11 feet long.

Mr. Jenyns mentions another instance of its occurrence in the river at Preston, the length of which was 11 feet.

Col. Montagu apparently describes another taken in the river Dart in Devonshire, the length of which was 12 feet.

Prof. Bell continues, "The history and description of this animal are still deficient; it is probably a rare or local species, and may be chiefly confined to the northern seas;" he also believes it probable, with Mr. Jenyns (Brit. Vert. p. 41), that *Delphinus truncatus* of Mont. (Mem. Wern. Soc. iii. p. 75. t. 3) may be admitted as a synonym of this species. The one described by Montagu as taken in the river Dart in Devon, about five miles from the mouth of the river, was 12 feet in length and 8 in circumference at the largest part. When wounded it is said to have made a noise like the "bellowing of a bull."

Our specimen is a female, 8 feet 4 inches in length and 4 feet in girth. In colour it is black on the back, gray and purplish gray on the sides, and white with tinges of dusky white beneath. Forehead convex; jaws produced, subrostral, lower a little longer than the upper. Teeth conical, $\frac{22}{20} : \frac{22}{20}$.

In taking a general view of the creature I noticed the following proportions, viz. the dorsal fin appears to occupy the middle region between the point of the jaw and tip of the caudal fin: then drawing an imaginary line perpendicularly down from the anterior base of the dorsal fin, the pectoral fins appear to occupy the middle region between this line and the point of the jaw; whilst the cloaca occupies the middle region between the same line and the base of the caudal fin.

There is a degree of beauty and elegance about the creature with regard to its general colouring and form, the fins presenting a series of ogee curves: the dorsal fin is ample and curves backward; the pectoral fins appear rather small in proportion to the size of the animal; the caudal fin, being the principal instrument of propulsion, is ample. The compressed character of the caudal extremity of the body is carried from the base along the middle region of the depressed fin so as to produce a ridge both above and below it, giving that part a peculiarly elegant form, and ensuring the greatest amount of effect in its vertical action upon the medium in which the creature is swimming.

The respiratory aperture is 1 foot 2 inches from the point of the nose, and looking at the animal in profile appears to form an isosceles triangle with the eye and point of nose, the short side of which triangle is bounded by this aperture and the eye: it is so completely closed by the valvular arrangement as to appear like a curved crescentic line with the ends or horns directed forwards. The extremities of this aperture are one inch and three-

quarters apart, and the convexity of the curve three-quarters of an inch, and when opened it presents a crescent-like form with the horns still directed *forwards*.

The mammary orifices are inguinal, and lie one on each side of the longitudinal folds or labia which conceal and are common to the anal, vaginal and vesical orifices, and are equidistant from its extremities : each is concealed within a small longitudinal fold and about half an inch from the former.

The external auditory meatus is very small and puncture-like, surrounded by a delicate membranous ruffle about $\frac{1}{3}\frac{1}{2}$ nd part of an inch in height.

The following are some of the measurements :—

	ft.	in.
Whole length	8	$4\frac{1}{2}$
Girth	4	8
Nose from the convexity of forehead to point	0	4
Length of mouth	1	0
Nose to eye	1	2
Nose to respiratory aperture	1	2
Nose to pectoral fin	1	$10\frac{1}{2}$
Nose to dorsal fin	3	10
Length of dorsal fin	1	4
Height of dorsal fin	0	8
Breadth of caudal fin	1	8
Length of pectoral fin, anterior slope	1	1
Length of pectoral fin, posterior slope	0	$8\frac{1}{2}$
Breadth of upper jaw at the base of the rostrum	0	$3\frac{1}{4}$
Breadth of under jaw at the base of the rostrum	0	$3\frac{1}{2}$
Length of the fold or labia common to and concealing the anal, vaginal and vesical orifices	0	6
Length of vaginal orifice including the vesical	0	3
Length of perineum	0	$1\frac{1}{2}$
Length of the fold, including the mammary orifice or nipple	0	$0\frac{3}{4}$
Collapsed nipple in length	0	$0\frac{1}{4}$
Collapsed nipple in width at its base.....	0	$0\frac{1}{2}$

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XI.—*On Entozoa found in the Lungs of a Sheep.* By JOHN GRAY SANDIE, M.D., and GEORGE PADLEY, Esq., Liverpool.

[With a Plate.]

WHILE passing along the street the other day, our attention was drawn to the lungs of a sheep exposed for sale at a butcher's shop. As the animal had been killed but a few hours before, the organ in question was quite fresh. From the middle to the base of the anterior margin of the lung, a number of opaque masses were observed, the smallest of which was the size of a split-pea, while the largest appeared to be as big as a hazel-nut. On cutting into them two different kinds of matter were apparent, one

more opake and interspersed with numerous white specks, while the other was semitransparent and resembled soft tubercle. The exterior of all the masses lay immediately underneath the serous membrane, and some of them penetrated the pulmonary tissue, which was otherwise healthy, for about a quarter of an inch.

A thin section was placed beneath the microscope and examined by reflected light, when a great many little objects, probably the white specks just spoken of, resembling in colour and outline grains of pearl barley, were seen distributed through the surrounding tissue. But with the aid of transmitted light and lenses of greater magnifying power ($\frac{1}{4}$ -inch focus), a number of animalecules, such as represented in the annexed figure (Plate V. B fig. 1), were seen coiled up and imbedded in a brownish mass consisting of minute cells and granules. They were very abundant in the opake portion of the section, and were very closely aggregated together in spots probably corresponding to the specks, whereas in the intervening portions as well as in the surrounding more transparent structure, comparatively few were to be found. On making our first observation each individual was inclosed in a transparent membrane, which upon a subsequent examination was proved to be the wall of the ovum. We afterwards found many that had escaped from this envelope lying free in the morbid substance. Some were in the form of the letter S, while others presented a more complex convolution. On scraping a small portion from one of the tumours and mixing it with a little water between two slips of glass, the animals were seen to greater advantage, and their position in the pellucid covering was better defined. On several occasions we saw the animal liberate itself from the membrane in which it was encased ; this was accomplished by the approximation of the head and tail, which were subsequently separated, and driven against the sides of the sac that had previously been elongated, with such force as to rupture it and so set the animal at liberty. In its movements, which were vermicular, the animal showed considerable activity. As it lay extended when quiescent the head appeared of a conical shape, and the tail presented a small, curved, flexible, filiform appendage which was very characteristic (Pl. V. figs. 1, 2, 3). The integuments being transparent the alimentary canal could be distinctly traced, commencing narrow at the head, enlarging somewhat and terminating near the tail. In some this canal was empty (fig. 2), and the parietes of the tube clearly defined. In others it was occupied with granular matter (fig. 3) having much the appearance of the substance with which they were surrounded; in some instances to such an extent as to fill completely the interior of the animal.

These Entozoa resemble the *Trichina spiralis* found in mus-

cular tissue more than any other parasite with which we are acquainted, although differing from it in habitat, in having little caudal appendage, and in being without, as far as we could discover, any distinct cyst, excepting that of the ovum before alluded to. This is the first instance within our knowledge of Entozoa having been found in the lungs. The *Filaria bronchialis* inhabits the bronchial glands, and is moreover about an inch in length.

We had an opportunity likewise of examining the ova of these animals, and of observing them in several stages of development. Some contained a simple oval granular mass (fig. 4); in others this appeared to be contracting (fig. 5), and in various stages of division and subdivision. In some there was a separation into two parts (figs. 6 & 7); others presented a mulberry mass similar to that found in the ova of other animals (figs. 8 & 9). Different degrees of progressive formation were observed from this subdivision up to the completion of the perfect animal coiled up within its unruptured envelope (fig. 10).

XII.—*The Musci and Hepaticæ of the Pyrenees.*

By RICHARD SPRUCE.

[Concluded from vol. iii. p. 503.]

Subtribus 2. JUNGERMANNIDEÆ, N. ab E.

5. *Plagiochila*, Nees et Mont.

8. *P. asplenoides*, L.; Hook. Br. Jung. t. 13 (sub *Jung.*); Syn. Hep. p. 49.

Hab. Z_{0—3} in umbrosis per montes totos. In Pyrenæis tres præprimis formas innotavi: sunt—

1. *minor*; H. P. 6: caule gracili, squamis minutissimis (ne amphigastriis dicam) in ventre adsperso vel nudo; foliis subsecundis, margine dorsali valde reflexis et ex eo ad *P. porelloidem* appropinquans.—*Hab.* in sylvis Pyren. centralium.

2. *major*; H. P. 7: foliis maximis, confertis, patulis; squamis caulinis obviis, plerumque amorphis, nonnullis bifidis, nonnullis linearis-digitatis.—*Hab.* in valle du Lys.

3. *heterophylla*, N. ab E.? Syn. Hep. p. 50; H. P. 8: caule flagellifero, squamis minutis subulatis prædicto; foliis repandis, retusis emarginatisve.—*Hab.* Val de Jéret et Bois de Gouerdère, in rupibus umbrosissimis.

9. *P. Pyrenaica*, Spruce in Hep. Pyren. n. 9: *caule horizontali in planum ramoso*; foliis imbricatis, plano-distichis aut adscendentibus, subconvexis, ovato-subquadratis, *apice variis*, ob-

lique unidentatis, truncato-bidentatis, denticulatis, retusis vel obtusis omninoque integerrimis: involucralibus majoribus, subverticalibus, arcte adpressis, ovato-linguaeformibus, repandis subdenticulatis; *perianthio obovato-oblongo*, compresso, incurvo, *ore spinuloso-dentato* hinc plerumque fisco.

Hab. Z_{1-2} ad rupes humidiusculas Pyren. centralium (*Superbagnères*; *Grottes de Bédat* prope *B.-de-Bigorre*; *V. de Gazos*) et occidentalium (*Mont Goursi*; *Gave de Valentin*).

Caules intertexti, fertiles $\frac{1}{2}''-1''$, steriles $2''-3''$ longi. *Folia* ramorum fertilium plerumque integra retusave, sterilium contra vario modo incisa rarius integra et integerrima. *Retis areolæ* 6-angulares, subcontiguae. *Color* viridi-olivaceus sicco statu in lutescentem vergens. *Perianthium* superne ampliatum. *Capsulas* maturas non habui.

Florescentia monoica: perigonia spiciformia: folia lobulo involuto spinuloso vel laciniato-dentato stamina obtegente prædita.

Plagiochila interrupta, N. ab E. Syn. Hep. p. 48, planta plerumque humilior, *folia semper integerrima* et *perianthium ore repando-crenulatum* habet. *P. porelloides* N. ab E., *caulibus adscendentibus et foliis gibbis, flaccidis, integerrimis*, sat superque distincta.

Although I have lately had Dr. Gottsche's sanction for retaining *Plagiochila Pyrenaica*, I think it not improbable that it may one day be proved a variety of *P. interrupta*, a striking one certainly, and perhaps confined to the Pyrenees. The *Plagiochilæ* are so liable to variation in the toothing of the leaves, that it is scarcely possible to suppose all the generally received species genuine. I have seen no specimens of *P. porelloides* which I can safely separate from *P. asplenoides*.

6. *Scapania*, Lindenberg.

10. *S. compacta*, Roth, Fl. Germ. 3. p. 375 (sub *Jung.*); Syn. Hep. p. 63. *Jung. resupinata*, Hook. Br. *Jung.* t. 23.

"Var. 1, foliis in duplicatura sæpius alatis, ala repando-dentata, lobo ventrali convexo;" H. P. 10.—*Hab.* Z_0 in Agro Syrtico circa *St. Sever* et *Aquas Tarbellicas*. "Collines de *St. Pandelon*, de *Tercis*," Grateloup in 'Cryptogamie Tarbellienne.'

"Var. 2, foliis ut plurimum inæqualiter bilobis, lobo ventrali concavo;" H. P. 11.—*Hab.* Z_1 P. c. in arenosis supra pagum *Gerde* prope *B.-de-Bigorre*.

Possibly a distinct species from the foregoing. The segments of the leaves are *subtrapezoidal*, quite entire, the *sinus gibbos*, the areolation rather closer and subguttulate. I have, however, only the sterile plant.

11. *S. undulata*, L. Sp. Pl. p. 1598 (sub *Jung.*); Hook. Br. *Jung.* t. 22; Syn. Hep. p. 65; H. P. 12.

Hab. Z_{0-3} in umbrosis humidis ad saxa. *Pont d'Espagne*. *Mt. Crabioules*. *V. de Courbettes* (Philippe!). "In Agro Syrtico prope *Dax*" (Grateloup, *l. c.*).

12. *S. nemorosa*, L. Sp. Pl. p. 1598 (sub *Jung.*) ; Hook. Br. Jung. t. 21. f. 1-4 ; Syn. Hep. p. 68 ; H. P. 13.

Hab. Z_{0-3} locis sylvaticis, frequens.

13. *S. umbrosa*, Schrad. Samml. 2. p. 5 ; Hook. Br. Jung. t. 24 ; Syn. Hep. p. 69 ; H. P. 14.

Hab. Z_{2-3} P. occ. ad saxa prope pontem dict. *Pont d'Espagne*. P. c. in monte *Crabioules* ad ligna putrida. E rarioribus.

14. *S. apiculata*, Spruce in Hep. Pyren. n. 15 ; caule brevi simplice, infra perianthium innovante, e basi flexuosa repente adscendente ; foliis pallidis vel fuscescentibus, infimis minimis, bidentatis, vix complicatis, superioribus majoribus, usque ad $\frac{1}{3}$ bifidis, conduplicatis, lobis oblique rhomboideis, apiculatis, subrepandis, haud arcte adpresso, ventrali plerumque concavo, dorsali paulo minori, convexo, margine tamen saepius reflexo, sinu depresso, guttulato-areolatis, cellulis discretis ; involucralibus conformibus, deflexis ; perianthio oblongo-clavato, compresso, subdeflexo, ore repando.

Hab. Z_2 supra ligna putrida in sylvis editioribus. P. occ. *Vallée de Béost*. P. c. *Cascade du Cœur* prope *B.-de-Luchon*.

S. umbrosa, proxima, colore specioso albo roseo, caule subramoso, foliis homomallis, argute serratis, usque ad $\frac{2}{3}$ bifidis, lobo dorsali ventrali 3-4plo minori, diversa est. *S. curta* N. ab E. foliorum forma, perianthio ciliato, &c. distinctissima.

7. *Jungermannia*, Linnæus.

Obs. Of the *Jungermanniae* observed in the Pyrenees, *Jg. acuta* and *Wilsoniana* have their normal station on calcareous rock ; *Jg. exsecta*, *ventricosa*, *curvula*, *incisa*, *divaricata*, *reclusa*, *curvifolia* and *setacea* were gathered only on decayed wood ; the remainder are chiefly glareal or viatical, and some of them were also occasionally seen on decayed wood. It will be remarked that those species which in the Pyrenees occupy semiputrid trunks are the same which inhabit heaths on the plains and hills of the north of Europe. The species which approaches nearest the snow-line is *Jg. julacea*.

§ 1. COMPLICATÆ, Syn. Hep.

15. *J. albicans*, Linn. Sp. Pl. p. 1599 ; Syn. Hep. p. 75.

Hab. Z_{0-4} terrestris et rupestris, fere ubique.

16. *J. obtusifolia*, Hook. Br. Jung. t. 26 ; Syn. Hep. p. 76 ; H. P. 16.

Hab. Z_{0-2} in viarum cavarum parietibus solo arenoso. P. occ. *St. Sever* ; *Cauterets*. P. c. *B.-de-Bigorre* ; *Port de Portillon*.

17. *J. exsecta*, Schmid. Ic. p. 241. t. 62 ; Hook. Br. Jung. t. 19 ; Syn. Hep. p. 77 ; II. P. 17.

Hab. Z_2 in truncis putrescentibus. Fructiferum legi in monte *Pic de Ger*, P. occ.

The fructification in my specimens differs somewhat from the description in 'Synopsis Hepaticarum'; it is as follows:—Involucral leaves with very acute segments, otherwise not differing from the caulin ones, with the exception of the innermost, which is rather shorter and terminated by several unequal apiculate teeth: it is accompanied by a lanceolate very acute stipule. Perianth oblongo-cylindrical, compressed, with four obtuse angles or plicæ, the mouth ciliate.

§ 2. INTEGRIFOLIÆ, Syn. Hep.

18. *J. Schraderi*, Mart. Fl. Erlang. Cr. p. 180. t. 6. f. 55; Syn. Hep. p. 83; Sullivant! Musci Allegh. n. 235; H. P. 18.

Hab. Z₂ P. c. ad saxa in umbrosissimis secus cataractam *Cascade du Cœur* dictam.

19. *J. hyalina*, Lyell in Hook. Br. Jung. t. 63; Syn. Hep. p. 92; H. P. 21.

Hab. Z₁₋₂ P. c. in rupibus secus rivulos, rarius ad terram. *Vallée de Castelloubon*; *Gorge de Labassère*, &c.

20. *J. nana*, N. ab E.; Syn. Hep.! p. 91; H. P. 20.

Hab. Z₁₋₃ per Pyrenæos occ. et centr. in viis eavis, sed nusquam copiosa. *Col de Louvie*; *Bois de Lagailhaste*; *Esquierry*, &c.

21. *J. Genthiana*, Hueben. Hep. Germ. p. 107; Syn. Hep. p. 94. " *J. crenulata*, Sm., var. foliis caulinum fertilium minus compresso-contiguis, vix marginatis, perianthio (haud compresso) obovato, submucronato, plicato-4-angulo, angulis papilloso-alatis;" H. P. 19.

Hab. Z₁₋₂ P. c. ad viarum parietes. *Bois de Gerde* prope *Bagnères*, *Port de Portillon*, &c.

The characters quoted above from 'Hepaticæ Pyrenaicæ' correctly indicate the differences of this plant from *Jg. crenulata*, and I am now quite satisfied of their being specific.

22. *J. crenulata*, Sm.! E. Bot. t. 1463; Syn. Hep. p. 90.

Hab. Z₀₋₁ in arenosis turfosisque Agri Syrtici et P. centr., rarius. *St. Sever*; *B.-de-Bigorre*.

23. *J. sphærocarpa*, Hook. Br. Jung. t. 74; Syn. Hep. p. 93; H. P. 22.

Hab. Z₁₋₂ P. occ. et c. locis similibus ac *Jg. hyalina* (n. 19). *Gorge de Cauterets*; *Labassère*; *Forêt de Transoubât* (Philippe!).

The black crumbling schist at *Labassère*, on which *Jg. sphærocarpa* and *hyalina* occur intermixed, is precisely of the same nature as the alum-shale in Eskdale near Whitby, Yorkshire, and it is remarkable that there also the same two species grow together in considerable quantity.

24. *J. cordifolia*, Hook. Br. Jung. t. 32; Syn. Hep. p. 95; H. P. 24.

Hab. Z_{1-3} P. c. in fontibus profundis secus ripas flum. *Adour*, in pagi *Asté* conspectu; necnon in humidis montis *Crabioules*.

Dr. Gottsche informs me that this species does not differ from *Jg. tersa* γ . *rivularis* of German authors.

25. *J. riparia*, Tayl. ! in Annals of Nat. Hist. xii. p. 88; Syn. Hep. p. 97; H. P. 25.

Hab. Z_{1-3} in rupibus irroratis, rarius ad terram, frequens.

This species is often mixed with *Jg. acuta*, but it is not, like that species, confined to calcareous rock.

26. *J. pumila*, With. Arrang. 3. p. 866; Hook. Br. Jung. t. 17.

Hab. Z_2 P. c. ad saxa in sylva *Bois de Sajust* dicta: aliubi haud visa.

I cannot distinguish authentic specimens of *Jg. Zeyheri*, Hueben, from this. Both are remarkable for the perianth terminating in a cone, which is not plicate, but has *a furrow on each face*, that on the dorsal being most evident, and along this the dehiscence takes place for the emission of the capsule.

§ 3. BIDENTES, Syn. Hep.

27. *J. acuta*, Lindbg.; Syn. Hep. ! p. 103. *J. Muelleri*, N. ab E.; Syn. Hep. ! p. 99; H. P. 26, 27, 28*.

Hab. Z_{1-2} locis calcareis subhumidis terrestris et saxatilis, rarius lignicola, per Pyrenæos frequentissima.

In 'Hepaticæ Pyrenaicae' I gave three forms of this species, scarcely differing from each other except in size; the third form (No. 28) attains a length of 3 or 4 inches, and forms closely-tufted patches on the nearly vertical faces of rocks watered by the spray of rivulets in the upper part of the *Vallée d'Ossau* and the *Gorge de Labassère*. I there considered *Jg. Bantriensis*, Hook. Mst., which I gathered abundantly in Teesdale in 1843, as belonging to the same species, but at Dr. Gottsche's suggestion I have reconsidered this opinion, and I now think that the two may in all cases be safely distinguished. The differences are these:—in *Jg. Bantriensis* the leaves are always more or less erect, and in the large form they are *secund*, the two rows being contiguous by their upper surfaces, which I have never seen to be the case in *Jg. acuta*; they are also less undulate, *the sinus not gibbous*, though from the incurvation of the apices there is sometimes the appearance of it. Perianth when *young* (and in all stages when *unfertile*) *pyriform or broadly clavate*; while the perianth of *Jg. acuta*, in all states and at every age, even when quite

* *Jg. acuta* and *Muelleri* are now ascertained to be absolutely identical, the former having the stipules nearly or altogether obsolete.

short and half-developed, is of equal width from a little above the base to the summit, i. e. *cylindrical**.

28. *J. Lyoni*, Tayl. ! Trans. Bot. Soc. p. 116. t. 7; H. P. 29.

Hab. Z₁^{sup.—2} inter muscos ad saxa sylvarum, haud rara. *Val de Jéret*, &c.

The authors of ‘Synopsis Hepaticarum’ had surely never seen correct examples of this when they referred it to *Jg. socia*, N. ab E., and their description of it, “foliis laciniis obtusis,” is quite at variance with specimens I possess from Messrs. Lyon and Taylor. It is singular that its near ally, *Jg. barbata*, Schreb., one of the commonest species in our mountains, should never have been observed in the Pyrenees. Dr. Grateloup indeed mentions it in his list as growing at the extreme western angle, “in montibus petrosis Cambo prope Bayonam,” but without seeing his plant I dare not say that it is different from *Jg. Lyoni*†.

29. *J. Wilsoniana*, N. ab E.; Syn. Hep. p. 103; H. P. 30. *J. turbinata*, Wils. ! in E. Bot. Suppl. t. 2744. *J. inflata*, E. Bot. t. 2512.

Hab. Z₁ in rupibus calcareis subhumidis. *Gélos* prope *Pau*. *B.-de-Bigorre*.

30. *J. ventricosa*, “Dicks.”; Hook. Br. Jung. t. 28; Syn. Hep. p. 108. *J. porphyroleuca*, N. ab E.; Syn. Hep. p. 109. “*J. alpestris*, Schleich.”; H. P. 31.

Hab. Z_{2—3} ad terram et trunco putridos. *P. c. Ruisseau d'Ardalos*. *P. occ. Val de Jéret*.

I am doubtful whether Dickson meant this species by his *Jg. ventricosa*, Fasc. 2. p. 14. He gives no figure, but cites figures of Michelii and Dillenius, which are certainly little like our plant, and adds, “*Folia in nostra profundius fissa*, quam in figuris Michelii et Dillenii depinguntur,” which is still more at variance with the species as figured by Hooker. Dr. Gottsche informs me that when this plant grows on rotten wood, where it often assumes a purplish tinge (as in some of my Pyrenean specimens), it is the *Jg. porphyroleuca* of Nees. In ‘*Hepaticæ Pyrenaicæ*’ I had considered this form as possibly *Jg.*

* The plant alluded to at the close of my description of *Jg. Bantriensis* (“Annals,” 1844) as gathered by Mr. Ralfe at Dolgelley, is possibly distinct from both the above. The three perianths in my possession are all subtriangular on the section, the dorsal face being the narrowest, and in one perianth the two lateral angles are winged and toothed. If it must be referred to one of the two, it will be to *Jg. acuta*, as it has the gibbous sinus of the leaves characteristic of that species. Mr. Wilson, to whom I am indebted for the specimens, has called it *Jg. culearis*.

† Dr. Grateloup mentions in his list “*Jg. setiformis*, Ehrh. *Hab. in sylvis ad terram et ad arb. trunco. Dax. Léspéron. Saubagnac*,” but as I searched for it in these stations without success, I cannot include it in my enumeration. It would be indeed remarkable to find in the *plains* of the south of Europe a species which grows most profusely in Lapland (Wahlenberg), and which when it extends farther south is uniformly *alpine*.

alpestris, Schleich., but specimens of the latter from Dr. Gottsche differ in having the leaves *roundish-ovate* (not quadrate as in *Jg. ventricosa*), the *sinus small*, and the *segments unequal, oblique*.

Var. *minor*. “*Jg. excisa*, Dicks. ? var. *foliis e basi cuneata* ovato-quadratis obovatisve, marginibus inflexis, sinu triangulari lunatove, involucralibus bifidis, integerrimis; perianthio oblongo, ore obtuse plicato;” H. P. 32.

I believe I am correct in regarding this a minute form of *Jg. ventricosa*; the leaves are usually more deeply cloven, the sinus triangular, the segments often divaricating; and yet stems of the large, ordinary form may be found having the same characters.

31. *J. curvula*, N. ab E.; Syn. Hep. p. 115; H. P. 33.

Hab. Z₂ P. occ. in valle *Combascou* supra ligna putrida.

32. *J. capitata*, Hook. Br. Jung. t. 80; H. P. 34. *J. excisa* β. *crispata*, Hook. l. c. t. 9. ff. 2, 11, 12. *J. intermedia*, Lindbg. Hep. Europ. p. 83; Syn. Hep. ! p. 116.

Hab. Z₀₋₂ P. occ. in arenosis *Sti. Sever.* P. c. in truncis putridis secus cataractam *Cascade du Cœur* dictam: rarior.

I am quite of opinion that the original name of Hooker should be retained for this species. Lindenberg was evidently not aware that his own *Jg. intermedia* and Hooker's *Jg. capitata* were forms of one species; from his description it is probable that he did not clearly distinguish it from some forms of his *Jg. bicrenata*, as he cites for it Hooker's tab. Suppl. 2 (Synopsis, p. 11), which exactly resembles Ekart's figures of *Jg. bicrenata*, and agrees well with specimens of the gemmiferous state of that species in my possession.

33. *J. bicrenata*, Lindbg. Hep. Eur. p. 82; Syn. Hep. ! p. 115; H. P. 35, 36.

Hab. Z₀₋₁ in arenosis ad viarum parietes. *St. Sever.* *Pau.* *Bagnères.*

Dr. Gottsche has pointed out to me *the remarkable scent of this species*, resembling that of *Jg. acuta* and *Bantriensis*, and *quite wanting* in *Jg. capitata*; by this character, by the deeply and acutely cloven leaves, and especially by the *guttulate areolation*, *Jg. bicrenata* may always be safely distinguished.

I fear *Jg. excisa*, Dicks. Crypt. 3. p. 11. t. 8. f. 7, will have to be entirely erased from the list of *Hepaticæ*. I have spent much time in the attempt to ascertain what it really is, but without success; formerly I thought it might be *Jg. bicrenata*, especially as there is a rude attempt in Dickson's figure to represent the guttulate areolation, characteristic of that species; but the larger size, the *branched stem*, and especially the *narrow shallow sinus of the leaves*, seem to disprove such a supposition. Very lately I consulted the Smithian herbarium in the hope of finding an original specimen from Dickson, but even the name does not seem to exist there. I have examined a multitude of specimens from various parts of the British Isles, sent

under the name of “*Jg. excisa*:” these belong in nearly equal quantities to three species, viz. :

1. *J. ventricosa*, forma minor = *J. excisa*, Hook. t. 9 (excl. var. β).
2. *J. birenata*, Lindbg. = *J. excisa* gemmifera, Hook. t. Suppl. 2.
3. *J. capitata*, Hook. = *J. excisa* β . *crispata*, Hook. t. 9. ff. 2, 11, 12 = *J. intermedia*, Lindbg.

It is exactly the same with specimens of “*Jg. excisa*” from the continent of Europe, nor have I ever seen a specimen agreeing with the descriptions that have been given of this species. Hooker says of *Jg. excisa*, “foliis profunde emarginatis;” of *Jg. ventricosa*, “foliis obtuse emarginatis;” Lindenberg says of *Jg. excisa*, “Differt foliis minus profunde incisis;” lastly, the authors of ‘Synopsis Hepaticarum’ describe *Jg. excisa*, “foliis . . . sinu profundo obtuso excisis.” From these and similar discrepancies, I cannot help concluding that these distinguished hepaticologists had under their eyes small forms of more than one of the three species above-cited when they drew up their descriptions of the supposed “*Jg. excisa*, Dicks.” Dr. Gottsche has even admitted to me that he is unable to determine *Jg. excisa* if given to him without a name. He adds, “what I have received from my English and German friends under the name of *Jg. excisa* differ so much from each other, that I confess not to know the species.”

34. *J. incisa*, Schrad.; Hook. Br. Jung. t. 10; Syn. Hep. p. 118; H. P. 37.

Hab. Z_{0-2} in truncis prostratis cariosis Pyrenæorum, frequens. “Ad terram humidam ac in rupibus muscosis circa Aquas Tarbellicas” (Grateloup, l. c.).

The leaves of this species are normally *conduplicate*; the lowest unequally bidentate with diverging segments, as in many *Scapaniæ*; the upper with very unequal lobes, the dorsal lobe triangular, undivided, appressed to the stem, the ventral lobe bifid: both either entire at the margins or with a few spinulose teeth. This is the typical structure, but, very rarely, the dorsal lobe is also bifid, and sometimes the ventral lobe is not bifid, but cut at the margin into several unequal spinulose teeth: sometimes it is trifid. In all cases the complication is discernible, notwithstanding the thickness of the stem, and even when the lobes are squarrosely spreading (as is seen also in some true *Scapaniæ*, e. g. in varieties of *S. nemorosa*). Hooker’s figs. 3 and 4, tab. 10, show this quite distinctly.

35. *J. minuta*, Crantz; Hook. Br. Jung. t. 44; Syn. Hep. p. 120; H. P. 38.

Hab. Z_2 P. occ. ad rupes, haud vulgata, locis *Val de Jéret et Montagne Verte*.

§ 4. BICUSPIDES, Syn. Hep. (= TRIGONANTHUS, nob. in hb.).

Obs. This very natural group, resembling *Lophocolea* in the nature of its fructification, may well constitute a separate genus, for which

I propose the name *Trigonanthus*. Many of the species are stellately branched, and, in all, the branches seem to have the same origin (*e dorso*). In those species which have the stems *exstipulaceous*, there are always *involucral stipules* present, e. g. in *Jg. bicuspidata*, where the *lowest stipule* is lanceolate, the *second* obovate, the *third* obovate with a deeper notch, the *fourth* (next the perianth) irregularly trifid, and the perianth itself is composed of a *fifth* stipule connate with two opposite leaves: hence its *trigonous form* and obvious affinity to that of *Lophocolea*. The capsule is always *oblong*, and often remarkably so.

36. *J. divaricata*, Smith! in E. Bot. t. 719. *J. Starkii*, Hb. Funck; Syn. Hep. p. 134; H. P. 39.

Hab. Z₂ P. c. supra ligna putrida in sylva Forêt de Transoubat dieta, non procul a *B.-de-Bigorre*.

I have examined the original specimen of *Jg. divaricata*, figured in ‘English Botany,’ from “Heaths near Holt, Nov. 1798, Rev. Mr. Francis”: it possesses very distinct *stipules* (!), and agrees in other respects with what has been called *Jg. Starkii* by German authors, and by Dr. Taylor *Jg. stellulifera*. My own herbarium contains a great many forms, some stipulaceous throughout the length of the stems, others only towards the apex, and some altogether without stipules. Between all these I can draw no certain line of demarcation, and if there be more than one species there must be several. In every form the leaves are nearly of the same width as the stem, roundish in outline or a little quadrate, the segments mostly acute and either diverging or connivent (when the leaves appear subcomplicate), the cellules mostly 4-sided with rounded angles and discrete by narrow interstices. In all there is the same peculiarity of the involucral leaves being united so as to form one or two exterior perianths; all have these leaves toothed and the real perianth more or less ciliated at the mouth.

37. *J. Francisci*, Hook. Br. Jung. t. 49; Syn. Hep. p. 133; H. P. 40.

Hab. Z₀ P. occ. ad fossarum parietes in ericetis Agri Syrtici, loco *Landes de Mugriet*.

38. *J. dentata*, Raddi in Mem. della Soc. Ital. di Mod. xix. p. 32; Syn. Hep. p. 143.

Hab. Z₀ P. occ. St. Sever, in arenosis, sociis *J. bicrenata* et *Trichostomo subulato*.

This differs somewhat from the description in ‘Synopsis Hepaticarum.’ The stems are closely creeping, mostly simple, rarely with one branch. Leaves brownish, crowded and capitate on the flowering shoots, scarcely at all complicate, cloven mostly to below the middle, spinuloso-dentate, the cellules rather small but discrete (not with such wide interstices as in *Jg. Turneri*). Stipules, on the lower part of the stem, minute, irregular in form, usually lanceolate or subulate and toothed; towards the apex larger, those of the involucrum

oval (= $\frac{1}{2}$ leaf) and as well as the involucral leaves deeply toothed or even laciniate.

The stems of *Jg. Turneri*, Hook., are much longer, more slender, and branched as in *Jg. bicuspidata*; the leaves are smaller and *more complicate*, and there are *no stipules*.

39. *J. reclusa*, Tayl.! in Annals of Nat. Hist. xii. p. 89; H. P. 41.

Hab. Z₂ in truncis putridis. P. occ. *Pic de Ger.* P. c. *V. de Castelloubon*.

I consider this quite distinct from *Jg. bicuspidata* (with which Dr. Gottsche unites it as var. *ericetorum*), and in some respects more nearly allied to *Jg. connivens*. In 1846 Mr. Jenner showed me magnificent patches of it, growing with *Jg. connivens*, &c., on sand-rocks in Eridge Park, Tunbridge Wells.

40. *J. bicuspidata*, L.; Hook. Br. Jung. t. 11; Syn. Hep. p. 138; H. P. 42.

Hab. Z₀₋₄ ubique.

41. *J. connivens*, Dicks. Cr. fasc. 4. p. 19; Syn. Hep. p. 141.

Hab. Z₂ P. c. loco *Hourquette d'Aspin*, lignicola. Semel visa!

42. *J. curvifolia*, Dicks.; Hook. Br. Jung. t. 16; Syn. Hep. p. 142; H. P. 43.

Hab. Z₂ in truncis putridis, frequens.

§ 5. *AEQUIFOLIÆ*, N. ab E.

43. *J. setacea*, Web.; Hook. Br. Jung. t. 8; Syn. Hep. p. 144; H. P. 44.

Hab. Z₂₋₃ supra ligna putrida, rarior. *Val de Jéret. Mt. Crabioules.*

44. *J. trichophylla*, L.; Hook. Br. Jung. t. 7; Syn. Hep. p. 145; H. P. 45.

Hab. Z₂₋₄ ad saxa, truncos putridos, inter muscos, &c., vulgata.

45. *J. julacea*, Lightf.; Hook. Br. Jung. t. 2; Syn. Hep. p. 146; H. P. 46.

Hab. Z₁₋₅ in rupibus humidis. P. c. *Mt. Crabioules; Lac Lehou.* P. or. "in convalle *Eynes*" (Montagne, l. c.).

8. *Sphagnoecetis*, N. ab E.

46. *S. communis*, N. ab E.; Syn. Hep. p. 148; H. P. 47. *Jung. Sphagni*, Dicks.; Hook. Br. Jung. t. 33.

Hab. Z₀₋₁ inf. ad arborum excisarum truncos cariosos in imis Pyrenæis. "Dax, in paludibus spongiosis turfosisque inter *Sphagnum palustre*" (Grateloup, l. c.).

9. *Lioclæna*, N. ab E.

47. *L. lanceolata*, L. (sub *Jung.*); Hook. Br. Jung. t. 18; Syn. Hep. p. 150; H. P. 48.

Hab. Z_{0-2} secus rivulos Pyrenæorum, lignicola, rarius terrestris rupestrisve, frequens; neenon in Agro Syrtico loco *St. Pandelon de Dax*. "In collibus umbrosis et ad rupes cretaceas *Tercis*; neenon rupibus ophiticis *St. Pandelon prope Dax*" (Grateloup, *l. c.*).

10. *Lophocolea*, N. ab E.

Obs. The species of this genus may all be considered rare in the Pyrenees. *L. bidentata* I did not once observe in the higher mountains, though it occurred at the foot of the low hills near *Pau*, intermixed with mosses; yet I can hardly persuade myself that it does not ascend higher, and that, being reputed so common a plant, I may have passed it by unnoticed. *L. heterophylla*, another species equally frequent with us, I gathered but once in the Pyrenees.

48. *L. minor*, N. ab E.; Syn. Hep. p. 160; H. P. 49.

Hab. Z_1 P. c. in aggeribus circa *B.-de-Bigorre* (δ) et in valle *d'Aure* dicta.

49. *L. bidentata*, L. Sp. Pl. p. 1598 (sub *Jung.*); Hook. Br. *Jung.* t. 30.

Hab. Z_{0-1} inf. P. occ. et c. circa *Pau* et *Dax*: In montibus nusquam vidi!

50. *L. heterophylla*, Schrad. (sub *Jung.*); Hook. Br. *Jung.* t. 31; Syn. Hep. p. 164; H. P. 50.

Hab. Z_2 P. c. *Cascade du Cœur* supra ligna putrida: e rarioribus.

11. *Harpanthus*, N. ab E. (caractere extenso).

51. *H. scutatus*, Web. et Mohr, Taschenb. p. 408 (sub *Jung.*). *J. stipulacea*, Hook. Br. *Jung.* t. 41.

Hab. Z_2 P. c. in monte *Crabioules* ad truncos putridos, sociis *Scapania apiculata*, *Jg. Schraderi*, &c.

The fructification of this plant is *truly lateral* (ramulo fertili e ventre caulis exeunte), and not as described in 'Synopsis Hepaticarum,' p. 101, "perianthio terminali, mox dorsali," for an instance of which I have in vain searched perhaps a hundred fertile stems. The involucral leaves are normally two, with an interposed stipule, and the uppermost leaf is concrete with the perianth for one-third of its length. The perianth is very thick below (= 3-4 cellules), and should perhaps be rather regarded in this part as a hollowing out of the apex of the stem. The calyptra is concrete with the inner surface of the perianth for more than half its length, as correctly represented in Hocker's figure, but not alluded to in 'Synopsis Hepaticarum.' All these characters bring this species very close to *Harpanthus Flotovianus*, N. ab E. (Syn. Hep. p. 170), the sole tangible difference being that in the former the perianth is obovate and in the latter fusiform, while they separate it widely from *Jung. acuta* and *Bantriensis*. If we consult now the organs of vegetation, we find the similarity quite as striking. The leaves of *H. Flotovianus* are biden-

tate in the same manner, only with a shallower sinus; the stipules are proportionally narrower, but *equally acuminate*, falcate and slightly *twisted*, and *toothed on each side at the base* just as in the other. With so many points of agreement, and with the same general habit (*H. scutatus* being only a smaller plant), I do not hesitate to place these two species in the same genus, which will still remain equally well distinguished from *Jungermannia* on the one side and from *Chiloscyphus* and *Lophocolea* on the other.

12. *Chiloscyphus*, N. ab E.

52. *Ch. pallescens*, Schrad. Cr. Gew. 2. p. 7 (sub *Jung.*) ; Syn. Hep. p. 187.

Hab. Z₁ P. c. ad terram in monte *Lhieris*.

53. *Ch. polyanthos*, L. Sp. Pl. p. 1597 (sub *Jung.*) ; Syn. Hep. p. 188.

Hab. Z₃ P. c. ad rivuli ripas in monte *Crabioules*.

Var. β . *rivularis*, Lindenb. Hep. Eur. p. 30 ; H. P. 51.—*Hab.* Z₁ in fontibus profundis secus ripas flum. *Adour*, socio *Jg. cordifolia* (n. 24).

Subtribus 3. GEOCALYCEÆ, N. ab E.

13. *Saccogyna*, Dumortier.

54. *S. viticulosa*, L. Sp. Pl. p. 1597 (sub *Jung.*) ; Hook. Br. Jung. t. 60 ; Syn. Hep. p. 194 ; H. P. 52.

Hab. Z₀ P. occ. in rupibus ophiticis *Sti. Pandelon* prope Aquas Tarbellicas. “Les rochers crayeux de *Tercis*, de *Rivière*; les forêts de *St. Vincent*, de *St. Paul*, de *Narrosse*; les côteaux de *St. Pandelon*” (Grateloup, *l. c.*).

Subtribus 4. TRICHOMANOIDEÆ, N. ab E.

14. *Calypogeia*, Raddi.

55. *C. Trichomanis*, L. Sp. Pl. p. 1579 (sub *Mnio*). *Jung.* *Trichomanis*, Dicks. ; Hook. Br. Jung. t. 79. *Calypogeia Trichomanis*, Corda ; Syn. Hep. p. 198 ; H. P. 53.

Hab. Z₀₋₂ ubique : fructifera in sylvis prope *Jurançon*.

15. *Lepidozia*, N. ab E.

56. *L. reptans*, L. Sp. Pl. p. 1599 (sub *Jung.*) ; Syn. Hep. p. 205 ; H. P. 54. *Jg. reptans*, Hook. Br. Jung. t. 65.

Hab. Z₀₋₂ supra ligna putrida, vulgaris.

16. *Mastigobryum*, N. ab E.

57. *M. deflexum*, N. ab E. ; Syn. Hep. p. 231 ; H. P. 55.

Hab. Z₂₋₃ in sylvis editoribus, haud rarum. *Mte. Verte* ; *V. de Castelloubon* ; &c. *Lac Lehon* (Philippe!).

58. *M. trilobatum*, L. Sp. Pl. p. 1599 (sub *Jung.*) ; Syn. Hep. p. 230 ; H. P. 56. *Jg. trilobata*, Hook. Br. Jung. t. 76.

Hab. Z₀₋₁ P. occ. in arborum excisarum truncis cariosis *Sti. Pandelon* prope Aquas Tarbellicas; locis similibus *Sti. Sever* invenit cl. Dufour! P. c. *Gorge de Labassère* (Philippe!).

Subtribus 5. PTILIDIEÆ, N. ab E.

17. *Trichocolea*, Dumortier.

59. *T. Tomentella*, Ehrh. (sub *Jung.*); Syn. Hep. p. 237; H. P. 57. *Jg. Tomentella*, Hook. Br. Jung. t. 36.

Hab. Z₀₋₂ locis humidis, frequens. "In umbrosis humidiusculis, in collibus et ad arb. truncos prope *Dax*" (Grateloup, l. c.).

Subtribus 6. PLATYPHYLLÆ, N. ab E.

18. *Radula*, N. ab E.

60. *R. complanata*, L.; Hook. Br. Jung. t. 81 (sub *Jung.*); Syn. Hep. p. 257; H. P. 58.

Hab. Z₀₋₂ ad trunkos et rupes.

19. *Madotheca*, Dumortier.

61. *M. laevigata*, Schrad.; Hook. Br. Jung. t. 35 (sub *Jung.*); Syn. Hep. p. 276; H. P. 59.

Hab. Z₀₋₂ in rupibus: semper sterilem inveni.

62. *M. platyphylla*, L.; Hook. Br. Jung. t. 40 (sub *Jung.*); Syn. Hep. p. 278; H. P. 60. *M. platyphylloidea*, N. ab E.; Syn. Hep. p. 280. *M. navicularis*, N. ab E.? Syn. Hep. p. 277?

Hab. Z₀₋₂ in rupibus arboribusque, vulgatissima.

Subtribus 7. JUBULEÆ, N. ab E.

20. *Lejeunia*, N. ab E.

Obs. The only species of this genus which attains the alpine region is *L. serpyllifolia*, but it is always unfertile there. *L. ovata* finds in the Pyrenees its only continental station, and but the second known, the first being the south-west corner of Ireland, around Bantry and Killarney. *L. calcarea* is confined to the rock indicated by its name*.

* I did not observe *Lejeunia minutissima* in the Pyrenees, but it will not be out of place to mention here that I had lately the opportunity of examining Sir J. E. Smith's original specimens of this species, gathered in the New Forest by C. Lyell, Esq. in 1806, and figured on plate 1633 of Eng. Bot., and that they agree *as to the presence of stipules and every other essential character* with Hooker's figure in 'Brit. Jungermanniæ,' t. 52. Dr. Taylor was therefore in error (as I have always suspected) in maintaining Sir J. E. Smith's plant to be the *exstipulaceous* species; but as my distinguished and lamented friend was the first clearly to distinguish the latter, I propose that it shall bear his name, and the amended synonymy will stand thus:

Lejeunia minutissima, Smith! in Eng. Bot. t. 1633 (sub *Jung.*); Hook. Br. Jung. t. 52. *Jungermannia ulicina*, Tayl.! in Trans. of Edinb. Bot. Soc. 1841, i. p. 115. *Lejeunia ulicina*, Syn. Hep. p. 387.

Lejeunia Taylori, Spruce. *Jungermannia minutissima*, Tayl.! l. c. (non Smith). *Lejeunia minutissima*, Syn. Hep. l. c.

63. *L. serpyllifolia*, Dicks. Crypt. fasc. 4. p. 19 (sub *Jung.*) ;
Syn. Hep. p. 374 ; H. P. 61.

Hab. Z_{0-3} in rupibus, arboribus imis, supra muscos, &c., frequens.

64. *L. ovata*, Tayl. ! mst. ; Syn. Hep. p. 376 ; H. P. 62.

Hab. Z_1 P. occ. inter muscos in rupibus subhumidis faucis
Gorge de Cauterets dict. repens.

I have sedulously compared this with specimens of *L. ovata* gathered in company with Dr. Taylor at Cromaglown, one of his original stations, and cannot detect the slightest difference. It is a rather larger plant than *L. hamatifolia*, Hook., from which it differs essentially as follows : the leaves are more *lurid and opaque* (more chlorophyllose) and *never serrated*, as they are most frequently in the other ; the larger lobe is *oblique, trapezoideo-ovate*, with the *margins convex* nearly to the apex (while in the ovato-acuminate leaves of *L. hamatifolia* the margins of the larger lobe are *concave* above the junction with the involute lobe) ; the involute lobe is smaller, and has not a projecting tooth near the apex as in *L. hamatifolia*.

65. *L. calcarea*, Libert ; Syn. Hep. p. 344 ; H. P. 63. *Jg. hamatifolia* β . *echinata*, Hook. Br. *Jung.* t. Suppl. 3.

Hab. Z_2 P. occ. ad saxa calcarea in regione media montis *Pic de Ger*, ut et in valle *Combascou*.

21. *Frullania*, Raddi.

66. *F. dilatata*, L. Sp. Pl. p. 1600 (sub *Jung.*) ; Syn. Hep. p. 415 ; Hook. Br. *Jung.* t. 5 ; M. P. 64.

Hab. Z_{0-3} in arborum cortice.

67. *F. fragilifolia*, Tayl. ! in Annals of Nat. Hist. xii. p. 172 ;
Syn. Hep. p. 437 ; H. P. 65.

Hab. Z_1 P. occ. in arboris unicæ truncæ prope pagum *Gélos*.

68. *F. Tamarisci*, L. ; Hook. Br. *Jung.* t. 6 (sub *Jung.*) ; Syn. Hep. p. 438 ; H. P. 66.

Hab. Z_{0-3} fere ubique, arborea et saxatilis.

Hemicyclum 2. *Frondosæ*.

Subtribus 1. CODONIEÆ, Dumortier.

22. *Fossombronia*, Raddi.

69. *F. pusilla*, L. ; Hook. Br. *Jung.* t. 69 (sub *Jung.*) ; Syn. Hep. p. 468 ; H. P. 67.

Hab. Z_{0-1} in fossarum parietibus, haud vulgata. *St. Sever.*
Dax (Grateloup). *B.-de-Bigorre*.

Subtribus 2. HAPLOLÆNEÆ, N. ab E.

23. *Pellia*, Raddi.

70. *P. epiphylla*, L. ; Hook. Br. *Jung.* t. 47 (sub *Jung.*) ; Syn. Hep. p. 488.

Hab. Z_{0-1} in fossarum marginibus.

71. *P. calycina*, Tayl. ! in Mackay, Fl. Hib. Pt. 2. p. 55 (sub *Jung.*) ; Syn. Hep. p. 490 ; H. P. 68.

Hab. Z₀₋₁ P. occ. et c. in rivulorum ripis udis circa *Dax*, *Pau* et *B.-de-Bigorre*.

24. *Blasia*, Micheli.

72. *B. pusilla*, L. Sp. Pl. p. 1605 ; Syn. Hep. p. 491 ; H. P. 69. *Jg. Blasia*, Hook. Br. Jung. t. 82-84.

Hab. Z₀₋₁ P. occ. in rupibus ophiticis *Sti. Pandelon* prope Aq. Tarbellicas. P. c. in humidiusculis montis *Superbagnères*.

Subtribus 3. ANEUREÆ, N. ab E.

25. *Aneura*, Dumortier.

73. *A. pinguis*, L. Sp. Pl. p. 1602 (sub *Jung.*) ; Syn. Hep. p. 493.

Hab. Z₀ "in paludibus ac ripis, fontibusque prope Aq. Tarbellicas" (Grateloup, *l. c.*).

74. *A. multifida*, L. Sp. Pl. p. 1602 (sub *Jung.*) ; Syn. Hep. p. 496.

Hab. Z₀ "ad terram humidam prope fontes ac supra truncos putridos arborum, circa *Dax*" (Grateloup, *l. c.*).

75. *A. palmata*, Hedw. Theor. Gen. (sub *Jung.*) ; Ekart, Synopsis. Jung. t. 13. f. 115 ; Syn. Hep. p. 498 ; H. P. 70.

Hab. Z₀₋₃ in truncis putridis. *Val de Jéret*, &c.

Subtribus 4. METZGERIEÆ, N. ab E.

26. *Metzgeria*, Raddi.

76. *M. furcata*, L. ; Hook. Br. Jung. t. 55 et 56 (sub *Jung.*) ; Syn. Hep. p. 502 ; H. P. 71.

Hab. Z₀₋₃ in saxis, arborum cortice, &c.

77. *M. pubescens*, Schrank ; Hook. Br. Jung. t. 73 (sub *Jung.*) ; Syn. Hep. p. 504 ; H. P. 72.

Hab. Z₀₋₃ in rupibus umbrosis montium frequens, planitiei rariores (*Dax*; Grateloup).

Tribus 2. MARCHANTIEÆ, N. ab E.

Subtribus 1. LUNULARIEÆ, N. ab E.

27. *Lunularia*, Micheli.

78. *L. vulgaris*, Micheli, Nov. Gen. Pl. p. 4. t. 4 ; Syn. Hep. p. 511 ; H. P. 73.

Hab. Z₀₋₁ inf. in imis muris, viarum umbrosarum lateribus, &c. Pyrenæorum humiliorum ut et Agri Syrtici, frequens.

Subtribus 2. JECORARIEÆ, N. ab E.

28. *Marchantia*, Linnæus.

79. *M. polymorpha*, L. Sp. Pl. p. 1603; Syn. Hep. p. 522.

Hab. Z_{0-1} locis exustis, &c., in planicie vulgatissime, in montibus rarius.

29. *Preissia*, N. ab E.

80. *P. commutata*, N. ab E. Europ. Leb. 4. p. lxv. et 117; Syn. Hep. p. 539; H. P. 74. *Marchantia androgyna*, Tayl. ! in Linn. Trans. 17. p. 380. t. 12. f. 1.

Hab. Z_2 in rupibus humidiuseculis. *Mont Lizé*; *Labassère*, &c.

30. *Dumortiera*, Reinwardt.

81. *D. irrigua*, Wils. in Hook. Eng. Fl. v. P. 1. p. 106 (sub *Marchantia*); Syn. Hep. p. 543; H. P. 75. *Hygropyla irrigua*, Tayl. ! in Linn. Trans. xvii. p. 390.

Hab. Z_1 inf. P. c. *B.-de-Bigorre*, ad ripas rivuli qui ad thermas dict. de *Salut* originem suam habet; sociis *Pellia calycina* et *Fegatella conica*.

31. *Fegatella*, Raddi.

82. *F. conica*, L. Sp. Pl. p. 1604 (sub *Marchantia*); Syn. Hep. p. 546; H. P. 76.

Hab. Z_{0-1} locis humidis.

32. *Reboulia*, N. ab E.

83. *R. hemisphaerica*, Raddi in Opusc. scient. di Bolon. ii. p. 357; Syn. Hep. p. 548.

Hab. Z_0 *Dax*, in humidiuseculis ac umbrosis (Grateloup; R. S.).

33. *Fimbriaria*, N. ab E.

84. *F. fragrans*, Schleich. Cent. exsicc. 3. n. 64 (sub *Marchantia*); Syn. Hep. p. 558.

Hab. Z_0 “ad margines fontium et fossarum ac in rupibus umbrosis prope *Dax*” (Grateloup, l. c.).

Subtribus 3. TARGIONIEÆ, N. ab E.

34. *Targionia*, Micheli.

85. *T. Michelii*, Corda in Opitz Beitr. i. p. 649; Syn. Hep. p. 574. *Targionia hypophylla*, L. Sp. Pl. p. 1604.

Hab. Z_0 “circum *Dax*” (Grateloup, l. c.).

Tribus 3. ANTHOCEROTÆ, N. ab E.

35. *Anthoceros*, Micheli.

86. *A. laevis*, L. Sp. Pl. p. 1606; Syn. Hep. p. 586.

Hab. Z_0 “ad terram, in locis umbrosis humidiuseculis, prope Aq. Tarb.” (Grateloup, l. c.).

87. *A. punctatus*, L. Sp. Pl. p. 1601; Syn. Hep. p. 583; H. P. 77.

Hab. Z_0 — 1 locis humidis solo argilloso præcipue. *St. Pandelon.* *St. Sever.* *Loucrup* prope *B.-de-Bigorre*.

Tribus 4. RICCIÆ, Lindenberg.

36. *Sphaerocarpus*, Micheli.

88. *S. Michelii*, Bell.; Mont. in Ann. des Sc. nat. ix. p. 39; Syn. Hep. p. 595.

Hab. Z_0 circa *Dax*. "Elle croît sur la terre humide de quelques landes de *Marenzin*, par l'ancienne route de *Bordeaux* à *Bayonne*" (Grateloup, *l. c.*).

37. *Riccia*, Micheli.

89. *R. glauca*, L.; Syn. Hep. p. 599.

Hab. Z_0 "supra terram argillaceam in locis umbrosis *Dax*" (Grateloup, *l. c.*); locis cultis *Sti. Sever*.

90. *R. ciliata*, Hoffm.; Syn. Hep. p. 602.

Hab. Z_0 "ad terram madidam circa *Dax*" (Grateloup, *l. c.*).

91. *R. fluitans*, L.; Syn. Hep. p. 610.

Hab. Z_0 "in fontibus *Sti. Pandelon*, &c." (Grateloup, *l. c.*); *St. Sever* (Dufour!).

92. *R. natans*, L.; Syn. Hep. p. 606.

Hab. Z_0 "in aquis stagnantibus *Sti. Paul*, prope Aq. Tarbellicas" (Grateloup, *l. c.*).

XIII.—*Remarks on the Growth of Bambusa arundinacea in the large Conservatory, Chatsworth.* By Mr. ROBERT SCOTT*.

In the tropics the Bamboo not only grows with astonishing rapidity, but attains a very great height,—in some instances as much as 100 feet†. This, together with its feathery elegance, places it in bold contrast to surrounding vegetation, and entitles it to rank second to the noble Palm. But under artificial culture it is indeed seldom seen in anything like its native majesty,—the extent of our horticultural structures not admitting of its full development.

In some degree at least this defect is obviated here, the *Bambusa* being planted out in a border of rich loam, with plenty of room for its roots, and the canes likewise, in most cases, having ample accommodation. So situated the Bamboo seems at home.

* Read before the Botanical Society of Edinburgh, July 12, 1849.

† Mr. John Gibson, who collected in India for the Duke of Devonshire, has seen the Bamboo 100 feet high.

On the 19th of August, 1846, I observed the crown of a cane just showing itself above the surface of the ground. From its appearance I was led to infer that ultimately it would attain to a large size, and I resolved to watch its progress. The cane was situated at the circumference of a group, and this circumstance rendered the observation of its growth more convenient than it would have been had the cane been situated in the centre.

On referring to notes then made, I find that on September 1st the cane had reached a height of 8 feet from the ground. On the 6th September it had attained the height of 19 feet; and on September 13th it was 25 feet high: during the latter seventeen days of September the growth was uniformly 1 foot per day. Thus in forty-two days the cane had reached 42 feet from the ground, making an average growth of $\frac{1}{2}$ inch per hour. The subjoined table may serve to place this matter in a clearer light.

1846.		Average daily growth.
Aug. 19.	Cane just appearing above ground.	
Sept. 1.	" 8 feet high.	nearly $7\frac{1}{2}$ inches.
" 7.	" 19 "	1 foot 10 inches.
" 13.	" 25 "	1 foot.
" 30.	" 42 "	1 foot.

Having attained the height of 42 feet, the top of the cane was in immediate contact with the roof of the house. This circumstance rendered an arrest of its progress necessary; had it been otherwise, in all probability the cane would have extended 8 or 10 feet more.

In December 1847, the subject of the preceding remarks, along with the other canes forming the group previously alluded to, was cut down. The following observations were then made: Number of internodes, 32; circumference of the base of cane, 8 inches; circumference of top, $1\frac{1}{2}$ inch. The greatest circumference, 9 inches, occurred 8 ft. 3 in. from the base, and extended over four internodes. The two longest internodes measured each 1 foot 6 inches. They occurred at 19 ft. 8 in. from the base, and were each 8 inches in circumference. The shortest internode was 11 inches, and was the lowermost on the cane.

During the growth of the cane the temperature of the house was,—maximum 87° , minimum 60° , Fahrenheit. (Average $73\frac{1}{2}^{\circ}$.)

In Paxton's 'Magazine of Gardening and Botany' for 1849, p. 62, there are a few remarks on the subject of this notice; but some mistakes have been made in the figures there given.

The cane is now in the British Museum.

I may add, that the *Bambusa arundinacea* very seldom commences to form its canes here until August and sometimes September, while the *Bambusa nigra* invariably makes its growth in May. The latter species has this year produced canes 16 ft. high.

XIV.—*On the Identification of the Parasitic Genus of Insects,*
Anthophorabia. By GEORGE NEWPORT, Esq., F.R.S. & L.S.*To the Editors of the Annals of Natural History.*

GENTLEMEN,

London, July 1849.

MR. WESTWOOD's letter, inserted in your July number, in reply to my remarks on the identification of *Anthophorabia*, obliges me to trouble you with some further remarks on this subject.

I mentioned in my letter to you, that immediately after the reading of my paper to the Linnaean Society, on the 20th of March, "the good faith of my statements (was) abruptly questioned in some remarks addressed to the Society by Mr. John Obadiah Westwood, who made it appear that my knowledge of the insect *Anthophorabia* must have been derived from *vivâ voce* statements made by himself at a meeting of the Entomological Society in July 1847" (*Annals*, vol. iii. p. 514). Mr. Westwood now, after professing that he "has neither leisure nor inclination to answer in detail,"—which very probably he has not,—says, "I again deny having expressed a single word of doubt as to Mr. Newport having found the insects in question in 1832, or that I asserted that his knowledge of them was derived from my communications." Now I beg to say, that whatever may have been the precise words employed, Mr. Westwood most certainly did express doubt, and did impress, and did endeavour to impress on the minds of those who were present, that my first knowledge of the insect I had described must have been derived from his observations at the Entomological Society in July 1847; and he asserted, in the most positive manner, that I was in the Chair at the time. The printed Proceedings of the Society prove that Mr. Spence was in the chair! I may now further state, that he succeeded, for the time, in injuring me in the good opinion of many who were present at the Linnaean Society, as I have since been assured by several gentlemen; as his imputations seemed to be supported by the fact—which he still dwells upon, with what object others may decide (*Annals*, p. 39)—of my having been present at the meeting of the Entomological Society when he referred to an insect by the name of *Melittobia Audouinii*; although, to this very hour, I have never seen that insect or his drawings of it. Further, I may mention that it was evidently his object to question the accuracy of my statements in the paper I read to the Linnaean Society which drew forth the spontaneous evidence in my favour from Mr. Nash, as I have since been assured by that gentleman, to whom I had shown drawings of my insect in 1832. These identical drawings, which I made from living specimens, and which I regard as some of the most care-

fully finished I have ever made, were on the table of the Linnaean Society when my paper was read, on the 20th of March, and also on the 1st of May; on which latter occasion they were examined *for a few minutes only* by Mr. Westwood. Yet he now makes the following assertion: "Having seen Mr. Newport's drawings made seventeen years ago, I do not hesitate to state that his description has been drawn up from this *imperfect sketch* (!), and that *seven* out of the nine generic characters given by him in the 'Gard. Chronicle,' p. 183, are erroneous." Indeed! *Seven* characters erroneous!! Mr. Westwood's former statement (Gard. Chronicle, p. 295) was, that *six* out of nine were wrong. But now he discovers "*seren*,"—size of the head, the antennæ, the wings, and the tarsi of the female, antennæ and eyes of the male, and *size* of the insect. Truly, here *are* seven. First then as regards *size*. I have described my insect as being of the Lilliputian dimension of *one line*. Mr. Westwood says, No, it is exactly *three-quarters*. Many thanks for this, and the other equally important corrections, if confirmed. I have said the head of the insect is wider than the thorax. Mr. Westwood says it is not. According to him, I have overlooked some joints in the antennæ and some peculiarities of the wings. Possible, certainly. But the admission of the possibility is not an assent to the assertion, without proof. In the tarsi, however, he thinks that I have seen too much.

As to the male insect he asserts that it has no eyes whatever, but that it has more joints in its antennæ than I have described. Yet in all this, while affirming the identity of his insect with mine, he keeps out of view the fact that the one he refers to is a native of France, and that which I have described is indigenous to this country; and that the middle portion of the antenna in my insect is "*large and globose*," while the corresponding part in his, according to his description, is "*very small and subannulose*." Nevertheless he "*does not hesitate*" to "*reaffirm*" the identity of two insects, *one of which he has never seen!* But further, he "*affirms*," and possibly may hereafter "*reaffirm*," that some of the characters I have given for my insect, "namely the veins of the wings and the five-jointed tarsi, neither belong to the *family nor subfamily* to which the insect is to be referred, whilst the possession of stemmatous eyes by the male is *disproved* by every known species of winged insect, whereas it is as essentially a character of some of the Ametabolous tribes." According to this lucid view, which seems to have been arrived at through one of Mr. Westwood's "*strikingly opposite analogies*," if a winged insect has not compound eyes it cannot have eyes at all. Now it was the peculiarity of my insect possessing stemmatous eyes that led to the introduction of a description of it in

my paper. With regard to the joints of the tarsi, it happens, unfortunately for Mr. Westwood, that he is in this instance, at least, in the unenviable situation of bearing evidence against the correctness of his own statements. Ten years ago he published in his 'Introduction,' vol. ii. *Generic Synopsis*, p. 73, detailed definitions of three genera of Parasitic Hymenoptera belonging to the *very family*,—*Chalcididae*, proposed also by himself,—to which my *Anthophorabia* belongs; and one of the characters which he employs to indicate each of these genera,—*Tetracnemus*, *Agonineurus*,—which comprises thirteen species,—and *Coccophagus* three species,—is, that their tarsi are "five-jointed."

Thus much reliance may be placed on the scientific accuracy of Mr. Westwood's statements. I have now but to notice one other of his unnecessary assertions, of a more personal character, and which I could have wished to have believed to be simply accidental. He says (*Annals*, p. 40) that Mr. F. Smith was the first to discover the parasitic larva of *Monodontomerus*, and that *I have attempted to deprive him of the credit* of this discovery. I regret much that this direct charge obliges me to state that Mr. Westwood asserts in this what is extremely wide of the truth. A short notice of the habits of the larva of *Monodontomerus* was sent by Mr. Smith to the Linnaean Society a fortnight after the reading of the first part of my paper on the 20th of March in which I described this larva; and that notice was read on the 3rd of April, Mr. Smith the author of it, Mr. Westwood and myself being present. Mr. Smith stated in his paper that he had found his insects at Charlton in Kent, in 1848. After this paper had been read, I mentioned what I had already stated in my paper on the 20th of March, that I discovered the larva of *Monodontomerus* on the 12th of September 1847 (at Gravesend), "that I had informed Mr. Smith at the time of the fact," and that "some time afterwards, as I learned from Mr. Smith himself, who, being present, could correct me if in error, he also collected larvae of this insect in the same locality" (see *Gard. Chron.* April, p. 231). Mr. Smith offered not the slightest remark on, or objection to this statement, but tacitly admitted its correctness. And yet Mr. Westwood having heard this public announcement from my own lips, and knowing that it has appeared in print,—as he quotes a portion of the identical paragraph,—and knowing also that it cannot be refuted, has ventured to "affirm" the contrary.

I remain, Gentlemen, yours very obediently,
GEORGE NEWPORT.

XV.—Descriptions of four new Asiatic species of the genus Pupa of Draparnaud. By W. H. BENSON, Esq.

IN the 'Zeitschrift für Malakologie' for 1846 Dr. Pfeiffer advertises to the paucity of known species of *Pupa* from other countries than Europe, North America, the West Indies, and the Cape of Good Hope. In his 'Monographia' he cites only *Pupa bicolor*, Hutton, as inhabiting India as well as the Isle of Bourbon (*P. Largillierti*, Philippi), giving but a single Indian locality (Mirzapore) for it; and he quotes *Pupa sulcata*, Müller, as a Ceylonese shell. The latter species may possibly occur in the station assigned to it, but it is also certainly a Mauritian shell, haunting the woods around Curepipe, with *P. Pagoda*, Fer., according to Sir David Barclay and Mr. Rawson. *Pupa bicolor* has a very extensive range. Its beautiful vermillion and yellow tints, similar to those of several Mauritian *Pupæ*, attracted my attention to the animal in Bundelkhund as early as 1825; and I subsequently took it in numerous localities*, but in no place very plentifully, from the foot of the Himalayas in Rohilkhund down to the neighbourhood of Calcutta. In 1847 I met with it at Point de Galle in Ceylon, and Dr. Cantor found it, though rarely, in Pulo Penang. It did not occur to me at the Mauritius, although inhabiting its neighbour island.

I have now to make known four new Oriental species; one from China scarcely yielding the palm of size to any of the genus, the other three from India proper, all minute. Of these, two inhabit the Himalaya and one Lower Bengal. Some other species from India have been assigned to the genus *Pupa*, which, however, fall more correctly into the cylindrical division of the genus *Bulimus*.

1. *Pupa regia*, nobis.

T. profundissime umbilicata, elongato-conica, subcylindrica, solida, alba, levigata, nitidiuscula, oblique et remote, obsoleteque plicato-striata; spira superne sensim attenuata, apice obtusiusculo; umbilico pervio; anfractibus undecim subplanulatis, ultimo antice ascende, validius plicato, ad basin compresso; sutura linearis, irregulariter crenata; apertura obliqua truncato-ovata, sublateralis,

* Viz. Bhamoury, Moradabad, and Bareilly, in Rohilkhund; Etawah and Futtahpore in the Do-âb of the Ganges and Jumna; at Huneerpore in Bundelkhund, south of the latter river; at Jounpore and Mirzapore in the Benares Division, north and south of the Ganges; and at Howrah, on the west bank of the Hooghly river, near Calcutta. It shelters itself in the ground under loose stones, bricks, or wood, and comes forth in the rains of July. At Bhamoury I got it by digging at the root of a tree. It was there much dwarfed. The lower ranges of the Himalaya, within which it has never been met with, rise immediately from that spot; and attain, in the course of twelve miles, an elevation of 8000 feet.

ab axe deviante, intus fulvida; plica columellari profunda, duplicita, parietali elongata, remotiuscula; peristomate valde incrassato, reflexo, subtus latiori, marginibus callo junctis, columellari expanso, superne sinuato, extus angulum efformante, dextro medio antrorum arcuato.

Long. 43 mill., lat. 23; aperturæ long. perist. incl. 18 mill. Lat. 9 millim.

Hab. prope Nanking, China.

Brought by the late Dr. D. King, H.M.S. Cornwallis, and presented by him to Dr. Cantor, to whose kindness I am indebted for the specimen. A wire introduced into the umbilicus will reach within a short distance of the summit.

2. *Pupa Huttoniana*, nobis.

T. rimata, ovato-oblonga, subcylindracea, hyalina, glabra, apice obtuso; anfractibus 5 convexis; apertura ovato-rotundata, quinqueplicata; peristomate expansiusculo, marginibus callo tenui junctis; plica unica irregulari, sinuata, parietali, columellaribus duobus, palatalibus duobus profundis.

Long. 1½ mill., lat. vix 1 mill.

Hab. rarissime ad Simla montibus sub-Himalayanis occidentalibus; Hutton.

This species (unlike most of the smaller Simla species of land shells) has not hitherto been taken in other parts of the Himalayan chain.

3. *Pupa plicidens*, nobis.

T. umbilicata, ovato-conica, subtrochiformi, glabriuscula, obscure striata, cornea; anfractibus quinque convexis, ultimo ventricoso, antice ascende, ad basin tumido; sutura impressa; apice obtuso; apertura irregulari, subtriangulari, 9-plicata; peristomate continuo, sinuato, expanso, marginibus callo appresso expanso junctis; dextro medio extus impresso, intus tuberculato-incrassato; plicis parietalibus 3, quarum 2 superioribus elongatis, columellaris dentiformi, unica, palatalibus 5, quarum 2 sub-basalibus minutis; margine basali extus callo prædicto; umbilico angusto.

Long. 2 mill., lat. 1½ mill.

Hab. ad Landour et Mussoorie, montibus Himalayanis.

The shell is very peculiarly formed, and seems to indicate the transition from *Pupa* to *Anastoma*.

The animal has four tentacula, the superior pair bearing the percipient points or eyes, the inferior very short. The foot is hyaline, the tentacula and neck fuscous. The shell is carried horizontally. It is very local, although tolerably abundant where found. It creeps among moss, on damp rocks, generally in places which are seldom or never visited by the sun, in some of the lofty and precipitous glens of the mountains near Landour. It seems to be a capricious species. On a rock on which I found it abun-

dantly one year, I could not obtain a specimen at the same season in the following year.

4. *Pupa brevicostis*, nobis.

T. rimato-perforata, cylindraceo-ovata, cornea, apice obtuso; anfractibus $4\frac{1}{2}$, longitudine celeriter crescentibus; ultimo antice non ascendeante, $\frac{1}{3}$ longitudinis testæ æquante, superioribus convexis, superne remote semicostulatis, ultimo et penultimo subplanulatis, dimidioque inferiori caeterorum sericeis, muticis; apertura rotundato-ovata, 5-6-plicata; plica 1 angulari, brevi; secunda parietali profundiore, obliqua; columellari unica; palatalibus 2-3 profundis; peristomate expanso, subreflexo.

Long. $1\frac{1}{2}$ mill., lat. vix 1 mill.

Hab. ad Barrackpore, Bengal.

Taken by Dr. J. F. Bacon on the trunk of a tamarind-tree at the Cantoninent of Barrackpore, near Calcutta, during the rainy season of 1848. Out of several individuals forwarded to me, overland, by letter in a quill, two reached me alive, and creeping about when supplied with moisture enabled me to verify their affinities. The lower pair of tentacula is deficient or inconspicuous, as in *Vertigo*; the upper pair carry the eyes at their summits. The shell is often carried at an angle of 45° .

In 1834 Captain Hutton referred a small shell to the genus under the name of *Pupa canopicta*, which belongs strictly to *Bulinus*, as conjectured by Pfeiffer, 'Monogr.' vol. ii. p. 82. It is figured, no. 492, in that genus by Reeve. It is necessary to remark that in the numerous specimens which I have examined, the callous parietal tooth at the junction of the outer lip has never been wanting. Yet this character was omitted by Captain Hutton, and it is not noted either in Reeve's figure or description. I first took the shell in Bundelkhund in 1826; specimens received in 1835 from Captain Hutton showed how the tubercle had been overlooked by him, the shells being still covered by the dirt, from the presence of which he had named them. Subsequently I found the species abundant under stones and rocks at Delhi, and Dr. Bacon met with it in great profusion at Kurnâl on mud-walls and under tiles. It has never occurred to me or to my correspondents on the left bank of the Junna nor of the Ganges. Dr. Bacon found a specimen or two at Dinafore on the right bank of the latter river, so that it has an extensive range to the south and west of those streams.

The only locality hitherto given for the sinistral toothed *Pupa Pottebergensis*, Krauss, from Southern Africa, is the Pottenberg Mountain in Zwellendam, where Krauss found it, though rarely, on plants. Sir Edward Belcher pointed the shell out to me as occurring near the Round Battery in Simon's Bay, among *Me-*

sembryanthema; and I found it subsequently at a distant point of False Bay, near "the Strand," and again at Hout Bay. In all these places it was found among plants and bushes growing on sandy dunes near the sea.

July 13, 1849.

XVI.—*On the Chemical Composition of the Fluid in the Ascidia of Nepenthes.* By Dr. A. VOELCKER of Frankfort*.

THE watery secretions of certain plants belonging to the genera *Nepenthes*, *Cephalotus*, and *Sarracenia*, have long attracted the attention of botanists; but whilst the secreting organs of these plants have been minutely described, the chemical nature of the fluid itself has been but very imperfectly examined. That these liquids have not met with the attention to which their importance entitles them, may be accounted for by the circumstance that few chemists have an opportunity of obtaining the unaltered fluids, and that even those who are fortunate enough to procure them, seldom can command a sufficient quantity to enable them to investigate their nature. With the exception of Dr. Turner's analysis of the fluid in the ascidia of *Nepenthes*, I know of no other analysis of this fluid or of similar secretions. The botanists who have given attention to the subject of the watery secretions of the leaves of plants have found these secretions to consist in most cases of nothing but pure water, and have only occasionally discovered in them some vegetable matter. Treviranus for instance observed a tasteless water in the corolla of *Maranta gibba*, which he however did not further examine; the same gentleman examined the watery secretion of *Amomum Zerumbet*, and caused Dr. Göppert to subject it to chemical analysis, from which it resulted that the fluid between the scales of the spikes consisted of almost pure water, containing a small quantity of vegetable fibre and mucus.

The most remarkable instance of a watery secretion from the leaves of plants is recorded in the 'Annals of Natural History' for 1848, in a paper by Mr. Williamson, who observed that the leaves of *Caladium destillatorium* had the peculiar power of exhaling watery fluid from a point near the apex on the upper side. Each full-grown healthy leaf, according to Mr. Williamson's observation, produced about half a pint of water during the night, which, on being analysed, was found to contain a very minute portion of vegetable matter.

* Read before the Botanical Society of Edinburgh, July 12, 1849.

It appeared to me highly improbable that these fluid secretions should consist of pure water with merely a trace of vegetable matter, and no inorganic substances whatsoever. If they are to be regarded as true secretions, we naturally should expect them to contain some of the salts which we find in all juices of plants. I was therefore anxious to examine this point, and I am glad that I have an opportunity of bringing the results of my analysis of the fluid in the ascidia of *Nepenthes* before the notice of the Botanical Society. It is through the kindness of Prof. Balfour, Mr. Evans of the Experimental Gardens, Messrs. Jas. Dickson and Sons, and Sir W. Hooker, that I have obtained the materials for the following analysis, and I consider it my duty to express here publicly my deep sense of gratitude for the kindness and liberality with which the above-named gentlemen have assisted me in carrying on this inquiry. I have also to express my obligations to Dr. George Wilson for kindly allowing me the use of his laboratory.

Linnaeus regarded the ascidia of *Nepenthes* as a natural reservoir for rain, and thought that the water found in them was introduced from without, and was not secreted by the plant itself. His opinion however has been contradicted already by many botanists, especially Treviranus, who observed that the water in the pitchers of *Nepenthes destillatoria* is always clear, and that there exists a distinct secreting apparatus. Treviranus says, in an article which appeared in the 'Edinb. New Philosoph. Journal' for Oct. 1832—April 1833 :—"The parietes of the leaf of *Nepenthes destillatoria* are traversed by a multitude of proportionally large anastomosing veins, which contain many true spiral vessels. The upper half of its inner surface is covered with a blue rind, as parts often are which require to be protected from the action of water; the under half is, on the contrary, shining and full of gland-like eminences directed downwards, and having a hole almost visible to the naked eye, which is uncovered by the cuticle which the remainder possesses." The watery secretion reaches generally to the level of these glands in the middle of the ascidium, and he thinks that they are true secreting organs. This peculiar structure alone gives a strong reason for thinking that the water in the ascidia of *Nepenthes* is supplied by the plant itself, and the circumstance that water is found in pitchers which have never been opened is another argument against the supposition that it comes from without. The subjoined analysis of the fluid moreover leaves no doubt that it is a true secretion.

Before I enter into the particulars of my experiments I will mention that I could not detect any oxalic acid in the fluid of *Nepenthes*. It is stated in Lindley's 'Vegetable Kingdom' that Dr. Turner found this acid in combination with potash, and that

he also detected a trace of organic matter, which caused the watery fluid when boiling to emit an odour of boiled apples. Though I have examined the water of many pitchers from four different localities, and paid particular attention to the detection of oxalic acid, I have failed in finding a trace of it, and I am therefore inclined to believe that Dr. Turner, on account of the minute quantity of solid matter which he must have got on evaporation of the water, was unable to subject the minute crystals which he took for superoxalate of potash to a further examination, which would have shown him that the crystals were not superoxalate of potash, but chloride of potassium. The proportion of chloride of potassium which I found in the fluid is considerable; it is deposited from the liquid after evaporation in the form of minute but very regular cubes. The odour of boiled apples which Dr. Turner observed I found very distinct when the water was heated to the boiling-point. Besides chloride of potassium I found malic and a little citric acid, in combination usually with soda, lime and magnesia, and a small quantity of another organic matter which gave a yellow tint to the water during its evaporation. The quantity of the latter was too minute to enable me to ascertain its chemical nature.

I will now proceed to describe the experiments with the different fluids in the ascidia of *Nepenthes* :—

1. Fluid from an unopened pitcher-plant grown in the Botanical Garden, Edinburgh.

The water which I got on the 12th of June, 1849, was perfectly colourless and clear; it had an agreeable, not very pronounced smell and a refreshing taste. Though its taste was not sour, litmus paper showed the presence of an acid or an acid salt by the red colour it assumed when dipped in the water. When heated it remained clear, and only assumed a slightly yellow colour when the liquid became very concentrated. The residue which remained on evaporation was cream-coloured, very hygroscopic, and dissolved entirely in a small quantity of distilled water. Litmus paper plunged in this solution was turned red immediately; the acid which is present in the water therefore was not volatilized during the evaporation.

The quantity of the water from one pitcher amounted to

17·41 grains,

which gave on evaporation

0·16 of dry residue, dried at 212° F.

100 parts of the fluid consequently contained

0·92 per cent. of solid matter.

2. Water from unopened pitcher-plants grown in the Botanical Garden, Edinburgh, June 13th, 1849.

The physical characters were the same as those of the preceding

liquid. Litmus paper likewise was turned red when dipped in the water.

The behaviour of the water towards chemical tests was as follows :—

Ammonia produced no change.

Carbonate of ammonia produced no change.

Lime-water produced no change.

Chloride of calcium and ammonia produced no change.

Nitrate of barytes produced no change.

Nitrate of silver gave a white voluminous precipitate, insoluble in nitric acid, but soluble in ammonia.

Acetate of lead produced a white precipitate soluble for the greater part in boiling water.

Basic acetate of lead gave a white voluminous precipitate in the clear liquid filtered from the precipitate which was caused by neutral acetate of lead.

Oxalate of ammonia produced a small white precipitate of oxalate of lime.

Phosphate of soda and ammonia, added to the concentrated liquid filtered from the oxalate of lime, gave a crystalline white precipitate of phosphate of magnesia and ammonia.

Chloride of platinum, added to the water after having been evaporated to a small bulk, produced a crystalline yellow precipitate.

The residue left on evaporation of the water coloured the alcohol flame yellow.

These reactions indicate the presence of chlorine, potash, soda, magnesia, lime and organic acids, and prove the absence of other bases and of sulphuric acid, tartaric acid, racemic acid, oxalic and phosphoric acid.

3. Fluid from unopened pitcher-plants grown in the Experimental Gardens, Edinburgh, June 13th, 1849.

The water was perfectly clear and colourless, had an acid reaction on litmus paper, and exhibited the same physical and chemical characters as the fluid from the pitcher-plants of the Botanical Garden.

63·21 grains of water left on evaporation a residue which, dried at 212° F., amounted to

0·58 grain.

100 parts of the fluid therefore contained

0·91 per cent. of dry residue.

Exposed to a red heat the residue (0·58 gr.) turned black, and gave off pungent fumes, and left a white ash after all the charcoal was completely burnt away, the weight of which was 0·42 of a grain.

The loss by burning therefore was 25·86 per cent.

The residue left on evaporation of this fluid was slightly coloured, and gave an almost colourless solution with water. A portion of this solution was kept in a closed bottle. After the lapse of a fortnight the water in the bottle became turbid and deposited some light white flakes. The acid reaction, which was very distinct before, had now disappeared entirely.

4. Fluid from opened pitcher-plants grown in the Experimental Gardens, June 14th, 1849.

The fluid in the open pitchers was coloured yellow, but otherwise perfectly clear. The reactions with chemical tests were the same as the preceding.

97·74 grains of water left on evaporation 0·85 of a grain of dry residue.

100 parts therefore contained 0·87 per cent. of solid matter.

This residue was coloured yellow, but redissolved entirely in a little water.

5. Fluid from unopened pitcher-plants grown in Messrs. Dickson's nursery, June 17th, 1849.

Fluid perfectly clear and colourless, reactions the same as above.

319·48 grains left a residue which, dried at 212° F., was found to weigh 1·88 grain; or

100 parts of the liquid contained 0·58 per cent.

6. Liquid from unopened pitcher-plants grown in Messrs. Dickson's nursery, June 21st, 1849.

Physical and chemical characters of the liquid the same as above.

193·82 grains of water left on evaporation 1·22 grain of dry residue, or 0·62 per cent.

When burnt the 1·22 grain lost in weight 0·41 of a grain, or 100 parts of the residue lost 36·06 per cent.

The solid matter of this liquid was very hygroscopic, and coloured more yellow than that of the Botanical and Experimental Gardens. I found that the total weight of the solid matter in this fluid was not so large as in that of the Experimental Gardens, but that the proportion of organic matter in the residue was larger than that in the residue of the fluid procured from the Experimental Gardens.

7. Water from opened pitcher-plants grown in Messrs. Dickson's nursery, June 24th, 1849.

This fluid was yellow-coloured and not quite clear. Litmus paper was turned red when moistened with the water. The reactions were the same as above, with the exception that nitrate of barytes produced a slight turbidity, indicating the presence of sulphuric acid. As I found no sulphuric acid in the liquid from the unopened pitchers of the same plants, nor in any of the liquids I examined, I think the sulphuric acid which I found

must have resulted from the water with which the plants had been watered which had found its way into the open pitchers*. In order to see if the liquid contained any volatile acid, I subjected about half an ounce of it to distillation. The distillation was continued till the residue in the glass retort was evaporated to dryness, and the generated steam carefully condensed in a glass receiver. The distilled portion was perfectly pure water, and experienced no change by any reagent.

It results from this experiment that the liquid in the ascidia of *Nepenthes* does not contain any volatile acids, such as acetic or formic acid.

8. Fluid from unopened pitcher-plants grown in the Royal Gardens, Kew.

Having been unable to detect any oxalic acid in the above-mentioned fluids, I was anxious to ascertain whether or not the fluid of plants grown in other localities contained oxalic acid. I therefore applied to Sir W. Hooker, who with great liberality directed some liquid of unopened pitcher-plants grown in the Kew Royal Botanical Gardens to be sent to me. The physical and chemical characters of this fluid were precisely the same as those of the previously examined liquids. The proportion of solid matter it held in solution however was much smaller.

299·87 grains of the liquid left on evaporation only

0·82 of a grain of dry residue.

100 parts of the liquid therefore contained

0·27 per cent. of solid matter.

On burning, the 0·82 of a grain lost 0·27 of a grain, or

100 parts lost 32·92 per cent.

All the liquids from the different localities above-mentioned which were left over I mixed together and evaporated the mixture to dryness. One-half of the dry residue I exposed to a red heat, and used the remaining white ash for the determination of the inorganic salts of which it was composed.

The other half I dissolved in water and precipitated with basic acetate of lead, in order to obtain the organic acids in combination with lead. This precipitate I collected on a filter and washed with cold distilled water. It was then removed from the filter and suspended in water, through which a current of sulphuretted hydrogen was passed. By this means I separated the lead as sulphuret, and obtained the organic acids free dissolved in water. This solution was colourless and very acid; evaporated to a small bulk in a water-bath it assumed a yellow colour, and dried at last to a yellow crystalline mass, which deliquesced in the air and dis-

* The water in this instance was procured chiefly from the Water of Leith.

solved readily in water and alcohol, leaving behind a trace of a brown organic matter.

Lime-water added in excess to a portion of the acid solution produced no precipitate in the cold, but on boiling a small white precipitate fell down which redissolved entirely in sal ammoniac.

Chloride of calcium and ammonium left the liquid unchanged in the cold, but on boiling a precipitate was formed which was soluble in sal ammoniac.

Acetate of lead gave a white precipitate insoluble in ammonia, soluble in acetic acid.

Basic acetate of lead added to the liquid filtered from the precipitate caused by neutral acetate of lead produced another abundant white precipitate. From these reactions it appears that the precipitate with lime-water was caused by citric acid and not by tartaric or racemic acid, the reactions of which acids are similar to those of citric acid, for tartrate of lime is not soluble in sal ammoniac, whilst tartrate of lead redissolves readily in ammonia. Tartaric acid moreover is sufficiently characterized by the sparing solubility of its acid potash salt, and as the acid liquid did not give rise to the formation of such a salt with potash, we have another indirect proof of the presence of citric acid. A little tartaric acid added to the liquid in which tartaric acid was sought in vain, after a few minutes produced the sparingly soluble potash salt.

Racemic acid is thrown down both by lime-water and by a solution of gypsum ; the acid liquid of *Nepenthes* remained unchanged by either reagent, hence it cannot have contained any racemic acid.

The precipitate caused by chloride of calcium and ammonia and boiling was filtered hot, and alcohol and ammonia added to the clear liquid. The addition of alcohol produced a voluminous white precipitate, a reaction which indicates the presence of malic acid. The quantity of this precipitate was much larger than that of the lime precipitate which citric acid gave. The formation of a precipitate, upon addition of alcohol to the liquid from which the first had been separated by filtration, is characteristic of the presence of malic acid, for no other lime-salts were present ; for instance, no sulphate of lime was present which could have produced a precipitate. But I thought it nevertheless necessary to examine the precipitate caused by the addition of alcohol further. When burnt it turned black, gave off pungent vapours, and was converted into carbonate of lime. The solution of chloride of calcium and ammonia used for the experiment remained clear after the addition of alcohol ; the acid liquid likewise remained clear when alcohol was added ; both put together immediately produced a white voluminous precipitate.

Basic acetate of lead, as already mentioned, throws down from the solution a white precipitate. I could not observe that this precipitate melted below the boiling-point of water, as pure malate of lead does, but it must be remembered that this reaction is distinctly marked only when the malate of lead is pure; admixtures of other salts of lead prevent it altogether; and as I have shown the presence of citric acid and another organic substance which is thrown down by basic acetate of lead, there can be no doubt that this was the reason why the precipitate did not dissolve in boiling water.

Though I have not been able to obtain a sufficient quantity of the acids of *Nepenthes* for an elementary analysis, I think the above reactions prove the presence of malic and citric acid. Oxalic acid, which is readily detected, as the weakest solution of an oxalate is thrown down by lime-water, I failed to discover; on the contrary, I have shown that the water contained lime, which excludes the co-existence of oxalic acid in a clear liquid. I have found that the smallest quantity of oxalic acid immediately caused the water of *Nepenthes* to become turbid.

The second half of the residue left on evaporation of the mixed fluids I exposed to a red heat in a platinum capsule. It turned black, gave off pungent fumes, and left a white salt after all the charcoal was burnt off.

On analysis this residue was found to consist of

Chloride of potassium	76·31
Carbonate of soda	16·44
Lime	3·94
Magnesia	3·94
<hr/>	
	100·63

The unburnt residue left on evaporation of the fluid in the ascidia of *Nepenthes* therefore consists, if we take the average of the loss of the three determinations at 31·61 per cent. and reject the carbonic acid of the ash, of—

Organic matter, chiefly	
Malic acid and a little citric acid .	38·61
Chloride of potassium	50·42
Soda	6·36
Lime	2·59
Magnesia	2·59
<hr/>	
	100·57

It is remarkable that none of the fluids which I examined contained any sulphuric acid, which acid has been found in all juices of plants, and which I do not doubt also exists in the sap

of *Nepenthes*. An ash analysis of this interesting plant would show the proportion of sulphuric acid at once ; and as we are not in possession of an analysis of the ash of *Nepenthes*, which in other respects might be of interest, I take the liberty of asking those gentlemen who are in the possession of *Nepenthes*' plants to preserve the clippings of branches, &c., which I shall be glad to receive as materials for an ash analysis.

XVII.—*Contributions to the Botany of South America.*

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

[Continued from p. 39.]

MARGARANTHUS.

AMONG the various collections of Mexican and South American plants, I have not been able to find any specimen corresponding with this genus, of which indeed nothing appears to be known, except the description given of it by Prof. Schlechtendal, and the figure drawn by that able botanist from living specimens raised in Halle from seeds received from Mexico. On comparing this with *Physalis* and its allied genera, it will be seen to differ from them in the smaller size and pale blue colour of its flowers, and particularly in the great contraction of the mouth of the corolla, which gives it a globular instead of a campanular form. The calyx is more entire on its margin, and like *Physalis* enlarges, becomes vesicular, and incloses a small globular berry with aqueous juice, which becomes exsiccous. I have here amended its character as contrasted with its allied genera.

MARGARANTHUS, Schl.—*Calyx urceolato-tubulosus, 5-angularis breviter 5-dentatus, persistens et accrescens. Corolla urceolato-globosa, 5-sulcata, imo attenuata, medio ventricosa, ore valde contracta, margine dentibus 5 minutis instructa, intus villosula. Stamina 5, æqualia, inclusa, corollæ dimidio breviora; antheræ conniventes, 2-lobæ, dorso affixæ, rima dupli longitudinaliter dehiscentes. Ovarium globosum, 2-sulcatum, disco carnoso annulari basi immersum, 2-loculare, placentis multiovulatis, medio dissepimenti utrinque adnatis. Stylus simplex, apice attenuatus. Stigma truncatum. Bacca subtilitata, 2-locularis, exsueca, pericarpio membranaceo, polysperma, calyce inflato, ovoideo, reticulato-venoso, dentibus ore clauso laxe inclusa. Semina orbiculato-reniformia. Embryo in albumen semipellucidum curvatus.*—Herba Mexicana dichotome ramosa, foliis alternis, ovatis, vel ovato-lanceolatis, acutis, petiolatis; floribus axillaribus, solitariis, parvulis, pedunculatis, nutantibus, sordide cærulescentibus.

1. *Margaranthus solanaceus*, Schl. (Hort. Halens. i. tab. 1);—

valde ramosus, foliis inferioribus obovatis, acutis, imo rotundatis, obsolete dentatis, utrinque fere glabris, venis subpilosis, margineque ciliolatis, superioribus lanceolatis, petiolo canaliculato sparse pubescente.—Mexico (Papantla, Schiede).

This plant appears to have very much the habit of a *Physalis*; its lower leaves are 4 inches long, $2\frac{1}{2}$ inches broad, on a petiole of $\frac{1}{2}$ to $\frac{3}{4}$ inch; the upper leaves are $2\frac{1}{4}$ inches long, 10 lines broad, on a petiole of half an inch; the peduncles are 1 line long; the calyx 1 line, and the corolla 2 to $2\frac{1}{2}$ lines in diameter; the calyx increases to the size of half an inch, is globular in form, reticulate, and incloses a berry of 3 lines in diameter.

NECTOUXIA.

This genus appears to have been little known hitherto except from the details given by Prof. Kunth (Nov. Gen. iii. p. 10), where a figure of *Nectouxia formosa* is given in plate 193 of that work. On comparing a specimen of this genus in the herbarium of Sir Wm. Hooker, I am led to conclude it to be a second species, as I can hardly imagine that so accurate an observer could have been mistaken. In this species the difference lies in the calycine segments being much narrower, in the greater length of the corolla, in the segments of the border being narrower, in the lower insertion of the stamens, in the longer and more linear anthers, and more especially in the singular expansion of the upper portion of the filament, and finally in the exertion of the style. Kunth describes his plant as being herbaceous and not higher than 8 inches, whereas this appears to be a much taller plant. *Nectouxia* evidently approaches very closely to the genus *Salpichroma*, and were it not for the remarkable peculiarity of the prominent corona in the mouth of the corolla, it could hardly be distinguished from that genus. Like *Salpichroma* it possesses the character of its flowers becoming black in drying: the expansion of its filament is also another distinguishing feature. I have not been able to examine its perfect fruit, but it is evidently a berry: the form and structure of its ovary quite correspond with that of *Salpichroma*. The following is its amended character:—

NECTOUXIA. Char. emend.—*Calyx* 5-partitus, lacinias aequalibus, erectis, linearibus, acutis, persistens. *Corolla* hypocra-teriformi-tubulosa, tubo 5-nervi, 5-angulato, superne paulo ampliato, calyce 2-plo longiore, limbo patente, 5-partito, laci-nias aequalibus, oblongis, acuminato-obtusiusculis, aestivatione induplicato-valvatis, fauce in coronam brevem urceolatam ex-sertam 10-nervem 10-dentatam producta. *Stamina* 5, inclusa, aequalia: *filamenta* brevia, supra tubi medium inserta, com-

pressa, sœpe (an semper?) superne in laminam membranaceam panduræformem apice acutam subito dilatata: *antheræ* linear-oblongæ, erectæ, mucronulatæ, medio dorsi affixæ, 2-loculares, loculis parallelis, usque ad medium disjunctis, rima longitudinali antice dehiscentibus. *Ovarium* conicum, disco parvo carnoso impositum, 2-loculare, placentis dissepmimento utrinque adnatis, multiovulatis. *Stylus* filiformis, tubo corollæ excedens. *Stigma* exsertum clavatum emarginato-2-lobum. Cetera ignota.—Herbæ perennes Mexicanæ *fatidæ*; folia petiolata sparsa, superiora subgeminata, cordata; integra. Flores solitarii, extra-axillares, pedunculati, cernui. Corolla flava, siccatio nigrescens.

1. *Nectouxia formosa*, H. B. K. iii. 10. tab. 193;—herbacea, caule angulato; foliis cordatis, ovatis, acutis, hirtellis; calyce piloso-hispido, corolla flava, staminibus tubo haud superantibus.—Mexico (Real del Monte).

This plant is described as being scarcely 8 inches in height with a fusiform root: its leaves, sometimes geminate, are from $1\frac{1}{2}$ to $1\frac{3}{4}$ inch long, and 1 to $1\frac{1}{4}$ inch broad, upon a petiole 9 to 10 lines in length: the peduncle of its solitary axile flower is half an inch long, its calycine segments 6 lines, the tube of its corolla 10 lines, the lobes of its border 7 lines and $3\frac{1}{2}$ lines broad.

2. *Nectouxia bella* (n. sp.);—herbacea, caule striato; foliis cordatis, ovatis, acutis, utrinque sparse et mollissime pubescentibus; flore cernuo, staminibus infra faucem corollæ omnino inclusis, filamentis superne in ligulam latam membranaceam expansis.—Mexico (Real del Monte, Coulter, no. 1270;—circa Toluca, Andrieux, no. 180).

Although found near the same locality, and in no way differing in the shape of its leaves, its herbaceous stem and tapering root, this plant offers many points of structure at variance with the foregoing species, if we depend upon the usually accurate descriptions of Prof. Kunth. It is double its height, and its leaves are proportionally larger, being often geminate, $2\frac{3}{4}$ inches long, 2 inches broad, upon a petiole $\frac{3}{4}$ inch in length; the peduncle of its axillary flower is 1 inch long, its narrow linear acute calycine segments are $\frac{1}{2}$ to $\frac{3}{4}$ inch, the tube of its corolla 1 inch to $1\frac{1}{4}$ inch in length, and 2 to 3 lines in diameter at the mouth; the lobes of its border are lanceolate, oblong, very patent, and $\frac{5}{4}$ inch long; the corona, with ten obsolete teeth, protrudes 2 lines beyond the throat; the stamens, inserted somewhat above the middle of the tube, are 3 lines long; the ovary is elongated and pointedly conical, 3 lines long, $\frac{7}{8}$ line at base, and is seated on a pro-

minent annular ring, and the style and stigma do not exceed the extremity of the corona*.

NICANDRA.

This genus of Adanson, on account of its augescent vesicular calyx, has been placed near *Physalis*, but it exhibits much dissimilarity in its habit, in the blue colour and aestivation of its large bell-shaped flowers, and in the structure of its fruit. There is only one recorded species, well known to our gardens, the old *Atropa physaloides*, Linn., which is manifestly related to *Atropa* and *Anisodus* on account of the form and imbricate aestivation of its corolla and the nature of its fruit; it differs however from both these genera in the very peculiar character of its calyx, in which respect it approaches *Juanulloa*, but it does not correspond with that genus either in its habit, the structure of its corolla, or the form of its embryo. It therefore takes its position in the tribe *Atropeæ* (Ann. Nat. Hist. 2nd Ser. ii. 166), and I annex an emended character in conformity with my own observations made upon the living plant.

NICANDRA, Adans. Char. emend.—*Calyx* magnus, 5-partitus, laciniis sagittato-cordatis, acutis, erectis, longitudinaliter replicatis, marginibus infra medium valvatum conniventibus, hinc pseudo-alatis, angulis basalibus in calcaria 5 uncinata acutissima productis, persistens et augescentis. *Corolla* magna, campanulata, limbo brevi 5-partito, lobis latis, rotundatis, patentireflexis, aestivatione imbricata. *Stamina* 5, æqualia, erecta, corollæ triplo breviora, *filamenta* basi tubi e glandulis totidem trigonis utrinque auriculatis lanato-tomentosis orta, hinc fornicate, erecta, et incurvata; *antheræ* ovatae, 2-loculares, imo cordatae, in sinu apicifixæ, loculis parallele connatis, rima marginali longitudinaliter dehiscentibus. *Ovarium* obovatum, disco carnosò crenulato insidens, 5-loculare, ovulis plurimis, placentis incrassatis axi adnatis. *Stylus* brevis, longitudine staminum. *Stigma* quinquelobum, lobis obtusis, glandulosopapillosis, in capitulum aggregatis. *Bucca* subsicca, sphaerica, calyce globoso, membranaceo, valde reticulato, aucto, 5-gono inclusa, 3-5-locularis, pericarpio tenuissimo fragili irregulariter rumpente. *Semina* plurima, reniformia, *hilo* in sinu laterali; *testa* scrobiculato-favosa. *Embryo* teres, intra *albumen* carnosum spiraliter areuatus, *cotyledonibus* semiteretibus, *radicula* angulo basali spectante, *hilo* evitante, duplo brevioribus.—*Herba* suffrutescens *Peruana*, caulinis plurimis, ramosis, deciduis; foliis alternis, superioribus geminis, oblongis, acutis, sinu-

* A representation of this species, with sectional details, will be given in plate 40 of the 'Illust. South Amer. Plants.'

ato-incisis, in petiolum longum decurrentibus, glaberrimis; floribus pedunculatis, solitariis, extra-axillaribus, cernuis, pedunculo fructifero elongato, erecto, apice recurvo.

1. *Nicandra physaloides*, Gaertn. ii. 237. tab. 131; Bot. Mag. 2458. *Atropa physaloides*, Linn.; *Jacq. Obs.* iv. tab. 98. *Phy-salis daturæfolia*, Lam. *Ency.* ii. 102. *Calydermos erosus*, R. & P. ii. 44. *Alkekengi*, *Feuillé, Obs.* 724. tab. 16.—*Planta omnino glabra, radice fibrosa, perennante; caulis frondosis, ramosissimus, annuis; foliis glabris, oblongis, acutis, sinuato-incisis, in petiolum longum decurrentibus; calyce reticulato, nitido, aucto; corolla magna, azurea, campanulata, fundo albido, maculis 5 obscure cœruleis notata.*—*Peruvia, v. v.*

This plant is well known in most tropical countries, where it has become almost indigenous; it is cultivated in the open air in Kew Gardens, from which source an ample opportunity has been afforded of examining its structure in a living state. It grows there to the height of about 5 feet; in warmer climates it attains a height of 6 or 8 feet; its leaves are oblong, irregularly inciso-sinuate on the margin, with an acute summit, cuneate at base, and decurrent on the channeled petiole; they are about $6\frac{1}{2}$ inches long, upon a petiole of $1\frac{1}{2}$ inch, are about 4 inches broad, and quite glabrous. The peduncle is pendent, about $\frac{3}{4}$ inch in flower, growing to a length of $1\frac{1}{2}$ inch in fruit, when it becomes erect and suddenly deflexed at its thickened apex: the calyx is 9 lines long from its base to the point of its segments, or 1 inch long including its basal lobes; the segments are erect, with their margins undulated and connivent with the adjoining ones for their lower half, salient, producing the appearance as if it were 5-winged; in fruit it preserves the same form, becoming almost globular and vesicular, and of very reticulated texture, with the points of its segments conniving and wholly concealing the berry. The corolla is about twice the length of the calyx, broadly campanular, swelling gradually upwards from its middle; the lobes of the border are rounded, somewhat erect and overlapping each other at the base, and suddenly revolute towards their apex, which is very obtuse, with a slight emarginature on each side of a short central point; the stamens are scarcely one-third of the length of the corolla, arising from as many glands adnate to the base of the tube, forming a kind of fornix about the ovary, and clothed with densely woolly brachiate hairs; the filaments above are quite smooth, erect, and incurved at the apex; the style is short, erect, surmounted by a large, globular, woolly or papillose stigma, composed of five segments closely connivent; the ovary is seated upon a small crenulated yellow gland. The berry is quite globular, about 8 lines in diameter, with three to five cells of unequal

size, having slender dissepiments, and being filled with an aqueous juice and numerous seeds attached to a large central placentation; the berry when fully ripe becomes dry with its pericarp of thin and brittle texture, being easily ruptured by an irregular laceration. The seeds are flattened, reniform and rounded, about 1 line in diameter.

CLIOCARPUS.

Among Gardner's Brazilian plants I have noticed one, which in the shape of its calyx, in the structure of its fruit, and especially in the form of its embryo, comes near *Nicandra*, but it disagrees in having a woody stem and a wholly different habit; its calyx does not, as in *Nicandra*, become thin, membranaceous and reticular, but is thick, somewhat fleshy, and densely covered with stellate tomentum, approaching in its form more to that of *Juanulloa*, although the shape of its embryo is that of the former genus. Its flower is yet unknown, as the only specimens collected were in fruit. On account of the structure of its seed I have placed it for the present next *Nicandra*, but its exact position cannot be known until we are acquainted with its floral characters. I have called the genus *Cliocarpus* from *κλείω, claudio, καρπὸς, fructus*, on account of its fruit being wholly concealed within the enlarged enveloping calyx. The following may be taken for its generic character until more ample details can be obtained:—

CLIOCARPUS (gen. nov.). *Flos ignotus*.—*Calyx* fructifer auctus, 5-partitus, lacinii lanceolatis, acutis, longitudinaliter subrepli-catis, marginibus valvatum conniventibus, hinc tubum ventri-cosum sinuoso-5-angulatum, ore 5-dentato fere clausum, simu-lantibus, angulis imo saccatis. *Bucca* omnino inclusa, globosa, 2-locularis. *Semina* plurima, placentis dissepimento adnatis affixa, reniformia, compressa; *testa* serobiculata, hilo in sinu laterali. *Embryo* teres, in *albumen* carnosum spiraliter arcuatus, *cotyledonibus* semiterctibus, *radicula* angulo basali spectante, hilo evitante, sub-3-plo brevioribus.—*Frutex Brasiliensis, dense stellato-tomentosus*; foliis *alternis, oblongis, integris, breviter petiolatis*; floribus *extra-axillaribus, binis vel solitariis, pedunculo fructifero cernuo*.

1. *Cliocarpus Gardneri* (n. sp.) ;—foliis obovatis, acuminatis, basi obtuse rotundatis, crassiusculis, supra pubescentibus, subtus dense cano-tomentosis, pilis stipitato-stellatis.—Brasilia, ad Arraial das Mercês, Prov. Minas Geraës, v. s. in herb. Hook. (Gardner, 5042).

This is described as a shrub 6 to 10 feet high; its branches are woody and covered with yellowish tomentum; the leaves are

oblong, acuminated gradually, and sharply attenuated at the apex, rounded or subtruncated, and somewhat inaequilateral at base, 3 inches long, $1\frac{5}{8}$ inch broad, upon a thick short petiole of 2 lines in length. The flowers, sometimes in pairs, grow laterally at the base of the petiole; the peduncle is refracted, $\frac{3}{4}$ to 1 inch long, and covered with long glandular hairs mixed with shorter stellate pubescence; the calyx, also tomentose, is 8 lines long, 6 lines across, inclosing a small globular berry 4 lines in diameter.

XVIII.—*On the Animal of Kellia rubra.*

By W. CLARK, Esq.

To the Editors of the Annals of Natural History.

GENTLEMEN, Beacon Hill, Exmouth, Devon, July 5, 1849.

I VENTURE to trouble you with a few observations in reply to Mr. Alder's last paper, in the 'Annals' of this month, on the subject of *Kellia rubra*, and then I hope to retire from the field. I have had ample scope allowed; and though you have not interrupted the discussion, by issuing the editorial veto,

“Claudite jam rivos, pueri, sat prata biberunt,”

still we ought to keep in mind the phrase,

“Est modus in rebus.”

Mr. Alder still continues to rely on the point that the regular ingress and egress of the branchial currents, and the regulation thereof, in the bivalve mollusea, are produced by the action of the vibratile cilia, which clothe the branchial laminae; I differ from his views, and think this doctrine entitled to no confidence, and that the cause is inadequate to the effect propounded.

The branchial cilia have very different functions; their sole use is to beat and subdivide the water, to facilitate the elimination of the vital principle therefrom, *after it has been admitted into the branchial cavity* by the opening of the valves of the animal, by the relaxation of the adductor muscles, and from whence the impure water is discharged by their contraction at the same points, ventral or siphonal, or a combination of both, as the animal may happen to be closed, or open mantled, at which it enters, and a fresh supply of the pure element is received to fill the vacuum caused by its expulsion.

Great misapprehension has arisen from confounding the functions of two different sets of organs, attributing to the one the uses of the other, the real functions of which have altogether been unnoticed.

The assumed regularity of the admission and discharge of the

branchial currents is a sad mistake ; nothing can be more irregular, capricious, and uncertain ; they depend entirely on the volition, habits, and wants of the animal, and are often suspended for weeks in *Kellia rubra*, and twice in every twenty-four hours in the mussels and numerous Gasteropoda inhabiting the higher levels of the littoral zone.

I positively dissent from Mr. Alder's views, repeated in his last paper, that the open fold of *Kellia rubra* is a *special* branchial organ. That the water enters therein no one disputes, inasmuch as this fold is a simple continuation of the ventral portion of the mantle, and the water must flow therein, as it does in every other part of an open mantle. This sentiment is a repetition of one in a former paper ; but it is necessary to keep it in view, to show that the fold in question has no pretensions, as I think, to be considered as a *special* branchial organ to supply the want of one in the usual place nature is always accustomed to fix it, and I am inclined to think that Mr. Alder will ultimately find that she has not, as he states, placed the "inhalant siphon" "before instead of behind."

This idea of inverting the invariable order of nature to account for an anomaly in the structure of *Kellia rubra* is a stretch of imagination, far beyond my conjecture, that the fold in question may be to assist locomotion. But I shall not be surprised to find that Mr. Alder and myself have mistaken the use of this fold in *Kellia rubra*, and that it may minister to supply water to the viviparous colony deposited in the ovarium of the animal of this species, and also act as an oviduct and receptacle for the young, until they are sufficiently developed for exclusion. This idea arises from having seen, when examining some *Kellia suborbicularis* in a saucer, several *testaceous* young ejected from the anomalous tube of one of the animals, which I find, as Mr. Alder states, is entire, and not an open fold as in *Kellia rubra* ; these I immediately gathered up, and have them now by me. I mentioned some time ago this circumstance to Professor Forbes ; but notwithstanding this fact, I have never been able to discover, in any of the very numerous ovaria of this species I have examined, anything but ova, but it is exceedingly probable the shells I saw ejected may have been deposited in the curious and extraordinary appendage in this animal, and there received the development in which I found them.

As to Mr. Alder's other observations, on some quotations from my last paper, I leave them as I find them. I really have some difficulty in appreciating their scope, aim and applicability ; indeed some of them are so involved as not to be clear. I therefore beg him to accept the following new demonstration of the fallacy of the inhalant and exhalant branchial currents in the bivalves

having separate apertures, as an acquittance on account of those parts of his observations which I have neglected to notice, and which, if established, will I am sure be considered by that gentleman as a sufficient answer.

I propose to demonstrate that the water for branchial, as well as alimentary purposes, passes into the branchial cavity by *both* the posterior siphons, in conjunction with the pedal aperture in those animals in which the ventral range is sufficiently open, and is expelled indiscriminately in various proportions from all the apertures I have mentioned.

It appears entirely to have escaped Mr. Alder's observation that the posterior siphons of all bivalves have other functions besides the conveyance of water to the branchiae, and that they are also furnished with most important organs of prehension, for providing for the animal's sustentation ; these are the tentacular cirrhi and cilia which clothe both the anal and branchial siphons of a great majority of the bivalve mollusca, to entangle and capture the minute animaleculæ to be conveyed into the branchial cavity : how, and by what means, is this operation to be accomplished ? I answer, through both the posterior ciliated siphons, by the agency of the currents of water, which enter and thus enable them to deposit within the branchial walls the prey which *each* cirrigerous siphon has captured. We cannot suppose that nature has furnished the siphons of the animals with organs for taking their prey, without at the same time providing the means of conveying it into the branchial cavity, and there cannot be any other than the passage of the water through *each* siphon. We have here irrefragable proof that both the posterior siphons are subservient to provide the animal with water for branchial and alimentary uses.

The *Pectines*, *Anomioe*, and *Ostreæ* also indisputably prove the fallacy of Mr. Alder's doctrine of distinct apertures of ingress and egress for the branchial currents, as in these genera the animals have only one immense aperture, which extends nearly throughout the periphery of the shell, consequently the water can only enter into and issue from the same aperture.

The only other point I must notice is Mr. Alder's assertion that I have "overstated" the tidal range of *Kellia rubra*. What I said with respect to the habitat of this species, was from the recollections of fifteen years ago. I visited the locality a few days since, and again this day, with a person well acquainted with the coast, who called in to assist his judgement another individual, who informed me that the rock from which I took in their presence *Kellia rubra*, is often not covered with water for a fortnight at a time in calm weather : therefore, as I stated in my last paper, the washing of the bases and sides of the rocks suffices

to supply moisture to prevent the desiccation of the branchiae of *Kellia rubra*, as well as those of the *Littorina jugosa* and *petreæ*, and of the *Patellæ* and *Mytili*, which, in many situations, are not submerged throughout the year; and I can affirm that I saw hundreds of some of the animals I have named from *ten* to *twenty* feet above the level of the highest spring-tide at any period of the year. How these animals exist is a mystery; it is possible the saline particles in the air, and the fine spray carried by the winds to the rocks on which these animals are found, may supply sufficient moisture for the branchiae; but can the animal from these materials extract sustentation? There is no appearance of their descent to lower levels; they appear to be fixtures; and I am informed they are to be found in the same situation in all seasons. As for *Kellia rubra*, they exist in myriads in all the higher levels of the littoral zone, but in the very lowest they are not submerged for four hours during the twenty-four.

These facts invalidate the doctrine of the branchial currents by cilia, and their having separate apertures of ingress and egress; for what can be the use of them in *Kellia rubra*, when they necessarily must be interrupted for twenty hours out of the twenty-four throughout the year? It seems strange, according to Mr. Alder, that a special branchial organ should be furnished by nature for a bivalve, which can better dispense with such a specialty than any other in existence.

With my best thanks for your liberal insertion of my papers in the 'Annals,'

I remain, Gentlemen, your most obedient servant,
WILLIAM CLARK.

POSTSCRIPT.—To corroborate the conjecture stated above of the real uses of the anterior tubes of *Kellia rubra* and *Kellia suborbicularis*, I beg to add, that I have just examined a fine *Kellia suborbicularis*. I placed it on the umbones; it immediately exerted and opened the tube, and by the aid of a powerful lens I counted at its fundus fifteen largely developed ova, and I have not the slightest doubt that these anomalous animals, as regards reproduction, are furnished with these anomalous tubes to minister thereto; and I have further to state, that on submitting this animal to my scalpel and to one of Mr. Ross's best microscopes, I received the fullest confirmation of my conjectures, having found at the bottom of the ovary resting on the fundus of the tube, ova in all states of development and *fully-formed testaceous young*. I have carefully preserved the shell and ovary. Therefore *Kellia rubra* and *Kellia suborbicularis* are undoubtedly viviparous; the only difference between the two is, that the young in *Kellia rubra* are fully developed in the ovary, and only require the open tube-like fold for an oviduct, and to convey water to

the pulli, whilst *Kellia suborbicularis* requires the tube to be closed, as it is for some time a nidus for the full development of the testaceous young.

I am at this moment enabled to add, that I have just opened a very large *Kellia suborbicularis* having the contents of the ovarium converted from its usual ova-like aspect into many thousands of completely testaceous young further to be developed before exclusion from the anomalous oviduct.

The reason why this state of the ova has so often escaped detection is, that the ovarium has not been examined at the *genial* season. To see it as I have stated, we must attend to the injunction of C. Lucretius—

“Ætheris et terræ genitabile quærere tempus.”

I have on a card many thousands of the testaceous young taken from the matrix of the individual above mentioned, a part of which I shall have much pleasure in forwarding to any gentleman who may desire it.

It gives me great pleasure that the question of the use of the anomalous tubes is at length set at rest, and the discussion as to them between Mr. Alder and myself is ended.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 27, 1848.—William Yarrell, Esq., V.P., in the Chair.

DESCRIPTION OF FOURTEEN NEW SPECIES OF HELICEA, FROM THE COLLECTION OF H. CUMING, ESQ. BY DR. L. PFEIFFER.

1. *HELIX VITELLINA*, Pfr. *Hel. testa angustissimè umbilicata, depresso-globosa, supernè minutissimè decussata, vix nitida, fuscenti-vitellina; spira breviter conoides, obtusiuscula; anfractibus 5½ convexiusculis, ultimo anticè subdescendente, infra peripheriam vix striato, juxta umbilicum contractum albo; aperturè obliqua, lunato-rotundata; peristomate simplice, marginibus remotis, columellari albo, incrassato-reflexo, supernè subdilatata.*

Diam. 29, altit. 18 mill.

Locality unknown.

2. *HELIX GEMMA*, Pfr. (*Vitrina suturalis*, Beck MSS.) *Hel. testa subperforata, conoideo-orbiculata, tenui, laevigata, nitida, pellucida, virenti-hyalina; spira depresso-conoides; sutura submarginata; anfractibus 4 vix convexiusculis, sensim accrescentibus, ultimo non descendente; aperturè parùm obliqua, rotundato-lunaria; peristomate simplice, recto, margine columellari brevi, arcuata, supernè reflexiusculo.*

Diam. 9, altit. 5 mill.

From the islands of Luzon and Camiguing; collected by Mr. Cuming.

3. *HELIX SUBFUSCA*, Pfr. (*Vitrina subfuscata*, Beck MSS.) *Hel. testa subperforata, depressa, tenui, subtiliter striatula, pellucida, corneo-fusca; spira vix elevata; sutura levi, submarginata; anfractibus 4½ vix convexiusculis, celeriter accrescentibus, ultimo peripherid rotundato, anticè non descendente; aperturam subobliquam, latè lunari; peristome simplex, tenui, recto, marginibus conniventibus, dextro subsinuato, columellari subverticali, supernè vix reflexiusculo.*

Diam. 11½, altit. 6½ mill.

From Sorsogon, isle of Luzon; collected by Mr. Cuming.

4. *HELIX VARGASIANA*, Pfr. *Hel. testa subobtecte perforata, conico-globosa, costulata, opaca, cretacea, fasciis nonnullis obsoletis griseis notata; spira conica, obtusa; anfractibus 5½ convexis, ultimo inflata, anticè descendente; aperturam lunato-rotundata; peristome simplex, margine supero et dextro rectis, basali breviter, columellari latissimè reflexo, subverticali, perforationem ferè tegente.*

Diam. 13, altit. 8½ mill.

From the island of Porto Sancto; collected by Count Vargas.

5. *HELIX CALCAREA*, Pfr. *Hel. testa perforata, depresso-globosa, striatula, lineis impressis obsoletè reticulata, opaca, calcarea; spira breviter conoidea, acutiuscula; anfractibus 5 convexiusculis, ultimo peripherid subcarinato, anticè vix descendente; aperturam subverticali, latè lunari; peristome simplex, margine supero leviter arcuato, basali breviter, columellari paulò latius reflexo, declivi.*

Diam. 15, altit. 10 mill.

From Porto Sancto; collected by Count Vargas.

6. *HELIX CASTA*, Pfr. *Hel. testa imperforata, depressa, utrinque subæqualiter convexa, carinata, striatula, nitida, sub epidermide decidua pallide lutescente albâ; sutura linearis, cretacea; anfractibus 4 subplanis, ultimo juxta suturam et infra carinam obsoletè angulato; columella brevi, declivi, excavata, basi subtortuosa; aperturam subtrapezid; peristome expanso, albo, margine basali leviter arcuato, cum columellâ angulum formante.*

Diam. 47, altit. 23 mill.

Locality unknown.

7. *HELIX ANOMALA*, Pfr. *Hel. testa umbilicata, depressa, carinata, solidâ, utrinque convexiuscula, granulata, violaceo-fusca; anfractibus 5 convexiusculis, ultimo undique soluto, anticè subito descendente, basi constricto, profundè 4-scorbiculato; umbilico cylindrico, aperto; aperturam horizontali, transversè pyriformi; peristome crasso, continuo, hepatico, undique latè expanso, margine basali profundè quadridentato.*

Diam. 24, altit. 11 mill.

From Jamaica. Nearly allied to *H. sinuata*, but differing in the umbilicus and the form of the mouth. Nevertheless it may possibly be a monstrous variety of that shell.

8. *BULIMUS IMPERATOR*, Pfr. *Bul. testa imperforata, ovato-conica, solidâ, striatula, strigis nigris, fulvis et albidis alternantibus,*

interdum interruptis elegantissimè pictâ; spirâ elongato-conicâ, acutiusculâ; anfractibus 6, superioribus planiusculis, 2 ultimis convexis, ultimo spirâ multò breviore; columellâ subverticali, basi extrorsum subdentata, carneo-lividâ; aperturâ truncato-ovali, intus cærulecente; peristomate latè expanso, nigro-marginato, margine dextro vix arcuato.

Long. 68, diam. 38 mill.

From the Philippine Islands.

9. *BULIMUS MONOZONUS*, Pfr. *Bul. testâ imperforatâ, conoideo-ovatâ, solidulâ, longitudinaliter obliquè plicatâ, saturatè castaneâ; spirâ conoideâ, obtusa; anfractibus $5\frac{1}{2}$ convexis, ultimo spirâ paulò breviore, ad peripheriam cingulo lato albo ornato; columellâ subverticali, basi extrorsum subtuberculatâ; aperturâ lunato-ovali, intus margaritacea; peristomate obtuso, vix expansiusculo, margine basali cum columellâ angulum obtusum formante.*

Long. 52, diam. 32 mill.

From the Philippine Islands.

10. *BULIMUS LEPTOCHILUS*, Pfr. *Bul. testâ imperforatâ, oblongo-ovatâ, solidulâ, striatâ et malleatâ, sub epidermide olivaceente castaneo-marmorata; spirâ elongato-conicâ, obtusa; anfractibus 6 vix convexiusculis, ultimo spiram vix superante; columella recente, obsoletissimè plicatâ; aperturâ oblongâ, angustâ; peristomate breviter expanso, simplice, tenui, pallidè carneo, marginibus callo tenuissimo junctis.*

Long. 98, diam. 40 mill.

From La Baja, province of Pamplona, New Granada (Funck).

Nearly allied to *Bul. Moritzianus*, Pfr.

11. *BULIMUS COSTATUS*, Pfr. *Bul. testâ vix perforatâ, solidâ, cylindraceo-turritâ, longitudinaliter subconfertim costatâ, nitida, cinerascenti-carnes; spirâ elongatâ, obtusa; anfractibus $8\frac{1}{2}$ planiusculis, ultimo $\frac{1}{3}$ longitudinis vix æquante; columella supernè dentato-plicatâ; aperturâ oblongâ, intus fusca; peristomate breviter expanso, margine dextro supernè arcuato, tum strictiusculo, columellari dilatato, reflexo, perforationem ferè tegente.*

Long. 18, diam. $5\frac{1}{2}$ mill.

From the Brazils.

12. *ACHATINA REEVEANA*, Pfr. *Ach. testâ oblongo-turritâ, tenui, sublævigatâ, sub lente spiraliter subtilissimè striatâ, nitidulâ, sub epidermide fugace, lutescente albida, luteo-bifasciatâ; spirâ sub-turritâ, obtusa; suturâ regulariter crenulatâ; anfractibus $7\frac{1}{2}$, omnibus convexiusculis, ultimo $\frac{3}{7}$ longitudinis subæquante; columella tenui, strictiusculâ, brevissimè truncatâ; aperturâ truncato-ovali; peristomate tenuissimo.*

Long. 48, diam. 22 mill.

From West Africa. Very similar to *Ach. alabaster*, Rang.

13. *ACHATINA PORTORICENSIS*, Pfr. *Achat. testâ turrito-oblongâ, levigatâ, lineis longitudinalibus impressis irregulariter sculptâ, nitida, pallidè cornea, strigis saturationibus ornata; spirâ elon-*

gatt, obtusiuscula; anfractibus 8 planiusculis, ultimo $\frac{1}{3}$ longitudinis paulo superante; columellā antrorum arcuatā, prope basin aperturā abrupte truncatā; aperturā elliptico-semiovali; peristomate simplice.

Long. 20, diam. 7 mill.

From St. John's, Portorico (under stones).

14. CLAUSILIA SIEBOLDTI, Pfr. *Claus. testa arcuato-rimata, fusiformi, solidi, confertim costulata, vix nitidula, corneo-fuscā; spira sensim attenuata, acuta; anfractibus 10 convexis, ultimo penultimum non superante, basi rotundata, obsoletè gibba; apertura magna, pyriformi; lamellis mediocribus, convergentibus; lunella profundā, arcuata, extus conspicua; plicis palatali 1 mediocri subcolumellarī inconspicua; peristomate continuo, libero, albo, expanso, reflexiusculo.*

Long. 18, diam. 4 mill.

From Japan (Sieboldt).

July 11.—R. C. Griffith, Esq., in the Chair.

The following papers were communicated to the Meeting:—

1. ON THE OCCURRENCE AND HABITS OF VESPERTILIO EMARGINATUS.
BY R. F. TAMES.

The specimen of a Bat, the habits of which I am about to describe, was taken in Warwickshire, near Stratford-on-Avon, whilst flitting around the tops of some high elms by the Avon-side on the 20th of June, 1847. It was in company with several others when I succeeded in shooting it, which I found very difficult on account of their exceedingly crooked, irregular mode of flight.

I believe I have never seen one of these flying in open places in a straightforward manner, as the commoner species, the Noctule and Pipistrelle, usually do; but they follow intimately and exactly the extremities of the top branches of high elm or ash trees, always in the most sheltered and quiet spots, never appearing on the windward side of a tree, even on the calmest evening. They seem of a much more social disposition than any other kind of Bat, being usually in parties of about half-a-dozen, and all of them most commonly hawking round the same tree for a few minutes, then moving off to the next, and so on till all the trees of the group have been searched; and then a re-examination of the same trees takes place.

As above stated, their flight is never straight, even for a moment, but is excessively vacillating and butterfly-like, though rather slow,—performed, as I believe, with the head directed towards the centre of the tree, so that they in fact fly in a sideward direction. From this circumstance I conclude that they take their food, which consists of very minute gnats, while resting on the outer leaves, or when about to settle on them.

If watched very closely for a little time, they move on to some other tree, appearing to shun observation very carefully.

Gilbert White, I think, remarked of the Noctule, that it usually came abroad later than the Pipistrelle, which I can from personal

experience affirm to be the case. The species now under consideration is even later than the Noctule, seldom being seen until the latter has been abroad for an hour; so late that, excepting on very clear evenings, there is little chance of either observing or obtaining specimens.

It is probable that they may be seen during the greater part of the summer months, for I remember to have seen and particularly noticed them for a long time before I thought of shooting one, and also for a considerable length of time afterwards. They may at any time be known by a person at all conversant with the method of flight of the different species of Bats, by their unsubstantial, butterfly-like appearance.

Both the specimens which came into my possession in the way alluded to were females, and on dissection contained a single foetus, about half an inch in length; yet even at this early age the membranes were considerably developed, and all the parts bore nearly the same relative proportion to each other as in the adult.

The auricle of the ear appeared to be nearly, if not quite fully formed, and folded forward over the eyes, reaching almost to the end of the nose.

When skinned and dissected this Bat was quite free from all unpleasant smell.

DIMENSIONS.

	in.	lin.
Length of the head and body	1	7½
Length of head	0	7½
Length of tail	1	6½
Length of the auricle	0	6
Width of ditto	0	3½
Length of the tragus	0	4
Width of ditto	1/10	0
Extent of wings	9	2½
Length of the humerus	0	9
Length of the thumb	0	2
Length from the point of the under jaw to the angle of the mouth, being the gape-line	0	3

DENTITION.

$$i. \frac{4}{6}; c. \frac{2}{2}; f. m. \frac{6}{6}; m. \frac{6}{6} : \text{total } \frac{18}{20}.$$

Since the specimen obtained by Brongniart in the neighbourhood of Dover, none are recorded as having occurred till the present time, with the exception of a single specimen mentioned by Professor MacGillivray, from Winchester, and described by him in the 'Naturalists' Library,' vol. xvii. He there states that the ears have "a semi-circular lobe at the base of their outer side, and a wide and deep sinus in their upper half," which certainly is not the case with my specimens, the notch being neither wide nor deep, nor the lobe at the base at all distinctly marked. Neither is there any great resemblance to Mr. Bell's figure, taken from Brongniart's; the ears in that being much narrower in proportion to their length, with the sinus near the

top of the outer side. It agrees however very nearly with the description and figure given by the latter naturalist from the specimen found by him near Dover, and there can be no doubt of its identity with his specimen of *Vespertilio emarginatus*.

2. ON THE SPECIES OF THE GENUS PLACENTA OF RETZIUS.

BY J. E. GRAY, Esq., F.R.S. ETC. ETC.

Lamarck describes three species of this genus, depending on the general outline and the waved or flat form of the shell, characters which are liable to considerable variations, as may be found on the mere inspection of any large number of specimens.

I have observed that the hinge forms a more permanent character, and affords the means of dividing the species into two sections, and furnishes characters which separate them from each other. In both subgenera the right valve is the flattest, and bears the ridges of the hinge.

Sect. I. *Placuna*, sp. Lamk. = *Ephippium*, Chemn.; *Placenta* β , Schum.

Shell purplish, subopake; hinge-ridges rapidly diverging from one another at about the angle of 45 degrees. Muscular scar under the centre of the hinge. The ridges of nearly equal length.

1. *Placenta Sella*.—Shell flexuous, outline rather rhombic, being straight in front and rather notched behind; the ridges of the hinge not longer than they are separate from each other at the base.

Anomia Sella, Gmelin, S. N. 3345, 1788.

Placuna Sella, Lamk. Hist. N. 2.

Ephippium anglicanum maximum, Chemn. C. viii. t. 79. f. 714. cop. E. M. t. 174. f. 1.

Placenta Ephippium, Retz. 1788.

Inhab. China, India.

β . Shell nearly flat, subquadrangular.

Inhab. Australia. Brit. Mus.

2. *Placenta papyracea*; *Placuna papyracea*, Lamk. Hist. N. 2 = *Ephippium parvum*, Chemn. Conch. viii. t. 79. f. 719. cop. E. M. t. 174. f. 2.

3. *Placenta Lincolnii*.—Shell flat, outline suborbicular, rounder before and behind; ridges of the hinge elongate, longer than they are separate from each other at the base.

Inhab. Australia; Mr. W. Davison. British Museum.

I wish to name this species after my excellent friend Mr. Abraham Lincoln, who kindly presented me with the specimen here described, and who is well known for his fondness for conchology and the liberality with which he allows persons to use his extensive collection.

Sect. II. *Placenta*; *Placenta*, Schum. *Shell semitransparent, flat, outline suborbicular; ridges of the hinge very gradually diverging from each other, the hinder ridge much the longest. Muscular scar rather in front of the middle of the hinge.*

1. *Placenta orbicularis*, Retz.; *Placuna placenta*, Lamk. Hist. N. 3; *Anomia placenta*, Linn. S. N. 1154; Chemn. Conch. viii. t. 79. f. 176. cop. E. M. t. 173. f. 2.

Shell colourless, semitransparent; when young, pale purplish.
Inhab. China. N.W. Coast of Australia; *Earl of Derby*. Port Essington.

The shells vary a little in the inequality of the hinge-ridges, but the hinder is always the longest.

I may remark that Chemnitz gives the best character for the species, and has observed the character furnished by the hinge, which has been overlooked by Lamarck, and, as far as I am aware, by all recent authors.

MISCELLANEOUS.

The Effect of Iodine upon the Nectary. By Dr. R. CASPARY*.

WE consider the nectary as a peculiar organ, in a physiological as well as in a morphological sense; *physiological*, inasmuch as it secretes a saccharine fluid, and *morphological*, inasmuch as its cells are distinguished both by their structure and their contents from the cells of the neighbouring parts of the plant. The cells of the nectary are very small, globular or nearly so, and they contain a peculiarly dense and granular matter.

One of the most important inquiries connected with the physiology of the nectary is to ascertain, how the sugar which it secretes is produced?

This question is only, as we may consider, one special form of the general question, how is sugar produced?

Without entering minutely into the general inquiry, we will refer only to two modes of the production of sugar, which probably have a special bearing upon the case before us.

1st. Sugar is produced from starch by the presence of *diastase*, which however cannot be prepared as an independent substance, and the existence of which is consequently disputed. Its active element appears to be nitrogen, so that we may say that sugar is produced from starch by the presence of a body containing nitrogen.

2ndly. Sugar is produced from starch or cellulose by the presence of *sulphuric acid*.

Frémy has made use of the latter mode of the production of sugar in accounting for the sugar in fruits. He endeavours to demonstrate that as starch or cellulose is converted into sugar by sulphuric acid, so certain substances, present in fruits and taking the place of starch or cellulose, are changed into sugar by the presence of free vegetable acids, which act in a similar way to sulphuric acid. This mode of the production of sugar has not yet been alluded to in accounting for the sugar of the nectaries of plants.

The first mode of the production of sugar, according to which starch is changed into sugar by the action of a body containing nitrogen, is employed by Liebig in his 'Chemistry of Agriculture and Physiology,' in illustrating the formation of sugar in the trunks of trees, as in the maple. He however does not prosecute the subject

* From the 'Botanische Zeitung,' Feb. 23, 1819. Translated and communicated by the author.

to a great extent, and does not show by accurate observations or experiments that starch is always present in this process, or if it is not present, what substance acts in its place.

I have assumed the first mode of the production of sugar in accounting for the saccharine secretion of the nectary in a little paper, 'De Nectariis, Bonnæ, apud Adolphum Marcum,' 1848, p. 45 seq. I ought there to have demonstrated two things: first, the presence of starch in the nectary, or at least of a substance deposited in it and holding the place of starch; and, secondly, the existence of a body containing nitrogen, which should act upon the starch or other substance and convert it into sugar. I have endeavoured to demonstrate that such a body containing nitrogen, the formation of which takes place very near the nectary and which operates upon it, is to be found in the pollen and in the ovules, l. c. p. 35 seq., and p. 48. I shall now proceed in these notes to give additional proofs of the effect of the substances containing nitrogen, which I conclude produce the nectar. In my former work I have ventured the supposition, that the variously-coloured granular substances deposited in the peculiar and globular or nearly globular cells of the nectary are actually starch, or at least hold the place of starch in the process. *The presence of starch in the nectary*, or the question as to whether the granular matter contained in the nectary be starch or not, is the subject of the following observations.

It is a well-known fact in chemistry and vegetable physiology, that iodine colours starch blue, and that it is a very delicate test. In answering, therefore, the question as to whether *the granular matter of the nectary be starch or not*, we shall submit the nectary to the action of iodine.

In the summer of 1848, I examined the nectaries of upwards of two hundred plants which are indigenous to the county of Norfolk in England. From the effect of iodine on the nectaries of those plants I obtained the following results. But before proceeding, I may be allowed to premise, that the iodine employed for the purpose was dissolved in weak spirits of wine, for I found it the most easy to manage in this form. If the iodine is dissolved in water, its action is not sufficiently rapid. If dissolved in more concentrated spirits of wine, it either colours too darkly, or on the addition of water under the microscope, disturbs the observation by the secretion of crystals.

The membrane of the cells of the nectary, like membrane in general, takes a yellow or brown colour, more or less deep, on the application of iodine. The nectary of *Euphorbia Peplus*, L., which has naturally a yellow colour, is hardly visibly affected by iodine. In a general way iodine colours the nectary much more deeply yellow or more deeply brown than the other parts of the flower, as the ovary, the style, the petals and sepals. This is the case in *Artemisia Absinthium*, L., *Lapsana communis*, L., *Filago germanica*, L. (male flower), *Bellis perennis*, L., *Sonchus oleraceus*, L., &c. In certain cases, in which there is some doubt as to the true site of the nectary, I would willingly be influenced by the effect of iodine, and assert, that that organ is the nectary which takes the darkest colour on the application

of iodine. I therefore conclude, in the case of *Knautia arvensis*, Coulter, that the nectary is a small cylinder under the style, and in *Succisa pratensis*, Moench., that it is a very peculiarly loose accumulation of cells at the base of the corolla, under the greatest lobe; and I arrive at this conclusion because these parts are coloured the most darkly by iodine, and because their structure is analogous to that of nectaries in general.

With respect to the contents of the cells of the nectary, we must carefully distinguish between the contents of the common cells and those of the pores. The contents of the former usually consist of a yellowish, greenish or uncoloured, transparent juice, and of a granular matter, the grains of which are sometimes so small that they are scarcely visible, even with a magnifying power of 550, the whole having the appearance of a mass of slime interspersed with traces of grains. In most cases however the grains are clearly visible. Their colour varies considerably, but is limited to the different shades of yellow, green, gray, brown, and obscure violet, though the last is but very rarely observed. It did not occur once in the two hundred plants I examined last year. The colour of the grains is generally the most readily detected when they are congregated one upon the other in small clusters. The individual grains are generally colourless and transparent. Sometimes in addition to the above-mentioned grains there are very large grains of the same globular form, but entirely transparent and free from colour, as in *Pedicularis palustris*, L. I need hardly mention, that there are also in the nectaries of plants, crystals, air-vesicles, &c., which have no reference to the present subject.

The grains contained in the cells of the nectary are also in most cases coloured yellow or brown by iodine.

In eleven plants iodine obviously colours the grains blue, and thus proves that they are starch. In four others it colours them a bluish-brown or a brownish-blue: *Armeria maritima*, Willd., *Hyoscyamus niger*, L., *Hypochaeris radicata*, L., and *Sinapis alba*, L. The eleven plants the grains of which become blue by the application of iodine are the following: *Pedicularis palustris*, L., *Arenaria media*, L., *Mentha arvensis*, L., *Malva moschata*, L., *Malva sylvestris*, L., *Clinopodium vulgare*, L., *Convolvulus sepium*, L., *Conv. arvensis*, L., *Lychnis sylvestris*, Hoppe, *Lychnis dioica*, L., *Bryonia dioica*, L. In the nectary of *Pedicularis palustris* only the above-mentioned larger and transparent grains take the blue colour. The nectary of *Arenaria media*, L., is the base of the sepals, where they abut upon the filaments, and the epidermis only contains starch. The nectaries of *Lychnis sylvestris* and *dioica* are on the gymnoporum between the bases of the petals and their processes. In *Lychnis sylvestris* I found evidence of starch only in the male flower, and in *L. dioica* only in the female flower. The grains of starch vary very much in size. The diameter of the largest is only about one-fourth of the diameter of a common grain of potato-starch, and the smallest grains are scarcely visible even with a magnifying power of 550. The form of the grains is irregular, but more or less globular. Though coloured by iodine they remain transparent, and generally show a

somewhat darker spot in the centre, which is probably a small hollow space, such as may often be seen in starch. Beside the dark spot in the centre I observed layers in the starch of *Clinopodium vulgare*, but there were only two in the largest grains. Iodine sometimes does not act upon the grains till after the lapse of some minutes, as in *Convolvulus arvensis*.

Before I speak of the effect of iodine upon the pores, I must premise, that the pores which are found in the nectaries of many plants have, with but few exceptions, a row of globular grains on the exterior margin, distinguished by their size, transparency, and freedom from colour. I found no trace of these grains in the pores of four of the plants I examined last summer, viz. *Cakile maritima*, Willd., *Euphrasia officinalis*, L., *Statice Limonium*, L., *Sedum Telephium*, L. Iodine had a different effect on the grains of these pores, although in their physical properties they appear to be identical. In seven plants they became blue, and in fourteen brown, of a deep shade, much browner than any other part of the nectary. But whether they became blue or brown, the effect was always a sudden one, and much more rapid than in the case of the grains in the other cells. This may be well observed in *Bryonia dioica*, in which the rings of the grains in the pores instantaneously appear on the change of colour, which takes place immediately iodine touches the nectary; whereas the grains in the other cells gradually and slowly assume the blue colour. All these grains, whether they take a blue or brown tint, have no dark spot in the centre nor any trace of layers, but consist of one uninterrupted mass of matter. The seven plants, the grains in the pores of which are coloured blue by iodine, are the following: *Bryonia dioica*, L., *Geranium Robertianum*, L., *Parnassia palustris*, L., *Sinapis alba*, L., *Cnicus lanceolatus*, Willd., *Scrophularia Balbisii*, Hornem., *Rubus fruticosus*, L. The fourteen plants, the grains of the pores of which iodine colours dark brown, are the following: *Campanula Trachelium*, L., *Carlina vulgaris*, L., *Calendula officinalis*, L., *Centaurea scabiosa*, L. (flower of the disc), *Senecio sylvaticus*, L. (flower of the disc), *Sonchus arvensis*, L., *Circaeæ lutetiana*, L., *Cichorium Intybus*, L., *Reseda luteola*, L., *Samolus Valerandi*, L., *Helianthus annuus*, L. (flower of the disc), *Tanacetum vulgare*, L., *Hieracium pilosella*, L., *Helminthia echooides*, Gaertn. In all these cases, whether the grains of the pores are coloured blue or brown, the grains of the other cells assume a yellow or brown tint, except *Bryonia dioica*, in which they become blue, and *Sinapis alba*, L., in which they take a brownish-blue tint.

The inquiry now presents itself, what is the granular matter in the nectaries and their pores which is coloured brown by iodine? I cannot state established facts in reply, but only advance the hypothesis, that it is a *starch-like* substance, from which the sugar of the nectary might be easily produced. I am urged to this conclusion by the following reasons:—

1st. The brown-tinted grains of the nectaries are in their physical properties, such as form, magnitude, colour and situation, exactly similar to the grains of the eleven or twenty-two plants,—as we include in the number those four plants the grains of which take a blue-

brown colour, as well as those seven the pore-grains of which assume a blue tint,—which grains iodine proves to be real starch. It would be remarkable indeed, if the substance in the former were not also of a similar nature to starch,—if it were not in fact isomeric with starch.

2ndly. It would also be most remarkable, if plants of the same family, the nectaries of which agree with one another in situation and structure, should in some cases contain starch in the nectary and in others a different substance. Amongst the *Labiatae*, for instance, it is indisputable that the nectaries of *Mentha arvensis* and *Clinopodium vulgare* contain starch. It would be extraordinary indeed if the contents of the nectaries of many other *Labiatae*, as of *Stachys sylvatica* and *arvensis*, *Prunella vulgaris*, *Lamium album*, &c., were not also starch, although they are turned brown by iodine, for their nectaries are in all other respects exactly similar to those of the first.

3rdly. The elements of starch (C^{12} , H^{10} , O^{10} *) form also with the same number of atoms three or four other substances, dissimilar in their chemical and physical properties, viz. cellulose, inuline, dextrine, and lichen starch. Schleiden, however, in his 'Wissenschaftliche Botanik,' 1846, does not consider lichen starch as a distinct substance, although Mulder in his 'Chemistry of Vegetable and Animal Physiology,' which I have before me only in an English translation by Fromberg, without date, regards it as a chemically distinct body. When will the time come when chemistry will state results on these important substances which will meet with general acceptance? It is certain, at all events, that the chemical combination of $C^{12} H^{10} O^{10}$ constitutes a most variable substance. Although we may never be able by direct analysis to prove the identity of the granular matter in the nectaries, which is coloured brown by iodine, and the formula $C^{12} H^{10} O^{10}$, there is nothing to prevent us from assuming the identity, and concluding that the contents of the nectary, which are coloured brown by iodine, are isomeric with starch. From this substance, therefore, and the nitrogen contained in the pollen and ovules, the sugar of the nectar results.

Cringeford, near Norwich, April 1849.

On the Intimate Structure of Articular Cartilage. By Dr. LEIDY.

As is familiar to every anatomist, articular cartilages always fracture in a direction perpendicular to their surface, the broken edge presenting a striated appearance in the same direction. This character the older anatomists ascribed to a fibrous or columnar structure of the cartilage, like that of the enamel of the teeth, while histologists at the present day consider it as dependent upon the vertical arrangement of the rows of cartilage-cells, although it has been suspected to depend upon some ultimate arrangement of the matrix or intercellular substance not yet detected. In some late observations upon the structure and development of articular cartilage, through means of an excellent microscope, made for me by

* I quote from Mulder's 'Chemistry of Animal and Vegetable Physiology.'

Messrs. Powell and Lealand of London, I have been enabled to discover a definite structure in the intercellular substance. This consists of an arrangement of exceedingly fine, transparent filaments, nearly uniform in thickness, and having an average measurement of the $\frac{1}{25000}$ th of an inch. An easy method of detecting this filamentous structure, is to tear a fine fibre from the broken edge of an articular cartilage which has been macerated in diluted muriatic acid, by means of a fine-pointed forceps, and exposing it in the ordinary way in water beneath the microscope, using the quarter- or eighth-inch objective power. The fine filaments, partly detached, will be seen in great numbers along the sides of the fibre. When these filaments are viewed by very oblique light, they appear to have an indistinct granular appearance, each composed of a single row of granules, which of course, in the articular cartilage, adhere together with greater tenacity in the direction of the length of the filaments than laterally.

When an articular cartilage is broken in a direction from the under to the free surface, it is found that the fragments adhere by a membranous layer, covering the free surface of the cartilage, which by the older anatomists was considered as the extension of the synovial membrane; by the anatomists of our day, either as a homogeneous layer, or as nothing more than a stratum of the cartilage, the rows of cells of which take a direction parallel with the surface, or at right angles to those more deeply situated, and thus giving rise to this distinct laminated condition. That it is a cartilaginous layer is undoubtedly correct; but instead of the rows of cells determining the arrangement, I find it depends upon the filamentary structure of the matrix, the filaments taking a course parallel with the surface of the cartilage, in a direction at right angles to those forming the matrix of the deeper part of the cartilage.

A straight fibre may be torn from the articular cartilage, and in the act of tearing, should a row of cells be in the line of rupture, as is frequently the case, (for although generally following the course of the filaments, yet a number are oblique or even somewhat irregular,) it will be torn through, which in itself would be sufficient to indicate that the fibrous arrangement of the cartilage did not depend upon its rows of cells, and indeed they have but little or no influence in this respect.

From the foregoing description of the structure of the intercellular substance of articular cartilage, it can be readily understood that it may determine the course of the rows of cells, which is really the case. In the earliest period of the existence of the articular cartilage, the cartilage-cells are single, isolated, and equally diffused throughout a mass of hyaline substance, which latter in the progress of development becomes indistinctly granular, and then for the first time have I observed the appearance of the filamentary structure. In the splitting up of the primary cartilage-cell and development of others, they arrange themselves in the direction in which there is least resistance, which would be of course in the direction of the filaments of the intercellular matrix. Hence, in the deeper part of the articular cartilage, the rows of cells are generally vertical to the surface, and parallel to the same in its more superficial portion.

In some of the articular cartilages sometimes there are peculiarities of structure which I think have never been pointed out, and are worthy of notice.

In the articular cartilage of the condyles of the os femoris, I have occasionally noticed numerous minute lacunæ?, found in greatest abundance near the surface of attachment, and gradually decreasing in number until they entirely disappear in the superficial third of the cartilage. They are elongated, compressed, and their long diameter is invariably situated transversely, at right angles to the filamentous matrix, or parallel with the surface of the cartilage. The longest measure transversely $\frac{1}{12}\frac{1}{50}$ of an inch, the shortest $\frac{1}{31}\frac{1}{25}$ of an inch, in the vertical direction $\frac{1}{62}\frac{1}{50}$ of an inch. When well-defined, they appear more transparent than the cartilaginous matrix in which they are situated; when viewed a little within the focus they appear deep black.

Fibres of bone are not unfrequently met with in the articular cartilages, especially in that of the head of the os femoris. They are generally found near the surface of attachment, but are not the continuation of the bony structure upon which the cartilage is placed, for they are always arranged in a direction parallel to the surface. They are compressed cylindrical in form, and in transverse section present an elliptical figure, the long diameter of which is placed at right angles to the filaments of the cartilage matrix. They present a concentrically laminated and a radiated structure, resembling somewhat that of the Haversian ossicle, but they neither present the canal nor the Purkinjean corpuscles.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 117.

NOTICE OF AN EXCAVATING CIRRIPEDE.

On the 8th of last June Mr. Albany Hancock communicated to a Meeting of the "Tyneside Naturalists' Field Club," an account of an excavating Cirripede which he had recently discovered on the neighbouring coast. This animal possesses much interest, not only on account of the peculiar habit of burying itself in the shell of mollusks, but likewise for its remarkable deviation of form from all the known types of the class. No part of the animal, though unprovided with shelly plates, is exposed, except two lips which guard a small narrow opening in the surface of the substance in which the Cirripede is concealed.

On the Arrangement of the Areolar Sheath of Muscular Fasciculi and its relation to the Tendon. By Dr. LEIDY.

It is well known that the fasciculi of fibres of the muscles are surrounded by sheaths of areolar tissue, but the arrangement of the filaments of fibrous tissue forming the sheaths, and their relation with the tendon, I think has not been properly pointed out. From repeated observation, I have found that the filaments of fibrous tissue cross each other diagonally around the muscular fasciculi, forming a doubly spiral extensible sheath. None of the filaments run in the direction of the length of the fasciculi, and but few are transverse. Many of the filaments of a sheath form an interlacement in the same diagonal manner with the filaments of the sheaths of neighbouring

fasciculi. This arrangement is readily distinguished, if several fasciculi be drawn slightly from each other upon a plate of glass, and the intervening areolar tissue be viewed beneath the microscope. When the filaments reach the rounded extremities of the fasciculi, they become straight, and in this manner conjoin with the tendinous filaments originating at the extremities of the muscular fibres. The importance of this arrangement can be readily understood: from the diagonally crossing course of the areolar filaments, comparatively inelastic in themselves, the sheath is rendered elastic, thus permitting the muscular fibres freely to move without their action being interfered with; while at the point of attachment of the fasciculi, where any elasticity would be worse than useless, from the fact that part of the muscular action would be lost in the mere extension of an elastic substance, we find the filaments arrange themselves so as to become part of the inextensible tendon.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 119.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1849.

Chiswick.—June 1, 2. Fine. 3. Fine: hazy: clear. 4. Very fine. 5. Sultry: showery at night. 6. Uniformly overcast. 7. Fine. 8. Fine: overcast. 9. Fine: rather cold; overcast: clear. 10—12. Overcast. 13. Fine: cloudy: clear. 14. Fine: slightly clouded. 15. Dusky haze. 16. Overcast: fine. 17. Fine: dusky haze. 18. Fine. 19. Slight rain. 20. Very fine. 21. Fine. 22, 23. Very fine. 24. Cloudless and very fine. 25. Overcast: very fine. 26—28. Very fine. 29. Cloudy: rain. 30. Cloudy: clear and cold at night.

Mean temperature of the month 59°.30

Mean temperature of June 1848 59°.58

Mean temperature of June for the last twenty-three years ... 60°.85

Average amount of rain in June 1.88 inch.

Boston.—June 1. Cloudy. 2—4. Fine. 5. Cloudy: rain, with thunder and lightning A.M.: rain P.M. 6—9. Fine. 10. Cloudy: rain early A.M. 11. Cloudy. 12. Cloudy: rain P.M. 13, 14. Fine. 15. Fine: rain P.M. 16. Cloudy. 17, 18. Fine. 19. Fine: rain A.M. and P.M. 20. Fine. 21. Cloudy. 22. Fine. 23. Cloudy. 24. Fine. 25. Rain. 26. Fine. 27. Cloudy. 28. Fine. 29. Fine: rain P.M. 30. Cloudy.

Applegarth Manse, Dumfries-shire.—June 1. Clear and bracing weather: shower A.M. 2. Fine and growing: one shower P.M. 3, 4. Fair and fine. 5. Fair A.M.: one shower P.M.: electr. 6, 7. Fair and fine. 8. Fair, but chilly from N.E. 9. Fair: air highly electric: thunder. 10. Fair and very droughty. 11. Fair and droughty: getting cloudy. 12. Fair and droughty: cleared away. 13. Fair and droughty. 14. Fair and droughty, but getting cloudy. 15. Fair and droughty: cloudy: thunder. 16. Slight shower: much thunder. 17. Again droughty. 18. Cloudy: a few drops of rain. 19. Heavy rain, night: shower, day. 20. Frosty during night: shower P.M. 21. A few drops: very high wind. 22. Rain at intervals. 23. Fair and clear. 24. Light rain: very mild. 25. Cloudy A.M.: slightly showery. 26. Slight shower P.M. 27. Fine: warm: fair all day. 28. Fair. 29. Rain P.M., not heavy but soft. 30. Fair all day and warm.

Mean temperature of the month 53°.3

Mean temperature of June 1848 55°.7

Mean temperature of June for twenty-five years 56°.1

Rain in June for twenty years 3.16 inches.

Sandwick Manse, Orkney.—June 1, 2. Bright: clear. 3. Bright: cloudy. 4. Showers: cloudy. 5, 6. Bright: clear. 7. Hazy: clear. 8. Bright: clear. 9. Bright: snow-showers. 10. Cloudy. 11. Bright: clear. 12. Bright: cloudy. 13, 14. Bright: clear. 15. Cloudy. 16. Drizzle: rain. 17. Clear: rain. 18. Rain. 19. Cloudy: damp. 20. Cloudy: rain. 21. Rain: clear. 22. Cloudy. 23. Rain: cloudy. 24. Bright: clear. 25. Bright: rain. 26. Fog: drizzle. 27. Showers: hazy. 28, 29. Bright: clear. 30. Bright: rain.

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

Days of Month	Barometer.				Thermometer.				Wind.				Rain.			
	Chiswick.		Dunfries-shire.		Orkney, Sandwick.		Dumfries-shire.		Orkney, Sandwick.		Boston.		Chiswick.		Boston.	
	Max.	Min.	9 a.m.	3 p.m.	9½ a.m.	8½ p.m.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1.	30-088	30-040	29-45	29-83	29-95	29-50	29-55	29-60	29-66	29-75	48	63	60	47	56	51
2.	30-162	30-076	29-55	29-97	30-07	29-60	29-70	29-85	29-90	29-95	47	71	62	50	55	49
3.	30-222	30-117	29-74	30-11	30-10	29-70	29-77	29-77	29-81	29-81	51	71	41½	62	53	52
4.	30-101	29-939	29-63	29-84	29-90	29-78	29-81	29-81	29-81	29-81	57	68	69½	41½	57	54
5.	29-987	29-795	29-35	29-84	29-90	29-62	29-62	29-62	29-62	29-62	51	66	68½	43	54	54
6.	30-109	30-090	29-62	30-05	30-13	29-75	29-81	29-81	29-81	29-81	51	63	62½	43	51	47
7.	30-237	29-920	29-78	30-15	30-07	29-72	29-77	29-77	29-77	29-77	50	60	66½	38	51	47
8.	29-990	29-892	29-56	30-00	29-98	29-98	29-98	29-98	29-98	29-98	42	65	55	38	48	46
9.	29-918	29-793	29-63	29-90	29-68	29-62	29-62	29-62	29-62	29-62	43	56	60	37	47	39
10.	29-728	29-668	29-30	29-71	29-80	29-52	29-52	29-52	29-52	29-52	42	46½	55	38	49	44
11.	29-851	29-797	29-13	29-82	29-78	29-50	29-48	29-50	29-50	29-50	37	55	59	35	43	43
12.	29-933	29-923	29-50	29-81	29-86	29-48	29-61	29-61	29-61	29-61	57	40	53	42	47	44
13.	30-118	29-927	29-55	30-00	30-02	29-67	29-67	29-67	29-67	29-67	34	56	61½	39	47	45
14.	30-175	30-116	29-67	30-02	29-98	29-71	29-74	29-74	29-74	29-74	40	59	59	36	49	44
15.	29-899	29-791	29-52	29-90	29-86	29-75	29-76	29-76	29-76	29-76	48	63½	53½	39	49	48
16.	29-778	29-750	29-35	29-84	29-80	29-64	29-63	29-63	29-63	29-63	46	61	64	42	51	47
17.	29-975	29-924	29-43	29-89	29-94	29-63	29-54	29-54	29-54	29-54	40	63	62½	43	49½	48
18.	30-066	30-038	29-59	29-92	29-82	29-80	29-80	29-80	29-80	29-80	75	41	62	60	43½	53
19.	29-906	29-822	29-32	29-48	29-64	29-98	29-88	29-92	29-92	29-92	43	58	60	50	48	46
20.	30-139	30-086	29-50	29-83	29-83	29-98	29-56	29-56	29-56	29-56	50	58½	59	35½	50	47
21.	30-118	30-050	29-50	29-90	29-90	29-98	29-98	29-98	29-98	29-98	42	63½	60	50½	52	47
22.	30-166	30-011	29-64	30-00	29-78	29-96	29-96	29-96	29-96	29-96	78	48	62	59	48½	51
23.	29-941	29-822	29-38	29-73	29-77	29-61	29-72	29-72	29-72	29-72	85	52	62	50	52	48
24.	29-904	29-880	29-40	29-79	29-80	29-85	29-92	29-92	29-92	29-92	46	66	63	50	51½	49
25.	29-979	29-907	29-50	29-81	29-72	29-88	29-84	29-84	29-84	29-84	53	64	67	53	51	54
26.	29-980	29-919	29-37	29-77	29-78	29-78	29-74	29-74	29-74	29-74	51	65½	60	52	54	54
27.	29-969	29-943	29-40	29-76	29-78	29-64	29-68	29-68	29-68	29-68	76	47	66	59	51½	46
28.	30-128	29-992	29-44	29-89	30-00	29-92	30-04	29-92	29-92	29-92	48	61	64	48	50½	47½
29.	30-079	29-919	29-62	29-95	29-86	30-01	30-00	30-00	30-00	30-00	53	60	59	46	50½	49½
30.	30-156	29-916	29-50	30-02	30-07	29-90	29-90	29-90	29-90	29-90	63	35	35	56	44½	44½
Mean.	30-027	29-929	29-49	29-894	29-724	29-745	29-747	29-747	29-747	29-747	51-2	47-3	47-3	47-3	47-3	47-3

THE ANNALS
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[SECOND SERIES.]

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XIX.—*On the Classification of some British Fossil Crustacea, with Notices of new Forms in the University Collection at Cambridge.*
By FREDERICK M'Coy, Professor of Geology and Mineralogy in Queen's College, Belfast.

THE class Crustacea having received less attention from British palaeontologists than perhaps any other of similar importance, I have put together in the following pages a few observations I have been able to make on the examples in the collection of the University of Cambridge, as well as on a great number of specimens of the same species, for the most part finely preserved, lent me by various friends to render my observations as perfect as possible. I have given descriptions of some of the best-marked new species, also of some new genera; I have endeavoured to refer some others, hitherto improperly placed in recent genera, to the various fossil genera established by foreign writers for cognate forms, and have ventured a few suggestions on the classification and systematic position of some of the groups.

Class CRUSTACEA.

Ord. PODOPHTHALMA. Tribe DECAPODA.

(*Brachyura.*)

Of this the most highly organized group of Crustacea, I believe the following genera have been quoted from British rocks without sufficient authority: viz. 1. *Zanthe* (Leach); this has been quoted with doubt by Desmarest, Bronn, &c. from the London clay; I have ascertained that the crustacea referred to are of an extinct genus, more nearly related to *Pilumnus* than to *Zanthe*, which I have named *Zanthopsis*. 2. *Orithya* (Fabr.): M. Deslongchamps referred with doubt a crustacean originally discovered by Sir Henry de la Beche in the greensand of Lyme Regis, to this recent genus of natatory *Brachyura*; I find however that the species referred to (*O. Labechii* of Desl. *Mém. de la Soc. Linn.*

de Normandie, Morris's Catalogue, &c.), and some similar forms from the gault, form a peculiar genus intermediate between *Homola* and *Corystes*, and belonging not to the *Brachyura* but to the *Anomura*, for which I have proposed the name *Podopilumnus*. 3. *Inachus*: Desmarest (Crust. Foss.), Morris (Catal.), and several other authors have quoted a species of this genus as found fossil in the London clay:—the figures and descriptions which I give below, from the abundance of perfect specimens which I have examined, leave no room for doubt that the fossil in question does not belong to the *Brachyura* but belongs to the *Anomura*, and forms a particular genus allied to *Notopus*, *Dorippa* and the like, to which I have given the name *Notopocorystes*. 4. *Corystes* (Latreille): the gault fossils referred to this genus in Morris's 'Catalogue' belong to the same Anomurous genus as the so-called *Orithya*.

Zanthopsis (M'Coy), n. g.

Gen. Char. Carapace suborbicular or transversely oval, gibbous, strongly arched from before backwards; *gastric region* very large, tumid, depressed in the middle towards the insertion

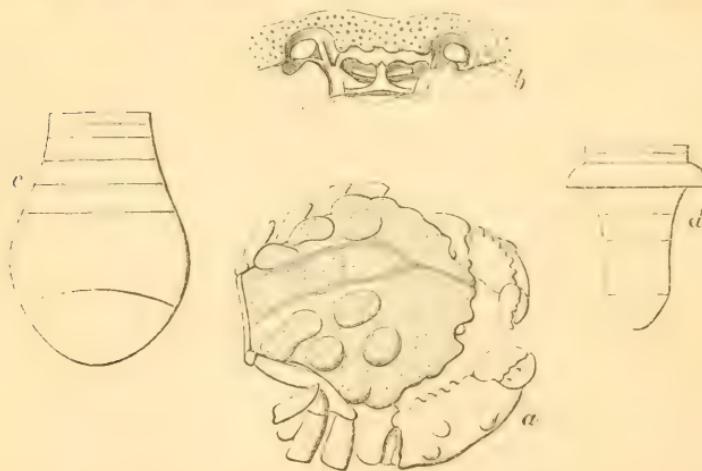


Diagram of the genus *Zanthopsis*.

- a. Entire animal as far as known; b, view of the front from below, showing the internal antennæ lodged in their transverse fossæ, and the position of the outer pair in the inner canthi of the orbits; c, abdomen of female, nat. size; d, ditto of male, nat. size.

of the *genital region*, which is very small, pentagonal, and not extending more than one-third the length of the carapace towards the front, generally divided by a transverse depression into two portions, the hinder of which is most prominent and equal in width to the *cardiac* and *intestinal regions*, which are longer than broad, and form together a tumid ridge of three

obtuse oblong nodules (defined by a hollow along each side smoother than the rest of the carapace); *branchial regions* with four large tubercles, two before and two behind, the inner posterior one elongate obliquely backwards and outwards; *front* four-lobed (including the prominent inner angle of the orbit); *orbita* large, the two lateral and the inferior angles prominent; *latero-anterior margin* with about three tubercles or spines on each side, the posterior pair largest, placed at the greatest width of the carapace, and in a line with the sulcus separating the genital and cardiac regions; *surface* minutely and closely pitted; *antennæ* as in *Zanthon* (outer pair in the inner canthi of the orbits, inner pair in deep transverse fossæ beneath the front); *eyes* on very short peduncles; *tail* of seven distinct pieces in both sexes; *first pair of feet* forming robust, unequal chelæ; *hand* subcompressed, nodulated, with the upper and inner edge tuberculato-dentate; *fingers* short, with few large obtuse teeth; *four hind pair* moderate, subequal, slightly compressed, smooth.

The *Cancer Leachii* (Desm.) may be looked on as the type of this genus; it was referred to *Cancer* or *Zanthon* by Desmarest (*Consid. sur les Crust. fos.*) and to *Cancer* by Milne-Edwards (*Suites à Buffon*), from the want probably of good specimens. It is nearer to *Zanthon* by its tuberculated carapace, few tubercles on the latero-anterior margins, and position of the external antennæ at the inner canthi of the eyes, instead of between these and the front; but it differs in the great convexity of the carapace, and materially from both those genera in *both* sexes having seven separate joints in the tail, showing in this a closer relationship with *Pilumnus*, from which however the strong nodulation of the hind part of the carapace and its oval, vaulted form, as well as the quadrilobed front and great extent of the gastric region, distinguish it. I only know the genus from the London clay.

Zanthopsis nodosa (M'Coy).

Sp. Char. Carapace about one-seventh wider than long, very gibbous in the middle, sloping gradually to the sides, more rapidly towards the posterior margin, falling most rapidly and with an abrupt curve towards the front; anterior half broadly rounded, each antero-lateral margin with three large, obtusely rounded, nodular tubercles gradually diminishing towards the front; tubercles of the branchial regions very prominent as large obtuse nodules; *gastric region* tumid with a shallow depression along the middle; *genital region* small, prominent, strongly divided by a wide transverse depression, posterior half most prominent, obscurely bilobed; hollow space on each side of the mesial regional ridge remarkably smooth; *chelæ* of the male rather larger than of the female, the upper ridge of the right

(large) hand with six or seven conical tubercles, that of the left with about four, outer side of each hand with two very obscure small tubercles near the carpus, and one much larger but less distinct near the origin of the fingers; two blunt teeth on the inner edge of each finger; *tail* of the female broad ovate, of the male narrow hastate, terminal joint triangular, about $\frac{1}{3}$ th wider than long, penultimate joint the same length but a little wider, third joint much wider than the others, but shorter than the fourth or fifth. Length about 1 inch 9 lines, width 2 inches.

Common in the London clay of Sheppey.

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

Zanthopsis bispinosa (M'Coy).

Sp. Char. *Carapace* transversely oval, about one-fifth wider than long, gently convex, two posterior pair of tubercles of the antero-lateral margin forming short, flattened, sharp spines, the anterior one forming a small, very obtusely angular projection; crest of the large hand with four or five tubercles, outer side with two strong elongate tubercles near the carpus, and one large obtuse one near the origin of the fingers; *tail* of the female broad oval, the last and the penultimate joint of equal length, the latter twice as wide as long, fifth joint half the length of the penultimate.

This is considerably wider and flatter than the *Z. nodosa*, and the tubercles on the branchial regions and those formed by the genital, cardiac and intestinal regions are much less prominent; the hollow space along each side of the ridge formed by the medial regions is punctured almost as strongly as the rest of the carapace; the tubercles on the ridge of the hand are fewer, but those on the outer side much more strongly marked; it is moreover easily distinguished by the two hind pair of tubercles of the antero-lateral margins forming depressed sharp spines in the one and large obtusely rounded nodules in the other. Length of carapace 1 inch 9 lines, width 2 inches 3 lines.

Common in the London clay of Sheppey.

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

Zanthopsis unispinosa (M'Coy).

Sp. Char. *Carapace* suborbicular, length and width nearly equal, evenly gibbous, sloping almost equally to the front and to the back; tubercles of the branchial and medial regions nearly obsolete, flattened, obscurely defined; antero-lateral margin with the posterior tubercle on each side forming a strong, short, depressed triangular spine, the two anterior pair almost obsolete, each indicated by a faint wave in the margin. Length of carapace 1 inch 6 lines, width 1 inch 8 lines.

This rare species is distinguished from the common *Z. nodosa* and *Z. bispinosa* by its more uniform convexity and by the orbicular form produced by the length so nearly equaling the width, as well as the single, angular, pointed spine on each side. The different projections on the posterior half of the carapace are much less strongly marked than in the other species, though having the same form and position.

Rare in the London clay of Sheppey.

(Col. University of Cambridge.)

Of this genus (*Zanthopsis*) authors describe from the London clay at Sheppey the *Cancer Leachii* (Desm.), which from the imperfection of the specimen described originally (even the margins of the carapace being absent), I do not think it is possible to recognise with any certainty. Also belonging to it and from the same locality is the *Brachyurites hispidiformis* of Schlotheim (Nachtr. z. Petrefactenk. t. 1. f. 3), which for a wonder has escaped insertion in my friend Mr. Morris's elaborate 'Catalogue'; it has the exact form and strong nodulation of the *Z. nodosa*, but having the two posterior pair of spines even more produced and slender than in the *Z. bispinosa*.

Podopilumnus (McCoy), n. g.

Gen. Char. Carapace having the front and antero-lateral margins forming a semielliptical curve, antero-lateral margins not compressed, tumid, obtusely rounded, with about three small spinose tubercles; front narrow, slightly projecting, deeply four-lobed (including the inner angles of the orbits), with a shallow furrow extending a short way on the back from the middle notch; orbits large, oval, lower margins denticulated, a small fissure in the under margin at the outer angle (and a doubtful trace of one in the upper margin); posterior lateral margin straight, longer than the anterior, converging towards the truncated base; posterior half of the carapace flat-



Diagram of the genus *Podopilumnus*.

a. Carapace, thighs and chelæ; b, abdomen of female, the two last dotted joints put in from their impressions on the breast-piece; c, profile of carapace showing the abrupt downward curve of the front.

posterior half of the carapace flat-

tened, anterior half abruptly sloped downwards towards the front; whole surface even and nearly smooth, the only regions defined are the cardiac and intestinal, which are marked by shallow furrows (*P. Peruvianus*); sides minutely granular; abdomen of the female broad oval (apparently of seven joints); four hinder pair of feet subequal, slightly compressed, very long, the thigh (or third joint) alone equaling the posterior lateral margin of the carapace in length; *chelæ* short and strong.

So far as the imperfection of the specimen allows of examination, the most striking difference between the present genus and the recent *Pilumnus* consists in the great proportional length of the legs, which are rather longer and more slender than those of the *Galene Natalensis* of Krauss (see his Südafrikanischen Crust. t. I. f. 4), to which it bears some resemblance; the tail of the female is more ample, and the tumid rounding of the antero-lateral margins and their small uncompressed spines contrast strongly with the similar parts in the recent genus. The only two known species are the following, and the so-called *Portunus Peruvianus* figured by D'Orbigny in the geological volume of his great 'Voyage dans l'Amérique méridionale' (t. 6. f. 17), of uncertain origin, but which he suspected to have come from the cretaceous beds of the Cordillera; a view I think confirmed by the geological place of the second species of the genus, which therefore at present would seem confined to the cretaceous system, and is I believe the oldest of the genuine *Brachyura* known.

Podopilumnus Fittoni (M'Coy).

As this is the only accessible species of the genus, it will be sufficient, in addition to the above characters, to add the following particulars:—Length of carapace 1 inch 5 lines, width 1 inch 9 lines, general surface smooth, sides minutely granular; hands about 7 lines wide and 1 inch 1 line long, the obtusely keeled upper edge with five or six obtuse tubercles, the outer surface minutely shagreened and bearing three or four irregular longitudinal rows of small tubercles; fingers short, curved, rounded on the outer edge, and with three or four blunt teeth on the inner edge; tail 6 $\frac{1}{2}$ lines broad, only the five proximal joints preserved, but the fifth being about the same length as the fourth, it is probable the remaining two were distinct, it being generally at that part of the tail that ankylosis occurs in those genera which have less than the normal number of abdominal or tail segments.

Greensand of Lyme Regis.
(Col. University of Cambridge.)

(Anomura.)

Basinotopus (M'Coy), n. g.*

I propose this genus for the reception of a very common crustacean of the London clay at Sheppey, originally figured and

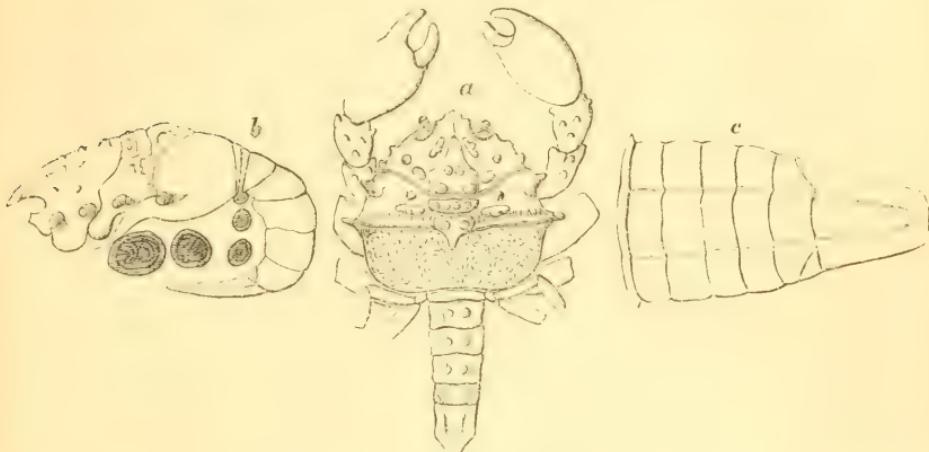


Diagram of the genus *Basinotopus* (nat. size).

- a. Male specimen seen from above; b, profile of female specimen showing the tumid pterygostomian region and the elevation of the two hinder pair of legs over the third pair; c, abdomen of female, showing the triangular intercalated pieces between the fifth and sixth joints.

described by Desmarest in his ' Histoire naturelle des Crustacés Fossiles' under the name of *Inachus Lamarckii*, but which I have ascertained, from the examination of numerous finely preserved specimens, not to belong to the genus *Inachus*, nor even to the Brachyurous division, but is truly Anomurous, retaining the little triangular plate between the fifth and sixth joints of the tail, indicating the presence of a caudal fin in the young, and also having the two hind pair of feet disproportionately small and elevated as in *Homola*, *Dorippe* and *Notopus*, &c., from all of which it differs in the large peculiar posterior or basal space behind all the other regions on the carapace (from which the genus derives its name), besides other less striking characters. As there is but one species known, which never has been very fully described, I subjoin a description comprising the generic and specific characters for the present.

* On recognizing at first the Anomurous nature of this fossil, I thought it might be the generic type named *Dromilites* by Dr. Milne-Edwards in the number of ' l'Institut ' for August 1837 from Sheppey, but having lately had the pleasure of showing him the specimens, I find that though closely allied they are yet distinct.

Basinotopus Lamarckii (Desm. sp.).Syn. *Inachus Lamarckii* (Desm.).

Carapace broad ovate, very slightly longer than wide, gibbous; *rostrum* short triangular, deeply channeled, bent downwards and with a small tooth on each side, a strong rough tubercle on each side of the base forming the inner angle of the orbits, another tubercle forms the outer angle, and from this to the level of the base of the cardiac region the margin bears four strong spinous tubercles; the *gastric region* extends half the length of the carapace, is strongly trilobed, the middle portion (corresponding to the so-called *genital region* of many crabs) tumid, subpentagonal, the pointed end extending to the level of the orbits; it bears one large rounded tubercle at each side of its base, and several irregular smaller ones between those and its apex; the lateral portions of the gastric region are less prominent and have an oblique ridge formed by the confluence of two or three tubercles parallel with the converging sides of the middle portion; below those near the nuchal * furrow is a large cleft tubercle, and sometimes between those and the orbit two or three small granules; a slight hollow separates the gastric from the small square *hepatic regions*, which correspond on each side to the two anterior marginal spines, each bears one tubercle in its middle; *pterygostomian regions* very tumid, mammillated; *branchial regions* very large, each divided about the middle by a strong, prominent transverse ridge extending from the cardiac region to the fourth (or last) great marginal spine; the anterior edge of this ridge is plicated, and the space between it and the nuchal furrow bears two tubercles, the anterior smallest; the large, peculiar basal space behind these ridges is continuous from side to side behind the intestinal region; it is closely pitted and rough with minute wrinkles; *genital region* forming a narrow transverse tuberculated ridge, its length being only one-fourth of its width, which equals that of the *cardiac region*, which is very gibbous, rotundato-quadrata, and bearing a large hemispherical tubercle on each side; *intestinal region* forming only a small mucro, imperfectly separated from the cardiac, and not extending more than half-way into the rough basal space towards the posterior margin; *abdomen* of six joints, in the male narrow, with nearly parallel sides, obscurely trilobed longitudinally, the first joint very

* I use this term to designate that most important and constant of all the furrows of the carapace—namely that which runs transversely across the back, forming the posterior boundary of the gastric and anterior hepatic regions; it is especially strong, and frequently the only furrow, in the carapace of the *Macrura*, and corresponds on the back to the line of separation between the cephalic and thoracic segments beneath—the neck as it were, whence the name.

small and smooth, second, third and fourth each with a pair of tubercles on the elevated middle portion, fifth smooth, with a small triangular piece (remains of the embryonic tail-fin) on each side between it and the sixth or last joint, which is subpentagonal and rather more than twice the length of the fifth; tail of the female broad ovate, smooth, trilobed; *anterior pair of feet* forming short robust cheke, with scattered spinose tubercles; the others small and smooth, the two hinder pair abruptly smaller and elevated above the rest. Length of carapace 10 lines, width 9 lines.

Common in the London clay of Sheppey.

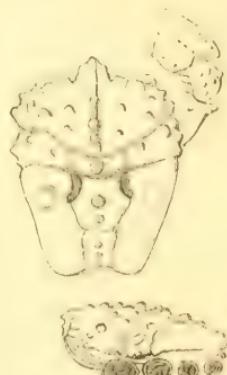
(*Col.* University of Cambridge and Mr. Bowerbank.)

Notopocorystes (McCoy), n. g.

Etym. *νωτός*, dorsum, *πούς*, pes, and *Corystes*.

Gen. *Char.* Carapace longer than broad, ovate, depressed, with scattered tubercles, anterior half broadly rounded and furnished with a few strong marginal teeth; posterior lateral margins acute, straight, rapidly converging towards the base, which is narrow and deeply emarginate; front forming a short triangular rostrum, depressed in the middle, and with a small mesial ridge; orbits large, transversely oval, complete below and above, with two longitudinal fissures in the upper margin; *gastric region* very large, rhomboidal, defined posteriorly by a strong obtusely angular nuchal furrow pointing backwards, slightly convex, extending nearly the width of the carapace, leaving a very small obscurely defined *hepatic region* on each side; *genital region* very small, about twice as wide as long, not dividing the gastric region; *cardiac region* moderately large, hexagonal, with a small deep lunate fossa on each side at its junction with the genital region; *intestinal region* narrow; *branchial regions* large, each divided by a shallow furrow proceeding from the base of the genital region to the lateral margin on each side, parallel with the nuchal furrow; *pterygostomian regions* very tumid; first pair of feet short, robust, didactyle spinulose; fifth pair of feet disproportionately small and elevated above the level of the others; *abdomen* of the male narrow (? six-jointed).

This little genus completes the chain of affinities between the recent genera *Homola* and *Corystes*, rendering the transition per-



Back view and profile of *Notopocorystes*.

feet from the *Anomura* to the *Brachyura*. In the general form of the carapace, of the rostrum, in the completeness and form of the orbits with the two fissures in their upper edge, it so exactly resembles *Corystes* as to have even deceived Dr. Leach, the first crustaceologist of his day (see Mantell's Geol. of Sussex, p. 97). I first suspected its anomurous nature from observing the faint sulcus dividing the branchial regions as we so commonly see in the short-tailed *Anomura*, and subsequently was gratified by the Woodwardian Inspectors with the sight of a little specimen of the *N. Mantelli* (M'Coy) in the old cabinet left by Woodward to the University of Cambridge, showing the chelæ and bases of all the feet, proving the posterior pair to be abruptly smaller than the preceding ones and elevated above them, and completely establishing the position of the genus: curiously enough, the entry of this specimen in Woodward's MS. Catalogue indicates the same analogy with the recent form which Dr. Leach pointed out so many years afterwards. This genus includes the "*Corystes*" of Leach and Mantell (Geol. Suss. p. 129. figs. 9 & 10), also the species figs. 13, 15, 16 of the same plate, and the "species of a new genus allied to *Arcania*," figs. 7, 8, 14 of the same plate, which is also the *Orithya Bechei* of Deslongchamps (Mém. de la Soc. Lin. de Normandie). Dr. Mantell in the above plate, fig. 15, shows a large joint in the abdomen below the fifth large one; the specimen of the tail which I have seen is broken before the end of the fifth joint, so that I have no independent authority for the sixth joint or its mode of junction with the fifth, or whether the supplementary side pieces occur between them.

Notopocorystes Mantelli (M'Coy).

Sp. Char. Greatest width of carapace (at base of gastric region) one-fifth less than the length; three strong teeth on the antero-lateral margin, the middle one largest, placed at the end of the nuchal sulcus, the lower one between the first and the end of the faint branchial sulcus, at the end of which a fourth small tooth is found; *gastric region* with a narrow mesial ridge from the rostrum bearing three small tubercles on its posterior half; each side of this region has a row of three tubercles running parallel with the gastric or nuchal furrow, the space between them being about equal to their distance from that furrow; behind the inner tubercles of each row is one rather smaller; the *genital region* bears one elongate tubercle in the middle; *cardiac* and *intestinal regions* with a mesial ridge, the former bearing two large and the latter two small tubercles; *branchial regions* with an obtuse boss close to their upper internal angle, and two equidistant tubercles on each side in an oblique line to the second marginal tooth close under the

nuchal sulcus ; pterygostomian regions marked with large longitudinal furrows and a few rows of sharp granules ; surface minutely granulated. Length from 9 lines to $1\frac{1}{4}$ inch.

I suspect that the figures in Mantell's 'Geology of Sussex,' t. 29, figs. 15 & 16, and possibly 9 & 10, may belong to this species, though rather more elongate than the specimens I have seen. The *N. Bechei* (Deslong. sp.) is broader, more quadrate, and has vertical rows of tubercles on the branchial regions. I have a sincere pleasure in dedicating this species to the indefatigable geologist, who in one of the earliest of his many valuable geological works, has given the only figures I believe extant of all the species of the genus.

Not uncommon in the greensand of Lyme Regis and in the gault of Folkestone.

(*Col.* University of Cambridge.)

Pagurus? platycheles (M'Coy).

Sp. Char. Hands nearly equal, very much compressed, broad ovate, width nearly three-fourths the length, the moveable finger little smaller than the other ; carpus trigonal, not so long as wide ; surface closely covered with very obtuse granules of unequal sizes. Length of left hand 10 lines, of right hand 8 lines ; width of left hand 7 lines, of right 5 lines ; length of carpus 4 lines, width nearly 5 lines.

One interesting specimen in the collection at Cambridge shows the two strong crustaceous hands *in situ*, while all trace of the body and abdomen have disappeared, which could scarcely have happened unless, as in the recent Hermit Crabs, those parts were almost membranous ; close under the right hand is a clear sparry cavity apparently indicating the place occupied by the soft perishable abdomen. The granulation of the surface resembles that of an *Echinus*. The species is remarkable for the width and brevity of its hands and wrists.

Not uncommon in the great oolite of Minehinghampton.

In connection with the group *Anomura* I may say a few words on a crustacean described and named *Ammonicolax longimanus* by Mr. Pearce (see Annals for September 1842), which he supposed to form a new genus of Hermit Crabs inhabiting the *Ammonites*. It seemed to me very inept to infer that the *Ammonicolax* lived in the *Ammonites* on no better ground apparently than their co-existence in the Oxford clay at Christian Malford, and on recently examining two authentic specimens presented by Mr. Pratt to the University collection at Cambridge, I found that so far from being *anomurous*, the species had a well-

developed abdomen, caudal fins, remarkably large false feet, and all the characters of the *Maerura*, being in fact clearly referrible to the genus *Mecochirus* of Germar, so abundant in the upper oolitic schists of Bavaria, though not hitherto recognised in Britain. The five internal processes mentioned on each side are merely the indications of the *apodemata* or internal partitions between the gills, and present no peculiarities. As the specific name *longimanus* would be peculiarly inappropriate when this interesting little crustacean is placed in its true genus (nearly all the species of which have longer hands), it might provisionally bear the name of *Mecochirus Pearcei*.

(*Macrura.*)

In this group we find several fossil crustacea referred to recent genera in British works, without, I believe, just reason:—thus in Morris's Catalogue we find *Palinurus Seurii* quoted from Leeds, Yorkshire;—if this muschelkalk fossil is found there, it should be placed in the Triassic genus *Pemphix*, formed many years ago for it by Von Meyer, it having no relation to *Palinurus*. The recent generic name *Astacus* has also been much used for fossils of various ages, but I have not yet seen or heard of the real occurrence of that genus in the fossil state; most of the species will be noticed below under their respective genera.

Eryon Barrovensis (M'Coy).

Sp. Char. Carapace subovate, about one-eighth broader than long near the truncated posterior margin; lateral margins set with short tooth-like spines, two narrow incisions on each side, the hind pair a little in front of the middle, inclosing between them on each side a short rotundato-quadrata lobe; front narrowed, concavo-truncate, with the lateral angles slightly produced outwards; each of the inner pair of antennæ having their two setæ deeply divided, the outer one of each slightly longest, scale of the external antennæ large, the setæ scarcely thicker than those of the inner pair; abdomen exceeding the length of the carapace by only one-third the length of the outer tail-flaps, which latter are very broad and subquadrate at the end (resembling those of the *Eryon Hartmanni*); each of the segments except the first bears a large, oblong tubercle in the middle; first pair of legs robust, short, hand and carpus together nearly one-fourth less than the length of the middle of the carapace; fingers very slender, both pointed, of equal length, incurved at the tip, the moveable one most abruptly. Surface minutely granulated, with larger granules on the mesial ridge of the carapace. Length of carapace 2 inches, width 2 inches 2 lines; length of abdomen (to end of outer pair of

tail-flaps) 2 inches 2 lines; length of hand 1 inch 3 lines, of carpus 4 lines, width of hand at middle $3\frac{1}{2}$ lines.

This is most allied to the only other liassic species which I am aware of, namely the *E. Hartmanni* of Herman von Meyer (see his "Beiträge zu Eryon" in the 18th vol. of the Nova Acta Acad. Cæs. Leop. Carol. &c.), from which it differs in its much shorter abdomen, a character which approximates it to the otherwise dissimilar *E. subpentagonus* (Münst.) and *E. arctiformis* (Schlot.) of the Kelheim and Solenhofen lithographic slates. In all the species described by Von Meyer and Münster the hand and carpus taken together equal or exceed the middle of the carapace in length; this species is therefore most remarkably distinguished by the comparative shortness of its chelæ as well as their greater robustness.

Rare in the lias of Barrow-on-Soar.

(Col. University of Cambridge.)

Archæocarabus (McCoy), n. g.

Etym. ἀπχαῖος, antiquus, and κάραβος, Aristotle's name for the *Palinurus* or spiny lobster.

Gen. Char. External antennæ very thick and long, the setæ of very short fimbriated joints; first pair of feet much thicker than the others, the extremity of the penultimate joint dilated on its inner side to a broad, subtruncate, subcompressed hand as wide as the length of the curved terminal joint which is inflexed on it; four posterior pairs of legs slender, compressed; carapace semicylindrical, obtusely rounded above; nuchal furrow very wide and deep, extending with a gentle backward curve across the carapace in front of the middle; cephalic por-

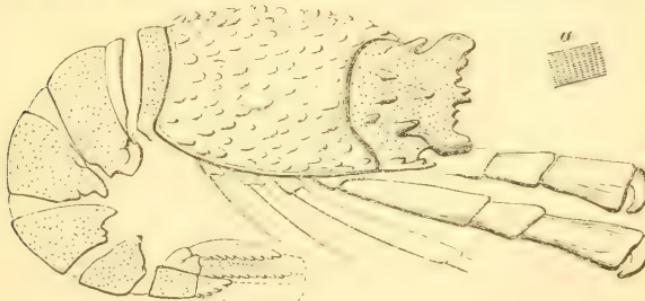


Diagram of *Archæocarabus*.

a. Portion of one of the outer antennæ.

tion depressed, front wide, subtruncate toothed, the lateral angles produced into large, flattened, slightly recurved spines over the eyes, shell below the orbits prolonged forwards into a thick spine; crust excessively thin and fragile, covered with

coarse adpressed tubercles; *abdomen* very thick, rounded, nearly twice the length of the carapace, segments nearly smooth, punctured, their extremities broadly falcate; tail having the crustaceous portion at the outer margin of the base of the two outer pair of fins long, elliptical, strongly serrated on their inner edge.

In all the characters of generic importance which I have seen in these fossils, they approach the recent *Palinuri* or spiny lobsters, with the important exception of the structure of the first pair of feet, which in the recent genus are small, slender, and terminated by a simple point for walking only, forming a strong contrast with the present genus, in which they are powerful prehensile organs, much more robust than the other feet, broadly dilated towards the end, and terminated by a strong subcheliform claw. I only know the genus in the eocene tertiary strata.

Archæocarabus Bowerbanki (M'Coy).

Sp. Char. Carapace about 2 inches 4 lines long and 1 inch 9 lines wide, all behind the nuchal sulcus marked with large semioval flattened tubercles, their blunt apices directed forwards and encircled by a crescent of small pores; the largest tubercles are about the middle of the back, and have a few small ones irregularly placed in the intervals, towards the side-margins they become smaller and more equal; anterior or cephalic portion more nearly smooth, having only small, sharp, widely separated granules, one on each side of the middle near the base and one or two in the median line near the front much larger than the rest; front margin with about three denticles on each side between the middle and the broad compressed horn-like processes at the angles, from each of which latter a ridge extends backwards bearing two or three strong spines; the anterior prolongation of the cheeks beneath the orbit has also a row of a few large spines: *abdomen* to end of caudal fins nearly twice as long as the carapace, semicylindrical, nearly smooth, with few distant punctures, the ends of the first five segments abruptly narrowed, thickened and falcately curved backwards, sixth segment having articulated to each end the two thick, elliptical, crustaceous outer marginal supports of the two outer pair of tail-fins; they are about three times longer than wide, serrated on the inner edge: *first pair of feet* larger than the others, compressed, penultimate joint dilated towards the extremity into a flattened trigonal hand; *terminal joint* forming a strong, subcompressed, curved, moveable finger, as long as the truncated end of the preceding joint, to which it is opposed for prehension, the *arm* about as long as the *leg*.

of the second pair; *carpus* about one-third the length of the arm and half the length of the hand, the width of which latter at top exceeds half its length; *three next pair of legs* compressed, gradually diminishing in size; fifth pair not seen. At about 2 inches from their bases the external antennæ are one-fourth of an inch in diameter.

I have great pleasure in dedicating this fine species to Mr. Bowerbank, who has done so much to illustrate the fossil botany and zoology of the London clay—his work on the former having almost created the subject; while the extraordinary extent and beauty of the collections which he has made of the other fossils of that formation are, I believe, quite unrivalled, and when fully published will demonstrate a richness in the fauna and flora of the eocene period in Britain for which few geologists are prepared. I have especially to record my obligations to him for sending me a large number of his choicest specimens of London-clay crustacea of those species which I informed him I was about describing from the Cambridge collection, but the specimens of which at my disposal did not fully exhibit all the characters of the species; and having mentioned my anxiety to render my descriptions of those as perfect as possible, without entering further on the extensive subject of the Crustacea of that formation.

The present species is usually found with the abdomen doubled close under the thorax, which latter is almost always crushed, owing to the fragile delicacy of the crust.

Rare in the London clay of Sheppey.

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

Hoploparia (M'Coy), n. g.

Etym. ὄπλα, *arma*, and παρειὰ, *gena*.

Gen. Char. *Carapace* minutely granulose, oblong, tumid, slightly



Hoploparia.

compressed, a little deeper than wide, ending in front in a strong sharp rostrum, the sides of which are strongly carinate

and smooth, or with few very minute teeth; beneath the orbits the cheeks are prolonged forwards about half the length of the rostrum, and usually strongly keeled and spinose, forming a semicylindrical sheath over the base of the strong triangular scale of the origin of the outer antennæ, which reaches as far as the rostrum; *nuchal furrow* strongly marked across the middle of the back, but not reaching the marginal third of each side; *cheeks** impressed by a deep λ -shaped sulcus, one portion of which extends upwards nearly parallel with the nuchal furrow, the longer lower branch curves forward under the projecting part of the cheeks, and the shorter branch curves backwards under the end of the nuchal furrow; *abdomen* subcylindrical, smooth or slightly punctured, the second joint having broad, dilated quadrate ends, the third, fourth, and fifth terminating in triangular or broadly falcate extremities, the sixth having articulated to each end the two outer pairs of large trigonal tail-fins, the outer one on each side divided by a transverse suture rather less than one-third from the extremity; seventh joint (or middle flap of the tail) oblong, sides denticulated, extremity narrower than the base, and bearing a small spine at each corner; *first pair of legs* very long and thick, unequal, the larger claw with large blunt teeth, the more slender one with more numerous and equal smaller sharp teeth; the other legs slender.

In the general characters, so far as I have been able to ascertain them, these crustaceans coincide with the living genus *Homarus*, but are constantly distinguished by the sheath-like prolongation of the strongly ridged and spinose cheeks, the nearly smooth-sided rostrum, and the short distance which the nuchal furrow extends down the sides, as well as the separate λ -shaped cheek-furrow on each side, and the size of the antennary scale. There are several species common in the British eocene tertiary and cretaceous rocks, only one of which has yet been noticed, viz. the *Astacus longimanus* of G. Sowerby (Zoological Journal, vol. ii. tab. 17) from the greensand of Lyme Regis, which I find to belong to the present genus, and which should have the name *Hoploparia longimana* (Sow. sp.).

Hoploparia prismatica (M'Coy).

Sp. Char. *Carapace* (excluding the rostrum) $1\frac{1}{2}$ inch long, width 10 lines, subcylindrical behind, but having the section of a five-sided prism towards the front from the strong projection of the large, acutely angular cheek-ridges, which bear

* Or sides of the carapace immediately in front of each end of the nuchal furrow.

about three large sharp teeth each ; *rostrum* large, deeply channeled in the middle, sides rising to very prominent keels minutely serrated towards the end, one elongate tubercle on each side of its base ; *nuchal furrow* strong, ends curved forwards, but only extending about halfway from the middle of the back to the side margin ; beneath and in front of each of its ends a very deeply marked λ -shaped sulcus ; surface very closely and minutely granulated, punctured on the cardiac and intestinal region ; ends of the abdominal segments broadly rounded with a small mucronate point directed backwards ; the last two joints with rough transverse scale-like sculpturing, the others so finely granulated as to appear nearly smooth.

This species is remarkable for the size and prominence of its sharply angulated cheek-ridges ; the surface, particularly of the abdomen, is more nearly smooth than in the other species which I have seen.

Common in the Speeton clay of Speeton, Yorkshire.
(*Col.* University of Cambridge.)

Hoploparia gammaroides (M'Coy).

Sp. Char. Carapace averaging from the orbit to the posterior side-margin $2\frac{3}{4}$ inches, depth $1\frac{1}{2}$ inch, minutely punctured on the middle of the back, coarsely squamoso-punctate on the gastric region, granulated on the sides, most strongly near the front lateral margins ; nuchal furrow strong, but only reaching halfway down the sides, its middle portion equally distant from the edge of the orbit and posterior margin of the carapace, or slightly nearer the former ; λ -shaped cheek-furrow deep ; rostrum strongly bicarinate, with a ridge-like tubercle about two lines long on each side of its base, and one small tubercle at an equal distance below the first pair at the edge of the orbit ; from a little behind the level of the orbit the cheek is elevated into a strong keel with about three large spinose tubercles, cheeks prolonged as a semicylindrical sheath to the outer antennæ half the length of the rostrum : *abdominal segments* very flat and smooth, the articular anterior portion scarcely convex, and the sulcus dividing it from the posterior portion not very strong, first segment closely punctured like the middle of the thorax, the dorsal portion of the others with the puncta slight and distant, flaps of the tail coarsely squamoso-punctate ; *chela* very large, with a rude scale-like sculpturing of the surface, broad one having the hand as wide ($1\frac{1}{2}$ inch) as from the carpus to the base of the moveable finger, four large, short spines on the inner margin, moveable finger longer than from its base to the carpus ; *carpus* with several thick short spines ; smaller hand as long as

the great one, but about one-third less wide; other legs very slender (third and fourth pair about 3 lines wide), subcompressed, smooth.

This fine species much resembles our common recent lobster at first sight, and has as large or even more robust claws, but similarly armed: in by far the greater number of specimens the characteristic prolongation of the cheeks, with its spinose keel becoming fixed in the matrix, causes the entire front of the carapace from a little behind the rostrum to be broken off, and so leaving no trace of this part of the carapace, heightens the resemblance indicated by the specific name.

Common in the London clay of Sheppney.

(Col. University of Cambridge and Mr. Bowerbank.)

Hoploparia Belli (M'Coy).

Sp. Char. Carapace averaging from the orbit to the posterior side margin $1\frac{1}{2}$ inch, depth of side 9 lines, closely punctured on the middle of the back, and very closely and uniformly granulated over the sides; *nuchal furrow* considerably nearer the posterior margin of the carapace than the edge of the orbit (measured a little one side of the mesial line), its ends reach two-thirds of the way from the mesial line to the lateral margin; λ -like cheek-furrow strong; sheath-like prolongation of the cheeks obtusely rounded, the margins and lateral angles much inflexed, about half the length of the rostrum, two or three obtuse, undefined nodulations on the rounded prominence which extends backwards from its contracted carinate end towards the cheek-furrow; bayonet-shaped antennary scale narrow, extending as far as the tip of the rostrum; one blunt tubercle about twice its diameter from the median line on each side of the base of the rostrum, and another similar one at an equal distance below it on each side: *abdomen* thick, each segment having a gently convex smooth anterior articular portion divided by a strong deep furrow from the rest, which is flattened and very closely and strongly punctured; epimeral extremities of the first joint rudimentary, of the second broad, subquadrate, rounded on the anterior and external edges, subtruncate behind, with the angle forming a short spine, third, fourth, fifth and sixth terminating in broad triangular plates, slightly falcate, the sixth rather longer than the preceding ones, and having the posterior lateral angles produced backwards into a small spine on each side of the base of the seventh joint or middle tail-flap, which latter is subquadrate, its length and the width of the base being equal, narrowing towards the end, which is rounded and terminates at each angle in a small sharp spine; side margins thickened, minutely dentated: *first*

pair of legs closely seabroso-punctate ; chelæ oval, very slender, about double the length of the carapace, not very unequal, greatest width about half the length from the base of the little finger to the carpus ; section subrhomboidal, outer angle obtusely carinated, smooth, sides obtusely rounded in the middle, inner edge with two rows of about four large spiniform tubercles arched forwards ; fingers about one-third longer than the base, equal, subcompressed, rounded, straight and of nearly equal width throughout, nearly smooth, with a raised line of very minute teeth on the inner edge ; carpus small, section oval, scarce half the length from its tip to the base of the moveable finger, finely punctured, and with a few strong spines ; arm compressed ; the other legs slender and nearly smooth (third and fourth pair 1 line in diameter).

This species is much more common in the London clay than the *H. gammaroides* (M'Coy), which it resembles, although only half the length ; it may be distinguished therefrom by the finer and more uniform granulation of the sides, the greater length of the *nuchal* furrow, and its being placed farther back towards the posterior margin ; the cheeks, instead of being strongly carinated and spined, are only obtusely rounded and nodulated ; the chelæ are more slender, and the segments of the abdomen differ in the present species, having the anterior smooth portion of each more convex and separated by a much deeper furrow from the posterior part, which in the *H. gammaroides* is closely punctate in the first segment only, the others being polished with comparatively slight distant puncta, while in the *H. Belli* the hinder parts of all the segments are equally rough with a coarse close-set punctuation.

I dedicate this species to Prof. Bell, from whose able pen we may one day expect an illustrated volume on all the crustacea of the London clay, for which I believe the most ample materials exist in metropolitan collections which will be at his disposal. Mr. Morris, in the preface to his Catalogue, mentions in the cabinet of Mr. Bowerbank alone, the perfectly astonishing number of twenty to thirty species from this formation. Upwards of a dozen beautifully perfect specimens of this species were most obligingly sent me by Mr. Wetherell, on our mutual friend Mr. Yates mentioning that I was about describing the species from the Cambridge specimens, but was very anxious to render my specific description complete by the inspection of more perfect specimens. Mr. Bowerbank also lent me charming specimens with the same object.

Common in the London clay of Sheppeney, Hampstead, Bayswater, Primrose Hill, &c.

(Col. University of Cambridge, Mr. Bowerbank, Mr. Wetherell, &c.)

XX.—*On the Animals of Cæcum trachea and C. glabrum.*
By WILLIAM CLARK, Esq.*To the Editors of the Annals of Natural History.*

GENTLEMEN, Norfolk Crescent, Bath, June 28th, 1849.

IN the year 1834 I discovered the animal of *Cæcum trachea*, in the coralline zones off Exmouth; notes were then made on it, but only communicated to a few friends, and I am not aware that any author has mentioned the animal since that time, except in doubt, as to its character and position. Having within the last week, at the same place, examined many of this curious and minute species, I am enabled to give a particular description thereof, as well as some account of the still more minute congeneric species, *Cæcum glabrum*, now seen for the first time.

The shells of these animals have, from their forms, long been located with the *Dentalia*, but it will appear that in respect of the animal they have little connection with them; they have also had other places assigned to them, and malacologists are still in doubt with regard to their natural position. I therefore think this account may interest some of your readers, and assist to determine the proper “locus standi” of these mollusca.

*Cæcum, Fleming.**Cæcum trachea et imperforatum, Montagu.*

Animal cylindrical, arcuated, externally pure white; the mantle is very thick and fleshy, fitting the shell closely, and not extending beyond its anterior margin; the body is elongated and slender, with a long flat head, which on all occasions is in advance of the foot, and appears to assist in locomotion; the fissure of the mouth is vertical, and from the tenuity of the skin the pale red buccal mass is distinctly visible, the corneous plates of which are of light yellow and subelliptical form; the tongue was not detected, though, without doubt, one of the invariable spiny character exists.

The tentacula are short, rather thick, subcylindrical, setose, and slightly clavate at the extremities; the eyes are very minute, black, not raised on any kind of pedicle or eminence, and placed nearly in a line with the tentacula at a short distance from their bases, and if there is a divergence therefrom the tendency is external.

The slender neck, as in most of the other Gasteropoda, is furnished with longitudinal ridges, and in this species on each side of its centre, there are two frosted, pale yellowish white, contiguous raised lines forming a very decided canal or groove, the points of which terminate anteriorly at the immediate base of the eyes, and posteriorly at the furthest end of the neck, on the left

side of which, at the usual point, may be seen a minute pale red branchial leaflet which puts on the appearance of there being two, a large and a smaller one, as in the canaliferous Gasteropoda; but here, though we cannot vouch that there are not two, we are inclined to think there is only one, with a divergence from its base of a part of its surface; the very marked canal seems necessary for the entrance of the branchial water, in consequence of the neck of the animal, when at rest, being so closely embraced by the fleshy muscular circular mantle, but in marching order it is protruded to an extraordinary extent.

The stomach was distinctly observed, and is an oblong bursiform organ, yellowish white and granular without, but on being opened presents a dark lead-coloured cavity, fortified by strong transverse muscular bands or fillets. From it arises a very long convoluted intestine, and when extracted exhibited the usual faecal matters; it appeared to coast the liver and ovary, amongst the folds of which it makes a double, as is usual with the regular Gasteropods, then progresses to the right side, where the minute, elongated, oval, conically pointed pellets were observed to be ejected.

The ovary is dark red-brown, aspersed with the most minute darker points, like the finest sand, with its posterior extremity fixed in the hollowed-out chamber of the terminal process of the shell; it then extends to the stomach accompanied by the liver in alternate transverse portions; this organ is a light greenish mass formed of larger granules than the ovary, and the contrast in colour of the two substances caused them to be observed without difficulty.

The neck admitted of a close examination, and did not exhibit the slightest traces of external reproductive organs; it would then appear that the animal must depend on its own influences, but there are doubts; and from the concordance of all its organs with a large class of the Pectinibranchous Gasteropods, it may, like them, be unisexual, though the organs have escaped detection; but in all the specimens examined the ovary was present in the usual place, and in no instance appeared to be replaced by the testicle, but the discriminations of such minute organs cannot be depended on.

The foot is short, narrow, and truncate anteriorly when in action, sloping posteaally to an obtusely pointed or rather rounded termination, on the upper part of which end is fixed the strong, circular, corneous, black-brown operculum, smooth and conical on the surface attached to the foot, concave without, and from its centre seven or eight fine close-set *spiral* lines, not concentrical, fill up the area.

The animal is not at all shy; it shows itself in all directions,

marches with great vivacity, carrying its shell sometimes with the convexity upwards, resting on the posterior point, or on one of the sides, frequently changing one for the other, by suddenly withdrawing the head and body, by which action it is thrown on the operculum at an elevation of 50° or 60°; it then turns on the side it wishes.

It thus appears that this minute creature has all the organs of the Gasteropoda with entire apertures; there are some modifications of them, and the animal is not spiral; still in number, quality and purpose they are essentially the same as those of this large class, and I think it is clear that the genus *Cæcum* must be placed with them, in the immediate vicinity of the *Rissoæ*.

It is necessary to mention that the *Dentalium imperforatum* and *D. trachea*, the types of the genus *Cæcum*, are identical; this fact is I believe generally admitted; I will however in corroboration thereof observe, that in the same watch-glass of seawater I carefully examined each of the two forms of this species, and their respective organs differed in no respect, except that the colour of the buccal mass in *C. trachea* (Mont.) was somewhat paler than that of *C. imperforatum*, in consequence of its adolescence. I have made a second examination of the animals of both forms with the same result.

The shell of *Cæcum imperforatum* (Mont.) is never found otherwise than adult; this fact proves that *C. trachea* is the young shell, of which I have seen hundreds of all sizes and gradations of arcuation and tapering of the posterior extremities: these shells, like some others of the Gasteropoda, particularly those of the genera *Aporrhais* and *Turritella*, have as a provision of nature the power to protect their delicate extremities by withdrawing them from the posterior pointed ends of the shells, some chambers of which they plug up; these being deprived of the animal, fall off and decay, and it remains uninjured. This is the case with *Cæcum trachea*, which probably performs this manœuvre more than once, until it arrives at the form *C. imperforatum*, with its adult constricted orifice, which it never has in a young state; and even when the anterior part of the shell is broken, the animal always repairs it with a somewhat fuller cylinder; but the new orifice will not be constricted until the mutilated shell has arrived at the complete adult state, and it is rarely seen in this condition. What is called the posterior process of the shell is only one of the testaceous plugs with which the animal from time to time closes the posterior extremity.

As to the specific appellations of *trachea* and *imperforatum*, though not quite contemporaneous, the more significant one of *trachea* ought, I think, to be adopted, as that of *imperforatum* is obviously improper.

The generic term *Cæcum* appears to be somewhat objectionable in point of significance. On the discovery of the animal I proposed to my friend Dr. Goodall, the late Provost of Eton, the generic appellation of *Dentaliopsis*, which I think I also mentioned to Mr. Jeffreys of Swansea; but Dr. Fleming is in possession of the field, and has the undoubted priority, and I may say, owing to *my own neglect*, in not launching the genus:

“Hos ego feci, tulit alter honores.”

Cæcum glabrum, Montagu.

After a research, in which I almost despaired of success, I have had the good fortune to meet with two living vivacious specimens of this species in the coralline zones of the Devonshire coast, off Budleigh Salterton, six miles from the shore, in ten fathoms water.

To describe the organs of this animal would only be a repetition of what has been said on *Cæcum trachea*; I will only recapitulate them and notice the modifications thereof.

The brown ovarium, light green liver, and the rectum with its contents of formed pale-brown pellets extending from the pylorus to the doubling amongst the folds of the liver, were distinctly visible through the transparency of the shell. The stomach, body and neck were of the purest white; the lines forming the canal or groove in the neck are less developed than in the former species; the buccal mass is of the palest blush colour, and the corneous plates of the most delicate and lightest green; the spiny tongue was not seen; the same default occurred in *Cæcum trachea*, probably from its white colour and extreme slenderness; it doubtless exists; the mantle is thick, circular and muscular, closely fitting the shell; the eyes are precisely fixed as in *C. trachea*; the very minute branchial leaflet is of the palest rose-colour, but the mantle must be removed to see it, owing to its extreme tenuity.

I now come to those organs in which there are some variations: the tentacula, as in its congener, are frosted white and setose, but they appear to be proportionably longer, slenderer and more elavate at the tips; these variations however are scarcely appreciable. The foot is very short, truncate in front, rounded behind, and carried much more laterally in this species than in *C. trachea*; and on its posterior upper part is the most differential point in the animals, the curious operculum, which is circular, and has six or seven spiral gyrations of a pale yellow, but instead of being concave or flat without and conical within, as in *C. trachea*, it is in both respects the reverse. Represent to yourself the flat spiral circular operculum of the last species, pushed out from its inner surface, or inverted, and thus forming a cone of

six or seven minute narrow terraces, one above the other,—you may then figure to yourself the form of that in *Cæcum glabrum*.

This creature marches, and in its course performs exactly the same manœuvres as the larger species. I thought the *Cæcum trachea* very active, but it is far surpassed by this animal; I put one of each in a watch-glass of sea-water, and with a camel's-hair brush gave them a fair start, but the little one beat its competitor hollow, and accomplished a space of 2 inches in 55 seconds; thus affording a proof, even in the Mollusea, that nature compensates for the small volume of the minute beings in giving them greater energy, vivacity and quickness. This creature I found by admeasurement to be $\frac{1}{20}$ th of an inch long, and $\frac{1}{100}$ th of an inch in diameter.

I have been thus particular, as it will fall to the lot of very few malacologists to see this curious species alive.

I beg to mention that last week, in the offing at Exmouth, six miles from the shore, I dredged in the coralline zone a very small specimen of that rare species the *Lucina orbicularis* of the British Mollusca, and *Venus orbiculata* of Montagu, *testante Laskeyo*, whose figure is an exceeding faithful representation of its shape. This species has been considered of very doubtful British origin, and we feel pleasure in adding it to our Indigena.

The general aspect of the shell is of the palest bluish white on the outside and the same within, with a tinge of yellow at the posterior extremity on both sides.

The longitudinal striae radiate from the very acute beaks to the ventral margin, and are most evident at the sides of the shell; these are crossed by the striae of growth, giving it an irregular cancellated appearance; the margin is quite plain and acute.

There are in the left valve three primary teeth, and a contiguous anterior lateral one, and in the right valve, three primary teeth with a receptacle for the lateral tooth of the left, and in each valve there are faint traces of posterior laminae; this is the hinge of the genus *Circe* of the 'British Mollusca,' but the twenty-four radiating longitudinal flattish costellæ eminently distinguish this species from *Circe minima*: I am inclined to think Montagu's shell should be styled *Circe* instead of *Lucina orbiculata*; that excellent conchologist mentions only two primary teeth in each valve, but the third might easily escape detection, as when he wrote imperfect instruments were in use, and perhaps there was a less critical examination of objects than in the present day. If this shell is not the *Venus orbiculata* of Montagu, as we confidently think, it must be considered a new species of *Circe*. The minute specimen is brilliantly fresh.

I am, Gentlemen, your most obedient servant,
WILLIAM CLARK.

XXI.—*Contributions to the Botany of South America.*
By JOHN MIERS, Esq., F.R.S., F.L.S.

[Continued from p. 142.]

MARCKEA.

Of this genus no further information has hitherto been recorded beyond the short account first published by Richard, and so little has its affinity been understood, that it was considered by Endlicher as related to the *Nicotianeæ*. Its alliance however is evidently with *Solandra* and *Juanulloa*, agreeing with the latter genus in the structure of its calyx and fruit, and differing in the hypocrateriform shape of its corolla, with broad, expanded and almost rotate border, and in its scarlet colour.

From a plant in Sir William Hooker's herbarium, with only a single flower and fruit, I have been able to make the following analysis, which in some respects is incomplete, as I was anxious not to injure the specimen.

MARCKEA, L. C. Richard. *Lamarckea, Pers.*—*Calyx* 5-sepalus, persistens, vix augescens : *sepala* lanceolata, acuminatissima, imo angustata, primum ultra medium, marginibus ciliatis, in tubum pentagonum valvatum conniventia, hinc superne linearis-attenuata, erecta, libera, dein in fructu omnino sejuneta. *Corolla* hypocrateriformis, tubo elongato, cylindrio, fauce sub-inflato, limbo 5-partito, laciniis oblongis, rotundatis, rotato-expansis, subreflexis, aestivatione imbricata. *Stamina* 5, æqualia, paulo supra basin corollæ orta, basi lanata, *filamenta* erecta, tenuia, *antheræ* in faucem corollæ inclusæ, 2-loculares, linearis-oblongæ, lobis disjunctis, puncto medio affixis, rima marginali longitudinaliter dehiscentibus. *Orarium* 2-loculare, placentis e dissempimento utrinque cruciatim tenuiter partientibus, hinc im-crassatis undique ovuligeris, ovulis angulo basali nexis, adscendentibus. *Style* tenuis, longitudine staminum. *Stigma* integrum? *Bæca* fere capsularis, exsueca, evalvis, pericarpio tenui indehiscente, sepalis persistentibus tecta, oblonga, 2-sulcata, 2-locularis. *Semina* plurima, imbricatim disposita, oblonga, acuminata, imo gibba, hilo in angulo basali, adscendentia, testa laxa. *Embryo* intra albumen parcum, carnosum, axillaris, leviter arcuatus, radicula infera tereti, cotyledonibus ovatis, compressis, incubentibus, æquilonga.—Suffrutices *Guianenses* et *Antillani scandentes*, ramis dependentibus; folia alterna, petiolata, elliptica, acuta, integra, glabra; racemi axillares; corolla coccinea.

1. *Marckea coccinea*, L. C. Rich. *Act. Soc. Hist. Nat. Par.* 107; A. Rich. *Dict. Class.* x. 168. *cum icon.* *Lamarckea coccinea*,

Pers. Ench. i. 218;—scandens, glaberrima; foliis oblongis, apice subito acuminatis, imo obtusis, nitidis, subcoriaceis; racemo longe pedunculato, paucifloro, corolla coccinea, calyx 2–3-plo longiore.—Guiana, *v. s. in herb. Hook.* (Surinam, Hostman, no. 348).

This is evidently a scandent plant with slender branches; the leaves are about $7\frac{1}{2}$ inches long, $2\frac{3}{4}$ inches broad, upon a somewhat slender petiole, somewhat thickened at base, $\frac{1}{2}$ inch in length; they are quite smooth and of thick texture; the peduncle of the raceme is axillary, about $3\frac{1}{2}$ inches long, bearing a few flowers, only one remaining in the specimen above referred to; the pedicel is about 1 inch in length; the sepals are $1\frac{1}{4}$ inch long, scarcely 3 lines broad in the middle; the tube of the corolla is $1\frac{3}{4}$ inch long, 2 lines in diameter, swelling to half an inch below the mouth; the lobes are 5 lines long, 4 lines broad, rounded, veined, overlapping each other on their margins, and when expanded, form a border about $1\frac{1}{4}$ inch in diameter; the insertion of the stamens is about half an inch above the base of the tube, the filaments are very slender, nearly an inch long, and the anthers are 3 lines in length; the berry is 8 lines long, 4 lines in diameter, apparently quite free of pulp, with a thin pericarp and slender dissepiment, containing numerous divaricate, ascending, imbricate seeds, each about $1\frac{1}{2}$ line in length*.

2. *Marckea ? longiflora* (n. sp.);—scandens, ramulis glabris compressis; foliis alternis, oblongis, apice repente acuminulatis, c medio ad basin subattenuatis, breviter petiolatis, coriaceis, glaberrimis, opacis; racemo sub-brevi, paucifloro; corolla calyce 4–5-plo longiore, tubo supra medium cylindracco-campanulato, limbi laciniis ovatis, subreflexis, staminibus inclusis.—Trinidad, *v. s. in herb. Hook.* (La Laguna de Ora pouche, Purdie.)

This plant corresponds in its habit with *Marckea*, but the specimen above referred to presents only a single flower in a very bad condition, so that it is impossible to determine with certainty whether or not it belongs to this genus. The leaves are $7\frac{1}{4}$ inches long, $3\frac{3}{4}$ inches broad, on a somewhat slender petiole thickened at base, and half an inch in length; they are quite coriaceous, opaque but not polished, though entirely glabrous; they are marked with strong prominent nerves; the peduncle of the raceme is apparently about $1\frac{1}{2}$ inch long, the pedicel 8 lines; the calyx exactly corresponds with that of the preceding species, the sepals being nearly an inch long, including their suddenly contracted linear apical points of 3 lines; they are about 4 lines broad, with nearly

* A representation of this plant, with sectional details, will be given in the 'Illust. South Amer. Plants,' plate 45.

parallel margins, which are slightly connivent; the tube of the corolla is about 3 inches in length, contracted at base for the length of $1\frac{1}{4}$ inch to scarcely more than $1\frac{1}{2}$ line broad, and swelling above to a diameter of half an inch; the lobes of the border are about half an inch in length and 4 or 5 lines in breadth, somewhat obtuse and patent; the stamens appear to originate in the contraction of the tube, with the anthers considerably below the mouth of the border; the corolla is of much thinner texture than that of *M. coccinea*: in the form of its berry and enveloping calyx, the arrangement, size, and shape of its seeds, its lax testa, very thin albumen, and form of its embryo, it quite agrees with the former species.

JUANULLOA.

This little-known genus of the ‘Flora Peruviana’ was scarcely understood by the botanists of our time, until the very interesting account and excellent figure of a plant raised from seed in the Botanic Gardens of Kew was lately published by Sir Wm. Hooker. This proves to be a very different species from that figured by Ruiz and Pavon, and although generically identical with the *Laureria mexicana* of Schlechtendal, is again specifically distinct from it. The genus approaches *Solandra* in its climbing habit, large coriaceous leaves, and in the general structure of its flower and fruit, agreeing with it also in having a calyx consisting of five distinct sepals, conniving by their edges into an acutely pentangular tube, but here they subsequently become quite separate; it is also dissimilar in the cylindrical form of its corolla, with a small border of five rounded patent lobes, and with included stamens. It likewise approaches *Markea* in the structure of its calyx, in which respect it resembles *Nicandra* and *Cliocarpus*, with which latter genus it also agrees, in having stellate tomentum. I have been able to complete from different sources the following amended generic character:—

JUANULLOA, R. & P. *Prodr.* xxvii. tab. 4. Ulloa, *Pers. Enc.* i.

218. *Laureria*, *Schlecht. Linn.* viii. 513. *Brugmansia*, *Sp. hortul.*—*Calyx* coloratus, 5-sepalus, sepalis oblongo-acutis, marginibus subreflexis undulatis valvatim conniventibus, tubum inflatum 5-angularem ore coaretatum et 5-dentatum simulantibus, dein liberis et persistentibus. *Corolla* cylindrico-tubulosa, medio inflata, carnosula, fauce coaretata, limbo 5-lobo, lobis brevissimis, rotundatis, patentibus, aestivatione imbricata. *Stamina* 5, æqualia, inclusa, erecta, *filamenta* in coarctationem imam corollæ inserita, basi villosa, *antheræ* sublineares, 2-lobæ, lobis parallelis, connectivo linearí dorsali adnatis, intus longitudinaliter dehiscentibus. *Ovarium* conicum, disco carnoso 5-lobo impositum, 2-loculare, multiovulatum, placentis centra-

ibus incrassatis dissepsimento utrinque adnatis. *Stylus* inclusus, apice crassescens. *Stigma* oblongum, sub-bilabiatum, lobis carnosis, adpressis, intus glandulosis. *Bacca* ovata, sepalis sejunctis cincta, 2-locularis. Semina plurima in pulpam nidulantia, oblonga, vix reniformia, compressa, hilo infra medium laterali. *Embryo* intra albumen carnosum, fere rectus, *radicula* infera, tereti, paulo incurvata, *cotyledonibus* oblongis, crassis, compressis, accumbentibus, rectis, duplo longiore.—Suffrutices Peruviani et Mexicanici dependentes; folia alterna, oblonga, integra, coriacea, pube tomentosa stellata plus minusve induta; racemi terminales penduli; flores aurantiaci, vel punicei.

1. *Juanulloa parasitica*, R. & P. Fl. Peruv. ii. 47. tab. 185. Ulloa parasitica, Pers. Ench. i. 218;—suffrutex epiphytica, ramiculis junioribus angulatis, glabris, epidermide tenui rimosa; foliis oblongis, acuminatis, coriaceis, nitidis, ruguloso-punctulatis, subtus albido vel flavidо-furfuraceis, petiolo canaliculato, tenui, limbo 4–6-plo breviore; racemis terminalibus, pendulis, dichotome ramosis; calyce magno, ovato, carnosus, colorato, inflato, 5-angulato, laciniis demum sejunctis; corolla punicea, cylindrica, calyce paulo longiore, medio subinflata, fauce coaretata, lobis brevibus rotundatis, patentibus; bacca cerasi magnitudine punicea, sepalis erectis vestita.—In Andibus Peruvianis excelsis, Pozuzo, Prov. Tarmæ, v. s. in herb. Mus. Brit. (Pavon).

The leaves in this species are $5\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches broad, with a thick channeled petiole of $\frac{3}{4}$ inch in length; the raceme is paniculate, 4–5 inches long, the pedicels $\frac{1}{2}$ inch; the calyx, almost glabrous, is $1\frac{1}{2}$ inch long, and $\frac{5}{8}$ inch diameter; the corolla is $1\frac{3}{4}$ inch long, 4 lines in diameter in the middle, 3 lines at both extremities, the lobes of the border being scarcely 2 lines in size; the filaments are 5 lines long, the anthers of equal length, the berry being 1 inch long and $\frac{7}{8}$ inch in diameter.

2. *Juanulloa Mexicana*. Laureria Mexicana, Schlecht. Linn. viii. 513. Brugmansia floribunda?, Paxton, Mag. Bot. ix. 241. cum icono;—frutex orgyalis, ramis glabris, epidermide rimosa, junioribus fulvido-tomentosis; foliis ovatis, v. lato-lanceolatis, utrinque breviter acutis, supra levibus, subtus præsertim in nervis tomento molli stellato tectis, breviter petiolatis; calyce magno, e sepalis 5, lato-ovatis, imo anguste attenuatis, tertia parte infimo in tubum 5-gonum 5-alatum margine cohærentibus, demum sejunctis; corolla calyce paulo longiore, tubulosa, sub-5-gona, extus stellato-tomentosa, intus glabra, carnosa, limbi laciniis brevibus, obtusis: staminibus imo tomentosis, inclusis.—Mexico, La Laguna (Schiede); v. s. in herb. Hook. (Tenampa, Prov. Vera Cruz, Linden, no. 50).

The leaves of this plant are described by Schlechtendal as being from 4 to 6 inches long and from 2 to 3 inches broad, upon a very short petiole of only 3 or 6 lines in length; the calyx is $1\frac{1}{4}$ inch long, increasing to $1\frac{1}{2}$ inch; the corolla is $1\frac{1}{2}$ inch long, the filaments being 9 lines and the anthers 5 lines in length.

Linden's plant above quoted, I have presumed to be the same species: here the leaves are thick and coriaceous, quite smooth above, clothed below with yellowish stellate down; they are broadly ovate, shortly and suddenly attenuated at the obtuse emarginated apex, $5\frac{1}{2}$ inches long, $3\frac{1}{2}$ inches broad, on a thick channeled petiole of $\frac{5}{8}$ to $\frac{7}{8}$ inch in length; the inflorescence is much longer than in any other species, each dichotomous branch forming a distinct raceme of $4\frac{1}{2}$ inches in length, bearing the articulations of several flowers towards their apex, which have all fallen off.

3. *Juanulloa Hookeriana*. *Juanulloa parasitica*, *Hook. Bot. Mag.* tab. 4118;—frutex subscandens, ramis glabris, incano-glaueis epidermide rimosa, junioribus argenteo-tomentosis: foliis elliptico-oblongis, utrinque subattenuatis, subcoriaceis, supra laevis, subtus alutaceo-pulverulentis, pilis stellatis subtomentosis, petiolo glabro, subtenui, canaliculato; racemo brevi, subpaniculato, terminali, pedicellis brevissimis, crassis; calyce magno, inflato, 5-angulato, breviter 5-dentato, angulis mox alatis et undulatis, e sepalis lineari-lanceolatis, 3-nerviis, crasso-coriaceis, aurantiaco-pulverulentis, margine cohaerentibus, demum liberis et persistentibus; corolla cylindracea, imo breviter coarctata, calyce tertio longiore, limbi laciniis ovatis, obtusis, patentibus; antheris infra faucem arete conniventibus.—*Patria ignota*; *v. v. cult. in hort. Kew.*

The leaves of this species are $5\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches broad, on a petiole of $\frac{1}{2}$ to $\frac{7}{8}$ inch in length; the terminal inflorescence branches into two or three very short few-flowered racemes, the pedicels being 2 lines in length; the thick fleshy sepals are of an orange colour, $1\frac{1}{4}$ to $1\frac{5}{8}$ inch long, $\frac{5}{8}$ inch broad, forming by their connivent edges a long and somewhat ventricose pentangular tube, the angles appearing in some degree winged and undulating; the tube of the corolla is $1\frac{3}{4}$ inch long, 4 lines in diameter, very thick and fleshy, of a deep orange colour, externally clothed with fine floccose down, and smooth within, the segments of the border being rounded, barely 3 lines long, and $2\frac{1}{2}$ lines broad; the stamens are fixed in the contracted portion of the tube, 3 lines above the base, and are pilose at their origin, quite smooth and terete above, erect, 11 lines long; the anthers, with somewhat mucronate apex, are 4 lines long, 1 line broad, adnate to a linear dorsal connective continuous with the filament; the ovary is conical, seated upon a thick fleshy five-lobed gland, with emar-

ginated rounded lobes ; the style is erect, smooth, thickened and hollow towards the summit ; the stigma consists of two oblong, adpressed, semiterete fleshy lobes, lined inside with green viscous glands.

4. *Juanulloa Panamensis* (n. sp.) ;—frutex subscandens, ramis glabris, anguloso-compressis, epidermide rimosâ; foliis elliptico-oblongis, utrinque attenuatis, coriaceis, supra levibus, subtus alutaceo-pulverulentis, pilis stellatis flavidis tomentosis, petiolo glabro, subtenui, canaliculato; racemis brevissimis, 3–4, terminalibus, aggregatis, floribus sub-umbellatim confertis : pedieillis calyce fere æquilongis, demum in fructu apice incrassatis duplo longioribus ; calyce breviore pseudo-angulato, sepalis demum liberis, lanceolatis, acutis, basi latis, carnosis, aurantiaco-pulverulentis ; corolla cylindracea, imo oreque coarctata, supra medium inflata, calyce fere 3-plo longiore, nervis 5 prominentibus, limbi laciniis brevissimis, obtusiusculis, staminibus inclusis ; bacca oblonga, stylo persistente apiculata, sepalis coriaceis sejunctis cincta.—Panama, v. s. in herb. Hook. Veraguas (Seemann, no. 1200).

This species bears much resemblance in the form and size of its leaves to *J. Hookeriana*, but its inflorescence is very different, its calyx not half the size, the sepals less acuminate, the corolla longer and more contracted in its lower half. The leaves are 5 inches long, $2\frac{1}{2}$ inches broad, on a petiole $\frac{1}{2}$ to $\frac{3}{4}$ inch in length ; they have a silvery lustre beneath, although covered somewhat more sparsely with yellow stellate or rather brachiate tomentum. The racemes, almost fasciculate at the apex of the branch, are scarcely more than $\frac{3}{8}$ of an inch in length ; the pedicels are $\frac{1}{2}$ inch long in flower, 1 inch long in fruit ; the sepals are little more than $\frac{5}{8}$ inch long and $\frac{3}{8}$ inch broad at base, and do not increase in size, but remain erect, separated, coriaceous, and embracing the ovate berry, $\frac{3}{4}$ inch long, $\frac{5}{8}$ inch diameter, crowned by the long, slender, persistent style ; the seeds are 2 lines long, nearly a line in breadth, and they have afforded the structural features given in the generic character*.

SARCOPHYSA.

Among the plants collected by Goudot and Purdie in New Granada, is one that nearly approaches *Solandra*, *Juanulloa* and *Marckea*, not only in its scendent habit, with large coriaceous leaves, but in the form of its corolla. It differs however from those genera in having a large, ovate, fleshy, tubular calyx, which

* A representation of this species with sectional details, and an analysis of the flower of *J. Hookeriana*, will be shown in plate 46 of the 'Illustr. South Amer. Plants.'

is much inflated in the middle, with a remarkably contracted mouth, bursting irregularly with the growth of the fruit, and not divided into distinct sepals as in the other genera above-mentioned; it is also distinguishable from *Juanulloa* by its long, handsome, tubular corolla. Its name is derived from σάρξ, *caro*, and φύση, *resica*, because of its fleshy inflated calyx.

SARCOPHYSA (gen. nov.).—*Calyx* magnus, coloratus, ovatus, inflato-tubulosus, crasso-carnosus, ore coaretato, breviter 5-partito, laciiniis acutis, erectis, persistens, sed non augescentes. *Corolla* cylindrico-tubulosa, tubo medio subinflato, calyce 3-plo longiore, limbo breviter 5-lobo, lobis acutis reflexis, staminibus styloque inclusis. *Bacca* ovata, styli basi apiculata, calyce coriaceo irregulariter fisso vestita. Cætera ignota.—Suffrutex scandens Nova Granadæ, folia alterna, ovata, coriacea; racemi penduli, pauciflores; corolla speciosa.

1. *Sarcophysa speciosa* (n. sp.) ;—ramis dependentibus, dense tomentosis; foliis ovatis, basi obtusis, apice breviter angustatis, crasso-coriaceis, nervis profunde impressis, supra glaberrimis, minute ruguloso-punctulatis, subtus flavidoto-tomentosis, pilis stellato-brachiatis, petiolo crasso, reflexo, canaliculato, sub-brevi; calyce magno, colorato; corolla punicea ?, calyce duplo longiore, extus subtomentosa; bacca magna, calyce vix aucto, fisso, aequilongo, inclusa.—Nova Granada, v. s. in herb. Hook. (Quindiu et Palmas, Goudot; Quindiu, Purdie).

This appears to be a scandent plant; its leaves are quite smooth above, with a finely rugulose or shagreened surface; below they are, as well as the petiole, covered with a dense orange-coloured and short tomentum; they are 4 inches long, $2\frac{1}{2}$ inches broad, on a thick channeled petiole half an inch long; the flowers appear racemose; the calyx $1\frac{1}{2}$ inch long, nearly an inch in diameter; the corolla is $2\frac{1}{2}$ inches in length, 8 lines diameter in the middle, contracted at both extremities to 5 lines, with oblong triangular teeth, 3 lines long; the berry unripe is $1\frac{1}{4}$ inch long, $\frac{3}{4}$ inch diameter, surrounded by the persistent coriaceous calyx, which is irregularly split on one side to the base; the hairs of the tomentum are distinctly brachiate*.

ECTOZOMA.

In the Pavonian herbarium, preserved in the British Museum, I have noticed a plant that offers much analogy with the foregoing genera, agreeing with all the *Solandreae* in its habit, its coriaceous leaves, and terminal paniculated inflorescence, and

* This species will be shown in plate 47 of the 'Illustr. South Amer. Plants.'

although its flowers are much smaller, they agree in having a fleshy tubular corolla with five short lobes, which are imbricated in aestivation. They present the unusual character of the insertion of the stamens upon a free perigynous ring, as in *Triguera*, but with the peculiarity of being adnate upon its external face; hence the derivation of its generic name, from ἐκτὸς, *extra*, and ζῶμα, *cingula*. In most cases where the stamens spring from a perigynous ring, the filaments originate from its inner face, as in *Salpicroma*, or from its margin, as in *Triguera*; but we have a somewhat analogous case in *Campanula medium*, where the filaments are distinctly adnate upon the back of the large, broad processes, that form the fornix around the base of the style, peculiar to that genus. Its generic features may be characterized as follows:—

ECTOZOMA (gen. nov.).—*Calyx* campanulatus, brevis, crassus, subæqualiter 5-dentatus, dentibus triangularibus, erectis. *Corolla* breviter tubulosa, medio subinflata, crasso-carnosa, limbo 5-lobo, lobis suborbicularibus, aestivatione imbricatis. *Stamina* 5, æqualia, inclusa, *filamenta* brevissima, compressa, e dorso annuli perigyni liberi tenuis margine ciliati orta. *Antheræ* oblongæ, imo subcordatae, apice mucronulatae, lobis coriaceis connectivo dorsali linearí parallele adnatis, margine longitudinale deliscentibus. *Ovarium* obovatum. *Style* erectus. *Stigma* fere exsertum, globosum, sub-2-lobum. *Fructus* ignotus.—Suffrutex *Ecuadorensis*, glaberrimus, subscandens?; folia alterna, ovata, rix acuta; inflorescentia paniculata, terminalis.

1. *Ectozoma Paronii*;—glaberrima, ramulis compressis, subangulatis, epidermide rimosa; foliis late ovatis, basi apicèque obtusiusculis, vix acutis, crasso-coriaceis, supra impresso-punctulatis, venis insculptis, subtus pallidis, venis prominentibus, petiolo crasso canaliculato; racemis paniculatis, 2-3, terminalibus; floribus breviter pedicellatis, calyce carnosæ aurantiaco, piloso, pilis brevibus articulatis; corolla carnosa, aurantiaca, glabra, limbi laciñiis crassiusculis.—Guayaquil, v. s. in herb. *Mus. Brit. (Pavon)*.

This plant bears much resemblance in its habit to *Juanulloa* and *Sarcophysa*. Its branchlets are much compressed, covered with a shining peeling bark; the leaves are 5 inches long, $3\frac{1}{2}$ inches broad, on a thick channeled petiole of half an inch in length. Its paniculate branching raceme is about 2 inches long, each pedicel is 1 line long; the calyx, 4 lines in length and 3 lines in diameter, is very fleshy and rugosely pilose, and is divided to one-third its length into five equal erect teeth; the tube of the corolla is 3 lines long, and the circular lobes of its border 1 line in diameter, the tube is somewhat narrowed at its base and in the throat; the antheriferous free ring arises in the constriction of

the tube. It is possible that in the specimen referred to, the flowers are only in a young state, and that when fully grown they may assume a somewhat greater development, but I give the description in accordance with the specimen as it exists*.

XXII.—Characters of Diplommatina, a new genus of Terrestrial Mollusks belonging to the Family of Carychiadæ, and of a second species contained in it: also of a new species of Carychium inhabiting the Western Himalaya. By W. H. BENSON, Esq.

AT page 81, vol. ii. of Pfeiffer's excellent Monograph of the *Helicidæ*, there appears an erroneous reference to that family of an anomalous shell, the animal of which must exclude it from the position there assigned to it;—I allude to the little Himalayan species called by Capt. Hutton in MSS. *Carychium costatum*, which Dr. Pfeiffer has described under the title of *Bulimus folliculus*. Capt. Hutton, referring to the situation of the eyes and to their not being borne on the summits of the tentacula, associated the form with *Carychium*. The shell alone, differing in the shape of the aperture and destitute of plaits or teeth, would certainly be anomalous in that genus; but it formed the only published type to which the species could be approximated. The following is the recorded result of my own repeated observations of the animals of both species.

Tentacula two only, originating from the upper part of the head, long and filiform; eyes situated on the posterior part of the tentacula at their base, composed of two lobes: one lobe deeply seated in the tentaculum and larger than the other lobe, which is a small black point coming to the surface on the outer side of the larger lobe; foot short.

Had the animal been provided with an operculum†, it might possibly have been referred to the family of *Cyclostomatidæ* in accordance with the position of the eyes, and the form of the aperture of the shell. The differences observable in the latter, as well as in its inhabitant, give countenance to a separation from *Carychium*; I therefore propose for the type the following name derived from the peculiarity of the percipient points or eyes.

Diplommatina, nobis.

Char. Gen. Testa vix rimata, tenui, subovata; spira elongata; anfractibus convexis, costatis, ultimo subascendente; apertura eden-

* A representation of this plant with details will be shown in plate 48 of the 'Illustr. South Amer. Plants.'

† I believe I have the concurrence of the major part of the conchologists of the present day in dissenting from Rang's opinion, "qu'il n'est pas possible d'établir des divisions fondées sur la présence ou l'absence d'opercule." — Vide Rang's Manuel, p. 198, Art. Litiopa.

tula, subcirculari; peristome duplicito, expanso; marginibus callo parietali appresso junctis; operculo nullo.

Sp. 1. *D. (Bul.) folliculus*, Pfr. Monogr. vol. ii. p. 81-2. *Carychium costatum*, Hutt. MSS.

Sp. 2. *D. (Carych.) costulatum*, Hutt. MSS.

Testa minima, subimperforata, cylindrico-ovata, minute costulata, costulis obliquis regularibus, approximatis; anfractibus 5, superioribus celeriter decrementibus; ultimo angustiori, antice subascendente; sutura profunda; apice obtuso; apertura rotundata, continua, peristome tenui, expanso, duplicito, labro secundo retromisso a costulis satis distincto.

Long. 2 mill., diam. vix 1 mill.

Hab. in montibus sub-Himalayanis occidentalibus.

It differs abundantly, in form as well as size, from *D. folliculus*, Pfr., in which also the double lip, distinct from the ribs, is strongly marked, although not noted in his characters. The present species is less than two-thirds the length of *D. folliculus*, and does not present the long conical spire of that species, decreasing more suddenly towards the apex.

It inhabits the same localities as the larger shell, abounding in masses of decayed fallen leaves, and under stones, in damp situations beneath trees, on the shady sides of the mountains, at from 5000 to 9000 feet elevation, at Simla, Mussoorie and Landour.

Pfeiffer has given Bengal as the habitat of *D. folliculus*. It has never been met with in that province. Capt. Hutton discovered it at Simla near the Sutlej, and I have taken it abundantly at Landour, and still further eastward at Nynee Tal, and on the Ghagur Mountain towards the head of the Sarjou. It will probably be found in Nipal, or even further in the range, when the attention of visitors to those quarters shall be attracted to these diminutive animals, or perhaps the known species may be there replaced by other allied forms.

In the same localities as *Diplommatina*, but less abundantly, occurs a new species of *Carychium* proper, quite distinct from the European species *C. minimum* and *speleum*, Rossm., as well as from the American *C. exiguum*, Say. The following are its characters:—

C. Indicum, nobis.

Testa minima, rimata, ovato-cylindracea, hyalina, nitida; anfractibus quinque, superioribus convexis, ultimo et penultimo subplanulatis; apice obtuso; sutura impressa; apertura ovata, peristome incrassato, margine dextro intus medio callo dentiformi praedito; plica parietali unica, columellari 1 obliqua.

Long. $1\frac{1}{2}$ mill., diam. $\frac{2}{3}$ mill.

Hab. ad Simla et Landour montibus sub-Himalayanis, foliis putridis adhaerens.

I should have adopted Capt. Hutton's MS. name "*bidens*," were it truly descriptive of the shell. The columellar plate appears to have escaped his observation from its minuteness and its backward position in the mouth.

July 25, 1849.

XXIII.—*Descriptions of Aphides.* By FRANCIS WALKER, F.L.S.

[Continued from p. 48.]

71. *Aphis Capreae*, Fabr.

Aphis Capreae, Fabr. Syst. Ent. 217. 33; Ent. Syst. iv. 221. 3; Syst. Rhyn. 294. 3; Schrank, Faun. Boic. ii. 1. 101. 1179; Gmel. Syst. Nat. i. 2203; Stew. El. ii. 110; Turt. ii. 703; Kalt. Mon. Pflan. i. 109. 84; Ratz. Forst. Ins. iii. 218. 110.

Aphis Pastinacæ, Linn. Syst. Nat. ii. 1. 36. 31; Faun. Suec. 997; Fabr. Mant. Ins. ii. 315. 13; Ent. Syst. iv. 213. 13; Syst. Rhyn. 296. 13; Gmel. ed. Syst. Nat. 2202; Turt. ii. 703.

A. Ægopodii, Fabr. Sp. Ins. ii. 387. 28; Ent. Syst. iv. 217. 33; Syst. Rhyn. 299. 33; Gmel. ed. Syst. Nat. i. 2204; Stew. El. ii. 110.

A. Podagrariae, Scop. Ent. Carn. 399; Schrank, Faun. Boic. ii. 1. 110.

Ægopodaphis, Amyot, Ann. Soc. Ent. 2^{me} série, v. 479.

This species feeds on *Salix babylonica*, *S. caprea*, *S. amygdalina*, *S. alba*, *Angelica sylvestris*, *A. archangelica*, *Ægopodium Podagraria*, *Chærophyllum temulum*, *C. sylvestre*, *Apium graveolens*, *A. Petroselinum*, *Sium nodiflorum*, *Heracleum Sphondylium*, *Pastinaca sativa*, *Conium maculatum*, *Anethum Fæniculum*, *Peucedanum officinale*, &c.

The viviparous wingless female. Pale green, especially on each side, elliptical, flat, and rather small: the front is slightly convex, and not notched: the feelers are pale green, and shorter than the body; their tips are black; the first and the second joints are not angular; the fourth joint is much less than half the length of the third, which is rather thick; the fifth is shorter than the fourth; the sixth is much shorter than the fifth; the seventh is very slender and much longer than the fourth: the eyes are black: the mouth and the nectaries are pale green; the former has a black tip, and the latter are very slightly spindle-shaped, and as long as one-fourth of the body: the legs are pale yellow; the tips of the feet are black. On the willow.

1st var. Oval, slightly convex, with two vivid green stripes along the back: the feelers are about one-fourth of the length

of the body ; their tips are brown : the eyes are dark brown : the tip of the mouth is brown : the nectaries are as long as one-eighth of the body : the legs are pale green ; the feet and the tips of the shanks are brown. Abundant on *Anethum Foeniculum* in the beginning of May.

2nd var. Small, grass-green, short elliptical, rather flat : the limbs are green ; the tips of the feelers, the eyes, the tip of the mouth, and the feet are brown : the feelers are not half the length of the body : the nectaries are about one-sixth of the length of the body. On *Peucedanum officinale* at the end of May.

3rd var. The feelers are pale green, and little more than one-third of the length of the body ; their tips are black : the eyes are dark red. On *Heracleum Sphondylium* at the end of June.

4th var. The body is pale greenish yellow, and the head inclines to a buff colour : the eyes are dark red : the feelers are pale yellow, darker towards their tips, and a little more than half the length of the body : the mouth is pale yellow with a black tip : the nectaries are pale yellow with black tips, and rather more than one-fourth of the length of the body : the legs are pale yellow or greenish yellow ; the tips of the feet are black.

5th var. Green, shining : the feelers are pale yellow, and less than half the length of the body ; their tips are darker : the mouth is pale yellow ; its tip and the eyes are black : the nectaries are pale yellow, and as long as one-sixth of the body ; their tips are black : the legs are pale yellow ; the thighs are pale green ; the tips of the shanks and of the feet are dark.

6th var. The body is pale red varied with yellow : the feelers are pale yellow, and about half the length of the body ; the tips of the latter joints are darker : the mouth is pale yellow ; its tip and the eyes are black : the nectaries are pale yellow with black tips, and nearly one-fifth of the length of the body : the legs are pale green ; the knees and the tips of the shanks are brown ; the tips of the feet are black.

7th var. The body is dark green, or pale green with the head and the limbs inclining to a white colour : the feelers are pale green with brown tips, and rather more than one-third of the length of the body : the nectaries are pale yellow with brown tips, and are as long as one-sixth of the body : the mouth is very pale green with a brown tip : the eyes are very dark brown : the legs are very pale green ; the feet are pale brown.

8th var. The body is dull green : the feelers are black, dull yellow at the base, and much shorter than the body ; the joints are rather thick with the exception of the last, which is slender : the mouth is pale yellow ; its tip and the eyes are black : the nectaries are dark green, and as long as one-eighth of the body :

the legs are dull yellow, and rather short; the knees, the feet, and the tips of the shanks are black.

9th var. Body pale yellowish green: the eyes are dark brown: the feelers are pale green at the base, brown at the tips, and rather less than one-third of the length of the body: the mouth is pale green with a brown tip: the nectaries are pale green, and nearly one-fifth of the length of the body: the legs are pale green; the feet are brown.

10th var. Body dark dull yellowish green; the head and the limbs are still darker.

11th var. Body grass-green.

12th var. Body green, mottled with red.

13th var. Body pale red.

14th var. The tips of the nectaries and of the shanks are brown.

15th var. The feelers and the legs are brown.

16th var. The body is pale whitish green: the limbs are dull white or greenish white; the former are nearly half the length of the body: the eyes are dark red: the tip of the mouth is black: the nectaries are as long as one-fourth of the body: the knees, the feet, and the tips of the shanks are dark.

17th var. The seventh joint of the feelers is shorter than the sixth.

The viviparous winged female. Green, and rather small: the head, the disc of the chest, and that of the breast are black: there is a large black spot on the back of the abdomen, and a row of small black spots on each side: the feelers are black, and a little longer than the body: the mouth is pale green; its tip and the eyes are black: the nectaries are dull green, and as long as one-fourth of the body: the legs are pale yellow, and moderately long; the thighs, except the base, the feet, and the tips of the shanks, are black: the wings are colourless, and much longer than the body; the wing-ribs are pale green; the wing-brands and the veins are dark brown; the tips of the latter are slightly clouded; the second vein diverges much from the first, but is nearly parallel to the third; the situation of the forks of the latter vein is variable, but the first is usually a little before one-third and the second much after two-thirds of the length; the fourth vein is more curved towards its base than near its tip, and the angle of the brand whence it springs is very slight. On the willow in the middle of June.

1st var. The abdomen is quite green: the thighs are green with black tips.

2nd var. The abdomen is green, and there are black bands across its back: the feelers are nearly as long as the body: the

legs are pale green ; the feet and the tips of the shanks are black : the wing-ribs are pale yellow.

3rd var. The back of the abdomen is black, and it is traversed by green bands, one of which near the base is broader than the rest ; the nectaries are as long as one-sixth of the body.

4th var. The abdomen is green, and its back is traversed by confluent black bands : the feelers are nearly as long as the body : the mouth is pale yellow with a black tip : the nectaries are also pale yellow with black tips, and as long as one-sixth of the body : the thighs and the wing-ribs are pale yellow.

5th var. Like the preceding, but the borders of the fore-chest and the fore-breast are dull yellow.

6th var. Black, shining : the borders of the fore-chest are dark green : the abdomen is pale green at the base and beneath ; the disc and the hind-part are almost black : the feelers are less than half the length of the body : the nectaries are black, and about one-seventh of the length of the body : the legs are dull yellow ; the feet and the tips of the shanks are black : the wings are nearly twice the length of the body ; the wing-ribs are pale yellow ; the wing-brands are pale brown, and very long ; the veins are brown. On *Anethum Fæniculum*, in the beginning of May.

7th var. Black : the base and the underside of the abdomen and the mouth are green, and the tip of the latter is black : the feelers are nearly as long as the body : the nectaries are about one-sixth of the length of the body : the legs are pale yellow ; the feet, and the tips of the thighs and of the shanks are black. On *Picecedanum officinale*, at the end of May.

8th var. Black : the fore-border and the hind-border of the fore-chest and the abdomen are green ; the latter is sometimes traversed by black bands : the feelers are much shorter than the body : the mouth is green with a black tip : the legs are yellow ; the feet and the tips of the shanks are black ; the tips of the thighs are sometimes brown.

9th var. Black : the abdomen is very dark green with a row of black spots on each side ; its underside is rather pale : the feelers are rather shorter than the body, or sometimes about half its length : the mouth is dark green with a black tip : the nectaries are one-fifth or one-sixth of the length of the body : the legs are dark dull green or dull yellow ; the feet and the tips of the thighs and of the shanks are brown or black : the wing-brands are dark green or pale brown. On *Chærophyllyum sylvestre*, in the beginning of May.

10th var. While a pupa it is pale yellowish green, with two vivid green stripes along the back : the feelers are full one-third or sometimes more than half the length of the body : the nec-

taries are about one-eighth of the length of the body : the rudimentary wings are buff. This colour continues for some little time after the insect acquires wings, which are milk-white for a while after their development. The winged insect is black and small : the feelers are more than half the length of the body : the mouth is dull green with a brown tip : the abdomen is green, and has a stripe of black spots on each side : the nectaries are black, and about one-sixth of the length of the body : the legs are pale yellow ; the feet and the tips of the shanks are brown ; the four hinder thighs are sometimes black : the wings are very much longer than the body ; the wing-ribs are pale green ; the brands are pale brown ; the veins are brown.

11th var. Like the last, but the fore-border and the hind-border of the fore-chest are green : the feelers are shorter than the body : the mouth is pale green with a black tip : the nectaries are green, and as long as one-fifth of the body : the legs are green ; the feet and the tips of the shanks are black : the wing-ribs and the rib-veins are pale yellow.

12th var. Like the 10th var., but the borders and the under-side of the fore-chest are dull yellow : the tips of the fore-thighs, the middle thighs from the middle to the tips, and the hind-thighs excepting the base, are dull green : the wing-ribs and the rib-veins are pale yellow ; the veins are pale brown.

13th var. The body is black : the sutures of the segments are dark green : the abdomen is green, and has a row of black spots on each side : the feelers are very much shorter than the body : the mouth is green with a black tip : the nectaries are green, and about one-sixth of the length of the body : the legs are dull yellow ; the feet and the tips of the thighs and of the shanks are black : the wing-ribs are pale yellow ; the brands are dull buff.

14th var. The body is black : the fore-chest is dull green : the abdomen is pale grass-green ; the disc of its back is darker, and there is a row of very small black spots on each side : the feelers are black, and rather more than half the length of the body : the mouth is green with a brown tip : the nectaries are black, and about one-tenth of the length of the body : the legs are green ; the feet and the tips of the thighs and of the shanks are black : the wing-ribs are pale yellow ; the brands and the veins are pale brown.

15th var. The body is black and rather small : the abdomen, the fore-breast and the borders of the fore-chest are dull green : the feelers are much shorter than the body : the mouth is dull green with a black tip : the nectaries are dull green, and as long as one-sixth of the body : the legs are dark green ; the hind-thighs, the feet, and the tips of the shanks are black : the wing-

ribs are yellow ; the wing-brands are pale brown ; the veins are brown.

16th var. The body is black and very small : the feelers are as long as the body : the mouth is dull yellow with a black tip : the nectaries are as long as one-eighth of the body : the fore-thighs are yellow at the base ; the shanks are dark yellow with black tips : the wing-ribs are yellow ; the brands are pale brown ; the veins are dark brown, and very distinct.

17th var. The body is black : the abdomen is green : the feelers are a little more than half the length of the body : the mouth is yellow towards the base : the nectaries are as long as one-sixth of the body : the legs are black ; the fore-thighs at the base, and the shanks except their tips are yellow : the wing-ribs are yellow ; the brands and the veins are brown.

18th var. The body is black : the borders of the fore-chest and the abdomen are dark green ; the back of the latter is black : the feelers are nearly as long as the body : the mouth is pale yellow with a black tip : the nectaries are black, and as long as one-sixth of the body : the legs are pale yellow ; the four hinder thighs, the knees, the feet, and the tips of the shanks are black : the wing-ribs and the rib-veins are pale yellow ; the brands and the other veins are pale brown.

19th var. The fourth joint of the feelers is full half the length of the third ; the fifth is shorter than the fourth ; the sixth is a little longer than the fifth ; the seventh is a little longer than the sixth.

20th var. The fourth joint is nearly half the length of the third ; the fifth and the sixth are slightly club-shaped, and are each as long as the fourth ; the seventh is hardly longer than the sixth.

21st var. The sixth joint is a little longer than the fifth.

22nd var. The third joint is as long as the three following joints, and the seventh is about thrice the length of the sixth.

23rd var. While a pupa it resembles the wingless *Aphis*, but the rudimentary wings are pale green : sometimes the body has two lively green stripes along the abdomen, and the colour varies to pale red which is sometimes varied with green and with brown. When winged it is dull greenish yellow : the disc of the chest and that of the breast are black : there is a brown band across the fore-chest : the feelers are shorter than the body : the mouth is yellow with a black tip : the nectaries are pale yellow with black tips, and as long as one-fifth of the body : the thighs are pale yellow.

24th var. While a pupa the body is pale green varied with dark green, or pale red varied with yellow : the head and the fore-chest are pale red : the legs are pale greenish yellow ; the feet are black.

There are two varieties of this species on the willow, and they differ in size; the black colour predominates in the smaller variety, and in the larger the green extends more over the body and over the legs. The pupæ resemble the wingless insect in colour, but the rudimentary wings and the disc of the chest are buff.

The oviparous wingless female. It appears at the end of October, and is elliptical, dark velvet-like red, and rather flat: the feelers are white with black tips, and about one-third of the length of the body: the mouth is white; its tip and the eyes are black: the nectaries are white with black tips, and nearly one-fourth of the length of the body: the legs are dirty white; the feet and the tips of the shanks are black; the hind-shanks are broad and grayish black. It continues sometimes till near the end of November.

1st var. Bright red: the disc of the abdomen is black.

2nd var. The head is almost white.

3rd var. Greenish yellow: the tip of the abdomen is orange: the legs are pale green; the hind-shanks are dull green.

4th var. Orange colour.

5th var. The body is dull yellowish green, flat, oval, not shining: there is a broad irregular black stripe along the chest whereon it divides and passes along each side of the abdomen: the feelers are pale yellow, black towards the tips, and very nearly half the length of the body: the mouth is pale; its tip and the eyes are black: the nectaries are white, and about one-twelfth of the length of the body: the legs are dirty yellowish white; the feet and the tips of the shanks are black.

The winged male. The body is small and black: the abdomen is dark brown: the feelers are black, thick from their base till near their tips, and nearly as long as the body: the mouth is yellow with a black tip; the nectaries are black, and about one-sixth of the length of the body: the legs are black; the shanks except their tips are yellow: the wings are colourless and much longer than the body; the wing-ribs and the rib-veins are yellow; the brands and the other veins are brown.

1st var. The abdomen is broad, and rather dark yellow; the nectaries are as long as the body: the legs are yellow; the four hinder thighs, excepting the base, the feet, and the tips of the shanks and of the fore-thighs, are black.

2nd var. The abdomen is very dark red beneath, and covered with white powder: the feelers are a little longer than the body: the nectaries are as long as one-eighth of the body: the legs are black; the thighs are pale yellow at the base; the shanks excepting their tips are dark yellow: the wing-brands are pale brown.

3rd var. The body is pale greenish yellow: the head, the disc

of the chest and that of the breast are black : there is a broad black stripe along the abdomen : the feelers are black : the nectaries are pale yellow with black tips, and less than one-fourth of the length of the body : the legs are pale yellow ; the knees, the feet, and the tips of the shanks are black.

Variations of the wing-reins. 1st var. The first vein, the lower branch of the first fork, and (with the exception of its tip) the upper branch of the second fork of the third vein, are wanting.

2nd var. The second vein has near its tip a fork which does not join the border of the wing.

3rd var. The second fork of the third vein is close to the tip of the wing.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

BOTANICAL SOCIETY OF EDINBURGH.

June 14, 1849.—Professor Balfour, President, in the Chair.

Donations to the library were announced. Specimens of the various species and varieties of tea cultivated in Assam were presented by Dr. Jameson ; and Himalayan ferns by Mr. Wyville Thomson.

The following papers were read :—

1. “On *Nostochineæ*,” by Messrs. Ralfs and Thwaites. This was a continuation of a former paper, being descriptions of the species of *Trichormus*, *Aphanizomenon*, and *Dolichospermum*. It will appear in the ‘Annals of Natural History’ and the Society’s ‘Transactions.’

2. “Remarks on the Origin of Plants and the Physical and Geographical Distribution of Species,” by the Rev. Dr. Fleming. The author stated that it had been assumed as a first principle, connected with an extensive series of speculations in botany and geology, that *species* had sprung from *single centres*, and that the individuals had “radiated from one point to greater or lesser distances around it,” according to Dr. J. Hooker ; or that all the individuals of a species could be traced “from a single progenitor, or from two, according as the sexes might be united or distinct,” and hence the origin of the phrase, “*specific centres*.” In opposition to this view, it was stated, that the history of the human race, traced to their origin in a single pair, did not furnish an analogical argument of any value ; while the dependence of the carnivorous animals on the herbivorous kinds, and the latter, along with man himself, on plants, gave good grounds to conclude that *many individuals*, of grasses for example, were requisite in the first instance, and were brought forth abundantly. These considerations rendered the assumption of “*specific centres*” extremely *improbable* ; but the occurrence of similar species, in localities remote from one another, and even in opposite hemispheres, over which, by no conceivable process, could dispersion

from a single plant be reconciled with the phenomena, did, in the opinion of the author, furnish a *demonstration* of its absurdity. Dr. Hooker, while admitting the identity of the species of opposite hemispheres, acknowledging about thirty antarctic forms as identical with European plants, even after careful comparison and with the ablest coadjutors, is inclined to consider the identity, not as indicating a multitude of progenitors of a species, but as an anomaly, the explanation of which must be sought for "*in some natural cause.*" Professor E. Forbes disposes of the anomaly in a more summary manner, by an *assertion*, that "species of opposite hemispheres, placed under similar conditions, are *representative*, not identical." If this opinion be correct, then form and structure are vastly inferior in value in the determination of species, to *latitude*, a conclusion not likely to be adopted. The author concluded by recommending the abolition of the term "*specific centres of distribution,*" as involving an erroneous hypothesis, and the substitution of the phrase "*patches of distribution.*"

Dr. Fleming exhibited a specimen of *Xanthorrhæa hastilis*, which had been sent by Assistant-Commissary Neill from St. George's Sound, together with some implements manufactured by the aborigines, by means of the gum exuded from the bases of the leaves of this plant.

July 12.—Dr. Balfour, President, in the Chair.

The following papers were read :—

1. "On *Nostochineæ*," by John Ralfs, Esq. This paper comprised descriptions of species of *Sphaerozyga* and *Cylindrospermum*, and will appear in the 'Annals of Natural History' and the Society's 'Transactions.'

2. "On the Chemical Composition of the Fluid in the Ascidia of *Nepenthes*," by Dr. A. Voelcker of Frankfort. (See p. 128.)

Dr. Fleming called attention to the fact, that the young leaves of barley distil a clear fluid from their extremities. He was not aware of any analysis having been made of it.

Dr. Balfour alluded to a similar phenomenon on the leaf of *Richardia (Calla) Æthiopica*; and Dr. Cleghorn made some remarks on the acid secretion (oxalic acid) of *Cicer arietinum*, the chick pea, which he had often observed the ryots collecting in India.

3. "Notes of Excursions in the neighbourhood of Edinburgh," by Dr. Balfour. In these notes Dr. Balfour gave a short account of the botanical trips which he had taken with his pupils this season to Dalmahoy, Arniston, Dysart, Prestonhall, Melrose, Gullane, Queensferry and the Bass, and noticed some of the more interesting plants which had been gathered.

4. Dr. Balfour exhibited specimens of roots which had entered and choked up tile-drains; viz. of an ash which had penetrated tile-drains in Hampshire, filling them up completely for a great extent, and causing serious injury, and stated that similar occurrences had been observed in various parts of the country, more especially at Muirkirk, the Carse of Gowrie and Prestonhall. The plants, whose

roots had penetrated the drains in different localities, were :—elm, poplar, willow and ash, *Polygonum Bistorta*, *Equisetum*, and *Tussilago Farfara*. The Bistort had been very troublesome in the Carse of Gowrie. Mr. Gorrie had found the roots of an alder penetrating into an old mine full of water, and developed there in a remarkable manner.

Dr. Neill stated that twenty years ago Mr. Riddoch of Falkirk had transmitted to him a specimen of the root of *Senecio Jacobaea* that had entered a drain by a very small orifice, but afterwards extended itself, completely filling the drain for about 20 feet.

Mr. Wyville Thomson referred to an instance which had come under his observation in Ayrshire, in which drains were completely obstructed at a place where they passed through a larch plantation, the roots of the larches having filled them up.

Sir John S. Forbes, in a letter addressed to Professor Balfour, gave some interesting particulars as to the water-pipes which supply the village of New Pitsligo, Aberdeenshire. Part of these tile-pipes, 3 inches bore, were laid about forty years ago, overlapping $2\frac{1}{2}$ inches, packed in clay throughout their whole length, and the joints filled with milled clay. The pipes are in general placed 3 feet deep; but in some instances they approach nearer the surface owing to the levels, and at these points roots have entered. The roots proceed from plants outside and never adhere to the tile. They run along the inside for 6 or 8 yards, and then become matted together so as to fill the pipes completely. The plants which have been observed to send their roots into the pipes are species of *Rumex* and *Carduus*, &c. The pipes require to be cleaned at least once in the season, which is done by a long wire with a screw at the end, which is twisted among the roots so as to break them up, and allow the loosened matter to pass out at the lowest level. Sir John sent a specimen of the root of a gooseberry bush which had entered the pipes where they passed through a garden.

Dr. Fleming suggested the importance of ascertaining the probable structural changes which enabled the roots of these plants to derive nourishment directly from running water.

Dr. Balfour exhibited specimens of a peculiarly knotted stem of an elm from Prestonhall. The leading stem had been broken off, and one of the side branches rising from a remarkably knotted base had become erect, giving the tree a peculiar aspect. All the branches of this new leader were covered with knots, while the other branches were free from them. The peculiarity was continued in plants raised from slips taken off the branch.

Dr. Balfour also noticed the occurrence in Prestonhall grounds of a mountain ash, from which a large limb had been broken, splitting the tree so as to expose its centre, which is now covered with roots, sent down from the branches above.

Dr. Balfour exhibited specimens of sycamore roots, taken by Mr. Gorrie from very stony ground, which had become flattened and hollowed so as to embrace large stones at different points. The roots, when removed, carried the stones with them, and in some instances

the stones were almost completely enveloped by the expanded continuous root.

5. "Remarks on the growth of *Bambusa arundinacea*," by Mr. Robert Scott. (See p. 120.)

Dr. Cleghorn of the Madras Army exhibited drawings of some interesting plants from Western Mysore, India, a tract of country little explored by botanists, where for some years he has been in a peculiarly favourable position for acquiring information. The district he represented to be singularly rich in natural productions: many medicinal shrubs are found, yielding gums, barks and dyes, the value of which is not sufficiently known or appreciated. There were laid before the meeting a specimen of Mysore gamboge, with figures of *Garcinia pictoria*, Rox., which furnishes it, and other *Guttiferae*; also *Zanthochymus pictorius*, Rox., &c. The analysis and researches of Dr. Christison (with the opinion of the Bombay Chamber of Commerce) has fully established the intrinsic value of this gamboge, whilst the concurrent testimony of several accurate observers prove that the tree is found in abundance at an elevation of 2000 to 3000 feet along a great portion of the range of Malabar Ghauts. The coffee-planters, who propose trading in the new article, have been seeking information, and it is expected that this hitherto neglected production of the forest may become an export of commercial importance from the western coast of the peninsula, rivaling Siam gamboge in the London market. Attention was directed to *Eutada Pursætha* (W. & A.), an immense climbing shrub which runs over the tallest forest trees; the legumes are often 3 feet long, and the seeds are used as weights in the bazaars. Among other plants exhibited were *Hexacentris Mysorensis* of Wight, *Xanthoxylon triphyllum*, Juss., and *Acrostichum flagelliferum* of Wallich. These drawings of Mysore plants, executed with the aid of a native artist, amount to 500; and the species collected by Dr. Cleghorn run up to 2000. From various interruptions and delicate health, the greater part of the collection remains unarranged. A sketch of the vegetation of Mysore was promised for a subsequent meeting.

Mr. M'Nab exhibited a peculiar gelatinous matter, which continues to increase in a solution of sugar, and forms it into vinegar. In the course of a month the mass divides, forming two independent masses, each of which has the power of carrying on the process of converting saccharine solution into vinegar. The vinegar produced is excellent, and is the only kind used by several persons in Edinburgh.

Mr. Evans exhibited *Antennaria dioica* and *hyperborea*, showing the difference between the two plants, the leaves of the latter being cottony on both sides, while those of the former are so on the under side only. Mr. Evans also exhibited plants of the Silesian potato, a small Ranunculaceous plant, whose tubers have been used for food.

Dr. Balfour exhibited male flowers of *Pinus Lambertiana* from Mr. Spiers, with whom this pine is flowering; and stated that the same plant has likewise produced fertile flowers, and is in course of ripening seeds.

Mr. Stark sent specimens for exhibition of the following Algae dredged in the neighbourhood of Lamlash, Arran :—*Bonnemaisonia asparagooides*, *Halymenia ligulata*, *Polysiphonia parasitica*, *Delesseria ruscifolia* and *Nicophyllum punctatum*.

LINNÆAN SOCIETY.

November 7, 1848.—Edward Forster, Esq., V.P., in the Chair.

A paper was read by F. J. Graham, Esq., F.L.S., “On the Injuries sustained by certain Plants from the attacks of parasitic Fungi, with particular reference to the Cause of the Potato Disease.”

In order to demonstrate the subject more clearly, Mr. Graham exhibited drawings, with magnified figures of several species of parasites; and a great many specimens of different plants, both native and exotic, presenting a healthy appearance on those parts which were still free from the attacks of the different species of mildew to which they were subject, but at the same time showing the most indisputable signs of disease on those parts which were infested by tufts of mildew. The manner in which one plant in particular, Shepherd's Purse (*Thlaspi Bursa Pastoris*, L.), was affected, was very remarkable. Portions of the stems of this were covered, to the extent of two or three inches, with *Botrytis parasitica*, which caused them to become gouty or swollen to three times their natural size; and eventually these parts assumed a brown colour and a moist putrescent character, which could be traced down the stalks, and in many cases killed the plants. Transverse sections of these blotches, compared with similar sections of a blotch on the potato stalk, exhibited the same effects, the dark fluid having penetrated the tissues of both to a considerable extent. Of all the species of parasitic mildews which he has noticed, Mr. Graham considers those belonging to the genus *Botrytis* to produce the severest injuries; and it is an undisputed fact that the potato crops have been universally attacked, during the last three seasons, by *Botrytis infestans*.

As to the manner in which these parasites acquire their destructive power, Mr. Graham considers that it arises from the natural decay of their *mycelium* or internal filaments, which he has found traversing the tissues of plants, beneath the external tufts of mildew. That the tissues of plants are extensively permeated by this *mycelium*, has been frequently shown by the Rev. M. J. Berkeley and other mycologists; but the important fact that these roots (as they may be termed) *die* within the tissues of plants, along with their superstructure, assuming a dark colour in decay and ultimately dissolving into a viscous mass, has hitherto, Mr. Graham states, escaped the notice of authors. Decaying matter being thus secretly introduced, corrupts the adjacent tissues, and in many cases spreads over the entire plant and kills it. Mr. Graham states that he has arrived at this conclusion after repeated examinations under powerful microscopes, but that the effects are visible in some cases to the naked eye. Experiments made by enclosing tufts of mildew in the sap of those plants on which it grew, also exhibited the results above stated.

November 21.—Edward Forster, Esq., V.P., in the Chair.

Mr. A. Adams, F.L.S., presented specimens of the habitations of a species of Spider, collected by Captain Sir E. Belcher on the north-west side of Majambo Bay, in the Island of Madagascar, and communicated by him to Mr. Adams, with the particulars of their history. It appears that on this coast the north-east wind blows so constantly and to such a degree, that it would effectually destroy the more usual forms of web; to remedy which, the spiders of the locality collect together a number of small even-sized grains of quartz-sand, of which they fabricate a tolerably firm horn-shaped habitaculum, uniting them together by means of a fine loose web, which they hang from the low shrubs that grow upon the sand, and thus suspended defy the breeze and ride out the gale in safety.

Mr. J. Clarke exhibited specimens of *Filago Jussiaei* and *Melilotus arvensis*, found near Saffron Walden, Essex.

Mr. J. Hogg, F.R.S., F.L.S., exhibited dried specimens of a plant which he regarded as a double variety of *Matricaria Chamomilla*, L., found by himself on the sandy road-side near Whitburn, Durham, together with a coloured drawing of the natural size. He stated, in a communication accompanying the exhibition, that he had never before observed any similar variety of the species above named, nor could he find any account of its having been known to vary with a double flower. Sir J. E. Smith, however, in his 'English Flora,' states of *Anthemis nobilis*, that "varieties with double flowers are common in gardens;" and in Smith's own herbarium, in the Museum of the Society, are two specimens of *Pyrethrum inodorum*, var. *flore pleno*, the flowers of which very strongly resemble those exhibited. These were found in Norfolk by Mr. Crowe in 1799, and are mentioned in the 'English Flora' as "a double variety, having a multiplied radius and an obliterated contracted disk." In the present example Mr. Hogg states that "the external white petals, or rather the florets of the radius, are altogether larger and stronger; they are much elongated, strap-shaped, less narrow, with their margins somewhat folded inwards, and are rather more numerous than those in the ordinary single flower, from which they also differ by being sometimes bilabiate; whilst the disk itself is greatly contracted and reduced, and its tubular florets appear to have become very small and abortive; thus apparently indicating that the florets of the radius have become lengthened and enlarged at the expense of those of the disk." Mr. Hogg adds, that in general appearance these large double flowers of *Matr. Chamomilla* resemble the common white double flowers of the genus *Chrysanthemum*.

December 5.—E. Forster, Esq., V.P., in the Chair.

Read the conclusion of Mr. Huxley's memoir on *Physalia*, commenced at the last Meeting.

The specimens of *Physalia* on which Mr. Huxley's observations were made, were collected on board the *Pattlesnake*, between the 25th of February and the 3rd of March, between lat. 25° and 37° S.

and long. 5° and 7° W. They varied in size from $\frac{1}{8}$ in. to 2 in. in the long diameter of the float. The author first describes the general appearance of the specimens, of which he doubts whether the largest were adult, and then proceeds to a minute examination of their details, dividing them for this purpose into the float or air-bladder, and the appendages of greater or less length which depend from it when the animal is in its natural position at the surface of the water. The smaller specimens he states to be the best adapted for examination.

The float is described as consisting of an outer coat, an inner coat and an air-sac contained within them, attached only to one spot of their parietes, and there communicating with the exterior by a small constricted aperture, which was always found on the upper surface. The disposition of the appendages is very irregular, but the larger tentacles are generally placed more externally, the smaller and nascent organs more towards the centre. These appendages are of three kinds, and consist of stomachal sacs, tentacles and cyathiform bodies. Of each of these the author gives a detailed description in their more perfect form, as well as in their undeveloped state as nascent organs; and then proceeds to inquire, first, what is the physiological importance of the organs described, and secondly, what zoological place should be occupied by an animal provided with such organs so disposed.

Each of these questions the author treats at considerable length. Of the function of the stomachal sacs in receiving the prey there can be little question; but it may be doubted whether the digested nutritive matter circulates in the ciliated water-carrying canals or is absorbed into totally different channels. In the latter case the purpose of the stomachal villi would plainly seem to be to absorb nutritive matter and convey it through their central canal to the wide interspace existing between the outer and inner membrane; but the author states that he has never seen in this interspace any corpuscles analogous to those described by Will as blood-corpuscles. He suggests that the villosities noticed by Dr. Milne-Edwards in the stomachal sacs of *Apolemia* are the same organs, and not ovaries as Dr. Milne-Edwards considers them; and observes that similar organs exist in a *Diphyia* (*Eudoxia*), hereafter to be more fully described. The function of the tentacles, both as prehensile and defensive organs, admits of little doubt; and on this subject the author notices an erroneous view of M. Lesson, who describes them merely as ducts for conveying an (hypothetical) acrid fluid from an (hypothetical) poison-gland. He also contests M. Lesson's opinion that certain of the colourless tentacles are to be regarded as branchiæ; being quite convinced that there is no difference between these and the ordinary tentacles except in the absence of colour. As regards the function of the cyathiform bodies, he has no other than analogical evidence to offer. The only organs in the *Acalephæ* with which he conceives them to have any resemblance are the natatorial organs of the *Physophoræ*. But their little adaptation to a similar purpose, and the entire absence even of their rudiments in young *Physaliae*, discourage this comparison; while on the other hand they bear a sim-

gular resemblance to the female generative organs of a *Diphyia*, and this resemblance extends even to the younger stages of both.

Mr. Huxley concludes by referring *Physalia* to the position assigned to it by Eschscholtz among *Physophoræ*, and near *Discolabe* or *Angela*. In fact, he regards *Physalia* as in all its essential elements nothing but a *Physophora*, whose terminal dilatation has increased at the expense of the rest of the stem, and hence carries all its organs at the base of this dilatation.

The paper was illustrated by pencil drawings of the structures described.

Read also a translation * from the Swedish, of "Almanac notes for the year 1735, by Charles von Linné."

* Note by Dr. Wallich.—The Council of the Society did me the honour at the end of last session to entrust the duty of translation to my care. It has been made in the first instance from a communication by Joh. Aug. Holmström, in "Botanical Notices" edited by Al. Ed. Lindblom, No. 12 for December 1845, pp. 210–218, with the following motto and preface. Mr. Bentham having pointed out to me that there existed a German translation by Dr. Beilschmid in the *Flora* for February 1847, pp. 97–104, I have gladly availed myself of this additional aid. Nor have I altogether neglected to consult the precious little relic itself, now in the Society's possession, although of course without any other result than that of verifying the fidelity of Mr. Holmström's edition. All the notes are his with very few exceptions, which have been duly marked. I have taken the liberty of frequently leaving Linnaeus's abbreviations *in statu quo*, and very rarely indeed altered his orthography.

"Parva hæc quippe, et quanquam paucis percontantibus adorata, tamen ignorantibus transcursa."—Apuleius, *Florida*.

Every, even the smallest memorial of a truly and through all ages great man, possesses its value, and deserves to be secured from decay and oblivion. It is on that account that I have thought it my duty to publish these notes of the 'Princeps Botanicorum,' which have accidentally come into my hands. Although containing nothing new, or of great importance, they furnish several valuable data connected with, perhaps, the most remarkable year in the life of Linné; they exhibit, in various points, traces of the peculiar *näveté* of his style, and are therefore, in respect to character alone, not without their value.

The annotations are written on ten pages, interleaved in an almanac having the following title: "Almanach på Året efter Jesu Christi näderika Födelse 1735. Til Skara Horizont, etc. Utreknad och steld af Birger Vassenio, samt vidare fortsättjande af underrettelsen til Retta Tanckar am thenna Synliga Werldennes Systemate, allar Sammanhang.—Skara, Herm. Arnold Möller." 16mo. (Almanac for the year 1735 from the gracious birth of J. C. For the horizon of Skara, &c. Calculated and regulated by Birger Vassenius, together with further instructions concerning right ideas of the system or structure of this visible world.)

The volume is quite complete and well-preserved. It appears, even during Linnæus's lifetime, to have come into the possession of

strangers, and to have been taken into the country and used there, through a succession of years, in lieu of a new almanac; for we find, in three several places, remarks made by peasants' wives on sundry matters. One of its latest male or female owners has even altered with ink the year printed on the title-page for that of 1765. Thus the little brochure has passed into the possession of several individuals, without any of them being aware, or caring, by whom the many notes were added. These notes are numerous, and constitute almost an entire diary, during the first months of the year; after which they become less and less frequent, ceasing altogether in the months of October and November. The complaint of A. Afzelius (in Linné's *Eg. Ant.** *pl. loc.*), that it is difficult to decipher the handwriting of Linnaeus, is often verified here. Yet I think I have hit on the right meaning in most instances. With respect to some of the most difficult places, Professor J. H. Schröder has afforded me explanation with his accustomed sagacity.

The notes are now published with as much accuracy as was possible, even as to spelling and grammar. The words which have been added by way of explanation are included within brackets. Italics indicate that abbreviations have been filled up†. A few notes have been subjoined.

(JANUARY.)

O! Ens entium miserere mei!

1. Christmas dinner with alderman Dan. Moræus.
2. called on *Sara Lisa*¹, in a Lapland dress.
3. the same, absentibus parentibus.
4. prepared a new edition of *Systema Mineral.*²
5. Assessors Benzelstierna and Kolmeter³ called on me.
6. Christmas party at alderman Anders Jers.
7. dined with assessor Kolmeter.
8. commenced writing *Sponsalia plantar.*⁴
9. continued.
10. called on S. L. M. and had a little fun.
11. tried Anders Jers's well.
12. dined at Morbygden with B. Forsling.
13. called on S. L. M., and at Kongsgården⁵, and on me assessor Moræus.
14. Christmas party at Troilli's, surveyor of mines.
15. ——— ——— ——— the provost's at Fahlun with S. L. M.

* Linnæus's Personal Notes, edited by A. Afzelius.—N. W.

† Except on the first mention of a name, I have thought it best to leave the abbreviations unsupplied.—N.W.

¹ Daughter of John Moræus, town-physician (*Stadsphysicus*), brother of the above mentioned. She was afterwards married to Linnaeus on the 26th June, 1738.

² Probably a revision, in manuscript.

³ The future brother-in-law of Linnaeus, married to Anne Christina, the younger daughter of John Moreus.

⁴ Published as a disputation at Upsala, in 1746, 4to.

⁵ North- or Fahlu-Kongsgård.

16. dinner at secretary Neuman's.
N.B. a day of immortal commemoration, of final settling with S. L. M.
17. wrote to baron Koskul, dean Sandel, magister Linder.
18. dined with the lieutenant of the province (Landshöfdingen).
19. Lars Petter¹ dined at a party at engineer (Konstmäster) Trygg's. Betted two tankards of rhenish wine, that there will be a christening (barnsöl) in 4 years.
20. wrote to J. Moræus, S. S.² about S. L. M. Explicitly solicited (her hand).
21. wrote to S. L. M.
22. called on — — —, gave annulum.
23. reciprocation by mother-in-law.
24. wrote to the Society³ cum lachesi Lapponica.
25. remained quiet.
26. noon⁴ (at) alderman Lundström's (with) Näsmann, controller, and Anders and Iöns Williamsons.
27. received from J. Mor. responsio concerning 3 ⊖⁵ secundum abitum. seven temptations!
28. called on Troilli, surveyor of mines; Strömberg, controller; Trygg.
29. called on S. L. M. concluded Floram Dalekarlicam⁶.
30. dined with the lieutenant of the province.
31. wrote to Doctor Celsius, Spelin and Neander about employment.

(FEBRUARY.)

1. attended a woman in childbirth.
2. dined with the provost of Fahlu; in the evening (at) Schultze's, accountant.
3. at the Kongsgård and (with) S. L. M. Gave obligatio scripta fidei.
4. was with a sick person at Morbygden.
6. received letters from Celsius, Spelin, Neander, Liungwal (and) Sophia Littorin.
7. wrote to Spelin, Liungwal, Tegnelin.
8. — — in the evening (with) S. L. M.
9. in the afternoon at a frolic at Morbygden.
10. — — evening (with) S. L. M.
11. with S. L. M. until X o'clock in the evening.
12. paid visits with Browallius⁷.

¹ Quis? ² Socero Suo?

³ The Society of Sciences at Upsala, which had defrayed Linnæus's recent journey into Lapland (in 1732.—B.).

⁴ Probably dined.—N. W.

⁵ Years. This stipulation is notorious. Miss Hedin, Minne (Souvenir) of Linné, i. p. 47.

⁶ Not published.

⁷ "At that time domestic chaplain and tutor in the family of Reuterholm, lieut. of the province, afterwards professor and bishop at Åbo."—Linnæus's Personal Notes, p. 22.

13. paid a visit to F. Ehrenholm absente S. L. M. received letters from Spelin, Osængius, Ahlgren.
14. wrote to dean Sandel (and) Anna Maria Linnæa¹.
16. dined with surveyor of mines Troill and parents-in-law.
17. Surv. of min. Borgenström (and) Svaben called on me².
18. took leave of father-in-law.
19. took leave of S. L. M., who wrote the oath³.
20. at 10 o'clock, left Fahlun with Clas Sohlberg.
21. dined with Swedenstierna (at) Högfors, arrived at Nya Elfsborg.
22. dined with Lybecker, surveyor of mines, arrived at Nora.
23. } remained at Knutsby with surv. of mines Christiernin.
24. }
25. was at the sulphur mine at Dylta, arrived at Örebro.
26. left Örebro.
27. went through Askersund; at noon with pastor Tiselius.
28. through schenninge, arrived at Wislena.

(MARCH.)

1. went to schenninge, called (on) Menlös, pastor loci.
2. —— — — —, at church, dined at Wislena.
3. called on Mag. Knop. Dinner at Bishop Benzelius's.
4. went to Wislena, called on professor Hermens.
5. remained.
6. went through Schenninge and Wastena, visited the church.
7. through Omberg to the end of Östergötland.
8. in Småland through grenna, Skiersadd to Jönköping.
9. at church in Jönköping.
10. dined at dean junbeck's.
11. left; remained at Wrekstad.
12. came to Wexiö.
13. dined at assessor Rothman's.
14. —— — general Koskul's.
15. —— — Höken's⁴.
16. —— — treasurer Bergman's.
17. —— — assessor Rothman's.
18. dined with treasurer Bergman.
19. went to stenbrohult.
23. Browall's letter dated the 7^h March arrived.
24. wrote to inspector Sohlberg, Brovall and S. L. M.
26. we were at möckelsnäs.
30. Browall's letter of 21 March arrived.
31. Doctor Rothman called on me at stenbrohult.

(APRIL.)

3. Rothman left; was at Diö.
6. feasted at Möcklanäs with Ekelund (and) Hök.

¹ Linnæus's sister, married to G. Hök, afterwards dean at Wiresta.

² Surv. of mines Anton Svab. After this follow two illegible words.

³ See 3rd of this month. This *reciprocal* obligation by a written oath was not known before.

⁴ Linnæus's brother-in-law.

7. feasted at stenbrohult with brother-in law (and) Törnquist.
8. feasted at Diö with brother-in-law.
9. —— — Dito — ————— and Unner.
13. Mag. Hök left us at stenbrohult.
15. took leave of stenbrohult and its inhabitants, arrived at the Ry iron mine at Unner's.
16. at noon at grotteryd; arrived at the inn at Markary.
17. arrived at Helsingborg.
18. Day of prayers; went across the sound after evening prayer.
22. embarked at Helsingör.
24. sailed past Zealand (and) Copenhagen.
25. got sight of german ground.
26. S. L. M's birth-day. 1716¹.
26. arrived at Lybeck.
27. at church at Lybeck.
28. went to Hamburgh.
29. inspected the town of Hamburgh.
30. called on prof. Koul.

(MAY.)

1. Prof. Koul called on me, visited Sprekelsons Hort.
2. inspected Nators cabinet and Hydram.
3. at the Resident's², and Sprekelson's.
4. dined at Schöning's and entertained Kohl (and) Jenes³.
5. (walked) with Sprekelson in hort. 1 ducat.
12. at a dinner party at Sprekelsons.
13. Carl Linnæi birth-day⁴.
13. wedding at Schönnings.
14. 35 daler 7 öre silvercoin due to me⁵.
15. visited Anderson's cabinet, drank 75 years old Rhenish wine.
16. took leave of Hamburgh for Altona.
17. at 9 o'clock ☾⁶ embarked.
18. arrived at stören, remained at wefwelsflyt.
19. at church at wäfvelsflyt, detained by contrary Δ⁷.
26. the environs of groeningen in sight.
27. saw gröningen.
28. got sight of Wästfriesland, refreshment at Stiernkoog⁸.
29. remained right opposite Stiernkoog.
30. went across the sea, saw omerland, an island⁹ of 3 miles, very near being wrecked.
31. at 5 o'clock in the morning passed by Harlem¹⁰ a small sea-

¹ By a singular conceit of Linnaeus ("qvam sunt lusus pueriles amoris"!), the name and year of birth of his betrothed are written with reversed letters and cyphers.—The pedigree in Personal Notes gives another day, namely the 28th April.

² Should this be the President's, as Dr. Beilschmid translates it?—N. W.

³ More correctly Jänitsch, Gottfr. Jac., physician. Compare Personal Notes, pp. 23 and 83; Hedin, i. p. 50.

⁴ This entry, too, is made with larger, reversed letters.

⁵ Quis ? ⁶ ☾ daytime.

⁸ Schiermonigkoog. ⁹ Ameland.

⁷ Δ wind.
¹⁰ Harlingen.

town; at noon (passed) Yorge. in the evening (at) Enkhysen, situated on our left. At noon a terrible hurricane with rain, wind, thunder, lightning. Haddervik to the eastward, we could not see. Enkhysen was the first (pretty place¹) of Holland.

(JUNE.)

1. obliged to continue off Enkhysen till noon, on account of the storm and contrary wind. afterwards on our right saw Horn, a town.
2. arrived early in the morning at Amsterdam; in the afternoon I saw Hortum Medicum there.
3. called on prof. botanices Burman, and at his library.
4. inspected Seba's incomparable dispensary.
5. dined at Burman's, (in) the evening went to Hadderwik.
6. at 3 o'clock in the morning arrived at Hadderwik. inspected the academy. Heard prof. Lom's introduction.
7. post Examen creatus fui Candidat. medic.
8. Recepit a Promotore Diss.² meam censuratam et typographo tradidi imprimendam.
9. } audivi Lectiones privatas Prof. de Gorter.
10. } 12. Linnæus Doctor Creatus fuit Harderovici³.
13. left Hadderwik in the evening.
14. arrived at Amsterdam.
15. was at the plantations and saw crowds of people.
16. took 7 ducats, total 8 ducats⁴.
18. went to Leyden.
19. saw Hortum academicum.
20. called on prof. v. Royen.
21. saw the library.
27. Artedi arrived at Leiden. saw the Arboretum of Boerhaave.
30. sent *Systema Naturæ* to the press⁵.

(JULY.)

14. (3. *old style*⁶) botanized on the sea-shore.
6. went to Amsterdam.
8. went to Leiden.
15. completed the *Systema nat.*⁷
16. wrote to Rothman and my father.
17. went to Ytrecht. inspected Hort. Acad.

¹ These very indistinct words are given conjecturally.

² *Nova hypothesis de febrium intermittentium natura.* Diss. grad. Harderovici, 1735, 4to.

³ The 13th, according to Pers. Notes, p. 24. ⁴ Compare 5th May.

⁵ The printing commenced; see further on, the 15th July and 2nd (13th) December.

⁶ This and some of the subsequent dates are according to the *new style*, quoted in a separate column in Vassenius' Almanac. In these cases I have added the old style dates within brackets.

⁷ Finished the manuscript.

18. went to Leiden with Gronov. and Mouschenbr.
22. went to Amsterdam, stayed with prof. Burm.
28. literæ ad uxorem¹.
29. sent to press Bibliotheca Botanica².

(AUGUST.)

12. (1. old style) received a bill of exchange for 200 Dollar silvercoin from Sohlberg.
13. (2. o. s.) went to Cliffort.
14. (3. o. s.) returned home.
17. (6. o. s.) went to Leiden.
19. (8. o. s.) arrived at Amsterdam.
- (18.) Appointed Præfectorus Horti Cliffortiani.
19. wrote to Inspector Sohlberg, Browall (and) S. L. M.

(SEPTEMBER.)

13. took charge of præfecturam horti Cliffort.
27. } (16–17. o. s.) horâ 1 noctis Artedi was drowned at Am-
28. } sterdam.

(DECEMBER.)

13. (2. o. s.) Promotio cum Kappa Lugduni³. Concluded the printing of Systema Nat.⁴

ZOOLOGICAL SOCIETY.

July 25, 1848.—William Yarrell, Esq., Vice-President, in the Chair.

The following papers were read:—

1. DESCRIPTION OF A NEW GENUS AND SPECIES OF SATYRIDÆ.
By W. HEWITSON, Esq.

The genus *Corades*, which Mr. E. Doubleday has named and kindly characterized for me, comprises but few species of butterflies, most of which are of recent occurrence. They are from the mountainous districts of Columbia and Venezuela, where, like our European Hipparchias of the same family, they delight in the alpine districts. They are remarkable for having the anal angle of the lower wings more or less produced into a tail.

Genus CORADES, Boisd. MSS.

Head of moderate width, hairy; maxillæ about two-thirds the length of the body, rather slender. Labial palpi porrect, ascending, longer than the head, clothed with hairs and scales, the scales at the

¹ Jocose ita dixit. Cic.

² Left the press only in 1736 at Amsterdam, small 8vo.

³ Cappa (medieval Latin), doctor's gown. See Du Fresne, Gloss. Lat. i. p. 856, et Gloss. Graec. p. 584. Sperling ad Testam. Absolonis, p. 105.

⁴ The printing finished. This editio princeps, which is very rare in Sweden, has the following title: Caroli Linnaei Systema Naturæ, sive Regna tria Naturæ, systematicæ proposita per Classes, Ordines, Genera, et Species. Lugd. Bat. ap. Haak, 1735. Fol. maj.—14 pages. The original manuscript is preserved at the *Carolinska Institutut*, at Stockholm. Comp. Beckman's Minnen (Recollections), p. 112.

back of the second joint forming a tuft before the apex. First joint short, subcylindric, curved, stoutest at the base. Second joint three times the length of the first, subcylindric, slightly curved at the base, incrassated towards the apex, which is truncate. Third joint slenderer than the second, about half its length, nearly cylindric, obtuse at the apex. Eyes nearly round, not very prominent, smooth. Antennæ less than two-thirds the length of the body, slender, grooved below, thickening gradually into a slender obtuse club.

Thorax moderately stout. Anterior wings subtriangular; the anterior margin slightly arched, the outer nearly straight, three-fifths the length of the anterior; inner margin nearly straight, four-fifths the length of the anterior. Costal nervule swollen at its origin, terminating beyond the middle of the anterior margin; subcostal nervure rather slender, throwing off its first nervule at a short distance before, its second immediately before the end of the cell, the third at a point about as far beyond the end of the cell as the origin of the first is before it, its fourth about as far beyond the third as the origin of this last is distant from the origin of the second. Fourth subcostal nervule terminating at the apex of the wing: upper disco-cellular nervule very short; middle and lower disco-cellular nervules about equal, the former curved inwards, the latter outwards; a rudimentary discoidal nervule extending inwards from the middle disco-cellular nervule: median nervure swollen at its base, its third nervule bent at a considerable angle where it is joined by the lower disco-cellular: submedian nervure stout, curved near the base: internal nervure wanting. Posterior wings obovate, produced into a short tail at the anal angle; the anterior margin nearly straight, the outer much curved; the abdominal fold ample. Precostal nervule stout, curved inwards: costal nervure rather stout, curved at its origin: subcostal nervure rather stout, bent at a considerable angle where the costal separates from it; its second nervule angular where the straight upper disco-cellular nervule anastomoses with it. Discoidal nervule extending into the cell: lower disco-cellular nervule straight, longer than the upper, anastomosing with the discoidal nervure a long way beyond the anastomosis of the upper disco-cellular. Third median nervule bent at nearly a right angle where the lower disco-cellular anastomoses with it. Anterior legs of the male slender, thinly clothed with scales and long delicate hairs; the femur rather shorter than the tibia; the tarsus little more than two-thirds the length of the tibia, one-jointed, nearly cylindric. Anterior legs of the female rather slender, clothed with scales and a few long fine hairs. Femur and tibia of about equal length, the latter nearly cylindric; the apex slightly stoutest, thinly spiny both within and without. Tarsus shorter than the tibia, five-jointed, the first joint more than twice the length of the rest combined; these all transverse: first to fourth bispinose at the apex; second and fifth with a tuft of hair on each side at the base. Middle and posterior feet with the femora rather stout; the tibiae very spiny all round, their spurs stout; the tarsi densely spiny above, and, except the fifth joint, spiny below; the spines below arranged somewhat in two series, the first joint longer than the rest combined, second about one-third the length of the

first, third three-fourths the length of the second, fourth rather more than half the length of the third, fifth not quite so long as the third. Claws curved, acute, grooved below; paronychia bilaciniate; the outer lacinia slender, pointed, not so long as the claw; the inner lancet-shaped, much broader than and nearly as long as the outer, very hairy; pulvillus jointed, broad, not so long as the claws. Abdomen rather short, not robust.

This interesting genus, as remarked above, appears to be almost confined to the eastern slopes of the Andes and to the great branch of that mountain-range which runs along the northern parts of South America. Nearly all the specimens of the five or six species belonging to it existing in British collections were sent home by Mr. Bridges from the eastern parts of Bolivia, and by Mr. Dyson from Caraccas. The peculiar sexual scales on the disc of the anterior wings of the males resemble those of the males of most species of this family in being long, tapering to a delicate hair-like point, at the end of which is a little plumelet.

In form this genus resembles the *P. Actorion* of Linnaeus, which is the type of the genus *Napho* of Boisduval, but that insect belongs to the preceding family of *Morphidae*.

CORADES ENYO. *Cor. alis omnibus, supra, chocoladinis, anticarum apice obscuriore, fulvo-maculatâ; subtus, anticis fuscouscentibus apice pallidiori, maculis tribus albidis notati, posticis fusco-griseoscentibus, lineis duabus transversis obscurioribus.*

Exp. $2\frac{1}{2}$ unc. vel 65 mill. *Hab.* Caraccas.

Anterior wings, above chocolate-brown at the base, darker at the apex and along the outer margin; between the cell and the apex is a transverse band composed of three fulvous spots, the first of which is divided by the subcostal nervure; midway between the cell and the outer margin a curved spot of the same colour, divided by the first median nervule, and a rounded spot of the same colour near the anal angle. Posterior wings with the anal angle considerably produced into a tail, entirely chocolate-brown. Below, the anterior wings are fuscous, the base rather paler, the apex ashy; the subapical spots nearly white, the others as above; the posterior wings clouded and freckled with ashy-grey and fuscous, having a slight silvery reflection; a transverse band, commencing on the costa, crosses the middle of the cell, and terminates before it reaches the inner margin; a second similar band commences on the costa, and running along the lower disco-cellular nervule, terminates at the tail.

Head, thorax and abdomen fuscous above, the two latter greyish below; antennæ fuscous; palpi fuscous above, pale below.

This insect was taken by Mr. Dyson in the mountains of Caraccas, where it seems to be rather rare.

2. DESCRIPTION OF A NEW GENUS OF NOTODONTIDÆ. BY E. DOUBLEDAY, F.Z.S.

Genus HYLÆORA.

Head small, densely clothed with long hair-like scales, those at the base of the antennæ very long, forming two tufts, which meet over the vertex. Eyes round, prominent. Maxillæ slender, short, scarcely

so long as the thorax. Labial palpi short, the first and second joints densely scaly, the scales hair-like, the third joint clothed with short scales : first joint much curved, broadest at the apex ; second joint one-half longer than the first, subcylindric, stoutest in the middle, truncate at the apex ; third joint small, oval, about one-third the length of the second joint. Antennæ of the male elongate, densely bipectinate, each pectination beautifully fringed with hairs : of the female long, setaceous, the inside set with short stiff hairs.

Thorax stout, crested, the crest much highest in front. Anterior wings elongate, the anterior margin but little curved until near the apex ; outer margin rather more than half the length of the anterior, slightly dentate ; inner margin nearly straight, rather longer than the outer. Costal nervure extending about three-fourths the length of the costa. First subcostal nervule thrown off beyond the middle of the cell, terminating not far from the extremity of the costal nervure ; second subcostal nervure thrown off shortly before the end of the cell, curved so as to cross the subcostal nervure at some distance beyond the end of the cell, terminating on the outer margin midway between the fifth subcostal and the first discoidal nervule ; third subcostal nervule arising rather nearer to the end of the cell than to the apex of the wing ; the fourth nearer to the third than to the apex, this nervule terminating at the apex. First discoidal nervule appearing at first sight to be a continuation of the subcostal nervure, the upper disco-cellular nervule being wanting. Lower about the same length as the middle disco-cellular nervule, united to the third median nervule shortly after its origin. Posterior wings with the anterior margin nearly straight, longer than the outer, which is rounded. Inner margin about two-thirds the length of the outer. Cell closed. Upper and lower disco-cellular nervule of about equal length. Discoidal nervure very slender ; the basal portion, as far as the end of the cell, atrophied. Legs with the femora and tibiae densely hairy. The anterior tibiae with a broad spur, nearly as long as the tibia itself, composed of a flat, slightly curved lancet-shaped lamina, fringed anteriorly. Tibiae of the middle pair with two unequal spines at the apex, those of the third pair with two before the apex, two at the apex. Tarsi scaly, the first joint much the longest ; claws small, curved ; paronychia broad, very hairy, especially at the apex, shorter than the claw ; pulvillus jointed, the second joint very broad. Abdomen clothed with long hairs, elongate, longer in the male than in the female.

Larva stout, tapering towards the tail, the back flat, with a crenated ridge on each side.

HYLÆORA EUCALYPTI. *Hyl. alis anticis brunneis, nigro pallidoque variis, maculâ basali, alterâque geminatâ marginis anterioris, vittâ pone medium valde angulatâ, fasciâque marginis exterioris fuscis; posticis rufo-brunneis.*

Exp. alar. $3\frac{1}{2}$ unc. – $4\frac{1}{4}$ unc. vel 90–108 millim.

Hab. Australia.

I have not thought it necessary to enter into a detailed specific character of this insect, as the accompanying figure will give a far better idea of the species than the longest description. The noc-

turnal Lepidoptera are often almost impossible to describe, and it is only by the most accurate figures, or by comparison of specimens, that we can arrive at the determination of species.

I am indebted to Mr. Alfred Lambert of Sydney for the specimens figured and for the drawing of the larva. The following note accompanies the specimen :—

"The larva is figured in drawing No. 2. When I first found it I concluded that it was a *Cerura*, as in its habits it resembles the larva of that genus. It forms a strong cocoon, which is slightly attached to the trunk of the tree just below the surface of the ground. In form this cocoon is much like that of our common *Saturnia*, only exteriorly it is covered with points of sticks, grass, &c. The larva feeds on the *Eucalypti*, is found in January; the imago appears in July."

From this it will be seen that it is a winter insect.

3. DESCRIPTION OF TWENTY-NINE NEW SPECIES OF HELICINA, FROM THE COLLECTION OF H. CUMING, ESQ. BY DR. L. PFEIFFER.

1. *HELICINA ACUTA*, Pfr. *Hel. testā depresso-conicā, solidulā, obliquē confertim striatā et subgranulatā, opacā, luteā, supernè rubro-unifasciatā; spirā conoidea, acutā, mucronatā; anfractibus ferè 6 planiusculis, acutē carinatis, ultimo basi planiusculo; apertura perobliquā, subtriangulari; columellā subverticali, brevissimā, basi angulatā, supernè in callum basalem tenuissimum abiente; peristome simplice, aurantiaco, margine supero subrecto, basali subin-crassato.*

Diam. 15, altit. $7\frac{1}{2}$ mill.

From Sibonga, isle of Zebu; collected by Mr. Cuming.

2. *HELICINA ADAMSIANA*, Pfr. *Hel. testā depresso-conicā, tenuiusculd, sub lente seriebus confertis concentricis pustularum exiguarum subasperatā, nitidulā, diaphand, rubellā; spirā brevissimē conoidea; anfractibus $5\frac{1}{2}$ planiusculis, ultimo depresso, peripherid rotundato, anticē non scrobiculato; apertura obliquā, subtriangulari; columellā verticali, brevissimā, basi subangulatā, supernè in callum tenuem, circumscripum dilatatā; peristome angulatim expanso, reflexusculo, margine supero breviter soluto, stricto, basali prope columellam subdentato.*

Diam. 8, altit. $4\frac{1}{3}$ mill.

From Jamaica.

3. *HELICINA AMENA*, Pfr. *Hel. testū subsemiglobosā, solidiusculd, obliquē striatulā lineisque impressis concentricis distantibus sculptā, nitidulā, roseo et luteo vel albo variegatā; spirā convexa, mucronulatā; anfractibus $5\frac{1}{2}$ vix convexiusculis, ultimo infra medium carinato, basi subplano; apertura obliquā, subtriangulari, intus flavid; columellā brevi, verticaliter subrimatā, basi angulosā, retrorsum in callum tenuem, diffusum abiente; peristome simplice, margine supero latē expanso, basali reflexo.*

Diam. 15, altit. $9\frac{1}{2}$ mill.

From Honduras.

4. *HELICINA BESCKEI*, Pfr. *Hel. testā subsemiglobosā, solidā, subtilissimē striatulā, sublavigatā, opacā, citrinā unicolore vel fasciā*

1 sanguineā juxta suturam ornatā, vel omnino rubicundā; spirā brevi, convexo-conoideā, submucronatā; anfractibus 5 subplanis, ultimo ad peripheriam carinā 1 acutā, pluribusque obtusioribus munito; apertura obliquā, subtriangulari; columellā breviter recessente, basi obsoletē angulatā; peristome expando, subincrassato, margine supero strictiusculo, basali subarcuato; callo basali tenuissimo.

Diam. 17, altit. 10 mill.

From Brazil (Bescke).

5. *HELICINA CAMPANULA*, Pfr. *Hel. testā campanulato-conicā, solidula, lavigatā, nitidā, citrina; spirā elevatā, convexa, acuminatā; anfractibus 6 planiusculis, ultimo pone aperturam subconstricto, basi planulato; apertura obliquā, semilunari-subtriangulari; columellā breviter recessente, basi subtruncatā, callum nitidum, semi-circularem emittente; peristome simplice, tenui, breviter expando, margine basali strictiusculo.*

Diam. $8\frac{1}{3}$, altit. 7 mill.

From the island of Cuba.

6. *HELICINA CONCENTRICA*, Pfr. *Hel. testā depressē trochiformi, tenuiusculd, striis longitudinalibus et obliquis sub lente subtilissimè sculpta, lineis concentricis elevatis utrinque munita, acutē carinatā, nitidula, carneo-fusca, albido variegata; spirā conoidea, subpapillata; anfractibus $4\frac{1}{2}$ vix convexiusculis, ultimo utrinque convexiore; apertura obliquā, subsecuriformi, latiore quam altd; columella subrimata, breviter arcuatā, basi incrassata in callum album subcircumscripsum retrorsum dilatata; peristome simplice, breviter expando, margine basali immediatē in columellam continuato.*

Diam. 10, altit. vix 6 mill.

From Venezuela and New Granada (De Lattre); a larger variety from Mirador, Mexico (Galeotti).

7. *HELICINA CONSTRICTA*, Pfr. *Hel. testā parvā, lenticulari, crassd, sublavigatā, non nitidā, opaca, albida, lineis undulatis rubris picta; spirā vix elevatā, obtusa; anfractibus $4\frac{1}{2}$ planulatis, ultimo angulato, basi subturgido, pone aperturam constricto; apertura obliquā, subtriangulari, intus rubra; columellā simplice, callum crassiusculum albium vel igneum retrorsum emittente; peristome simplice, obtuso, latere dextro rotundato.*

Diam. 6, altit. $3\frac{1}{2}$ mill.

From Otaheite and the Sandwich Islands.

8. *HELICINA CONVEXA*, Pfr. *Hel. testā convexo-orbiculatā, solidā, lavigatā, nitidā, alba; spirā fornicatā, mucronulatā; anfractibus $4\frac{1}{2}$, ultimis 2 convexiusculis, ultimo obsoletissimè angulato; apertura integrā, obliquā, semilunari; columellā breviter arcuatā, retrorsum in callum crassum, concolorem abiente; peristome incrassato, breviter expando, margine basali à callo columellari incisurā levissimè separato.*

Diam. $6\frac{1}{2}$, altit. $4\frac{1}{2}$ mill.

Locality unknown.

9. *HELICINA CUMINGIANA*, Pfr. *Hel. testā subglobosā, tenuiuscula, longitudinaliter et confertim plicatula, carneā, rubro punctatā et*

variegatā; spirā brevi, conoidea, obtusiusculā; anfractibus 5½ planiusculis, ultimo inflato, obsoletē angulato; aperturā subverticale, semiovali; columellā basi dilatatā, antrorsum arcuatā, subtruncatā, retrorsum in callum basi crassum, supernè diffusum abiente; peristomate subincrassato, breviter expanso, albo.

Diam. 21, altit. 16½ mill.

Locality unknown.

10. HELICINA DYSONI, Pfr. *Hel. testā orbiculato-conoidea, solidiusculā, striatulā, nitidulā, carneā, supernè fasciis 2 angustis, saturatoribus ornata; spirā clatā, obtusiusculā; anfractibus 5 convexiusculis, lente accrescentibus, ultimo basi subplanato; aperturā obliquā, semiovali, altiore quam latā; columellā brevi, basi subtruncatā, callum albido, linea subimpressa circumscriptum emitente; peristomate simple, brevissimè reflexiusculo, margine utroque leviter arcuato.*

Diam. 8, altit. 5½ mill.

β. *Minor, testā saturatē carnē, supernè fasciis 2 angustis rubris et ad peripheriam 1 albū.*

γ. *Testā fulvo-rubella, supernè fasciis 2 angustis saturatoribus.*

δ. *Minor, testā flavā, supernè fasciis 2 angustis fulvis, ad peripheriam 1 albida ornata.*

From Cumana, Honduras (Dyson).

11. HELICINA EXIGUA, Pfr. *Hel. testā minutissimā, conicā, tenui, subtilissimè punctato-striatulā, pellucidā, pallide cornē; spirā conicā, obtusiusculā; anfractibus 5 perconvexis, ultimo obsoletē angulato, basi planiusculo; aperturā obliquā, lunari; columellā breviter recedente, callum exiguum emitente; peristomate simple, tenui.*

Diam. 2½, altit. 2 mill.

From Honduras (Dyson).

12. HELICINA FUNCKI, Pfr. *Hel. testā conico-subglobosa, tenuiusculā, sub lente tenuissimè obliquè striatulā, vix nitidulā, flavidā, roseo-nebulosa; spirā conoidea, obtusiusculā; anfractibus 5½ planiusculis, ultimo utrinque convexitore, obsoletē angulato; aperturā obliquā, semiovali; columellā subarcuatā, linea impressa verticali notata, basi subnodosa, in callum sensim tenuiorem retrorsum abiente; peristomate latē expanso, margine supero subrepando.*

Diam. 13½, altit. 9 mill.

From San Yago, New Granada (Funck).

13. HELICINA GONOCHEILA, Pfr. *Hel. testā conoideo-subglobosā, tenuiusculā, supernè striis spiralibus obsoletis sculpta et punctata, nitidulā, fulvo-carnē; spirā brevi, conoidea, subacutā; anfractibus 4½ vix convexiusculis, ultimo medio subcarinato, luteo-cingulato, basi convexitore, distinctius concentricè striato; aperturā subobliquā, triangulari-semiovali, altiore quam latā; columellā subrecedente, supernè lineam impressam, brevem, curvatam emitente, basi acutē dentatā; peristomate albo, rectangulē latē patente, margine basali substricto, cum columellā angulum acutiusculum formante.*

Diam. 10, altit. 6½ mill.

From Venezuela.

14. *HELICINA GOSSEI*, Pfr. *Hel. testá depresso-globosá, solidá, pustulis seriatís subasperatá, nitidulá, fuscidulo-rubrá; spirá convexa; anfractibus 4½ parum convexis, ultimo rotundato; aperturá triangulári-semiovali, intus carneá, nitidá; columellá basi truncatá, retrorsum in callum crassum carneum abiente; peristomate subin-*

crassato, expanso, juxta columellam vix emarginato.

Diam. 19, altit. 13½ mill.

From Jamaica (Gosse).

15. *HELICINA GULDINGIANA*, Pfr. *Hel. testá depressá, tenuiusculdá, sub lente subtilissimè granulatá, diaphaná, straminea vel albida, infra suturam fulvo-unifasciatá; spirá brevi, convexa; anfractibus 4 vix convexiusculis, ultimo subdepresso, basi vix convexiore; aperturá obliqua, subtriangulari-semiovali; columellá brevi, excavata, antrorsum in denticulum desinente, retrorsum in callum tenuem, semicircularem, flavescentem expansa; peristomate tenui, breviter reflexo, margine supero repando, basali incisurá levi à columellá separato.*

Diam. 8, altit. 4½ mill.

Locality unknown.

16. *HELICINA HANLEYANA*, Pfr. *Hel. testá globoso-conicá, solidá, lineis concentricis, impressis, subdistantibus sculpta, vix diaphana, nitidá, fulvo-carnéa; spirá breviter conoidea, obtusiuscula; anfractibus 5 vix convexiusculis, ultimo rotundato, anticè subdescendente; aperturá parum obliqua, subsemicirculari; columellá brevissima, extrorsum denticulatá, callum tenuem, albidum, diffusum emitente; peristomate albo, vix expansiusculo, intus sub-incrassato, basi in denticulum columellæ abiente.*

Diam. 7½, altit. 5½ mill.

From New Orleans (Mr. Salle).

17. *HELICINA KIENERI*, Pfr. *Hel. testá conoidea, tenuiuscula, obliquè striatá, lineis concentricis confertis subtilissimè decussatá, albida, fusco-violaceo marmorata; spirá convexo-conoidea, acutd; anfractibus 5½ vix convexiusculis, ultimo compressè carinato, basi convexiore; columellá recedente, planata, superne impressa, basi incrassata in callum basalem tenuem abiente; aperturá obliqua, integrá, semiovali, altiore quam latá; peristomate simplice, tenui, latè expanso.*

Diam. 16, altit. 11½ mill.

Locality unknown.

18. *HELICINA LINDENI*, Pfr. *Hel. testá globoso-conicá, tenuiusculdá, subtilissimè striolatá et punctatá, subdiaphana, pallide straminea vel carnéa; spirá conicá, acutiuscula; anfractibus 6 vix convexiusculis, ultimo inflato, obsoletè angulato; aperturá integrá, parum obliqua, semiovali, altiore quam latá; columellá leviter arcuatá, extrorsum in denticulum desinente, callum emitente exiguum, tenuem; peristomate breviter expanso, reflexiusculo.*

Diam. 11½, altit. 8½ mill.

From Tapinaba, Mexico (Linden).

19. *HELICINA ORBIGNYI*, Pfr. *Hel. testá depressa, sublenticulari,*

solidá, striatulá, vix nitidá, fusco-carned; spird vix elatá; anfractibus 4½ planiusculis, ultimo depresso, subangulato; apertura obliquá, semiovali, altiore quam latá; columellá brevi, basi antrorsum dentatá, callum albido, semicircularem retrorsum emittente; peristomate recto, subincrassato, juxta dentem columellæ non emarginato.

Diam. 7½, altit. 4 mill.

From the island of Cuba.

20. *HELICINA OWENIANA*, Pfr. *Hel. testá conicá, tenui, lævigatá, sub lente lineolis impressis, antrorsum obliquis subtilissimè sculpta, nitida, pellucidá, stramineá, sursum saturatiore; spird conicá, vertice obtusiusculo, castaneo; suturá linearí, albo-marginatá; anfractibus 6 planis, ultimo basi planiusculo; aperturá subobliqua, semiovali; columellá brevi, verticaliter rimatá, callum tenuissimum retrorsum emittente; peristomate aurantiaco, angulatim patente, reflexiusculo, margine utroque levissimè curvato.*

Diam. 9, altit. 7½ mill.

From Chiapas, Mexico (Ghiesbreght).

21. *HELICINA PLICATULA*, Pfr. *Hel. testá depressè conoidea, solidulá, obliquè regulariter et elegantissimè plicata, nitida, corned; spird brevi, conoidea, acutiuscula; anfractibus ferè 5 convexiusculis, ultimo supernè impresso, peripheria obsoletissimè angulato; aperturá obliqua, semilunari; columellá brevissimá, simplice, in callum tenuissimum diffusa; peristomate subincrassato, carneo, margine supero sinuato, basali juxta columellam subdentato.*

Diam. 5, altit. 3 mill.

From the island of Martinique.

22. *HELICINA REEVEANA*, Pfr. *Hel. testá conicá, solidulá, striis incrementi distinctis et lineolis obliquis impressis confertissimis sub lente clathratulá, nitidulá, albida, rufo nebulosa et tæniata; spird elevata, acutiuscula; suturá impressa; anfractibus 6 convexiusculis, ultimo angulato, basi vix convextiore; aperturá subsemiovali, intus castanea; columellá brevissimá, horizontaliter in callum parvulum, album, expansa; peristomate albo, angulatim patente, margine basali leviter arcuato, cum columellá extus subangulatum juncto.*

Diam. 8½, altit. 6 mill.

From Cuba.

23. *HELICINA ROHRI*, Pfr. *Hel. testá conoidea, crassá, striatula et submalleata, opaca, vix nitidula, stramineo-albidá vel purpurea, albo-fasciatá; spird conoidea, acutiuscula; anfractibus 4½—5 planiusculis, ultimo supernè turgido, ad peripheriam carinat acutá, compressa, prominente munito, anticè deflexo, basi vix convexo; aperturá obliqua, parvula, semiovali, altiore quam latá; columellá subsimplice, basi obsoletè tuberculata, callum semicircularem altè retrorsum emittente; peristomate recto, acuto, intus crassè albo-labiato, margine supero emarginato.*

Diam. 10, altit. 7 mill.

From the Marquesas Islands (Rohr).

24. **HELICINA SANGUINEA**, Pfr. *Hel. testá conoideo-orbiculatá, crassá, punctato-striatuld, opacâ, sanguined; spiri brevi, conoideâ, acutiuscul; anfractibus 4½ planis, ultimo utringue convexiusculo, medio subangulato; aperturâ obliquâ, subtriangulari, altiore quam latâ; columellâ basi antrorsum dentatâ, callum tenuem, semicircularem retrorsum emittente; peristomate recto, intus sublabiato, margine basali strictiusculo.*

Diam. 10½, altit. 6 mill.

Locality unknown.

25. **HELICINA (TROCHATELLA) SEMILIRATA**, Pfr. *Hel. testá conico-globosa, solidâ, opacâ, flavidâ, supernè confertim albo-lirata; spirâ conicâ, acutiusculâ; anfractibus 5½ planiusculis, ultimo convexiusculo, carinato, basi subtilissimè concentricè striato; aperturâ perobliquâ, subtriangulari; columelli simplice, immediatè in marginem basalem abiente; peristomate incrassato, angulatim expanso, marginibus callo tenuissimo junctis, supero sinuato.*

Diam. 10½, altit. 7½ mill.

From Venezuela (Linden).

26. **HELICINA SOWERBIANA**, Pfr. *Hel. testá depresso trochiformi, tenuiusculd, lineis impressis spiraliter sulcatâ, albâ; spirâ conicâ, acutiusculâ; anfractibus 6 planiusculis, ultimo subcarinato, basi convexiusculo; aperturâ parum obliquâ, subtriangulari; columelli tenui, basi nodiferâ; peristomate simplice, angulatim expanso, margine supero sinuato; callo basali tenuissimo.*

Diam. 21, altit. 14 mill.

From Guatimala (De Lattre).

27. **HELICINA TENUILABRIS**, Pfr. *Hel. testá subglobosâ, solidiusculâ, sublævigatâ, albo et cinnamomeo variegatâ et subfasciatâ; spirâ breviter conoided, acutiusculâ; anfractibus ferè 5 planiusculis, ultimo utringue convexo, anticè vix descendente; aperturâ obliquâ, semiovali, intus cerasinâ, pallido-fasciatâ; columellâ recedente, angustâ, retrorsum in callum tenuem dilatatâ, basi immediatè in peristoma tenue, expansiusculum, abiente.*

Diam. 10, altit. 7 mill.

Locality unknown.

28. **HELICINA TENUIS**, Pfr. *Hel. testá turbinatâ, tenuissimâ, vix striatuld, pellucidd, corneo-albidâ, rubro obsoletè trifasciatâ; spirâ conicâ, acutâ; anfractibus 6 vix convexiusculis, ultimo basi planiusculo; aperturâ ferè verticali, triangulari-semiovali; columellâ brevi, basi retrorsum subdentatâ, supernè in callum nitidum, circumscriptum, dilatatâ; peristomate tenui, angulatim expanso, margine basali cum columellæ basi angulum formante.*

Diam. 11, altit. 8½ mill.

From Yucatan.

29. **HELICINA UNIDENTATA**, Pfr. *Hel. testá depresso, tenuiusculâ, liris concentricis alternatim validis, obtusis et minoribus cinctâ, diaphanâ, nitidulâ, rubella; spirâ vix elevatâ; anfractibus 4½ depressis, ultimo anticè descendente, basi medio profundè excavato; aperturâ perobliquâ, latè lunari; columelli simplice, retrorsum in*

*callum albidum circumscriptum dilatata; peristome expando,
intus albo-labiato, margine basali prope columellam dente magno,
prominente, instructo.*

Diam. 5, altit. 2½ mill.

From Honduras (Dyson).

MISCELLANEOUS.

Descriptions of Owls presumed to be undescribed. By JOHN CASSIN.

Epialtes sagittatus, nobis. Adult? Entire plumage above rufous brown, inclining to chestnut; plumage of the head with small pale spots encircled with black, bordering the shafts of the feathers, and near the tips assuming a hastate or sagittate form.

Plumage of the back with every feather having about three to five spots of the same description, the arrow-headed shape and black border distinct and well-defined, some of the spots nearly white; every feather also with very fine transverse lines, and minutely dotted or freckled with black.

Wing-coverts with pale, nearly white, sagittate spots encircled with black. Internal coverts of the wings pale fawn yellow, more or less spotted with black, and with their tips broadly terminated with black, which forms a conspicuous bar on the inferior surface of the wing. Outer edge of scapulars nearly white with black spots. External webs of primaries with alternate bands of pale and darker rufous brown; internal webs much darker, with nearly black bands alternating with others slightly paler, which (the paler) are mottled with black towards the extremities of the quills. Exposed ends of the secondaries rufous brown, with large pale spots on the shafts, approaching the sagittate form, with their black borders extending into transverse narrow bands. First primary shortest, fifth and sixth longest.

Feathers encircling the eyes, and the long bristle-like feathers at the base of the bill dark chestnut-brown, the latter freckled with black; between the eye and the cavity of the ear whitish, with transverse lines, and broadly tipped with deep rufous brown. Feathers of the ruff white at their bases, with narrow transverse lines of deep rufous, but presenting a broad subterminal band of pure white, every feather terminated with a semicircular or lunular band of bright rufous brown.

Front and superciliary region white, the feathers of the former with their shafts and with some minute marks of very dark brown; superciliary feathers with well-defined tips of nearly black. Shorter (or anterior) feathers of the ear-like tufts white, with minute transverse lines and freckles of rufous brown; longer feathers of the tufts brown on their external and white on their internal webs, transversely lined and tipped with darker brown.

General colour of the under surface of the body very pale rufous and sordid yellowish white, on the breast with every feather having about five to seven very narrow transverse bands more or less di-

stinctly defined, of blackish brown, and minutely and irregularly dotted with the same colour. Abdominal region with the bands less numerous, and many of the feathers having several irregularly shaped, though rather rounded and sagittate spots of nearly black.

Tarsi covered to the toes with pale rufous whitish feathers. Toes naked.

Tail same rufous brown as the back, with alternate bands of darker and paler shades; in some instances the paler band on the external opposite to the darker band on the internal web.

Bill and feet yellow, claws long and slender.

Total length of skin about 10 inches, wing 7, tail $4\frac{1}{4}$.

Very young. Upper surface of the head and body pale yellowish and sordid rufous, every feather with several narrow transverse dark lines. Breast and belly darker, with the spots more distinctly rounded and occupying the whole breast and inferior surface.

Wings and tail more fully developed than the other plumage.

Hab. India?

One specimen of this species, without label, belongs to the R'voli collection; another, which is that of a young bird, labeled Malacca, has been received from Mr. Edward Wilson, who obtained it in Paris. I am acquainted with no species of *Ephialtes* with which this can readily be confounded, and, in fact, it looks more like Dr. Horsfield's plate of *Strix (Phodilus) badius*, than any other which I have met with, and is about the same size (as the figure), while in general appearance, particularly in the colouring of the breast and belly, it bears some resemblance to *Strix (Lophostrix) cristata*, Daud. (*griseata*, Lath.). It is however a true *Ephialtes*, though an aberrant species. The sagittate spots distinguish it, and, as far as I know, are peculiar.

Ephialtes Watsonii, nobis. Summit of the head black, with a few very minute pale spots, more numerous on the front and eyebrows. Shorter feathers of the ear-tufts black, others black also, but with their inner webs spotted or mottled with white. A semicircle above the eye extending to the ear-tufts black; rigid feathers at the base of the bill black, with pale grayish terminations; feathers immediately below the eye gray, mottled and broadly tipped with black.

Discal feathers grayish white, many of them speckled, and all tipped with black, presenting a white and black semicollar or ruff on each side of the neck. Plumage of the throat with fine alternate bars of black and nearly white.

Neck above with a well-defined collar, the feathers composing which are strongly fulvous, terminated with white and speckled with black.

Back, rump, tail- and wing-coverts mottled and freckled with grayish white upon a black ground, many of the feathers having about three to five very irregular transverse bands of whitish; on the wing-coverts and back some of the pale marks are almost circular with black centres, others are of irregular form also enclosing centres of black.

External webs of the primaries black, with subquadrate nearly white bars, nearly all of which have black centres, assuming also a

more or less well-defined square form. Internal webs of primaries with alternate bands of different shades of black.

Breast and entire inferior parts pale fulvous, every feather conspicuously marked on the shaft longitudinally with black, and with very irregular transverse bands and irregularly mottled with black; the black markings most numerous and most irregular on the breast. Many of the feathers on the breast with very pale nearly white spots, having somewhat the appearance of being distributed in pairs.

Tail black, with about seven or eight narrow irregular grayish bands, many of which have central lines of black.

Tarsi feathered to the toes, pale fulvous white, mottled with black.

Bill horn-colour at the base, whitish at the tip.

Total length (of skin) about $9\frac{1}{2}$ inches, wing 7, tail $3\frac{1}{2}$.

Younger? Plumage above paler, with small spots and minute freckles of grayish white, scarcely assuming the appearance of bands.

Breast with the dark markings predominating, and tending to form a broad pectoral band; lower parts of the body bright fulvous with black marks.

Hab. South America.

This species bears some resemblance to *Ephialtes atricapilla* (Natt.), Temm. Pl. Col. 145, but is much larger, and has only one nuchal collar. The general colour above is also much darker; the fulvous colouring of the inferior surface of the body is also a striking difference.

One specimen of this species in the Rivoli collection is labeled "Orenoque," and another in the collection of the Academy is probably from South America.

I have named this bird in honor of Gavin Watson, M.D., of this city, a gentleman of extensive knowledge of natural history, much attached to the study of the American Raptore, and an especial admirer of the Owls.

Syrnium albogularis, nobis. Entire plumage above deep umber-brown, every feather more or less finely vermiculated and minutely spotted with black; on the head also transversely lined and spotted with pure white, especially in the region of the occiput, where upon some feathers the white spots are disposed regularly in pairs upon the opposite webs.

Feathers of the back and rump having also three or four irregular transverse lines, and irregularly spotted with pale brownish nearly white. Scapulars broadly barred and edged with white.

Lesser wing-coverts with irregular lines of pale brownish, and with large white marks on their external webs. Primaries with their external webs nearly black, with about eight to twelve square spots or bands of fulvous. Internal webs of primaries plain black or with obscure bands.

Eyebrow white; a large semicircular segment of white covering the jaws and throat, interrupted at the base of the under mandible by a few brownish feathers; many of those white feathers conspicuously tipped with black, forming a well-defined semicircular discal collar or ruff.

Breast with a broad band of the same umber-brown as the back,

every feather irregularly lined and minutely spotted with black; many of the feathers also with subrounded spots of pure white, occasionally disposed in pairs.

Abdomen, flanks and under tail-coverts fulvous, every feather marked longitudinally with black, and about one to three transverse marks of the same colour, assuming a partially lyrate form; these marks less distinct on the flanks.

Tail umber-brown, with about eight to ten irregular pale brownish white bars; under surface paler.

Plumage of the tarsi reaching nearly to the toes, pale reddish fulvous; tibial plumage darker, inclining to ferruginous; toes naked.

Bill yellow.

Total length about $9\frac{1}{2}$ inches, wing 8, tail $4\frac{1}{2}$.

Hab. South America.

Two specimens of this bird in the Rivoli collection are without label; a third, obtained in Paris by Mr. Edward Wilson, is labeled "South America."

I am acquainted with no species which in any considerable degree resembles the bird now described, nor have I met with a description applicable to it.

Syrnium virgatum, nobis. Plumage of the entire upper surface dark umber-brown, every feather having about three to five irregular transverse narrow bands of sordid yellowish white, most numerous and distinct on the head and rump. Upper tail-coverts banded with pure white.

Scapulars obliquely banded on their outer webs with fulvous, on their inner webs more or less regularly banded with yellowish white. Wing-coverts with broader bands, and also mottled and pointed at their tips with whitish.

Primaries very dark brown, nearly black, external webs with about seven square spots of grayish white, some of which enclose central spots of dark brown, and all more or less dotted and mottled with the same colour. These square spots less regular on the first and second primaries; all the primaries with broad pale tips. Internal webs with regular bands of dark and paler brownish black.

General colour of the face same as the head and back; superciliary plumage and discal circle nearly white, more or less spotted and lined with deep brown.

Breast deep umber-brown tinged with fulvous, every feather having about three very irregular transverse bands, which are broader and paler than those of the back, though of the same character; on the lower part of the breast these bands are nearly white.

Abdomen pale fulvous, every feather with a longitudinal stripe of black, and with one or two transverse irregular bands at the tip of the same colour; ventral region and under tail-coverts pale fulvous nearly white, with a trace of blackish spots.

Tarsi dark fulvous, mottled with brown; feathered to the toes.

Tail black, tipped with white, and having about five bands, which are brownish on the outer and white on the inner webs.

Bill horn-colour at the base, pale yellow at the tip; toes quite naked.

Total length about 14 inches, wing $10\frac{1}{2}$, tail 6.

Younger or different sex? Pale bands on the superior surface of the body broader, those on the wing-coverts, primaries and secondaries enclosing tolerably regular bands of black. Scapulars with their outer webs fulvous and pure white.

Spots on the outer webs of the primaries and bands on the tail nearly white; secondaries broadly tipped with white, each terminal spot enclosing a segment of dark brown.

Entire inferior surface of the body fulvous, feathers having longitudinal stripes only of dark brown; under tail-coverts nearly pure white.

Younger? Bands on the back and rump almost obsolete, having the appearance of spots only. Scapulars and some of the wing-coverts broadly edged with pure white.

Entire under surface of the body nearly white, with but a tinge of fulvous, the feathers having longitudinal bands only of deep brown. Under tail-coverts and tarsi nearly white.

Total length about 14 inches, wing $9\frac{1}{2}$, tail 6.

Hab. South America.

This is a bird of which I have frequently seen specimens, and am surprised that I have not succeeded in finding a description of it. I am acquainted with no species intimately resembling it.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 121.

Descriptions of new Marine Shells. By T. A. CONRAD.

The following new and interesting shells are from the coasts of Lower California and Peru:—

SOLECARDIA, *Con.*

Shell bivalve, equivalve; hinge with two diverging cardinal teeth, and a linear oblique cartilage-pit between; cardinal plate profoundly grooved on each side of the teeth; muscular impressions 2, small, rounded, remote from the margins, particularly from the base; pallial impression entire.

S. eburnea. Oblong-oval, equilateral, ventricose, thin; extremities nearly equally rounded; basal margin arched; valves white, shining, minutely shagreened, towards the base minutely rugose, with fine impressed radiating lines; concentric lines towards the base finely waved, indenting the margin. 12-10: 8-10.

In this singular bivalve the pallial impression shows no junction with the adductor impressions, but joins the extremities of the cardinal plate. The muscular impressions are as distinct on the exterior as on the interior.

PETRICOLA.

P. sinuosa. Subtriangular; inflated anteriorly; profoundly sinuous posteriorly; ribs radiating, prominent, acute, except towards the anterior margin, where they are replaced by closely-arranged lines; basal margin profoundly sinuous; within brown, cavity of umbo white; cardinal teeth prominent, two in one valve, and one broad one in the other. 8-10: 6-10.

Family ANATENIDÆ.

CYATHODONTA, Con.

An inequivaled bivalve; hinge with a broad, not very projecting, cartilage-fosset, which is carinated near the margin; muscular impressions rounded, indistinct; pallial impression with a large rounded sinus.

C. undulata. Subovate, inequilateral, very thin and fragile, with obliquely concentric undulations, profound on the anterior side, and suddenly becoming obsolete towards the posterior extremity, which is truncated and direct; posterior slope of the deeper valve obscurely tricarinated; cartilage-pit robust; valves with minute, very closely arranged, granulated radiating lines. 1 2-10 : 1 nearly.

Family PHOLADIDÆ.

PHOLADOPSIS, Con.

Inequivalved; right valve produced posteriorly, left valve overlapping the opposite; cartilage situated on a projecting callus.

P. pectinata. Ovate, very thin and fragile, profoundly gaping posteriorly; profoundly ventricose anteriorly; valves with elevated waved laminæ terminating near a profound sinus, which extends from beak to base; right valve undulated near the posterior end, reflected, margin pectinated; both valves have concentric lines.

PARAPHOLAS, Con.

P. bisulcata. Ovate-oblong; anterior accessory valves or deposit strong, shining, gibbous on the margin of aperture, and having obscure decussated striæ, the transverse ones a little raised; anterior side of the larger valves with numerous prominent crenulated radii; a slightly oblique sulcus extends from beak to base, and a slightly impressed line runs from the beak to the posterior end of the closed portion of the base; between the two impressed transverse lines the valves have closely-arranged, rugose, longitudinal laminæ, and posterior to these the laminæ are remote and elevated. 2½.

PENITELLA.

P. Wilsonii. Ovate-oblong, very thin, profoundly ventricose; valves with a furrow from beak to base; the papyraceous anterior valves very wide; anterior valves with numerous oblique waved laminæ and radiating acute ribs; ligament margin sinuous; posterior side with concentric distant undulations; two small accessory valves behind the beak, which are reflected posteriorly; membranaceous appendage with a sinuous or concave margin where it joins the shell, and a deep annular groove anterior to the middle. 2½.

TRITON.

T. perforatus. Subpyriform; volutions 5 or 6; ribs revolving, flattened, slightly prominent, wide and narrow alternately, with narrow interstices, and an occasional revolving line; angle of body whorl tuberculated; spire scalariform, the angle of each whorl with a tuberculated rib or carina; colour cinereous; epidermis brown, rough, hairy, longitudinally ribbed; aperture wide; margin of labrum sinu-

ous above, profoundly ribbed; ribs about half an inch long, on an ochraceous submargin; columella with white folds and narrow, dark brown interstices; beak bent, umbilicated. 3 8-10 : 2 $\frac{1}{2}$.

OLIVA.

O. propatula. Ovate-oblong, slightly gibbous towards the base; colour pale ochraceous, marked with a few longitudinal zigzag brown lines, and with darker transverse hair-like lines and a few spots; columella patulous, deeply sulcated inferiorly; deposit at the base carinated in the middle. 2 $\frac{1}{2}$: 1 1-10.—*Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. iv. p. 155.

METEOROLOGICAL OBSERVATIONS FOR JULY 1849.

Chiswick.—July 1. Very fine. 2. Light clouds: very fine. 3. Cloudy: slight showers. 4. Cloudy: clear at night. 5. Clear: very fine. 6, 7. Very fine. 8. Very hot: clear at night. 9. Very fine: cloudless. 10. Dusky haze: clear. 11, 12. Very fine. 13. Cloudy. 14. Very fine. 15. Overcast. 16. Very fine. 17. Cloudy: showery. 18. Very fine: cloudy: heavy shower 5 P.M.: showery. 19. Showery. 20. Fine: dense masses of low white clouds: showery. 21. Cloudy: showery. 22. Very fine: overcast. 23. Rain: cloudy. 24. Cloudy: heavy showers in forenoon: excessively heavy rain at night. 25. Fine: cloudy: showers occasionally: heavy showers, with thunder in afternoon. 26. Fine: thunder showers. 27. Overcast: very fine. 28. Very fine: cloudy. 29. Densely overcast. 30. Fine. 31. Very fine: cloudy.

Mean temperature of the month	62°·29
Mean temperature of July 1848	62°·09
Mean temperature of July for the last twenty-three years ...	63°·23
Average amount of rain in July	2·38 inches.

Boston.—July 1-6. Fine. 7. Fine: thermometer 81° from 2 P.M. to 6 P.M. 8-12. Fine. 13-16. Cloudy. 17. Cloudy: rain A.M. 18. Cloudy: rain P.M. 19. Rain: rain A.M. and P.M. 20. Fine: rain A.M. 21. Fine: rain P.M. 22. Fine. 23. Rain: rain A.M. and P.M., with thunder and lightning. 24, 25. Cloudy: rain A.M. 26-28. Fine. 29. Rain: rain A.M. and P.M. 30. Fine. 31. Cloudy.

Applegarth Manse, Dumfries-shire.—July 1. Fine rain: high wind P.M. 2. Rain during night: cleared and fine. 3. Heavy rain and strong wind. 4. Fine: slight shower. 5. Fine: occasional showers. 6. Complete day of rain. 7. Very heavy rain: high flood. 8. Fine and fair: pleasant air. 9, 10. Fine and fair. 11. Very fine summer day. 12. Very warm. 13. Warm, but cooler from east wind. 14, 15. Warm. 16. Warin, but getting cloudy. 17. Heavy rain at night: clear day. 18. Rain. 19. Showers: occasionally fair and warm. 20. Showers: heavy P.M. 21. Fine and fair. 22. Drizzlly: showery. 23. Fine A.M.: showery P.M. 24. Showery. 25. Heavy showers: thunder. 26. Warm: slight shower: thunder. 27. Fair: cloudy: cleared P.M. 28. Fair A.M.: rain P.M. 29. Heavy showers. 30. Heavy showers: thunder. 31. Heavy showers, less frequent: thunder.

Mean temperature of the month	57°·0
Mean temperature of July 1848	56°·5
Mean temperature of July for twenty-five years	58°·1
Rain in July for twenty years	3·91 inches.

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

Days of Month.	Barometer.												Thermometer.												
	Chiswick.				Orkney, Sandwick.				Dumfries- shire.				Orkney, Sandwick.				Wind.				Rain.				
	Max.	Min.	9 a.m.	9 p.m.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Boston.	Chiswick.	Dumfries- shire.	Boston.	Chiswick.	Dumfries- shire.	Boston.	Chiswick.	
1.	30-160	29-921	29-63	29-70	29-61	29-70	29-75	29-73	29-60	29-58	29-55	29-58	29-61	29-60	29-61	51	51	47	54	51	51	51	51	51	
2.	29-999	29-964	29-40	29-45	29-08	29-30	29-33	29-32	29-23	29-23	29-23	29-23	29-23	29-23	29-23	57	55	58	64	52	53	48	50 ₁	50 ₂	
3.	29-745	29-667	29-067	29-10	29-45	29-58	29-48	29-57	29-57	29-57	29-57	29-57	29-57	29-57	29-57	64	59 ₁	59 ₂	63 ₁	50	51	50 ₁	50 ₂	53	
4.	29-702	29-697	29-10	29-10	29-70	29-70	29-70	29-70	29-65	29-77	29-77	29-77	29-77	29-77	29-77	43	45	45	61 ₁	44 ₂	52	53	56	57	
5.	29-973	29-772	29-50	29-50	29-81	29-78	29-78	29-77	29-64	29-64	29-64	29-64	29-64	29-64	29-64	48	66	58	51	61	56	57	57	57	
6.	30-097	30-078	29-20	29-20	29-81	29-78	29-78	29-77	29-64	29-64	29-64	29-64	29-64	29-64	29-64	86	52	68	60 ₁	56	61	57	57	57	
7.	30-065	29-995	29-20	29-20	29-77	29-74	29-74	29-74	29-67	29-67	29-67	29-67	29-67	29-67	29-67	50 ₂	60 ₁	60 ₂	65 ₂	55	60	53	53	53	
8.	30-129	30-038	29-34	29-34	29-80	29-80	29-80	29-80	29-02	29-02	29-02	29-02	29-02	29-02	29-02	50	66	50	66	65 ₂	51	52 ₁	52 ₂	52 ₁	
9.	30-276	30-223	29-60	30-11	30-20	30-20	30-20	30-20	30-04	30-16	30-16	30-16	30-16	30-16	30-16	49	62	64	49	54 ₁	54 ₂	54 ₁	54 ₂	54 ₁	
10.	30-373	30-335	29-75	29-75	30-27	30-27	30-27	30-27	30-15	30-22	30-22	30-22	30-22	30-22	30-22	84	46	59	68 ₁	54	56 ₂	55 ₁	55 ₂	55 ₁	
11.	30-373	30-325	29-70	29-70	30-30	30-30	30-30	30-30	30-31	30-31	30-31	30-31	30-31	30-31	30-31	81	47	64	71	57	58	56	56	56	
12.	30-343	30-257	29-64	29-64	30-30	30-30	30-28	30-28	30-40	30-40	30-40	30-40	30-40	30-40	30-40	81	52	64	73	55	60 ₂	51	51	51	
13.	30-213	30-203	29-71	29-71	30-26	30-21	30-21	30-21	30-36	30-36	30-36	30-36	30-36	30-36	30-36	81	48	62	69	53	56	51	51	51	
14.	30-202	30-129	29-71	29-71	30-21	30-21	30-21	30-21	30-31	30-31	30-31	30-31	30-31	30-31	30-31	81	52	62 ₅	70 ₁	51	55 ₁	55 ₂	55 ₁	55 ₂	
15.	30-136	30-125	29-64	29-64	30-15	30-15	30-14	30-14	30-20	30-18	30-18	30-18	30-18	30-18	30-18	75	49	63	71	50	54	54 ₁	54 ₂	54 ₁	
16.	30-118	29-990	29-64	29-64	30-09	29-82	29-82	29-82	30-13	29-70	29-70	29-70	29-70	29-70	29-70	81	51	55	68	49 ₂	60	57	57	57	
17.	29-864	29-725	29-25	29-25	29-62	29-20	29-52	29-52	29-61	29-61	29-61	29-61	29-61	29-61	29-61	69	49	63	65	56	55	55	55	55	
18.	29-741	29-622	29-20	29-20	29-52	29-52	29-52	29-52	29-57	29-57	29-57	29-57	29-57	29-57	29-57	73	50	64	54	51	59	54	54	54	
19.	29-603	29-571	29-03	29-39	29-39	29-39	29-39	29-39	29-58	29-58	29-58	29-58	29-58	29-58	29-58	73	44	57	60 ₁	50	55	52	52	52	
20.	29-677	29-526	29-03	29-45	29-57	29-57	29-57	29-57	29-65	29-65	29-65	29-65	29-65	29-65	29-65	73	47	58	59	52 ₁	54 ₁	54 ₂	54 ₁	54 ₂	
21.	29-982	29-821	29-35	29-35	29-70	29-70	29-70	29-70	29-80	29-80	29-80	29-80	29-80	29-80	29-80	79	44	57	61 ₁	54	53	53	53	53	
22.	30-055	29-959	29-55	29-55	29-55	29-55	29-55	29-55	29-55	29-55	29-55	29-55	29-55	29-55	29-55	79	56	60	60	50 ₁	50 ₂	54 ₁	54 ₂	54 ₁	
23.	29-768	29-556	29-20	29-20	29-52	29-46	29-46	29-46	29-60	29-60	29-60	29-60	29-60	29-60	29-60	77	48	62	58	55	58 ₂	55	55	55	
24.	29-519	29-438	29-05	29-05	29-40	29-28	29-28	29-28	29-59	29-59	29-59	29-59	29-59	29-59	29-59	77	46	62	61	47	58	53 ₁	53 ₂	53 ₁	
25.	29-478	29-434	28-88	28-88	29-26	29-30	29-41	29-41	29-49	29-49	29-49	29-49	29-49	29-49	29-49	77	48	58 ₅	60	47 ₁	55 ₁	55 ₂	55 ₁	55 ₂	
26.	29-626	29-549	29-07	29-38	29-53	29-49	29-49	29-49	29-59	29-59	29-59	29-59	29-59	29-59	29-59	74	47	61	61 ₂	48 ₂	58	52	52	52	
27.	29-973	29-841	29-34	29-34	29-83	29-72	29-72	29-72	29-83	29-83	29-83	29-83	29-83	29-83	29-83	75	45	63	61	51 ₂	54	52	52	52	
28.	30-030	29-963	29-53	29-80	29-61	29-82	29-60	29-60	29-60	29-60	29-60	29-60	29-60	29-60	29-60	73	57	63	60 ₂	52	57 ₁	57 ₂	57 ₁	57 ₂	
29.	29-836	29-765	29-24	29-61	29-61	29-56	29-56	29-56	29-56	29-56	29-56	29-56	29-56	29-56	29-56	68	52	60	60	52	58 ₁	52 ₁	52 ₂	52 ₁	
30.	29-662	29-614	29-10	29-40	29-40	29-50	29-48	29-48	29-48	29-48	29-48	29-48	29-48	29-48	29-48	74	50	61	61	52 ₁	53	57 ₁	57 ₂	57 ₁	
31.	29-913	29-771	29-20	29-57	29-80	29-62	29-62	29-62	29-77	29-77	29-77	29-77	29-77	29-77	29-77	70	47	60	54	49 ₂	53 ₁	49	49 ₂	49 ₁	
Mean.	29-956	29-868	29-35	29-750	29-750	29-750	29-750	29-750	29-750	29-750	29-750	29-750	29-750	29-750	29-750	75	16	49-42	62-2	62-6	51-3	56-09	53-12	53-12	53-12

THE ANNALS
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XXIV.—*Description of two new species of Floscularia, with remarks.* By W. MURRAY DOBIE, M.D., F.B.S.E., Member of the Royal Medical and Clinical Societies of Edinburgh.

[With a Plate.]

WHILE examining various Rotifera in April this year (1849), I met with two Floscularias which differ essentially from any hitherto described. I propose in the present paper to characterize and describe briefly these two species, to which the plate has reference, and accompany the description with a few general remarks.

Floscularia campanulata (mihi). Pl. VI. fig. 3.

Sp. Char. Case diaphanous. Rotatory organ furnished with *five* flattened lobes fringed with very long cilia. Body ovate, without proboscis. Tail long and terminating abruptly in a transparent filament spread out into a kind of sucker at the point of attachment. Pl. VI. fig. 1.

Length $\frac{1}{50}$ in. when extended. Egg with two red eye-spots, contained in a large ovary.

Hab. Boggy Park pond, $8\frac{1}{2}$ miles from Chester. Found on *Ceratophyllum* and *Confervae*.

Floscularia cornuta (mihi). Plate VI. fig. 4.

Sp. Char. Case short, diaphanous, and not very distinct. Rotatory organ furnished with *five* rounded lobes surrounded with extremely long and delicate cilia. A short, narrow, non-ciliated, flexible process (*cornu*) is attached to the outside of one of the lobes. Egg with two red eye-spots. Young animal with vibratile cilia on head and rapidly locomotive.

Length $\frac{1}{40}$ in. when extended.

Hab. Boggy Park pond. Found on *Ceratophyllum*.
Ann. & Mag. N. Hist. Ser. 2. Vol. iv. 16

The following table will serve to show the relation these new species bear to the *Floscularias* which have been already discovered.

Species.	Lobes.	Processes.	Cilia.
<i>Floscularia proboscidea</i>	6.	One large and ciliated.	Short.
— <i>ornata</i>	5-6 rounded.	None.	Long.
— <i>campanulata</i>	5 flattened.	None.	Long.
— <i>cornuta</i>	5.	One narrow and non-ciliated.	Very long.

The usual length of the adult *Floscularia campanulata* is about $\frac{1}{50}$ th of an inch when extended, but I have met with specimens larger than this. The case in this species is long, and not very defined, its surface is granular, and it contains minute rounded bodies in its substance.

The body of this *Floscularia* when fully contracted is completely inclosed within its case, which however is absent in the young animal. The body in both species is hyaline or colourless, except when coloured food has been received into the alimentary canal.

The entrance to the alimentary canal in the *Floscularia campanulata* resembles a large open cup, and may be termed the infundibulum; the edge of which, when the animal is expanded, is divided into five lobes by a corresponding number of depressions. Each of these lobes is flattened or laminar, slightly thickened at the margin, which is thickly fringed by long and very delicate cilia or setæ, except for a small space in the middle of the depression. One of the lobes is rather larger than the other four. Five bands, apparently muscular, are seen passing to the centre of these depressions. Lines of a fainter description run up the centre of each lobe to near its apex; these lines are frequently observed to contain highly refracting bodies resembling little globules of oil. See fig. 3.

The rotatory organ of the *Floscularia cornuta* differs from the preceding; it is divided by very deep depressions into five lobes, each terminated by a kind of ciliated knob; and to the back of one of these lobes the flexible *cornu* is attached externally. The infundibulum in both species is separated from the next cavity,—which, following Dujardin, I call the vestibule,—by a rim enlarged at certain points into little knobs, each of which is clothed with cilia, not vibratile.

The next portion of the alimentary canal is the crop separated from the vestibule by a diaphragm, in which is a slit-like opening fringed with vibratile cilia, the motion of which gives rise in

my opinion to the peculiar serpentine movement always observed at this point. See fig. 3 d.

The cilia on the upper surface of this diaphragm and on the edges of its aperture assist in carrying the food into the crop.

In both species the crop is ciliated throughout its interior. The next cavity, or second œsophageal bulb, contains the jaws and teeth—communicating above with the crop, and below with the conical termination of the alimentary tube. The teeth and jaws seem exactly alike in both the species I have examined with care: each jaw contains a bifurcated tooth, greatly resembling that of the *Stephanoceros*, only much more minute. See figs. 3, 4 & 5.

The ovigerous sac or ovary is large in both, containing several large ova which seem to be discharged from the cloaca, which is common to both the ovary and the alimentary canal. The red points can be seen in the egg before it is discharged; the movements of the young animal within its case are quite perceptible at this period. See figs. 6 & 3 h.

The eggs for some time before they are completely hatched remain about the bottom of the case. I have been unable to detect any male organs in either of the species.

The tail is long, and composed of non-striated muscular fibre inclosed in a continuation of the general integument. In the *Floscularia campanulata* it terminates in a homogeneous non-contractile filament produced into a sucker-like expansion, by which the animal attaches itself to *Confervæ* or *Ceratophyllum*.

The muscular system consists of non-striated fibres. Those composing the tail extend upwards and are lost upon the surface of the body. In the *F. campanulata* five very distinct bands run up the sides of the vestibule and infundibulum, and terminate by bifurcating in the depression between the lobes. The body and tail are highly contractile; the vestibule particularly so, large animalecules being frequently forced through the aperture leading into the crop by the powerful and continued contractions of its walls.

No trace of a vascular system can be observed. The tremulous gill-like organs found in some Rotifers are here absent.

With the exception of the eye-spots in the young animal, there are no organs of special sense. The whole surface is acutely sensible of tactile impressions, but the lobes of the rotatory organ and the *cornu* are perhaps more sensitive than the general surface.

The cilia on these animals are of two kinds: the usual short vibratile kind line the interior of the crop and alimentary canal, and cover the lower part of the vestibule. The other variety of cilia are extremely long and filiform, of uniform thickness, and not vibratile under ordinary circumstances. They are slowly

moved and spread out by the contractile substance of the lobes of the rotatory organ.

When a solution of caustic potash is brought in contact with the filiform cilia, a most violent vibratile action immediately commences, and continues till the whole bundle is completely disorganized. Violent mechanical stimulation seems to have a similar effect, though in a less degree.

I may here notice more particularly the peculiar *cornu* or process of the *F. cornuta*. The lobes of the rotatory organ of this animal resemble very much those of the *F. ornata*, with this difference, that in the *F. cornuta* only five exist, while in the *F. ornata* there are six according to Ehrenberg. The *cornu* is attached to the exterior of one of these lobes ; it is narrow and flexible ; the animal seems never to move it. It is best seen when the animal expands itself fully, for in the contracted state it is completely retracted within the integument.

Immediately below the integument of the *Floscularia cornuta* are groups and lines of very small granules continually in a state of rapid molecular motion. In appearance they exactly resemble the molecules in the cusps of the *Closterium*. Besides the molecular they are subject to another motion ; for occasionally they may be seen to move from one part of the surface to another in currents not very distinct or persistent, and in no definite direction. I have seen them running in lines down the tail and collecting into groups. This flowing movement occurs chiefly during the contractions and relaxations of the entire animal. See fig. 4.

In the *Flos. campanulata* there are larger *fixed* granules distributed here and there throughout the body and tail ; these bodies more nearly resemble globules of oil.

I am in much doubt as to the nature of these minute bodies in the *F. cornuta*. I think it probable they are connected with the nutrition of the animal, and analogous to the free floating corpuscles in the abdominal cavity of the *Hydatina senta*, or the so-called blood-corpuscles of the Tardigrada, so well described by M. Doyère.

The *Floscularia campanulata* is gregarious ; sometimes as many as eight or ten specimens may be seen attached to a small portion of Conferva.

The *Flos. cornuta* is found single ; there are seldom more than two or three near one another.

The *Flos. campanulata* is a very active animal, expanding and contracting itself with great rapidity. The *Flos. cornuta* is by no means so strong and active : both species when satiated with food remain contracted for a considerable time.

Ehrenberg regards the *Floscularia* described and figured by

M. Peltier* as identical with his *Floscularia ornata*. Both Dujardin and Peltier found the rotatory organ five-lobed in the species observed in France. Admitting these descriptions to be correct, we must either hold with Pritchard that the *Floscularia ornata* has sometimes five, at other times six lobes, or consider the five-lobed species of Peltier and Dujardin† to be a variety of Ehrenberg's true *Flos. ornata*.

In no kind of *Floscularia ornata* has any *cornu* or process been seen attached to any of the lobes. My friend Mr. Hallett, late of the Museum of the Royal College of Surgeons, writes me that he finds the *Flos. ornata* with a six-lobed rotatory organ and no process.

M. Dujardin ‡, in describing his family *Floscularia*, observes as follows on the masticatory apparatus of the genus *Floscularia* :— “The *Floscularia* has simple mandibles; in the *Stephanoceros* the mandibles are compound.” With this assertion of Dujardin I do not agree; the whole apparatus closely resembles that of the *Stephanoceros*, only on a smaller scale. One thing I feel certain of is, that the tooth is bifurcated and therefore cannot be simple.

In figure 5 I have endeavoured to represent the dental apparatus of the *Floscularia* as I myself have frequently observed it. I cannot vouch for its entire accuracy, as it is very difficult to obtain a good view of them.

M. Dujardin § thus observes regarding the eggs: “Les œufs montrent un seul point rouge et non deux comme ceux qu'a représentés M. Ehrenberg.” I must here also differ from M. Dujardin. In nearly all my examinations of the eggs and young of the *Floscularia*, I have been able to make out two very distinct red eye-spots; they appear in the egg when it has reached its full size, but are best seen in the young animal.

Dujardin's observations|| differ from those of Ehrenberg in another particular; I again quote from Dujardin's work: “Ce même auteur (M. Eh.) leur assigne un étui membraneux, mais ceux qui ont été observés en France manquent toujours de cet étui.” My own observations coincide with Ehrenberg's descriptions; the sheath is never absent except in the very young animal, but is often so delicate as to escape superficial observation.

The two *Floscularias* described in this communication were obtained from a pond situated in Trevalyn in the parish of Gresford, Denbighshire, within a few yards of the boundary line limiting the detached portion of Flintshire in Gresford. The

* Annales des Sciences Naturelles, 1838, t. x. p. 40, planche 4.

† Hist. Nat. des Infus. p. 610.

‡ Hist. Nat. des Infus. p. 609, also at p. 611. “Les mâchoires m'ont paru unidentées.”

§ Hist. Nat. des Infus. p. 611.

|| Ib. p. 609.

place is named the "Boggy Park," from an elevated quagmire in the meadow abounding in *Pinguicula vulgaris*, *Anagallis tenella*, *Parnassia palustris*, &c. It lies nearly two miles south of the Rossett station of the Shrewsbury and Chester Railway, at the base of the slope which descends from the table-land of Gresford. This eastern declivity of North Wales commands, at an elevation little exceeding a hundred feet above the level of the sea, a view not to be surpassed for extent and beauty;—on the north stretching over the peninsula of Wirral; and in some states of the atmosphere even to the southern mountains of Cumberland; on the south to the Wrekin far into Shropshire; eastward to the Peckforton, Delamere and Lancashire Hills;—the towers of Chester and to Beeston Castle over the Vale Royal; in clear weather to the mountainous district where Yorkshire, Derbyshire and Lancashire unite—a distance not less than forty miles.

EXPLANATION OF PLATE VI.

Fig. 1. Sucker-like termination of the tail of *Floscularia campanulata*.

Fig. 2. Process on one of the lobes of *Flos. cornuta*. The cilia surrounding the rounded knob-like extremity of the lobe are supposed to be cut short.

Fig. 3. *Floscularia campanulata*, magnified 270 diameters. The cilia are represented on one lobe only.

- a. Granules resembling oil globules.
- b. One of the five muscles of the infundibulum.
- c. Rim separating the infundibulum and the vestibule.
- d. Diaphragm separating the vestibule from the crop with waved aperture.
- e. Dental apparatus and sac.
- f. Termination of the intestine.
- g. Case (*étui*, Dujardin).
- i. Sucker-like termination to tail.

Fig. 4. *Floscularia cornuta*, magnified 200 diameters.

- a. *Cornu* or flexible process.
- b. Division between infundibulum and vestibule, with ciliated knobs as in fig. 3.
- c. Minute granules in a state of molecular motion.
- d. Diaphragm.
- e. Dental apparatus.
- f. Two ova in ovisac.
- g. Termination of intestine.
- h. Case in outline.

Fig. 5. Dental apparatus isolated.

Fig. 6. a. Young *Floscularia cornuta* with vibratile cilia.

- b. Same, contracted.

XXV.—*Observations on Mr. Hancock's paper on the Excavating Sponges.* By JOHN MORRIS, F.G.S.

In the interesting communication “On the Excavating powers of certain Sponges,” &c. which appeared in the May Number of the ‘Annals,’ Mr. Hancock appears to have overlooked a paper published some time since by an Italian naturalist in which the same facts are fully and clearly described. Had this paper been more generally known, probably “the prevailing belief that *Cliona* does not excavate the chambers in which it is found, but that they are formed by worms or by decay,” &c., might have been somewhat shaken, and “the matter which has remained up to the present time in obscurity” more clearly defined. It may therefore be interesting to some of the readers of this Journal to give a short abstract of what was previously known on this subject, not merely for advocating the priority of discovery, but as strengthening the opinion as to the excavating power of these bodies, so admirably illustrated by Mr. Hancock*.

Ten years have elapsed since Dr. Nardo communicated, in the name of his brother, to the Scientific Congress held at Pisa in 1839, a paper “On a new genus of Siliceous Sponges, named *Vioa*, living in excavations formed by itself in stones and in the shells of marine mollusca, boring them in every direction.” This sponge consists of numerous small very fine acicular siliceous bodies arranged irregularly in a fleshy but not mucous substance, of a yellowish, orange or purple colour, permanent or fugacious according to the species. At certain periods of their growth, these sponges emit small germs visible to the naked eye, which transported by currents attach themselves to stones or marine shells, and commence to form passages in their substance, riddling them in every direction, so as even sometimes to destroy the stone or shell, leaving the sponge isolated and free. Dr. Nardo observed the following species all obtained from the Adriatic, and named by him *Vioa typus*, *coccinea*, *Clio*, *Pasithea*†.

At a subsequent meeting of the same Congress held at Milan in 1844, M. Michelin, whose attention had been previously directed to the point, read a short notice on the same subject, in which he alluded to the traces of an organized zoophytic body

* It is but justice to Mr. Hancock to state, that his description of the means by which these sponges perforate calcareous substances is both novel and interesting.

† Atti della prima riunione degli Scienziati Italiani tenuta in Pisa, 1839, p. 161; Pisa, 1840. A fuller notice of this paper is in the ‘Annali delle Scien. del Reg. Lomb.-Venet.’ vol. ix. p. 221; see also Revue Zoologique, 1840, p. 27. In the same journal (p. 343) is M. Duvernoy’s description of *Spongia terebrans*, inhabiting the valves of *Ostrea hippopus*, Lam.

inhabiting the tubular and vesicular cavities in the shell of *Placuna sella*, but uncertain as to what family it really belonged. The Prince of Canino, President, appointed a commission, consisting of Drs. Rüppell and Nardo and Prof. Géné, to express their opinions on the fact, and Dr. Nardo in their name made a report, from which the following remarks are abridged.

The peculiarity described by M. Michelin consists in having noticed between the two faces of the superior valve of *Placuna sella*, on account of its transparency, a kind of arborescence with dichotomous and anastomosing branches, having the inferior branches thick and decreasing towards their extremities, which are generally sharp and forked.

On the inner layer of the shell no pores were observed communicating with the branches, but on the outer layer are numerous small perforations serially disposed and corresponding with the articulations. These cavities have been produced by a perforating parasitic animal which has introduced itself into the substance of the valve, and which in consequence of a greater resistance or hardness of the inner layer in contact with the animal of the *Placuna*, has been compelled to extend itself horizontally, so as to form the arborescence described. On some parts of the surface may be observed a few attempts at perforation which have been arrested by a new layer of solid matter. In the Milan city museum is a fine specimen of *Placuna* having both valves perforated. The large size of the holes in this shell has allowed a portion of the animal filling the cavities to be carefully examined. It belongs to the class of sponges, and specially to the genus *Via*, which Dr. Nardo first described in his memoir on the perforating sponges, published in the 'Annals of Science of the Lombardo-Venetian Kingdom*.' From the form and arrangement of the siliceous spiculae, imbedded in the substance, sharp at one end and rounded at the other, it should be arranged (according to the system of Dr. Nardo) in the second order of siliceous sponges, the ninth family *Vividæ*, and the first subfamily *Vivina*. This species appears to be distinct from all those previously known and described, and may therefore bear the name *Via Michelini*. Dr. Nardo further adds as an important fact, that it is not only the *Placuna* which have been attacked by this kind of sponge, but also univalve shells; and mentions a large specimen of *Voluta* in the Milan museum, which is perforated by a species of sponge distinct from the *Via Michelini*, as regards its mode of development, which although serial and dendritic, has the vesicular and articulated cavities smaller and bored on both sides.

Dr. Nardo concludes the report with some remarks relative to

* See the volume previously quoted.

the genus *Vioa*, as well as to some inaccuracies of those authors who have written after him. He mentions that Dr. Johnston has not even suspected the *Halichondria cælata* (which is a *Vioa*) to be a perforating sponge; and also opposes the opinion of M. Dujardin, who thought that the perforations in shells and stones (which he, Dr. Nardo, had proved to be the work of a sponge) were at first occupied by small species of Aannelides, and that the sponge subsequently inhabited their cavities. Dr. Nardo does not think that the name *Cliona* ought to be preferred to that of *Vioa* proposed by him, because Dr. Grant, in establishing his genus, did not consider it to be a sponge, but a polype having eight tentacula; and he consequently proposes that the *Spongia terebrans*, Duvernoy, which M. Dujardin regards as a *Cliona*, should be named *Vioa Dujardini*, if however it is distinct from the species already described*.

Since the publication of this report for 1844, M. Michelin has observed a valve of *Meleagrina margaritifera*, Lam., and specimens of the genera *Conus* and *Fusus* perforated by species of *Vioa*, as well as a valve of the fossil, *Trigonia Dædala*, Park. M. Michelin has also noticed traces of the same genus on fragments of fossil shells from the chalk of Orglandes and the supracretaceous beds of Grignon (Revue Zoologique, 1846).

The following species of *Vioa* appear to be identical with two of those described as *Cliona* by Mr. Hancock.

Vioa Nardina, Michelin, Rev. Zool. 1846, pl. 1. fig. 1.

V. dendritica, dichotoma, ramosissima, utriculis et tubulis composita; utriculis vel rotundis vel ellipticis in seriebus eleganter dispositis, inter se junctis per tubulos exiguo interne rugosos; tubulis terminalibus, acutissimis, saepe furcatis.

Inhabits the upper valve of the *Placuna placenta*, Lam.

This species is identical with *Cliona Fryeri*, Hancock, Ann. Nat. Hist. 1849, p. 338. pl. 14. f. 2; and that author described it as imbedded in the same shell.

Vioa Michelini, Nardo, Rev. Zool. 1846, pl. 1. fig. 2.

V. dendritica, dichotoma, divaricata, utriculis et tubulis composita; utriculis numerosis, vesiculosis, subpolygonis, interne rugosis, utrilibus maximis, junioribus parvulis, elongatis, deinde subrotundis, per minutissimos tubulos junctis et anastomosantibus.

Inhabits the upper valve of *Placuna sella*, Lam.

This species is the same as the *Cliona spinosa*, Hancock, Ann.

* Atti della sesta Riunione degli Scien. Ital. tenuta in Milano, 1844, pp. 372, 428, and Revue Zoologique, 1846; see also Annali delle Scien. del Reg. Lomb.-Ven. 1845, p. 11.

Nat. Hist. 1849, p. 339. pl. 13. f. 5, and which he also found in the valves of *Placuna sella*.

At the Scientific Congress held at Lucca (1843), Dr. Nardo proposed a new classification of the *Spongiadæ*, dividing them into five families, under the names of Corneo-spongia, Silico-spongia, Calci-spongia, Corneo-silici-spongia, Corneo-calci-spongia, these families containing thirty genera*.

XXVI.—*On the Branchial Currents of the Bivalve Mollusca.*

By JOSHUA ALDER, Esq.

To Richard Taylor, Esq.

DEAR SIR,

Newcastle-upon-Tyne, 16th August 1849.

It was not my intention again to have troubled you concerning those points in the œconomy of the Bivalves about which Mr. Clark and I are at variance, but the concluding paragraph of that gentleman's letter, in which he claims to have set at rest the use of the anterior siphon in the genus *Kellia*, demands a few words from me, lest my silence should be taken as an acquiescence in such a statement. Perhaps I am also entitled to a reply to the two new arguments by which my opinions are attempted to be disproved.

Mr. Clark has at length given us a distinct statement of his views with respect to the admission of water into the branchial cavity of the bivalves, which he attributes to the opening and closing of the valves alone, and not to the action of cilia. Had this been stated at first, some misunderstanding might have been avoided. Undoubtedly a branchial current entering by a special aperture, whether anterior or posterior, cannot be accounted for by the opening and shutting of the valves. To explain such a current the existence of ciliary action is required; but I was unwilling to believe that a gentleman of Mr. Clark's information could entirely have discarded it. However, instead of arguing this point further, I shall take the liberty of giving the result of some observations made upon two or three species of bivalves since the publication of my last letter.

A small specimen of *Modiola vulgaris*, placed in a glass of sea-water, gradually expanded the margin of the mantle beyond the shell, and protruded the excretory siphon. When these were

* Atti della quinta unione degli Scien. Ital. tenuta in Lucca, 1843, p. 436. The details of this paper have not I believe been published; a short notice however of the three first families appeared about fifteen years ago in Dr. Oken's 'Isis.'

extended to their full length, an action commenced in the surrounding water which was very discernible with a common lens; but for its more careful examination I put the animal under a low power of the microscope, and could then distinctly see that a current of water was passing in at the lower side of the open mantle, partly by the cirrigerous portion (as observed by Cuvier and others in the common mussel), but more especially at the part of the mantle just in front of the cirrhi, and between them and the foot. At the same time a very strong current was flowing off by the posterior siphon;—so strong as to communicate a motion in the same direction to the surrounding water and its contents. These two currents continued while the mantle was expanded, but on its withdrawal they ceased, and the animal became quiescent. During the whole of the time the valves remained stationary.

My next experiment was upon *Modiola nigra*, and with exactly the same results. The mantle of this species has the margin perfectly smooth, and is extended in the posterior part of the large opening so as to simulate a second siphon. The current, however, did not go in at the prolonged extremity of this siphonal fold, but at the anterior part of it. The egress-current of the anal siphon was very distinct.

A specimen of *Mactra elliptica* was some time in protruding its siphons, which, as is well known, are long, and united to their extremities. No distinct action of the water could be observed until these were fully extended, and the hyaline valve exserted from the anal siphon. A violent agitation then commenced in the vicinity of the apertures, and, on looking carefully, I could see a current containing floating particles, animalcules, &c. flowing in at the branchial or inhalant siphon; while an ex-current, still more conspicuous, flowed simultaneously from the anal one, sending the water to a considerable distance. At short intervals during this operation a spasmodic contraction of the valves and siphons sent off the water with a squirt; probably at both apertures, but this I could not distinctly make out. At such times only was there any perceptible motion of the valves, which, while the regular branchial currents were flowing, remained stationary and were held a little apart. The water remained motionless opposite the pedal aperture. The strong currents at the extremities of the siphons induce me to attribute a more powerful action to the cilia lining these orifices than I was at first inclined to do, as they are generally much smaller and more difficult to observe than those on the branchiae.

The only other species I shall here notice is the *Turtonia minuta*. At first the water was observed to pass into the widely open mantle of this little mollusk at all parts of the base of the

shell. This was perhaps owing to the gradual opening of the valves, as afterwards the current appeared to be confined to the posterior portion, and while it was flowing in at that point, I could distinctly see an opposite current passing off at the posterior siphon. This simultaneous action of currents in contrary directions, observed in all the instances mentioned, is surely sufficient to prove the existence of some special motive power distinct from the action of the valves*.

We shall now turn to Mr. Clark's two additional 'proofs,' by which he "proposes to demonstrate" that the water passes into the branchial cavity by *both the posterior siphons, in conjunction with the pedal aperture*, and that it is *expelled indiscriminately in various proportions by all*. The argument is a little obscure, but if admitted in its fullest extent could not demonstrate the whole of this proposition. As far as I can understand it, it is this:—that as "important prehensile organs"—cirrhi and cilia—clothe both the anal and branchial siphons "to entangle and capture the minute animalecules to be conveyed into the branchial cavity," therefore a current of water must pass into *each* siphon to carry them forward to their destination. But the premises are assumptions that require in the first place to be proved. According to my observations, the cirrhi that surround the apertures are not prehensile but only tentacular; their use apparently being to guard the orifices from the intrusion of anything hurtful. The cilia that clothe the interior of the siphons (which I presume are what Mr. Clark alludes to) are neither prehensile nor tentacular, but perform the office usual to these minute organs in assisting to create a current. But why should the food be seized and detained by these organs at so great a distance from the mouth, when it could (and does) flow freely into the branchial siphon by means of the same current that brought it to the aperture? The hyaline valve of the anal siphon would obstruct the performance of such a function by the cirrhi of that aperture. This argument, therefore, instead of being 'irrefragable,' appears to me to prove nothing.

The next argument rests on the literal meaning of the word 'aperture.' In those bivalves whose mantle is entirely open the whole circumference forms only *one* aperture, consequently in these species there cannot be *two apertures* (ingress and egress). True. But there may be nevertheless an ingress- and an egress-current at different points of the open mantle without their interfering with each other: and such is the case in *Anomia*, where a current may be seen to pass in at the anterior base of the shell

* "The respiratory currents are occasioned by the action of cilia, and are not dependent upon the opening and closing of the valves of the shell."—Owen's Lect. Comp. Anat. vol. i. p. 283.

while another flows off posteriorly near the termination of the branchiæ*.

I now come to the most interesting part of Mr. Clark's letter, where he informs us that he has ascertained that *Kellia suborbicularis* is viviparous,—a good discovery: but the supposition that the anterior siphon is only intended as a marsupial pouch for the further development of the ova after their extrusion from the ovary, is a conjecture not warranted by Mr. Clark's own observations, as he afterwards saw completely testaceous young in the ovary, thus doing away with the necessity of their being further detained in the open siphon, which is ill-adapted to the office assigned to it. Besides, if such had been the case, it would most likely have been observed before, as from the hyaline transparency of the tube and its wide aperture, it is always easy to see to the bottom of it. That the young escape by this aperture is probable, but this does not prevent its being used for branchial purposes; as in no instance that I am aware of, either in a Bivalve or an Ascidian, is there a separate orifice of the cloak set apart for the extrusion of the ova. All that can therefore be admitted as proved by Mr. Clark's observations, are the viviparous character of the reproduction in *Kellia suborbicularis* and the escape of the young (in one instance at least) by the anterior siphon. May I not add,—it is also proved by equally authentic observations, often repeated,—that both in *Kellia rubra* and *K. suborbicularis*, a special current can be seen to go into this siphon, and at no other part of the circumference of the mantle?

I remain, dear Sir, yours very truly,
JOSHUA ALDER

P.S. Since writing the above I have had an opportunity of examining the currents in *Pholas crispata*, which I find to correspond entirely with those of the species already mentioned. As however Mr. Garner, in his excellent paper on the *Lamelli-branchiota*, though agreeing in the general existence of ciliary currents received and expelled by separate apertures, yet considers this and some other allied genera to be exceptions, I purpose, with your permission, to treat this part of the subject a little more at large in a separate communication.

* With respect to the range of *Kellia rubra*, Mr. Clark has ascertained that he was right in stating that near Exmouth this species is found beyond ordinary high-water-mark, and often, in calm weather, is only covered by the sea at spring tides. If it has been also ascertained that "thousands of these animals pass their entire existence without perhaps being completely in a condition to receive branchial currents of sea-water," I shall agree that I was mistaken in thinking the account in question overstated. The ordinary range of *Kellia rubra* is within tide-marks.

XXVII.—Description of three new Genera and Species of Snakes.
By J. E. GRAY, Esq.

THE greater part of the genera of innocuous Colubrine Snakes have only a small number of shields on the sides of the lips, the eyes being generally placed over the fourth, or the suture between the fourth and fifth upper labial shields. In the very long-headed genera, as *Dryophis*, the eye is over the fifth, and in one species, *D. Catesbyi*, it is over the suture between the fifth and sixth. *Periops* of Wagler and *Chilolepis* of Fitzinger, exhibit the greatest number of these shields amongst the snakes hitherto recorded; the eyes in them are placed over the fifth, sixth and seventh shields, which are of small size. In the two genera I am about to notice the shields are large, and the eye is placed over the suture between the sixth and seventh shields.

1. *CYNOPHIS*.—Head moderate, elongate, rather compressed on the sides; crown flat, shielded, frontal shields four, anterior small between the nasals, hinder larger, bent down on the sides; vertebral elongate, narrower behind; supraciliary shield narrow in front, wider behind and bent down on the outer side; occipital shields large, elongate, subtrigonal; nostrils rather large, lateral, between two shields, the hinder rather the largest; loreal shields moderate; one very large, squarish, five-sided, anterior and a small posterior ocular; temple with elongate shields, the upper one linear, oblique, margining the occipital; rostral shield rather broad and high, subtrigonal, convex; upper labial shields rather large, the five front ones rather narrow and high, the sixth and seventh broader, placed under and forming the lower margin of the orbit, the eighth, ninth and tenth rather large, subtrigonal, with the temporal shield above them; the lower rostral small, the first, second, third and fourth lower labial narrow, the fifth and sixth much larger and broader, the hinder ones rather narrow; chin shield two pair, elongate, strap-shaped. Eyes rather large, pupil round. Body elongate, compressed; back rounded; belly flattened; scales lanceolate, closely imbricate, smooth, the lower series rather broadest; ventral shield rather broad, flat in the middle, and rather angularly bent up on the sides. Tail rather short, slender, conical, tapering; subcaudal plates two-rowed, flat on the inner and somewhat bent up on the outer sides.

This snake has somewhat the external appearance of a small *Boa*.

Cynophis bistrigatus.—Yellow, rather paler beneath; a narrow erect streak under the eyes on the suture of the sixth and seventh, and an oblique one from the back edge of the eyes to the suture of the eighth and ninth upper labial, a short broad streak on each

side of the occiput, and an oblique streak on each side of the neck, and four or six spots forming cross bands on the front of the body black, a broad brown streak on the sides of the hinder part of the body.

Inhab. Ceylon. Presented by R. Templeton, Esq.

2. *ALOPECOPHIS*.—Head rather elongated, somewhat flattened on the sides; crown flat, shielded, frontal plates four; anterior moderate between the nasals, slightly bent down on the side, hinder large, broad, bent down on the side; vertebral broad, narrower behind; supraciliary large, broader behind; occipital large, subtriangular; nostril lateral between two nearly equal plates; loreal plate elongate, narrow; anterior ocular very large, subtriangular, the upper edge forming part of the crown; posterior oculars two, the upper large, the lower very small; temporal shields elongate, the two upper edging the occipital plate; rostral shield very broad, rather low, convex above; labial of both jaws similar, moderate and rather high, sixth and seventh upper rather larger, under and forming the lower edge of the orbit, the tenth rather elongate; chin shield two pair, hinder smaller. Eyes rather large, pupil round. Body rather compressed; back rounded beneath flattened; scales lanceolate, imbricate, smooth; ventral shield rather broad, flat, angularly bent up on the side. Tail about one-third the length of the body, slender, tapering, subtriangular, flat beneath, subcaudal plate two-rowed.

This genus chiefly differs from the former in the elongated form of the loreal, the height of the anterior ocular, the two posterior oculars, and in the greater equality in the labial shields.

Alopecophis chalybeus.—Purplish brown, edge of the scales rather darker; lips and beneath paler, with a very narrow rather darker line along the upper edge of the upper labial shields.

Inhab. Mauritius.

The third genus belongs to the tribe *Elapsinæ*, and is one of the largest and most beautiful-coloured of that deadly tribe.

3. *MEGÆROPHIS*.—Head small, scarcely wider than the body, rounded in front; crown flat; nostrils large, open, lateral. Eyes lateral, large; loreal shield none; fangs distinct, maxillary teeth few. Body triangular; scales of the sides elongate, six-sided, in oblique series five in each, of the vertebral series very broad, transverse; subcaudal plate entire.

This genus has the scaling of *Bungarus* and the small head of *Naja* and *Elaps*.

Megærophis formosus.—Bluish black; head, under side, tail, a spot on each vertebral scale, and the upper edge of the lower series of scales yellow.

Inhab. Borneo. Presented to the British Museum by Sir James Brooke.

This species has the colouring of *Elaps bivirgatus*, Müller, and has most probably been mistaken for that species; but it is of a much larger size, and easily known by the large size of the vertebral scales.

In the young specimen the spot on the back and sides forms a nearly continued stripe, and the outer edge of the ventral shield is clouded with black.

British Museum, August 21, 1849.

XXVIII.—Contributions to the Botany of South America.

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

[Continued from p. 193.]

SOLANDRA.

I NOTICE this genus, in order to confirm what has been already advanced respecting it in the preceding volume of the 'Annals,' p. 176, when I endeavoured to show that its relation is decidedly with *Juanulloa*, *Marckea* and *Sarcophysa*, constituting with these genera a distinct tribe of the *Atropaceæ* or *Atropineæ*, and in no degree related to *Datura*, with which it has been classed by all botanists heretofore. It will be seen to approach *Juanulloa* in its large tubular calyx, which splits generally on one side, in consequence of the growth of its large fleshy berry, in the structure of which there exists a considerable resemblance in both genera, but it differs from that genus, in its much larger and more campanular corolla. It bears also great analogy with *Brunsfelsia*, in its large, yellow, fleshy border, with five rounded lobes, greatly fimbriated on their margins, and deeply imbricated in aestivation, and also in its large berry filled with pulp; but it differs from this last-mentioned genus, in its general habit and in the structure of its stamens. It will serve to connect the *Solandreae* with the *Brunsfelsieæ*, and in the linear arrangement shown in the tabular view, p. 176, as above quoted, it should have been placed below *Ectozoma*, and immediately preceding *Brunsfelsia*. I have not been able to examine its seeds or to find any analysis of its structure, any farther than that the embryo is said to be areuate; in this respect it will probably resemble *Juanulloa*, *Marckea* and *Franciscea*, where it is terete, nearly straight or only slightly bent, with short, ovate cotyledons. The following is offered as an amended generic character:—

SOLANDRA, Swartz. (Char. emend.)—*Calyx* 5-sepalus, persistens; *sepala* lanceolata, acuta, marginibus in tubum longum, cylindraceum, 5-angulatum, inaequaliter et breviter 2-3-partitum, demum hinc fissum, valvatum conniventia. *Corolla*

magna, inferne valde coaretata, carnosa, cylindracea, 5-gona, superne ventricoso-campanulata, crassa, 5-nervis, venis anastomosantibus, limbo 5-partito, laciniis revolutis subequalibus rotundatis margine inciso-crispatis, aestivatione valde imbricatis. *Stamina* 5, æqualia, ad constrictionem tubi inserta, inclusa; *filamenta* glabra, subulata, erecta, cum stylo declinanta; *antheræ* approximatæ, oblongæ, basi subcordatæ, sub-4-gonæ, apicifixa, 2-loculares, margine longitudinaliter dehiscentes. *Ovarium* conicum, 2-loculare, placentis cum dissepimento cruciformibus, hinc in loculis centralibus, valde incrassatis, lunulatis, undique seminigeris. *Style* tenuis, sub-exsertus, declinatus, superne subrecurvus. *Stigma* parvum, sub-2-lobum, intus glandulosum. *Bucca* calyce fissa cineta, ovata, apice conica, imo e placentis cum pericarpio demum connatis breviter sub-4-locularis, superne 2-locularis; *semina* plurima, oblonga, compressa, reniformia, in pulpam carnosam nidulautia. *Embryo* intra albumen carnosum arcuatus.—Frutices sarmentose *Antillæ et Mexicanae*; folia alterna, ad apicem ramorum conferata, obovato-oblonga, integra, subcarnosa; flores terminales, solitarii, rarius 2-vel 3-ni, maximi, alboluteentes, rubro-picti.

1. *Solandra grandiflora*, Swartz, *Act. Holm.* 1787, 300. tab. 11; *Fl. Ind. Oe.* i. 387. tab. 9; *Rehb. Fl. Exot.* ii. 41. tab. 134; *Jacq. Hort. Sch.* i. 21. tab. 45; *Salisb. Linn. Trans.* vi. 100. tab. 6; *Meen, Exot. Pl. Kew.* tab. 6; *Bot. Mag.* tab. 1874; *Tussac, Fl. des Antilles*, ii. 49. tab. 12. S. scandens, *Wild. Reliq. Rom. Sch.* iv. 700. *Datura* sarmentosa, *Lam. Encycl.* vii. 463; —viscido-pubescentia, caule sarmentosa, radicante; foliis alternis, aggregatis, petiolatis, obovato-oblongis, acuminatis; floribus terminalibus, solitariis, rarius 2-3 aggregatis, laciniis corollæ obtusissimis, crenato-laciniatis, antheris sublunatis, 4-cornibus, apiculatis, basi parum fissis, genitalibus subexsertis.—Jamaica.
2. *Solandra nitida*, Zuccag. *Cent. Roem. Coll.* 128. no. 40. *Portlandia grandiflora*, *Hort. Batav.*; —caule arborescente, ramis flexilibus, elongatis, divaricatis, cortice rimoso; foliis glaberrimis, nitidis; flore glabro, calyce 4-fido, corollæ limbo 6-7-fido, segmentis rotundatis, crenato-undulatis, revolutis; antheris 2-cornutis.—Jamaica.
3. *Solandra guttata*, D. Don. *Bot. Reg.* tab. 1551; *Tecomaxochitl*, *Hern. Mex.* 408. *cum icono*; —frutex erectus, ramosus, rami foliorum lapsorum cicatricibus hispidis; foliis late elliptico-oblongis, acutis, subtus lanuginosis; floribus terminalibus, solitariis; calyce tubuloso, 3-dentato, dentibus inæqualibus, acutis; corolla ampla, pallide lutea, fauci purpureo-maculata, tubo longiori infundibuliformi, limbi laciniis latissimis, rotundatis, crispato-undulatis.—Mexico.

DYSSOCHROMA.

A recent inquiry into the different species of *Solandra*, with the view of determining the true limits of that genus, has convinced me that a considerable difference of structure exists between *Solandra grandiflora* and *S. viridiflora*; upon comparing these carefully, we cannot fail to arrive at the conviction, that these two species must be held to be generically distinct. In the former instance, the calyx has the shape of a large and cylindrical tube, irregularly cleft in the mouth into three unequal rather short teeth; it does not increase in size, but, in consequence of the growth of the fruit, splits on one side, by a longitudinal fissure, to the base; in *S. viridiflora*, on the contrary, the calyx consists of five, very distinct, lanceolate divisions, all free to the base, which at first are slightly connivent by their somewhat thickened margins, but which are easily, and soon become, separated into distinct sepals. The corolla in *Solandra grandiflora* is much larger, more campanulate, of thicker consistence, of a yellowish colour, with deep red nervures, and with a border of five large rounded lobes, remarkably crenated or fimbriated on their margin, and these are considerably imbricated in aestivation, one lobe being quite interior, and another altogether exterior: the stamens are also very glabrous. On the contrary, in *S. viridiflora*, the corolla, of a greenish lurid white, is deeply divided (half-way down) into five equal, revolute, lanceolate, acuminate and entire segments, which are quite valvate in aestivation, and connivent by their somewhat inflected tomentose margins: the stamens are swollen and very sericeously pilose at their base; in drying, both calyx and corolla become black, which does not occur in the true species of *Solandra*: in the latter genus the flowers are always terminal, whereas in *S. viridiflora* they are solitary and axillary, or at least grow out of several nearly terminal axillary fascicles of leaves: there are some other minor points of difference that will be traced in the details of the characters described. From these facts it will be seen that the new genus, of which the *Solandra viridiflora* may be considered the type, must be referred to the true *Solanaceæ*, and that it will belong to the *Jaboroseæ*, serving to connect that tribe with the *Iochromæ*, and closely allied to *Salpichroma* and *Nectouxia*. I have called it *Dyssochroma*, from δύσσοος, *aeyer*, and χρώμα, *color*, on account of the lurid sickly green colour of its large flowers, which become black as they wither, or lose their moisture in drying, a character common to all the *Jaboroseæ*. I have not been able to examine the embryo of this genus, but we may expect it will prove very different in form from that of *Solandra*. The following may be considered as its generic character:—

DYSSOCHROMA, gen. nov.—*Calyx magnus, 5-sepalus, persistens;*

sepala lanceolata, acuminatissima, primum marginibus in tubum 5-angulatum conniventibus, semicylindrica, demum libera, erecta. *Corolla* carnosa, tubo imo cylindrico, angulato, superne infundibuliformi, aut ventricoso-campanulato, 15-nervi, limbo æquilongo, 5-partito, laciinis aequalibus, longe lanceolatis, acuminatissimis, integris, 3-nerviis, circinato-revolutis, aestivatione valvatis, marginibus tomentellis, subintroflexis. *Stamina* 5, aequalia, ad constrictione tubi adnata, erecta, longissime exserta; *filamenta* subulata, imo incrassata, et sericeo-pilosa, superne glabra; *antheræ* lineares, apice mucronulatae, imo cordatae, in sinu dorsi affixæ, 2-loculares, loculis connectivo angusto parallele adnatis, intus longitudinaliter dehiscentibus. *Stylus* erectus, staminibus longiusculus, apice inerassatus. *Stigma* 2-lobum, lobis oblongis, adpressis, intus et marginibus recurvis glanduloso-viscosis. *Orarium* conicum, disco carnoso magno impositum, 2-loculare, placentis centralibus dissepimento adnatis, multiovulatis. *Bucca*; cætera ignota.—Suffrutices *Brasilienses*, scandentes, glabrae; folia alterna, in ramis laxa, in turionibus florentibus fasciculatis, ellipticis, acuminatis: flores pedunculati, e fasciculis solitarii, cernui, siccitate nigricantes; corolla albido-viridescens.

1. *Dysochroma viridiflora*. Solandra viridiflora, Sims, Bot. Mag. tab. 1948; Link & Otto, Ic. Pl. sel. 101. tab. 47;—foliis elliptico-oblongis, utrinque attenuatis, glabris, petiolatis, deciduis; floribus magnis, solitariis, calyce glaberrimo, corolla tubo viridescente, limbo lurido-albescente.—Brasilia, Prov. Rio de Janeiro, v. v. et s. in herb. meo et Hook. (Gardn. no. 502).

I found this plant growing at Tejuca and in the Orgau mountains: it is altogether glabrous: the stems are sarmentose, and in the younger branches the leaves grow in dense fascicles, which, as they fall off, leave them covered with crowded cicatrices, giving them an arolate rugose appearance; these terminate in a straight, angular, smooth stem, covered with a shining bark that readily peels off; the axils here are from $1\frac{1}{2}$ to 2 inches apart, and each solitary petiole is articulated in a projecting cup, from which a sharp ridge becomes decurrent on the stem below it; the leaves are $4\frac{1}{2}$ inches long, 2 inches broad, on a channeled petiole $\frac{1}{2}$ to $\frac{3}{4}$ inch in length; the peduncle is $\frac{5}{8}$ inch long; the calyx $1\frac{1}{2}$ inch in length, $\frac{1}{2}$ inch diameter; the corolla including the lobes, at the period of opening, is 4 inches long, and when the segments are coiled back, $2\frac{1}{2}$ inches long; the cylindrical portion of the tube, $\frac{3}{4}$ inch long, is included within the calyx, from which point it becomes gradually funnel-shaped, and a little below the mouth is somewhat ventricose, and about 1 inch in diameter, the lobes of the border being $1\frac{1}{2}$ inch in length and 5 lines broad at base, these are marked by three parallel nerves which are continued

along the tube ; the stamens and style are exserted $1\frac{3}{4}$ inch beyond the mouth of the tube, the anthers being 6 lines long and a line broad ; the style thickens towards the summit, and is terminated by a stigma formed of two adpressed lobes, lined within by a thick viscous gland ; the ovary is about 3 lines in diameter and 3 lines in height, quite conical, and seated on a large fleshy and coloured gland.

2. *Dyssochroma longipes*? *Solandra longipes*, *Sendt. in Mart. & Endl. Fl. Bras.* vi. 159; *Walp. Rep.* vi. 573;—fruticosa, glabra, foliis congestis, glabris, utrinque acutis, integerrimis ; floribus nutantibus ; pedicellis calycem subæquantibus, vel superantibus, fructiferis valde elongatis : calyx 5-partito ; corolla infundibuliformi, e basi sensim dilatata, limbo breviter 5-fido, lacinis acutis revolutis : stigmate longissimo spatio in stylum decurrente.—*Brasilia australi*.

The above is all the information I have been able to obtain of this species : it will be seen to differ in no respect from the preceding one (as far as we may judge from the foregoing characters) except in the shorter lobes of the corolla : the gradual dilatation of the corolla, without any sudden ventricose enlargement, is very often seen in *D. viridiflora*.

CACABUS.

This genus was first proposed by Bernhardi for a Peruvian plant of Dombey's collection, which was many years before accurately described and figured by L'Heritier (*Stirp. Nov. Angl.* p. 43. tab. 22), under the name of *Physalis prostrata*, and which appears to have since escaped farther notice : I find other species allied to it, which are all distinguished by their inflated calyx, generally of very delicate texture, remarkably reticulated, marked by dark green lines and veins, and which, swelling after the fall of the flower, eventually incloses the fruit, as in *Physalis* and several other genera. They have all herbaceous stems, are of a prostrate or straggling habit, and they bear a very striking resemblance to *Nolana*, especially in their fleshy flexuose branches, often geminate leaves, large campanular blue flowers, with a somewhat pentangular border, and marked with fifteen longitudinal nervures, as in that genus : the stamens are also included and somewhat unequal in size : indeed so near is this similarity in external appearance, in one species, that I have constantly passed over, without suspicion, a specimen of Mathews's collection, named by him "*Nolana spathulata*, R. & P.," which I did not consider it necessary to examine, as it was not in fruit.

There exists in Sir William Hooker's herbarium, a plant belonging to this genus, which appears to correspond well with the description of the *Nolana inflata* of the 'Flora Peruviana,' a spe-

cies which its authors neither saw nor examined, the drawing and details there given having been furnished by their draughtsman Tafalla, who probably never looked to the structure of the fruit, concluding the plant to be similar to the other species of *Nolana* there described: it is to be observed, that these species are as yet quite unknown to modern botanists, except from those descriptions, and may therefore be doubted as appertaining to that genus.

In all the specimens I have examined belonging to the genus *Cacabus*, the ovary is 2-celled, with a slender membranaceous dissepiment, along the axile line of which, the free placentae are respectively attached at right angles; these are fureated and fleshy, extending near to the walls of the pericarp, so that when the fruit is cut open, the dissepiment being scarcely visible, the placentations, with the attached seeds, appear disposed in a somewhat cruciform shape, seemingly as if the berry were 4-locular. The fruit, according to L'Heritier (*loc. cit.*), is a berry with an aqueous juice, as in *Nicandra*, and which, upon becoming dry, leaves a subcapsular, brittle, valveless shell, and which is bilocular with a membranaceous partition: as in *Physalis*, this berry is enclosed within a much larger ventricose calyx. Upon the summit of the ovary and of the immature berry is seen a small flattened prominent gland, out of which the style originates: this bears much analogy to the larger epigynous gland so conspicuous in the ovary of *Hyoscyamus*, and to which is attributable the peculiar mode of dehiscence in the fruit of that genus; but in *Cacabus* there is no such opercular dehiscence, although the gland is visible in the apex of the cells after the opening of the pericarp; a similar disc exists also in *Thinogeton*. I propose for this genus the following character:—

CACABUS, Bernh. — *Calyx* ventricosus, ureolato-subglobosus, membranaceus, inflatus, 10-angularis, 5-dentatus, dentibus inaequalibus, aequatis, erectis, angulis nervosis, persistens et accrescens. *Corolla* campanulata, tubo imo breviter coaretato, subito ampliato, limbo campanulato, magno, margine explanato, subintegro, sinuato-pentangulari, 15-nervi, nervis in angulis ternatim parallelis, aestivatione ignota. *Stamina* 5, inclusa, fere aequalia; *filamenta* ad coaretationem tubi adnata, filiformia; *antherae* ovales, erectae, 2-lobeae, lobis parallele adnatis, margine longitudinaliter dehiscentibus. *Ovarium* ovatum, substipitatum, apice glandulo parvo carnosamente donatum, 2-loculare, placentis dissepimento tenuissimo utrinque adnatis, cruciatim dispositis, et demum divaricatim 2-sidis, multiovulatis. *Stylus* filiformis, longitudine staminum. *Stigma* elongatum, 2-lamellatum, lobis crassis subcommixtibus intus stigmatosis. *Bacca* intra calycem auctum, vesiciformem, venoso-membranaceum,

reticulate pictum inclusa, subrotunda, exsucea, cortice fragili evalvato, 2-locularis, dissepmimento tenui, placentis suberuciatis seminigeris. *Semina* numerosa, subreniformia, compressa, *testa* rugosa, hilo laterali marginali. *Embryo* intra *albumen* carnosum teres, subannularis, *radicula* angulo basali spectante et hilo evitante, *cotyledonibus* semiteretibus æquilonga.—*Herbae Americæ meridionalis prostratae, subsuccose, pilosæ, Nolane facie; folia in axillis alterna, geminata, orata, sinuato-angulosa, petiolata; flores gemini, extra-axillares, pedunculati; corolla violacea.*

1. *Cacabus prostratus*, Bernh. *Linn.* xiii. p. 360. *Physalis prostrata*, *L'Herit. loc. cit.*; *Jacq. Ic. Pl. Rar. Am.* tab. 38; *Andrews, Rep.* tab. 75; *Nees ab Esenb. Linn.* vi. p. 480. P. Limensis, *Retz. Observ.* v. p. 22. *Physaloides prostrata*, *Mönch. Method.*; —herbaceus, annuus, pilis articulatis patentibus vestitus, caule prostrato; ramulis dichotome flexuosis; foliis radicalibus oppositis, caulinis alternis, et geminis, altero minori, late ovatis, sinuato- vel repando-angulatis, basi subinæqualibus, obtusis, supra glabris, subtus villosis, margine ciliatis, longe petiolatis, petiolo canaliculato dilatato, ciliato, folio æquilongo: pedunculis solitariis vel geminis, in axillis lateralibus, floriferis erectis, demum reflexis, elongatis; corolla cœrulea, imo albido-radiata; bacca globosa, glandulo parvo epigyno apiculata, calyce membranaceo multo majori recondita.—*Peruvia, in maritimis? ad Chancay et Chorillos, Prov. Limæ.*—*v. s. in herb. Soc. Lin. (ex hort. cult.); in herb. Hook. (Palaria, ad sinum "los Chorillos" dictum, MacLean).*

It is unnecessary to offer any detailed account of this species, as we find so excellent an account of it given by L'Heritier, who described it from living plants, at that time growing in England; it seems however to have been long lost to our gardens, although it was cultivated in Lee's nursery grounds in 1793, according to the specimen preserved in Sir J. E. Smith's herbarium. The leaves are from 2 to $2\frac{1}{2}$ inches long, $1\frac{1}{2}$ to $1\frac{3}{4}$ inch broad; they are finely reticulated, with a number of raised minute dots in each areole; the petiole is about 2 inches long, the flowers are quickly fugacious; the corolla is 1 inch long and 1 inch diameter across the mouth, the contracted base of the tube being 3 lines in length; the filaments are 3 lines long, slender, and hairy below; the fructiferous calyx is white, and almost transparent, hairy, globose, contracted in the mouth, with ten longitudinal nervures and anastomosing reticulations of a dark green colour, and is half an inch in diameter; the inclosed berry, when ripe, is 3 lines in diameter, 2-celled, with bifurcate placentæ bearing a number of minute rugose seeds; it is quite devoid of pulp; the pericarp is membranaceous, indehiscent, and its apex is marked

with a callous discoid process, resulting from the hardening of its epigynous gland.

2. *Cacabus Nolanoides* (n. sp.) ;—herbaceus, molliter villosus, caule striato, dichotome ramoso ; foliis geminis, altero multo minori, ovatis, crassiusculis, undulato-vix sinuato-angulosis, margine ciliatis, basi inaequalibus, utrinque glabris, inferne nervis pilosulis, petiolo late dilatato, ciliato, folii longitudine ; floribus solitariis, lateraliter extra-axillaribus, pedunculo florifero erecto, fructifero reflexo, corolla caerulea : calyce inflato, membranaceo, 10-nervi, reticulatim picto.—Peruvia, v. s. in herb. variis (Mathews, no. 839, sub nomine *Nolana spathulata*).

The leaves of this species are nearly oval, 4 inches long, $2\frac{1}{4}$ inches broad, upon a fleshy dilated petiole, with winged ciliate margins, $2\frac{1}{4}$ inches long and nearly 2 lines broad, subamplexieaul at base. The peduncle in flower is $1\frac{1}{4}$ inch long, the calyx is 6 lines long and 4 lines broad, the corolla is $1\frac{1}{4}$ inch long, and $1\frac{1}{4}$ inch across its somewhat expanded and nearly entire border. The peduncle in fruit is reflexed, $1\frac{1}{2}$ inch long ; the enlarged calyx is 8 lines long and 7 lines broad, the inclosed berry measuring 3 lines in diameter. This plant, which so greatly resembles the figure of *Nolana spathulata* in the ‘ Flora Peruviana,’ differs from it in the size of its leaves, the length of the petiole, the shape of the calyx, the size of its corolla, its more entire, not deeply-lobed border, the shape of its stigma, its vesicular calyx, not fleshy and subsequently bipartite, and finally by the very different structure of its fruit. It agrees in many respects however with the description of the text*.

3. *Cacabus ? inflatus*. *Nolana inflata*, R. & P. *Flor. Peruv.* ii. p. 7. tab. 112. fig. a ;—herbaceus, pedalis, prostratus, annuus, foliis radicalibus confertis, oblongis, in petiolum longum imo decurrentibus, caulinis geminatis, ovatis, subobtusis, basi inaequalibus, breviter petiolatis, petiolo dilatato ; floribus geminis, ex axillis lateraliter ortis, corolla speciosissima, albo-violacea ; fructu calyce striato, ventricoso, inclusa.—Peruvia (in arenosis Prov. Arequipæ).

From its inflated calyx, there is every reason to conclude that this plant belongs to this genus, rather than to *Nolana*. It was not seen by Ruiz and Pavon, being only known to them from the sketch sent them by their draughtsman Tafalla ; the fruit is not described as consisting of distinct carpels, but as “ semina 4-locularia,” which may have been construed from “ fructus 4-locularis,” which the fruit of *Cucabus* almost appears to be, from its projecting placentæ. It has a prostrate habit, is about a foot long, its

* A drawing of this species, with generic details, will be given in plate 49 of the ‘ Illust. South Amer. Plants.’

radical leaves are 4 inches in length, 2 inches broad, upon a petiole $1\frac{3}{4}$ to 2 inches: the caudine leaves are $1\frac{1}{2}$ inch long, 1 inch broad, on a petiole of 3 lines; the peduncles are $1\frac{1}{2}$ inch, the calyx 8 lines long, swollen in the middle, 4 lines in diameter, and 10-nerved: the corolla is nearly 2 inches long, $1\frac{3}{4}$ inch diameter across the mouth, which is obsoletely 5-lobed. In all the other species of *Nolana* mentioned in the work above referred to, the calyx is described as being deeply 5-cleft, with the divisions sagittate or cordate at the base, as in our well-known garden species *Sorema prostrata*; but in the plant under consideration the calyx is said to be distinctly ventricose and striated, which agrees with the character of *Cacabus*.

XXIX.—On the extinct and existing Bovine Animals of Scandinavia. By Prof. NILSSON of Lund*.

Of the Ox kind (Bos, Linn.).

Head oblong with broad muzzle† in which the nostrils project forward, open; no lachrymal fossæ; the ears pretty long, oval. *Horns* for the most part round, near the roots annular according to their growth ‡, otherwise smooth; with roots pointing outwards and curved in different directions, according to the various races.

Body heavily built; loins angular, not round; stout, short, not high-boned, and broad. The female is provided with four teats.

Tail long, pendent; at the end it is furnished with a tuft of long hairs.

Teeth, the grinders with the internal and external borders parallel. *Skull*: no opening between the facial bones above or in front of the orbits over the eyes, as in the Deer tribe. The lachrymal bones flatter, not hollowed out. The spinal process of the anterior vertebrae particularly strongly developed, to serve as attachment for the strong neck-muscles and ligamentum nuchæ which support the heavy head.

The animals belonging to this class, with few exceptions, are the largest and strongest built of ruminating horned cattle. In a wild state they always live in herds under the guidance of some strong pugnacious bulls; wandering from one track to another; at one time seeking the forests, at another the plains; at another, mountains and table lands; and at other times low and marshy places. They seek grassy spots, for their chief food consists

* Translated from his 'Skandin's Däggdjur.' 8vo, 1848, pp. 536–574

† The naked part where the nose ends is so called; it comprises the upper lip and that portion between the nostrils.

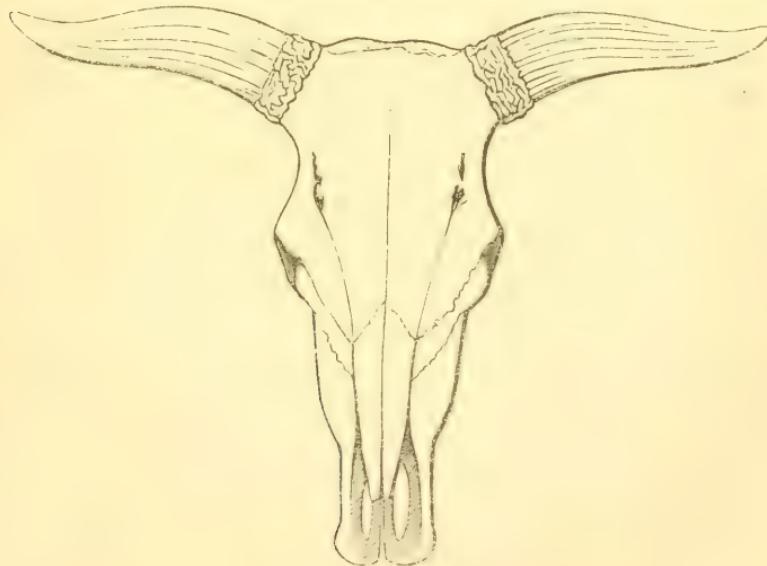
‡ Whence the age of the animal is determined.

of grass: they often devour green leaves and young tender branches, and these generally, besides the leaves of the pine and mosses, are their principal food during the winter in cold districts. (I am not here speaking of cattle that are housed.) They live like all ruminating animals (perhaps with the exception of the roe kind), and like their representatives among birds, viz. gallinaceous domestic fowls, in a state of polygamy; and like these, congregate, particularly at pairing-time, in flocks, when the forests resound and the fields echo with their loud cries. During this time, obstinate conflicts take place between the males, and the strongest are those which perpetuate the breed. Their cry is usually lowing, with some it is more grunting. They do not breed more than once a year, and the female seldom brings forth more than one calf at a time.

Before showing from whence our domesticated races and those of other states of Europe are derived, I consider it more desirable first to describe the *wild species*, the *fossil bones* of which have been found in the turf-bogs in the south of Scania. These are divided into those which have—

a. The forehead more long than broad, more or less flattened, the horns growing from the extremity of the angle which divides the vertex from the occiput; the intermaxillary bone generally reaches up to the nasal bones. To this class belong—

1. Uroxen (*Bos Ursus*, Antiqu.* *Bos primigenius*, Recentiorum).



Bos primigenius, Recentiorum.

The forehead flat; the edge of the neck straight, the horns

* The denomination Urox is derived from that language which the Ger-

very large and long, near the roots directed outward and somewhat backward, in the middle they are bent forward, and towards the points turned a little upward.

SYNONYMY. *Urus*, Jul. Cæsar, Bell. Gall. vi. cap. 28. Plinius. Hist. Nat. ii. cap. 37. Gesner, Hist. Animal. (Frankfort, 1620) i. p. 145 with fig.; *ibid.* p. 137 (skulls). Cuvier, Ossæm. Foss. iv. p. 150. tab. 11. fig. 1-4; 12. fig. 3-8 (skulls). Retz. Vet. Akad. Handl. 1802, p. 282.
The *Wild Ox*, Griffith, Animal Kingdom, iv. p. 111. *Bos primigenius*, Bojanus, Acta Acad. Cæsar. Leopold. Carolin. tom. xiii. p. 422. pl. 11. N.B. I have not this treatise at hand.

Description.—This colossal species of Ox, to judge from the skeleton, resembles almost the tame ox in form and the proportions of its body, but in its bulk it is far larger. To judge from the magnitude of the horn-cores, it had much larger horns, even larger than the long-horned breed of cattle found in the Campania of Rome. According to all the accounts the colour of this ox was black; it had white horns with long black points; the hide was covered with hair like the tame ox, but it was shorter and smooth, with the exception of the forehead, where it was long and curly.

The only specimens which we now possess of this extinct wild ox, are some skeletons dug up, of which two are at present preserved here at the Museum of the University, where are also preserved about a dozen skulls of earlier and later specimens.

THE SKELETON.—*Skull.*—The forehead smooth between the

manic race seems to have had in common in the earliest times, and signifies *forest ox, wild ox* (*Bos sylvestris*): for *Ur*, or *Or*, signifies *forest* or *wood, wilderness*, and is still used in many places in Sweden, Norway and Iceland. That the old word *Ur* or *Urd* was changed to *Or, Ore, Ora*, is shown by the word *Orrhöns*, which by the common people in Scania is called *Orhöns*, and in many places in Norway it is called *Urhöns*. The stony and wild tracts which surround the base of the mountains are called in Norway *Ore*, in Iceland *Urd*. In Scania there still exist many old forests which bear the name of *Ora*, and the peasants in some parts of the country say indifferently *kora till oran* and *kora till skogen*, which is in both instances "drive to the wood." Also in the older German, *Ur* signifies *wood, forest*, but has in compositions of later times been changed into *Iuer*; ex. gr. *Aurochs, Auershahn*. The Romans, when in Germany, first heard the word *Urocs*, and as they generally changed all names after the form of their own language, turned it into *Urus*. The Uroxen which were conveyed to Rome, and highly prized in the bull-fights of the circus, were by the ignorant confounded with the African *Antelope Bubalis*, wherefore the Urox sometimes by the Latin authors is mentioned under the name of *Bubalus*,—an error which Pliny notices.

By our forefathers in Scandinavia as well as in Germany this wild animal is, however, not called *Urox*, but *Ur* or *Ure*, as in the poem of the Nibelunge, v. 3762, thence *Urahorn* in our old Sagas. In certain provinces an angry mad bull is still called *Ure*. The Canton of Uri in Switzerland takes its name from this animal, and bears a bull's head in its arms.

roots of the horns, but lower down more or less hollowed out. The nasal bone reaching up to the line drawn between the lower borders of the orbits; the lower part of the lachrymal bones a little broader than the upper; the distance between the orbits and the bases of the horns is double the diameter of the orbit; the occipital ridge straight or rounded off backward from the base of one horn to the other, and hollowed out below so that it forms an acute angle; foramen occipitale somewhat higher than broad; the horn-cores without pedicles, but with a broad knotty ring round the root, are near the root directed outwards and somewhat backwards, in the centre curved forwards with the points upwards*. The outer edge of the zygomatic process of the temporal bone forms a right angle. A right line drawn between the points of the horns falls over the roots of the horn, between them and the orbits. *Atlas*: its wings curved backwards, oblique, much broader at the back, 10 inches 3 lines in breadth, the upper arch convex, the lower with a compressed hump over the hinder edge. *Epistropheus* short, the processus spinosus a high rising ridge, inclining backwards, whose outer edge is thin, the anterior angle rounded: along the under side of the vertebra is a ridge which passes backwards over the edge of the cup-formed articular surface; *foramen medullæ spinalis*, in front round, back above cylindrical, below flat. The arterial foramen oval.

The remaining bones in the skeleton resemble those of the tame ox, with the exception of their magnitude, and like this species, the *Urox* has thirteen pairs of rib-bones and six lumbar vertebre. As it would be far too diffuse to describe every single bone, I will only give the dimensions of those which are dis-

Fig. 2.

*Bos primigenius.*

* Precisely such a direction have the horns of our tame oxen, quite contrary to the assertion of Bojanus and many others, who, in the unlike direction of the horns, choose to find a specific difference between the *Urus* and the *Taurus*.

milar in the skeletons. The whole length * of the skeleton from the nape to the end of the rump bones (*ossa ischii*) 9 feet.

	ft.	in.	lin.
The length of the head from the anterior border of the ossa intermaxill. to the occipital ridge.....	2	4	4
Thus the whole length of the animal about	$11\frac{1}{2}$	to 12	
The height over the mane about.....	6	to	$6\frac{1}{2}$

The other dimensions.

The length from the horn-cores to the intermaxillary bone's anterior edge	2	1	5
The length from the orbit's lower edge to ditto...	1	3	4
" " horn base to the orbits.....	0	6	4
" " horn-core's concave side ...	1	6	6
" " horn-core's convex side ...	2	2	0
The under jaw from the angle to the point	1	8	0
The molar series in the upper jaw	0	7	4
Breadth of the forehead between the upper part of the crown of the horn	0	9	1
Breadth of the forehead between the lower parts of ditto.....	1	0	2
Breadth of the forehead between the orbit's upper part	1	0	2
Breadth of the forehead between the orbit's lower part	0	11	4
Breadth between the intermaxillary bone's upper parts.....	0	3	2
Breadth between the apertures of the ear in a line	1	0	4
Distance between the points of the horn-cores ...	2	4	0
The circumference of the crown of the horn	1	2	4

* I have at hand, in the Museum here, a complete and an incomplete skeleton of this species; besides from ten to twelve skulls both of younger and older; also many different loose bones from various parts of the body. When I wrote the first edition of this work twenty-seven years ago, I had seen skulls only of this colossal species; I came however to the conclusion, upon comparing them with the skulls of tame oxen, that the animal must have been about $11\frac{1}{2}$ feet long and 6 feet high, which comes the nearest to the proportion. But I insert here the whole note:—

“ From these measurements (of the skull of an Urox) an idea may be formed of the magnitude of the Urox, which certainly far surpassed that of all existing European animals. To judge from the proportions of the parts to a tame bull, the head of the Urox shows that it must have been an animal that from the nape to the root of the tail measured nearly $11\frac{1}{2}$ feet, and in height over the mane about 6 feet. In the Museum of the Royal Academy are fragments of the cranium of the Urox, which must have belonged to an animal more than 12 feet in length and $6\frac{1}{2}$ feet high. On one, the distance between the base of the horns above is $9\frac{1}{2}$ inches, below $13\frac{1}{2}$ inches, the thickness at the root 15 inches. The largest Scanian ox I have seen, and which was of an unusually large size, measured in length from the nape to the root of the tail 8 feet, and was 5 feet high over the mane. When we now consider that bulls and cows never reach the size that castrated oxen do, and that we ought to compare the bull or the cow with the wild ox kind, we shall then easily perceive that this last-mentioned was much larger than the tame ox, and perhaps he was even somewhat bigger in the southern regions, for example in Germany, than here in Sweden.

“ Caesar's account that the *Urus* was *magnitudine paulo infra Elephants*, was not so exaggerated as one has imagined.”

The body.

	ft.	in.	lin.
The length of the spinal column to the last dorsal vertebra	7	7	4
The length of the spinal column further in a right line to the upper tuber ischii	0	9	0
The length of the neck from atlas to and with the last neck vertebra	1	11	4
Greatest length of one of the middle ribs without the cartilage.....	2	5	0
Breadth	0	2	5 to 6

The extremities.

The length of shoulder-blade	1	8	0
Breadth of its base	1	0	0
The length of os humeri between the articulations	1	2	0
" " radius	1	2	4
" " ulna with olecranon	1	7	6
" " olecranon from the articulation ...	0	7	0
" " metacarpus between the articulations.....	0	10	0
The length of pelvis between the tub. ilii and ischii	2	1	4
The breadth in a line between both tub. ilii.....	1	11	0
The length of os femoris between the articulations	1	7	0
" " tibia	1	5	6
" " metatarsus.....	0	11	0

Remarks.—This skeleton is the most perfect specimen we have hitherto possessed; but the animal was not full-grown at its death. In the museum there are several bones which indicate somewhat larger individuals. Yet this species, as it came in long *after* the Scandinavian boulder period, and therefore at a much later time than that during which the same species lived in England, has never attained to the same size here as there. The skull which Prof. Owen gives in his 'History of British Fossil Mammals,' London, 1846, p. 498, fig. 208*, is in length 3 feet 1 inch, and the distance between the points of the horncores is more than 3 feet 6 inches, and the width of the forehead is near 11 inches; os metacarpi about 10 inches 5 lines; os metatarsi about 12 inches. At the Hunterian Museum in London there is a horn from the same species of animal found *under* turf in the marl, in which bones of the *Cervus megaceros* occur. From this situation it may be concluded that it is a still *older* and, in fact, much larger form than the preceding. It contains in length, according to the upper curvature, 3 feet 2 inches, and the circumference at the base is 1 foot $7\frac{1}{2}$ inches! With us they neither occur so large nor from so early a period.

Place of abode.—This colossal species of Ox, which is no longer

* Since the foregoing was printed and after this (thirty-fourth) sheet was set up, but not struck off, I made a journey to England, where I first obtained the above-mentioned work, which I was not able to quote before.

to be found on the earth in its wild state, was formerly widely spread over the greater part of Europe, from the present Scania to France and Italy, and from England to the northern and western parts of Asia; as in all those places its fossil bones are found in more recent strata. That great physical changes have occurred in the position of places in Europe, during the long time it sojourned here, is more than probable. South Scania has separated itself from the German continent, by means of that part of the Baltic which now lies between its shores and those of Pomerania; also from Denmark by means of the Sound; and England has also been separated from the great European continent by the Channel. Whether these straits—the Öresund, the Chamel and the southern part of the Baltic—were formed at the same time, we do not know with certainty; but from zoological reasons, which shall hereafter be adduced, it will appear that Scandinavia was at a much later period united to the European continent than England. In the present southern part of Scania, in the district south of Söderås, which anciently appears to have formed the northern boundary of the Germanic continent, this species was found in vast numbers; and to judge from the fossil bones dug up from our turf-bogs, they are found here in much greater number than the *Bison*, which existed here contemporaneously with it. During an equally long period, fifteen skeletons or skulls of the *Urus* have been found in Scania and only three of the *Bison*. According to these remains found, there must have lived five times as many of the former species as of the latter. However, although this proportion cannot be determined so exactly by figures, it nevertheless shows that the *Urus* was found here in much larger number than the *Bison*, and this same proportion might hold good in the whole of the western part of Europe*; while on the contrary, the *Bison* appears to have been far more numerous in its eastern parts, and far into west Asia, where it is yet found in great numbers between the Black and the Caspian seas. And that the *Urus* belonged to the western tracts of Europe, which being thickly peopled and cultivated before the eastern parts, might also be a reason that it was, as wild, extirpated or passed over into a tame race; while the *Bison* of the east preserved itself much longer in East Prussia and Poland, and is even now found in a perfectly wild state in those countries most nearly bordering on Asia. This species never could be tamed.

Julius Cæsar describes the *Urox* in his time as being found in

* In Denmark a vast number of bones belonging to the *Urus* have been found, but as yet not one of the *Bison*. The *Bison* skulls which I saw in England belonged, if not to a totally different species, at least to a much older form than ours.

the forests of the Hartz. He says that they in external form and colour fully resembled the common ox, but in point of magnitude they were little less than the elephant. They were both strong and swift, at the same time so spiteful that they spared neither man nor animal when they once caught sight of them. With the chase of these animals the Germanic youth became hardened, and the greater the number of horns of dead oxen they could exhibit, the more highly were they esteemed. These horns, which were larger than the common ox-horn, were frequently edged with silver and used as drinking vessels at great festivals (Jul. Cæsar, Bell. Gall. vi. cap. 28). Also our forefathers and other descendants of the Germanic race appropriated the horns of the Urox to the same use. Pliny affirms that the northern peoples (*Barbari septentrionales*) drank out of Urox-horns, which were so large that one contained an urna* (Plin. Hist. Nat. ii. cap. 37). Solinus mentions, that this horn, on account of its great capacity, was used as a drinking-vessel at royal feasts.

From the hide of the Urox our Germanic forefathers made girdles, and the flesh was eaten as palatable and healthy.

Remarks.—The earlier existence of the Urox as a different species from the Bison can no longer be doubted, seeing that we possess not only the skulls but also entire skeletons of both; but in later times a violent contest has arisen touching the question how far this animal existed in Europe during the age of history, and how far it is this species that is alluded to by the Roman authors under the denomination *Urus* (sometimes by them called *Bubalus*), and by the German writers of the middle age by that of *Ure*; or, whether this name applied only to that one species of *Bison* which German and our own middle-age writers call *Wisen*. It is more especially Professor Pusch of Warsaw who in later times has maintained the latter opinion. If the question be, whether this colossal, flat-foreheaded species of Ox, which we here call *Urus*, lived in Europe, and at various times and even in Scania *after the country had been inhabited by men*, the answer requires no learned historical or philological research, no wasting of time and trouble which might be employed on more useful objects; it requires for such an object only to visit the Museum at the University of Lund and to inspect one of the Urox skeletons preserved there, which I had the honour of presenting to the Museum, and which in the year 1840 was taken up under

* A Roman *urna* holds in Swedish measure $4\frac{9}{10}$ kans. Pliny's account seems rather exaggerated, partly because a drinking-vessel that holds 4–5 kans was too heavy and too large even for the stoutest drinker; and partly because a horn of the largest Urox-skull, among the Scanian ones which I have before me, did not hold more (counting from the base) than about $1\frac{1}{2}$ kan.

my own eyes from a depth of 10 feet out of a turf-bog near to Önnarp in the district of Wemmenshög in the south of Scania. This skeleton affords an incontestable proof that the animal during its lifetime was in contact with man : it has on its back a palpable mark of a wound from a javelin. Several celebrated anatomists and physiologists of the present day, among whom I need only mention the names of John Müller of Berlin and And. Retzius of Stockholm, have inspected this skeleton, and are unanimous in the opinion, that this hole in question upon the backbone is the consequence of a wound which during the life of the animal was made by the *hand of man*, and therefore not the least doubt can remain on this subject in the mind of any competent judge who examines it. The animal must have been very young, probably only a calf, when it was wounded. The huntsman who cast the javelin must have stood before it. The javelin, which entered at an *extremely acute angle* (which proves a sharp-pointed instrument) on the external part near the edge on the projection of the first lumbar vertebra, has pierced the bone, passed out on the backward side, and pierced through the projection of the next bone. The weapon, which probably remained in the wound, had through suppuration ultimately fallen out. The side of the opening where the javelin entered is more round, surrounded by a callus, and in the inner part is a cavity which shows there had been a great suppuration (Ur-invân. tab. 15. fig. 175). The opposite side of the aperture, which is more oblong in a vertical direction, and shows the form of the weapon, is surrounded by many projections of bone (Ur-inv. tab. 15. fig. 176–177), which manifests that the animal lived at least one or two years after it had been wounded. It was yet young when it died, probably not more than three or four years old, and not unlikely was drowned by falling through the ice into the water, where in after-times a turf-bog has formed over it. The skeleton lay with its head downwards, and one of its horns had penetrated deep into the blue clay which formed the bottom under the turf.

As it is thus practically shown that this species of Ox lived *contemporaneously with man*, and as it is equally certain that the same species of Ox lived here contemporaneously with the *Reindeer* and *Elk* (some of their fossil remains being not unfrequently found together in our old turf-bogs); so it is more than probable that these animals, namely the *Wild Ox with the flat forehead*, the *Reindeer* and the *Elk*, also lived contemporaneously in Germany, from whence they evidently came hither : and this is so much the more certain, as bones of all three have also been dug up from turf-bogs in Pomerania. But now Julius Cæsar relates (Bell. Gall. vi. 26–27), that among the animals which in his time were known and found contemporaneously in the Hercynian

forest in Germany, and which (according to his meaning) were not found in any other place, were *Reindeer*, which he describes but does not name, together with the *Alces* and *Urus*, which he both names and describes. The first-named was in form and the varied colour of its hide like a goat, but in size rather larger; it had branching horns, and these were found with both male and female; they were longer and more elevated than in any other known animal*.

That Cæsar here means the *Wild Reindeer* is evident to every zoologist. In another place (vi. cap. 20) he speaks of the half-savage Germans, in his time, as using the reindeer skin for clothing†. Thus did the Reindeer at least exist in Germany in the historic period, which has also been denied. The second animal found in the Hercynian forest was the *Alces*, and the third was the *Urus*. The last-mentioned (cap. 28) was, according to Cæsar, so colossal that it was only a little less than the elephant; in its external appearance, colour and form, it resembled the tame ox, but it had much larger horns, &c. It is thus possible, and more than possible, that Cæsar's third Hercynian animal was the same as the three which formerly lived contemporaneously in Scania. But to assume with Pusch, that Cæsar's *Urus* was not the flat-foreheaded *Urox*, but the convex-foreheaded *Bison*, would be to reject without reason what Cæsar expressly alleges of the likeness of the *Urus* to the tame ox, both in outward appearance, form, and enormously large horns; for it is certain that the *Bison* never can be said to be, “*specie et colore et figura tauri*;” neither could a Roman, who was accustomed to see the large-sized, long-horned cattle in Italy, of which we have representations even from Cæsar's period, find the horns of the *Bison* so enormously large as Cæsar describes those of the *Urus*‡; for the *Bison*, to judge from the cores on the skulls that have been found among us, even in its wildest state (at least in Cæsar's time), could never have had such large horns as the Italian tame ox. Besides, it is a fact which cannot be disputed, that Roman writers who speak of the *Urus* (by some called *Bubalus*; which appellations were synonymous, according to what Pliny expressly tells us, Hist. Nat. viii. 5) exactly characterize him by his large, wide, open horns, his strength and swiftness, while the characteristic of the *Bison* is *long hair* on the back, neck, or under the chin; and also that no one Roman

* It is quite evident that Cæsar has confused his remarks on the *Reindeer* and the *Elk*, so that at the same period he has inserted something that belonged to the one and something to the other of these species of animals.

† “*Pellibus . . . rhenorum tegimentis utuntur.*”

‡ “*Amplitudine cornuum et figura et specie multum a nostrorum bovum cornibns differt,*” Cæs. vi. 29.

writer ascribes to the *Bison* wide horns, or to the *Urus* long hair.

“Tibi dant variæ pectora tigres,
Tibi villoſi terga bisontes
Latisque feri cornibus uri.”—Senec. *Hippol.* Act. 1. v. 63.

“Germania . . . gignit . . . jubatos Bisontes, excellentique vi et velocitate Uri, quibus imperitum vulgus Bubalorum nomen imponit.”—Plin. *Hist. Nat.* viii. cap. 5.

Both these animals were carried to Rome to be viewed by the people in the Circus. Martial and others, who were present and saw them, describe them as of different species.

“Illi cessit atrox *bubalus* atque *bison*.”—Martial, *Spect.* 23.

For my part, I am convinced, from all these combined reasons, that our two largest species of fossil Ox were known to the Romans under the name of *Urus* and *Bison*. They are also spoken of by German writers of the middle age. In the poem of the ‘*Nibelungen*,’ v. 3761, a chase is described which took place in a mountainous and woody tract (v. 3775) in the neighbourhood of Worms, where it is related that Siegfried killed one *Visent* and four Uri:—

“Darnach schluch er schiere einen *Visent* und einen Elch,
Starker *Ure* viere und einen grimmen Schelch *.”

In Griffith’s admirable ‘Animal Kingdom,’ an English elaboration of Cuvier’s ‘*Règne Animal*,’ to which I had not previously had access, is given in the 4th book, p. 416, an engraving of the *Bos Urus*. The original painting, which was found in the possession of a merchant at Augsburg, and copied for that work by Hamilton Smith, is supposed to have been executed in the beginning of the sixteenth century. This old painting, which is upon a square piece, had in one corner the remains of a (noble) coat of arms and the word *Thur* in gilt German characters almost effaced. If the plate be a true copy of the original, it shows plainly that it was made from a wild and not a tame animal. Such an exterior and such horns no *tame animal* has; but just such horns and with just such a curvature and direction, to judge from the length and direction of the horn-cores, our fossil, great, flat-foreheaded Ox *must* have had. As a further proof of this my conviction, it may be added, that I possess a *war-horn in bronze*, dug from a depth of 6–8 feet out of a turf-bog in southern

* Many have been the conjectures as to what animal is meant by *Schelch*. Büsching has translated it by *Brandhirsch*; others are of opinion that it was the now fossil Irish *Cervus euryceros*; but all this is only conjecture. In the same poem it is said (v. 3756), that Siegfried’s hound (Bracke) started “*ein ungefügēn leuwen*” which Siegfried shot, with bow and arrow, and which made but three springs after being shot. But it is probable that by *Leuwen* is meant *Lo*, the Lynx. In v. 3755 is mentioned “*ein vil starchez halpwul*,” by which probably is meant a *Glutton* or *Badger*.

Scania, which evidently belongs to that period when the inhabitants there used bronze for their weapons. This *war-horn* in form and curvature wholly resembles the horn-core upon the cranium of an Urox, and has the same long, thin, upturned points, like the ox in Hamilton Smith's drawing. It is more than probable that the inhabitants of the south of Sweden first used the horn of the Urox for their war-horns, and at a later period made themselves horns of bronze in the same form as the former. To this may be added, that Baron Sigesm. Herberstain relates in his 'Rerum Mosecoviticarum Commentar.' of the year 1549, p. 33, that in his time, about the latter half of the sixteenth century, there was found in Massovia a species differing from the wild Lithuanian *Zubr*, which in its native land was called *Thur*. They were not found there in any large number, but were kept in some parks, and there were certain burthens laid on the towns to preserve and maintain them. In the same manner the Bison (Pol. *Zubr*) is now kept in a large forest at Bialowieza in Lithuania, by command of the Emperor of Russia*; and, in like manner, a race of wild oxen is still preserved in Scotland in some woody parks† (Compare Bell, Brit. Quadr. p. 422): a stuffed specimen of one of these animals is preserved in the British Museum‡.

Again, the above-mentioned painting, which Hamilton Smith copied, shows that the *Urus* was without mane, and had pretty smooth hair over the whole body, with the exception of the flat-(not convex) formed forehead, where it was longer and curly; the head was large, the neck thick, the dewlap small, the back straight, and tail long, so that it reached to the middle of the tarsi. The colour was entirely sooty black, the chin alone was white; the horns, which were straight-out, forward, and upward, were whitish with long black points§.

* See the Note of M. Dimitri de Dolmatoff in vol. iii. of the New Series of the 'Annals,' p. 148; and Prof. Owen's notes on the Anatomy of the Bison at p. 288 of the present Number.—ED. *Ann. Nat. Hist.*

† Notices relative to the wild oxen of Britain will be found in the earlier volumes of the 'Annals': see vol. ii. p. 274, and vol. iii. pp. 241 and 356.—ED. *Ann. Nat. Hist.*

‡ It has been said that this "White Scotch Bull" was the last remnant of the *Urus* in its half-wild state; but such is certainly not the case. Our large Holstein cattle come much nearer to the *Urus*, both as to the form of head and the size and direction of the horns. In the Scotch, the horns are curved upward, almost only in one direction; the hair on the head and neck is longer and curlier; the forehead is, however, smooth; the colour white, the ears a reddish brown, the head and neck with a gray-brown shade. There is no race of wild oxen of this colour. It is a pity that no cranium has yet been preserved of it; at least not one is to be met with in the Museums in London.

§ Hamilton Smith adds in a note, that this painting agrees with a figure which is found in the 'Stone of Clunia' with a Celtiberian inscription, and which represents a huntsman and a wild ox.

This figure I look upon as genuine, and the best now to be found of the *Urus* in a wild state. The figure which Gesner (in his History of Animals, Francof. 1622, lib. i. p. 145) gives of the *Urus* or Polish *Thur* is inferior to the former, yet in all essential points they perfectly agree; the direction of the horns, the long curly hair on the forehead, the short hairy covering of the remaining parts, the length of the tail, &c., are in both the same. Gesner assures us, after Wolfgang Lazius, that the communicated figures of that and of the *Bison* are made from living animals, through the care of Baron Herberstain; and in the text he says: “*Urus . . . est forma bovis nigri, habet longiora cornua quam bisons.*”

It is almost inconceivable how any one will reject so many concordant testimonies, and from such widely different places and times, that during the historical period there lived in Europe an enormously large ox, of the form of the tame ox, of a black colour and long spreading horns, quite dissimilar from the *Bison*. This denial is so much the more unreasonable, as the bones of just such an ox as described by the ancients have been found in the earth, and they have also been found in the same places with the bones of the *Bison*.

That this Wild Ox has contributed to produce the race of our large, long-horned cattle, is more than probable.

When and where this colossal, flat-foreheaded, large-horned Wild Ox first became tamed, we do not know; but certainly it took place in remote antiquity and in a land far distant from us. Among the copies taken from fresco paintings on the sepulchres at Thebes, preserved in the *Egyptian room* of the British Museum, are to be seen groups of cattle, among which we distinguish some as the *Zebu*; others have long horns bent in different directions, and seem already to be tame descendants from the *Urus*. They show a species of small growth, and have the horn-cores (*steglar*) outward, upward, and bent in *one* direction. It appears to me probable that the colossal smooth-foreheaded *Urus* was first tamed either in the south or south-west part of Europe, or already in Asia by some Celtic race; but, nevertheless, long after this it was often found in a wild or half-wild state in the forests of central Europe, even till the beginning or middle of the sixteenth century; that the tame race which sprung therefrom, perhaps like all tame races, became gradually smaller than the wild stocks, but yet larger than other tame races which spring from smaller stocks; and it was this *large breed of black cattle* which the Celtic races brought with them here to the north, and which are spoken of in many passages of our Sagas as belonging to the Jötens (giants). The tame race which sprang from the *Urus* has reached us from the south and west of Europe. It was found probably in Italy already in Cæsar's time; but in the

interior of Germany quite a different race of tame oxen was found, much less in size, with smaller horns, and often without any : this will be treated of in the next article.

This same small race was, without doubt, found among the Germanic tribes also here in Scandinavia, where the inhabitants, accustomed to small cattle, looked upon those introduced by the Jötens as so enormously large. That this race might exist at one and the same time, and in the same country, both wild and tame, is not more extraordinary than that the *reindeer* in Lapland and the *swine* in the whole of south and central Europe should yet exist in the same tracts both in a wild and tame state.

That the wild Urox from the earliest times was an object of chase to the inhabitants here, is proved beyond contradiction by the before-mentioned skeleton preserved in the museum at Lund. This race of wild oxen has never lived in Scandinavia further north than Scania, and even here the fossil remains occur for the most part in the districts of Skytts, Bara and Wenmehög. Once only have I obtained a skull from Allerum in the district of Luggude.

We perhaps may be astonished at the thought that so colossal an animal as an ox of this race, whose natural food was grass, could winter in a country such as this, where the snow covers the fields often during five to six months of the year, and where the grass during that period either failed or was inaccessible. But our astonishment ceases when we see how the cattle support life during the winter in the forest tracts ; with what avidity they bite off and devour the tender branches with their buds, and the catkins of birch, hazel, sallow and other species of willow. Those places where the Urox wintered were certainly thickly grown with the above-named trees, and from them it sustained life. It is not more surprising than to see the Elk live and winter in climates which are much more severe than that in which the Urox existed.

[To be continued.]

XXX.—*Observation of some of the Phases of Development of the Trichodina pediculus (?).* By J.T. ARLIDGE, A.B., M.B. (Lond.), Member and Student in Anatomy of the Royal College of Surgeons.

[With a Plate.]

In examining the contents of a bottle of water procured from a pool in the swampy part of Hampstead Heath, in the past month (July), and during the drought prevailing at that time, I encountered an animaleule which I determined to be, most probably, the *Trichodina pediculus* (Ehr.). Perceiving that the animal was disposed to remain in the same locality under the mi-

microscope, and possessed in its interior several globules about a clear nucleus, indicating an aptness for ulterior changes, I determined to prosecute a further observation of it.

Occupying about the centre of the being was a distinct, clear nucleus*, and around this were arranged six or seven granular greenish globules, with interspersed particles or granules. The circumference was also furnished with a single row of long and large cilia, which caused the animaleule to rotate on its own axis, without altering its relative position (Pl. VII. B. fig. 1).

After observation had been continued a little while, most probably from a change of position of the creature, an interior, contained circle came into view, eccentric to the outer one so far, that an interval was left between the two for about half of their periphery, whilst in the remaining half the two spheres were in apposition. This interval left between the two had a rather darker colouring, owing to its finely granular character, being minutely dotted as in engraving (fig. 2).

These appearances were present about half-past one o'clock p.m. Moreover, at the same time that the two circles came under notice, the inner one was observed to rotate independently of the outer one, and indeed in the contrary direction,—a result I believe due (judging however from some slight indications only) to its surface being clothed with delicate cilia. Thus, the cilia of the external tunic bent themselves to the left†, producing a motion from right to left, whilst the inner one revolved turning from left to right. This contrariety in the direction of the revolution of the two spheres was very observable, being, at this period and for some time afterwards, very active.

In process of time the motion of the contained circle waxed more rapid than that of the external, and seemed to impede the latter; at least, the rotation of the outer sphere became irregular, and was altogether slower than when first witnessed.

Between two and three o'clock the number of included globules had decreased; and instead of six or seven about the pellucid nucleus, only four could be discovered, but these were of larger size than those heretofore noticed. One of the four seemed more granular than the rest, and deeper seated; another, of the largest size, had one-half of its cavity clear, the other occupied with green granular matter. The remaining two were tolerably clear. Scattered in the interspace between the vesicles were some rounded granular green masses about one-fourth the size of the former, and, in addition, the common formless green particles (fig. 3).

* This nucleus would, according to Ehrenberg's ideas, be called the testis or sperm-cell.

† I speak here of the apparent directions assumed, viewed under the microscope: hence the real directions are just the reverse.

At three o'clock a similar character prevailed; two, however, of the vesicles having grown larger than the other two.

At four o'clock the selfsame two larger ones had attained to double the size of the two others, and one of them exceeded the rest, and appeared to contain in its interior two rounded green nuclei. The two smaller ones now hardly surpassed the rounded green granules spoken of (fig. 4).

At five o'clock two large vesicles were visible, and one smaller one of about one-fourth their size. The nucleus could still be detected about the centre of the animalecule, by a delicate pellucid outline, encroached upon and partly concealed by the peripheries of the two developing cells of the interior (fig. 5).

About six o'clock the two large vesicles had further augmented in size, and occupied the greater part of the area of the entire animal. One of these had in or upon it the two small granular masses described. The outline of the original nucleus was still perceptible.

The two growing cells had now nearly come into contact, and every minute hastened the apposition which presently occurred, and in about another half-hour the two vesicles had blended together, a constriction only indicating the previous line of separation. Rather to one side of this constriction, and engaged within the periphery of the coalesced cells, thus occupying nearly the centre of the animal, the outline of a third vesicle could be seen, probably the original nucleus. Again, on the side opposite to the last vesicle—on that, viz. in which the gap of the mouth was perceptible,—was another sac, overlying slightly the margin of the large constricted coalesced cell, at the point of constriction, and containing granules in its interior (fig. 6).

The original rotundity of the animalecule had become, to some extent, already interfered with by the development of the contained cell; but this interference was destined to proceed; for now the outer tunic began to protrude at one pole, in the long axis of the enlarging interior cell, that is, in the direction in which the latter exerted its outward pressure. This tendency of the animal to increase in one direction continued, and an oval, and afterwards a pyriform figure was attained.

The two green masses, described in one of the now-coalesced cells, occupied a position at the projecting part of the animalecule, remaining distinct (fig. 7).

The great cell would seem now to have undergone some degree of contraction on itself, for it became more globular, the constriction almost disappearing, and left a larger interval at the opposite end of the animal to that from which it protruded. In the meanwhile, the sac described as existing on the same side of the animalecule as the mouth, increased rapidly in its dimensions, so much so as to compress the larger one, forming for

itself a hollow in its wall (fig. 8). Moreover, the rotatory motion became very slow and feeble, and although the external large cilia still flapped, bending towards the left, no motion occurred in that direction, save a slight oscillation of the lower half ; whilst the motion of the inner mass was irregular and slow.

During the next quarter of an hour, the animaleule went on enlarging where occupied by the growing cells, the primary one, now spherical, protruding strongly : and, by reason of this cell having now nearly equalled in size the original being, the whole appeared like an animaleule in process of transverse fission (fig. 9).

The second cell, which previously had occupied rather a lateral position with reference to the primary one, was now situated almost entirely beneath it. This second and smaller cell also was the only one which could be properly said to be included within the parent form, the larger one being but an appendage. The only portion which would seem to retain the latter *in situ*, was one—containing granular matter and some globules like the rest of the parent substance,—extending upwards for a short distance as a lateral band.

The revolution of the animal seemed now to cease for a little while, but presently was resumed feebly and irregularly ; the external cilia however only causing a jerking movement of the lower part.

During the later changes, the cilia, which primarily fringed the entire margin, were now seen on the lower one—that viz. which remained of the original periphery—and also, owing to the transparency of the animal, along a line behind and just below that along which fission was about to occur (fig. 9).

At seven o'clock, the lateral band attaching the budding cell to its parent had retracted to within a little distance of its base : the growth of the second cell had much advanced, and by its upward pressure against the primary sac, and the lateral pressure of the walls of the parent animal, it had assumed an irregular shape ; but its cavity remained quite diaphanous, excepting in its lower part, where a few fine granules were dispersed (fig. 10).

On one side of the two developing cells a small transparent globule existed, along with three or four others, and some amorphous particles, in the substance of the parent being. The cilia had apparently decreased in size—or at least in distinctness and energy, and at half-past seven they had disappeared, motion in them having previously been arrested (fig. 10).

At about a quarter to eight o'clock P.M. the first-formed cell had rendered itself almost independent of its parent, and was bent to one side. The second sac had much increased in size (fig. 11).

Having withdrawn my attention for a moment to complete the

sketch of the animaleule at this stage of development, it happened unfortunately, that, in the instant, the first vesicle had detached itself and floated away, leaving the second free at the margin.

Moreover, it is to be noted, that, after the disappearance of this first sac, two spherical granular bodies similar to those I had thought to be present in it were still perceptible, occupying the same relative position to one another (fig. 12).

Watching the progress of the second sac up to eight o'clock, I saw it gradually make its way outwards, leaving more and more of the parent-being free. The latter still presented numerous small globules and greenish particles. Having subsequently made compression, the process of detachment was hastened, and at length completed, the second sac becoming independent. However, this interference with the natural progress of development seemed to arrest its activity, for the detached bud showed no indication to move away, and the parent animal was left broken and misshapen, but still retaining its green globules and particles (fig. 12).

Remarks.—The process of development above described may be called one of internal gemmation, and is distinct from that of spontaneous fission, as detailed by authors, although in some of its phenomena and phases it may resemble it. M. Dujardin would restrict the modes of propagation of the true Infusoria, or so-called Polygastria, to that by spontaneous fission, and, occasionally, by gemmation. But in the animaleule observed by me, we certainly find another mode in operation, more akin to generation by ova, which Ehrenberg considers to occur, although that most able microscopist would seem to have founded his opinion on other observed appearances, interpreted by Dujardin as due to the process of 'diffusione.'

It would have been very gratifying to me to have been enabled to follow the detached bud, and to have watched the changes it might have undergone. I have since met with diaphanous vesicles similar in character, devoid of any distinct nucleus, containing only some small particles of greenish matter, but have never been able to discover a very decisive progress in their development. However, this fact is certain, that the product of the animaleule observed did not partake of its distinctive characters, but was merely a simple non-ciliated cell. Such characters truly might be subsequently developed in it, or in another being derived from it, in accordance with the phenomenon of 'alternation of generation' of Steenstrup, or with the truth-bearing hypothesis of Prof. Owen, of an active 'spermatic force.'

It being much more my purpose in writing this paper to record an observation than to speculate upon it,—leaving the latter to others more capable than myself,—I shall conclude by merely

stating that most of the phenomena I have traced were also observed by my friends and fellow-students at the College, Messrs. Hulme and Hallett.

BIBLIOGRAPHICAL NOTICES.

The Rudiments of Botany: a familiar Introduction to the Study of Plants. By A. HENFREY, F.L.S. &c. London, Van Voorst, 1849. 24mo. Pp. 249.

WE have often been asked to point out some book by which a beginner might easily attain a knowledge of the more elementary parts of botany, and have always felt much difficulty in giving a satisfactory answer to the question. The above-named work has now supplied the want, and in future we shall at once direct the inquirer's attention to it. It is written in simple language, so as to be easily understood by those who are totally without botanical knowledge, and nevertheless contains nearly all that preliminary information which it is requisite to obtain before approaching the more elaborate 'Introductions to Botany,' such as the 'Outlines of Botany' by the same author, or Professor Balfour's 'Manual.' Those who desire, as we hope all who have gone so far will do, to obtain still more minute scientific knowledge, will then study Dr. Lindley's excellent 'Introduction.' It is not however absolutely necessary, for such as only contemplate attaining a knowledge of the names of British plants, to extend their reading, at first, beyond the nice little book before us, since they will find in it all that is absolutely requisite to enable them to use the books descriptive of our native plants. We say *absolutely* necessary; for we certainly do not believe that those who have attained to that amount of knowledge will be satisfied to remain ignorant of the many highly interesting subjects included in physiological, not to mention the more curious and abstruse parts of systematic, botany which are elucidated in the more elaborate works, which, having got over the difficulties attending the attainment of the rudiments of the science, they will then be enabled to read with interest and ease.

We think that Mr. Henfrey has performed the task which he has undertaken in a very satisfactory manner, nor have we any objections to make to the plan which he has followed, but think that he will be able in a future edition (for which we expect an early call) in some degree to improve the language of his book: not that much improvement is requisite, but such a book cannot be written in language of too simple and perspicuous a character. In some few cases an error in the punctuation has caused some slight ambiguity which will be immediately detected by its author. There are also a few typographical errors which require correction. These ambiguities and errors present no difficulty to the botanical reader, but may be the cause of error or inconvenience to the beginners to whom the book is addressed. For instance (p. 34), the wallflower, pink and

pear are instanced as illustrating the mode of growth in annual plants; (page 41) the holly is called a shrub; (page 43) the snowdrop is instance as having a solitary flower on a stalk called a scape, in which we think that we see two errors, since a scape often bears more than one flower, and the snowdrop has several flowers. At page 98, line 3, we fancy that "figure" is put for "Fig." "In the different kinds of clover we meet with spikes, umbels and capitules" (p. 99); we doubt the correctness of this statement. Sepals is put for petals on page 131 at line 11.

There are a few other similar instances of inadvertence, but their very insignificance shows how little there is to which to except in the book, which we cannot too strongly recommend to our readers.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

Dec. 19, 1848.—The Lord Bishop of Norwich, President, in the Chair.

Mr. Adam White, F.L.S., exhibited three curious species of *Hemiptera* belonging to the genera *Scaptocoris* and *Petalochirus*. He made some remarks on fossorial insects in general, illustrating them with specimens of a New Zealand Mole-Cricket and of a new genus of *Carabide*, allied to *Scarites*. He particularly described a new species of *Scaptocoris* (*S. Amyoti*) from Northern India, remarkable inasmuch as it forms a second distinct species of a very striking genus hitherto known to occur only in Brazil (*S. castaneus*, Perty).

Read a paper, entitled "Experiments and Observations on the Poison of Animals of the Order *Araneidea*." By John Blackwall, Esq., F.L.S. &c.

After referring to the fabulous accounts of the singular effects said to be produced in the human species by the bite of the Tarantula, and of the serious and sometimes fatal consequences attributed to that of the Malmignatte, Mr. Blackwall proceeds to consider the validity of an opinion prevalent among arachnologists of the present day, that insects pierced by the fangs of spiders die almost instantaneously. He states that in the summer of 1846 he commenced an experimental investigation of the subject, the particulars of which he communicates, arranging his experiments under four distinct heads, corresponding to the objects upon which they were made, namely the human species, spiders, insects, and inanimate substances. The experiments are detailed at length, and the following are the principal results.

First, as regards the effect of the bite of spiders upon the human species. The species selected was *Epeira Diadema*, and Mr. Blackwall states the legitimate conclusion deducible from various experiments to be, that there is nothing to apprehend from the bite of the most powerful British spiders, even when inflicted at a moment of extreme irritation and in hot sultry weather, the pain occasioned by

it being little if any more than is due to the laceration and compression which the injured part has sustained.

Under the second head, the observations were made on a male and female of *Tegenaria civilis*; on two females of *Segestria senoculata*; twice on females of *Ciniflo atroa* and females of *Lycosa agretica*; on a female *Epeira Diadema* and a female *Calotes saxatilis*; on two females of *Epeira Diadema*; and lastly on a female of *Epeira Diadema*, which in a state of high exasperation bit itself. Extensive mechanical injuries, Mr. Blackwall states, commonly prove fatal to spiders, whether received in conflicts with their congeners or otherwise; but no evidence supplied by his experiments indicates that the fluid emitted from the orifice in the fangs of the *Araneidea* possesses a property destructive to the existence of animals of that order when transmitted into a recent wound.

Thirdly, as the result of numerous experiments on insects, made with *Epeira Diadema*, *Segestria senoculata*, *Epeira quadrata*, *Tegenaria civilis*, and *Agelena labyrinthica*, the author comes to the conclusion that they do not present any facts which appear to sanction the opinion that insects are deprived of life with much greater celerity when pierced by the fangs of spiders than when lacerated mechanically to an equal extent by other means. It is true however that the catastrophe is greatly accelerated if the spiders maintain a protracted hold of their victims, but this is obviously attributable to the extraction of their fluids, which are transferred by often-repeated acts of deglutition into the stomachs of their adversaries.

Fourthly, in his experiments on inanimate substances, Mr. Blackwall found that litmus-paper presented to spiders belonging to several genera when in a state of extreme irritation, and moistened by the transparent fluid which issues under such circumstances from the fissure near the extremity of their fangs, invariably became red as far as the fluid spread, clearly proving that this secretion, although tasteless, is an acid. On the other hand, the fluid which flows from the mouth, as also that contained in the stomach and that which is discharged from wounds inflicted on the body or limbs, were found by the same chemical test to be alkaline. Turmeric paper was rendered brown by the application of the fluids from the mouth and stomach, and restored to its original colour by the agency of the fluid secreted by the so-called poison-gland, thus affording complete confirmation of the respectively alkaline and acid natures of these several secretions.

Mr. Blackwall concludes his paper by proposing the name of *salces* for the instruments by which spiders seize and destroy their prey; the term *mandibles* being obviously improper for organs which do not, as Mr. W. S. MacLeay has plainly shown, constitute any part of the oral apparatus; and that of *chelicera*, proposed by M. Latreille, implying an hypothetical analogy to the antennæ of hexapod insects, from which they differ so widely both in structure and in function. He adds, that he has observed the labrum in a low state of development in species belonging to numerous genera, and that it is attached by its base to the superior surface of the palate, but

that the extremity, which is free and usually round or somewhat pointed, can be slightly elevated, depressed, extended, retracted and moved laterally at will; and mentions that Professor Owen has detected a rudimental labrum in spiders of the genus *Mygale*. To apply the term *mandibles* to organs originating above the labrum, and therefore not situated within the mouth, is evidently erroneous; and the author ventures to anticipate, upon anatomical considerations, that future investigations will lead to the conclusion that the mandibles of the *Araneidea* are confluent with the palate.

March 6, 1849.—R. Brown, Esq., V.P., in the Chair.

The necessary business of the Meeting having been disposed of, the Vice-President in the Chair proposed, that, in consequence of the recent death of Edward Forster, Esq., Treasurer and Vice-President of the Society, and in consideration of his long connexion with, and eminent services to, the Society and to Natural History, the Meeting should adjourn; which was unanimously agreed to.

March 20.—The Lord Bishop of Norwich, President, in the Chair.

Read a paper "On the Anatomy and Development of certain *Chalcididae* and *Ichneumonidae*, compared with their special economy and instincts; with descriptions of a new genus and species of Bee Parasite." Part I. By George Newport, Esq., F.R.S. & L.S.

Mr. Newport remarked that the parasitic *Hymenoptera* in their larva state are among the most imperfectly organized forms of *Articulata*, and yet, having passed through this stage of their existence, they become some of the more active and perfect of insects. They are nourished by suction, and either are attached singly to the external surface of the bodies of their victims, or reside in the same cells with them gregariously, or infest them internally, according to their species. In the whole of them, however, the general form of body and of the digestive organs, at the earlier periods of growth, is very similar, and the special development of each species is regulated by the same laws. They cast their tegument at different periods of growth like other larvæ, a fact which Mr. Newport has observed in *Paniscus*, although in the apodal larvæ of *Hymenoptera* it has heretofore escaped the observation of naturalists. Their digestive apparatus at first is extremely simple, and has the form of a capacious bag or sac, without any anal outlet. Consequently no faeces are passed until the larvæ have acquired their full growth and ceased to feed. After this period of assimilation the digestive cavity begins to assume a new condition. It becomes perforated at its base, and an intestine and anal outlet are formed, and faeces are then passed. One reason for this late completion of the alimentary canal seems to be the necessity that the fluids of the insect preyed upon should be preserved in a healthy state for the support of the parasite; and another, that the food of the victim should not be contaminated. But when the parasites are full-grown the necessity for these conditions ceases, and the intestinal portion of the digestive apparatus is developed.

The following description of a new genus of *Chalcididae* found in the cells of *Anthophora* was then given :—

Genus ANTHOPHORABIA, Newp.

Fem. *Caput* thorace latius; *antennæ* 6-articulatæ, pilosæ, articulis 2^{do} 3^{to} 4^{to} 5^{to} que subæqualibus, 6^{to} clavam elongato-ovalem efformante. *Thorax* abdomenque longitudine æquales. *Alæ* venâ medianâ bifidâ. *Tarsi* 5-articulati. *Mas:* *Antennæ* 4-articulatæ, articulo basali arcuato, magnoperè dilatato, infernè excavato, 2^{do} cylindrico, 3^{to} magno globoso, 4^{to} elongato-ovali. *Oculi* stemmatosi. *Alæ* abbreviatæ.

ANTHOPHORABIA RETUSA (*Fem.*). Æneo-viridis, capite magno, oculis compositis nigris, abdomine nitido ovali, alis magnis rotundatis, pedibus flavescentibus. (*Mas*) flavus vel saturatè ferrugineus, capite magno rotundato ocello utrinque unico tribusque in vertice instructo nigrescente, pedibus robustis.—Long. lin. 1.

Mr. Newport found this species in abundance in the nests of *Anthophora* at Richborough in Kent, while searching for the larvæ of *Meloë* in August 1831, 1832 and 1834. The larva is apodal, sub-cylindrical and slightly attenuated at each extremity, and formed of fourteen segments, with a small head and short acute mandibles, and there were usually from thirty to fifty specimens in each bee-cell. In some instances they changed to nymphs and imagos at the end of summer, but in others the change did not take place until the spring, at which time the perfect insect comes forth.

The author states that he was unable to find any description of this curious parasite in the works of entomologists; the only writer who makes reference to an insect which, possibly, may have some affinity with this, being Mr. Westwood, who refers to a species, found by M. Audouin in France, under the name of *Melittobia Audouinii*, but without describing it; so that if the two insects should prove to be identical, which Mr. Newport considers doubtful, this name cannot be adopted. Reaumur and Degeer both found parasites in the cells of Mason-bees, but their species have not been clearly made out.

The author deduced conclusions with regard to the habits of *Anthophorabia* from peculiarities in the anatomy of the sexes, and expressed an opinion, from the absence of an ovipositor in the female, from both sexes being found in activity in the closed bee-cell, and more especially from the male possessing only stemmata, instead of the usual compound eyes of winged insects, that impregnation is effected before the female first quits the cell, and that she deposits her eggs in new cells while these remain open and are being provisioned. The difference of structure and function between compound eyes and ocelli was explained in support of these opinions, and the sexes of *Anthophorabia* were contrasted with those of *Stylops*, as described by the author in his "Memoir on *Meloë*," read to the Society on the 19th of January 1847. These differences of structure in similar organs were regarded as always indicatory of peculiarities in economy.

A second species of *Chalcididae* had also been found by the author, in the larva state, in the nests of *Anthophora*, on the 12th of Sep-

tember 1847, at Gravesend, and which he at first mistook for the larvæ of the species now named *Anthophorabia*. These larvæ afterwards proved to be of a species which he named provisionally *Monodontomerus nitidus*. The general form of the larva and the armature of its body were then described, and the question discussed as to whether it was a carnivorous feeder, subsisting on the body of the bee larva, or a pollinivorous, subsisting on its food. The armature of hairs on the surface of its body showed that it was not an internal-feeding larva, as the author has never yet found the internal-feeding parasites of insects clothed with hairs. From the presence of hairs on its body, and from an examination of the faeces, the author was induced to regard it as pollinivorous.

The larvæ remained unchanged until the middle of May 1848, and some time before passing into the state of nymphs, faeces were passed for the first time, similar to those of the larva of *Anthophora*, which, like its parasite, Mr. Newport has constantly found passes nothing until it is full-grown and ready to undergo its transformation. The digestive apparatus of the larva of *Monodontomerus* was then described as occupying nearly the whole interior of the body in the shape of an oval sac, or Florence-flask, with exceedingly thick parietes formed of masses or packets of cells, enclosed between a delicate muscular envelope on the external and a granulated mucous layer on the internal surface. This capacious digestive stomach is connected anteriorly with a short and narrow œsophagus, and posteriorly with an imperforated column of masses of cells, which are continuous with those that form the chief portion of the walls of this organ. After the larva has ceased to feed, the cells separate, and the column becomes a tube, the separation proceeding from the centre of the base of the sac along the axis of the column to the anal outlet in the terminal segment, after which this intestinal portion of the canal is further developed and the larva undergoes its transformation.

The nymph state was assumed at the end of May, and the first perfect insects appeared on the 27th of June, or about four weeks afterwards. The author concludes that the female deposits her eggs in the cell of the bee, after it has been closed, by perforating it with her ovipositor.

Drawings of the sexes of *Anthophorabia* and its larva, and of the larva and nymph of *Monodontomerus*, with details of anatomy, were exhibited.

April 3.—Robert Brown, Esq., Vice-President, in the Chair.

Read a paper “On the Development of the Ovule in *Orchis Morio*, L.” By Arthur Henfrey, Esq., F.L.S. &c.

The paper contains the results of a series of observations made in May 1848, which Mr. Henfrey presents to the Society, partly because he believes that in the present state of the question all evidence derived from careful observation is of some value, and partly because he has succeeded in obtaining a more complete series of figures illustrating the successive conditions of the ovule than has yet been

published ; Mohl, who gives the most complete account of the development in *Orchis Morio*, having given no drawings. In the first stage, examined on the 3rd of May, the ovules of flowers which were just opened and were without signs of pollen on the stigmatic surface, were just curving over towards the anatropous position ; the nucleus projected beyond the cells forming the single coat of the ovule, and consisted of a large central cell (the embryo-sac) enclosed by a layer of very delicate cells of small size, constituting a proper coat of the nucleus. On the 9th, the ovules of fully-expanded flowers were not much altered except in the much clearer definition of the walls of the cells. The embryo-sac was filled with a clear colourless fluid, in which floated minute black atoms. In some flowers the stigma was smeared with pollen, which sent down numerous tubes, about $\frac{1}{1000}$ th of an inch in diameter and at most one-fourth of the size of the smallest surrounding cells. On the 13th, when the flowers were withered and the stigmas were covered with pollen, a dense bundle of tubes lay in the midst of the lax tissue of the canal leading to the cavity of the ovary. Some of the ovules were completely anatropous, while others were about three-fourths curved, the former being about $\frac{1}{100}$ th of an inch in length. The two coats of the ovule were now distinctly evident, and the nucleus was still covered by its own cellular coat, and still contained only the clear colourless fluid with black points. On the 16th, the pistillary cords extended nearly to the base of the ovary, presenting all the characters of pollen-tubes, and apparently continuous with those derived from the pollen on the stigma. Both coats of the ovules had become considerably developed, and the inner had grown up far beyond the nucleus ; the embryo-sac had lost its proper cellular coat, had acquired the aspect of a large ovoid sac attached by a pedicle to the chalazal region, and contained opalescent mucilaginous matter (protoplasm), in most cases accumulated at the ends, chiefly at that next the micropyle. On the 20th, the last-mentioned appearance continued ; and at the micropyle end, one, two or (usually) three minute vesicles had been formed, always seeming to originate as cavities in the mucilage, and not as if derived from the formation of a membrane on the outer surface of a nucleus or cytoblast. These vesicles soon took the appearance of distinct cells with exceedingly delicate walls, and undoubtedly existed before the pollen-tubes entered the foramina of the ovules. In those ovules which had been penetrated by the pollen-tubes, these were traced by Mr. Henfrey through the wide mouth of the outer coat and the narrow canal of the inner, as far as the apex of the embryo-sac, which however they never entered, but generally appeared to be directed a little to one side and to lie in contact with its outer surface, just over the place where the minute vesicles lie within. On the 31st, the previous observations were repeated and confirmed on specimens in various stages of growth. At this period, in some of the embryo-sacs one of the vesicles had become divided into two cells by a horizontal septum, the upper cell dividing again and growing out through the endostome in a conical form to produce the confervoid filament de-

scribed by Mr. Brown, and which Mr. Henfrey believes Prof. Schleiden to have mistaken for the pollen-tube. On the 3rd of June, the author again satisfied himself that the vesicle within the embryo-sac (the germinal vesicle) is the first cell of the embryonic body; it generally exhibits a slight collection of protoplasm at its base, and soon after the pollen-tube reaches the surface of the embryo-sac divides into two cells, the upper dividing again and growing out into the articulated filament, the cells of which are formed by the production of septa in the same way as in confervas, hairs of phanerogamous plants, &c.; the mucilaginous layer (or primordial utricle of Mohl) being rendered very evident by the application of iodine. At the same time the lower part of the embryonic body enlarges and soon perfectly fills the embryo-sac, the process of cell-formation by which the embryo is produced varying apparently in different cases. Generally the lowest cell enlarges very much and becomes filled with dark mucilaginous matter, and then this is soon divided into a number of cells by the formation of septa. In some cases two of the germinal vesicles undergo development and two confervoid filaments are produced.

From these observations Mr. Henfrey concludes that the embryo is really produced by the ovule itself; that the germinal vesicle exists within the embryo-sac before the pollen exerts its influence; that the pollen-tube penetrates the coats of the ovule to reach the embryo-sac; and that the passage of the pollinic fluid through the intervening membranes impregnates the germinal vesicle and determines its development into an embryo. The investigations having been made with every precaution, and the results being in perfect accordance with those of Amici, Mohl, Müller and others, he believes them to be a sufficient refutation of Schleiden's views so far as the plant in question is concerned. He regards, however, as points requiring further investigation, the question whether the whole of the pistillary cords are composed of filaments directly produced by the pollen granules; whether there is any relation between the application of the pollen on the stigma and the development of the germinal vesicles; and whether the production of the confervoid filaments is a normal process, which is open to doubt when only observed in ovaries containing such an abundance of ovules as those of *Orchis Morio*.

Read also a notice of a species of *Monodontomerus*, parasitic in the cells of *Anthophora retusa*, contained in a letter addressed to, and communicated by, Adam White, Esq., F.L.S. &c.

Referring to the *Monodontomerus* described by Mr. Newport at the last Meeting, of which an account will be found at page 279, Mr. Smith remarks that it is identical with a species which he some months ago showed to Mr. Adam White and Mr. Francis Walker, the latter of whom then informed him that it was a new species of *Monodontomerus*. He adds, that Mr. Walker, in whose hands he placed specimens of both sexes for description, on learning a few days afterwards that Mr. Newport had reared the same insect from

the nest of *Anthophora*, readily waived his right of description in deference to Mr. Newport's wish to describe the insect himself.

In the 'Zoologist' for March of the present year, Mr. Smith incidentally mentioned that he had bred two distinct species of *Monodontomerus* from the cells of *Osmia bicornis* and those of *Anthophora retusa*. Anxious, in the summer of 1848, to discover the larvæ of *Melecta punctata*, he procured from a colony of *Anthophoræ* at Charlton in Kent a number of larvæ and pupæ; but all the larvæ, though differing much in colour, produced *Anthophoræ* only. While separating the larvæ from the pupæ, he observed in a cell partially broken open, containing a pupa of the bee, a small larva by its side slightly moving; and on removing the pupa, he found twelve more minute larvæ feeding upon it, which they continued to do for ten or twelve days, by which time they were fully grown. When first observed, the pupa of the bee was about one-third consumed, and at last not a vestige of it remained; all that the cell contained besides the larvæ being a small portion of yellow dust or small granules. They remained in the larva state for several weeks, and then changed to pupæ, in which state they continued for about a fortnight, when they became perfect and active insects. The species of *Monodontomerus* bred from the cells of *Osmia* also fed upon the pupa, and underwent the same process of development.

Mr. Smith concludes by referring to a statement of Mr. Westwood in his 'Introduction to the Modern Classification of Insects,' that he had frequently observed *Monodontomerus* flying about and entering the holes made in walls by *Osmiæ*, in which they were doubtlessly about to deposit their eggs; and to his mention of a species communicated to him by M. Audouin, in which the males have rudimentary wings; and suggests that it would be exceedingly interesting to determine whether the species of *Monodontomerus*, and the *Anthophorabia* also, might be identical with the insects observed by Audouin and Fonsecolombe.

April 17.—N. Wallich, M.D., in the Chair.

Read a paper entitled "Remarks on the genus *Atriplex*." By Joseph Woods, Esq., F.L.S. &c.

After observing, that, as far as the British species are concerned, the genus *Atriplex* had remained till lately as it appeared in the 'English Flora' of Sir J. E. Smith in 1828, Mr. Woods proceeds to notice the additions made to it by Mr. Babington. The first of these is *A. nitens* (*A. Hermanni* of Moquin-Tandon), belonging to a division of the genus in which some of the flowers are perfect and produce horizontal seeds. The author thinks the division a sound one, though on one occasion he has found a few horizontal seeds, the produce probably of perfect flowers, in *A. littoralis*. The second is *A. marina*, introduced by Linnæus as a plant found in England, and distinguished from *A. littoralis* by its serrated leaves. Hudson admitted it under the name of *A. serrata*, but most of our later botanists have considered it as a variety of *A. littoralis*, and it must be placed among the doubtful species.

The next group, which has no perfect flowers, and a tendency to produce hastate or triangular leaves, is the one which presents the greatest difficulties. We find here, in the last edition of Mr. Babington's 'Manual,' three new species, besides *A. erecta* of Hudson, which, though adopted by Smith as a very rare plant, is, if Babington's view be correct, one of the most common. The surface of the seeds and the shape and tubercles of the perigonium or enlarged calyx covering the fruit seem to be a good deal relied upon in distinguishing these species; but Mr. Woods states that several species, or at least several forms, have two sorts of seeds. Those of the smaller calyces are slightly depressed, smooth, black and shining; while those formed in the larger calyces are much larger, so much so as to have occasionally three times the diameter of the upper seeds; they are considerably more depressed, of a dark chestnut colour, and wrinkled or shagreened. The sepals are all at first smooth, and those in the lower part of the plant frequently never become tubercled. This he notes as particularly the case in *A. angustifolia*, of which otherwise the perigonium is as distinctly tubercled as in *A. erecta*. Mr. Woods is willing to admit as three common species—*A. angustifolia*, with rhomboid leaves and all the seeds black and smooth; *A. patula*, with triangular leaves, and all or nearly all of the seeds depressed and shagreened; and *A. deltoidea*, with triangular leaves, and all or nearly all the seeds thick, black and smooth. *A. erecta* he thinks to be different from *A. angustifolia*, though he is unable to point out any satisfactory character. With *A. prostrata* and *A. microsperma* he is not sufficiently acquainted to form any judgment. *A. rosea* of Babington is perhaps a good species, though nearly allied to some of the maritime varieties of *A. patula*, and perfectly distinct from the *A. rosea* of continental botanists. The latter is a self-supporting plant, and not prostrate like the *A. rosea* of Babington. Koch separates *A. laciiniata* and *A. rosea* from the other species by the lobes of the perigonium, united to the middle; but this is often the case in *A. patula*, and not always so in *A. laciiniata*. They are however hardened and of a pale colour. The author is disposed to rely more on the uniform buff colour of the stem, which in *A. patula* and its allies is green with resinous stripes. The *A. laciiniata* of the south of Europe is not our English plant. The former has its clusters disposed in long naked spikes, the latter in short leafy ones. Ours is probably the Linnæan plant. The perigone in *Atriplex* varies from ovate to rhombic, or to a square attached at the angle, and from that to campanulate; the latter form is so decided in all the specimens of the continental plant with fully formed seeds within reach of Mr. Woods, that he suggests the trivial name of *A. campanulata*.

Read also the following Letter from Linnæus to the Rev. John White, formerly Chaplain at Gibraltar, and brother of Gilbert White of Selborne and of Benjamin White, then the principal English publisher of works on natural history. Communicated by John Gould, Esq., F.L.S. &c.

Viro Reverendissimo et Venerando D^{no} I. WHITE.

s. pl. d.

Car. Linné.

Accepi literas Tuas, ad calend. januarii datas, suo tempore et ad eas regessi : accepi et datas d. 1 Martii, et 22 Aprilis. Accepi et ante duos dies merces Tuas et dona vere aurea ; pro quibus omnibus ac singulis grates immortales reddo, reddamque dum vixero.

Sturnus collaris Scop. ann. 1. p. 131. *Fringilla Sordone Manett. orn. t. 338. f. 1.* *Avis kyburgensis, Gesn. orn. app. 725.* *Muscicapa gula fusco undulata, tectricibus alarum nigricantibus apiculo albo, (collaris) mihi dicenda.* Rostrum admodum parum est emarginatum, diversa a Turdo arundinaceo.

Turdum pygargum non antea vidi ; erit equidem *Turdus* ; apex rostri modice incurvus.

Pratincolam antea non vidi ; ad Grallas spectat et proprii generis est. *D^{no} Lever* ne desinas grates meis verbis agere pro egregie et pulcherrime conservatis *aviculis*, quibus me beare voluit.

Phytolithi Filicum erant certe optimi

isti lapides qui referunt tænias non vidi ; an radicum plantarum aquatricarum rudimenta ?

ista impressio in schisto, ita refert *Sertulariam* quandam Ellisii, ut nisi magnitudo vetaret, dicerem eam *Sertulariam*.

alia foliis atris linearibus est *Zostera*.

quadrati politi, *Quartzum coloratum* γ. *Syst. nat. 3. p. 65.*

Fuei rubri et pilosi impressiones rariores :

Lepadogaster Gonum in lagenula est certe *Cyclopterus nudus* meus *Syst. nat. 414. p. 2.*

Attelabus calpensis : hunc etiam ab aliis accepi.

Tenebrio femoribus uncinatis (bispinosis) *Tenebrio calpensis* mihi dicendus.

Motacilla cauda albo nigroq; maculata. a me non antea visa.

Myrmeleon formicarium nostrum habet in alis stigma album, habeo jam insectum coram.

Formicalyn. lege *Formicalynx*.

Artedi opera non prostant apud nos, sed *Leidæ*.

Gryllus umbraculatus ubi habitat ; quid agit cum umbraculo ?

Te Datore optimo multa animalia habeo.

Tetrao tridactylus pedibus nudis tridactylis.

Hirundo rupestris nigricans, rectricibus subæqualibus : 2, 3 macula alba.

Piscis thoracicus capite excoriato ; nondum nomen imposui.

Attelabus calpensis cærulescens thorace piloso, elytris rubris : punctis 3 nigris.

Sphecius mutabilis atra pedibus hirtis, abdomine maculis luteis plurimumque quatuor.

Sphecius erosa nigra, capite thorace alis pedibusque ferrugineis.

Apis calpensis labio superiore acuminato inflexo, abdominis segmentis punctis geminis nigris.

Cancer *dæresis* brachyurus, thorace lævi linea transversa insculpta
marginibus serratis, chelis lævibus.

Cancer —— brachyurus subhirsutus, manibus totis ciliatis.

Cancer ex squillarum prosapia + distinctæ ; nondum posui differ-
entias et numero plura, præter ultima, Te inventore, alleganda.

Literæ excrescerent in infinitum, si simul et semel omnia responso
exponerem, nunc aliis negotiis implicitus reservo reliqua proximæ
epistolæ.

Scripsi multa addenda vol. 1. *Syst. nat.* idq quotidie ; absolvı di-
dium tomum. Si Tuus frater edat, certus sum quod hoc prodeat
optimis typis, qui Anglis communis. Tam multa quæ quotidie
prodiere, post priorem editionem operis, et quæ allegavi multum
laboris expostularunt. Si vixero absolvam opus in autumnum.
Quid mihi offerat in sostrum ? An poterit habere optimum cor-
rectorem typi ?

Upsaliæ, 1774. d. 3 julii.

Viro Reverendo Domino Joh. White,
London.
Blackburn.

May 1.—The Lord Bishop of Norwich, President, in the Chair.

John Hogg, Esq., F.L.S., exhibited a portion of a large and remarkable Wasp's Nest, taken by himself last autumn. The portion exhibited formed about one-third of the entire nest, which was built in the inside of the roof of one of the wings of Mr. Hogg's house at Norton in the county of Durham, a part being fixed under the roof, and the remainder to the side wall immediately below it. The hole under the slates by which the wasps went in and out was originally made by sparrows ; and at this part, and among another portion of the wasp's nest, appeared the remains of the old bird's nest, consisting chiefly of straw with a few feathers. The entire wasp's nest bore the appearance of having been the fabric of several years, some of it being apparently older and in inferior preservation to the rest, as well as somewhat blackened. Externally the nest is beautifully parti-coloured, the layers of the various substances used in the construction presenting circular or curved lines or rings, which are brown, buff, yellow, grey, dark grey, nearly black, &c. ; altogether exhibiting a very elegant shell-like structure, which Mr. Hogg has not observed in any other British wasp's nest. These layers he regards as indicative of the mode in which the wasps carried on their labours ; one wasp, or set of wasps, having made use of the same substance (such as wood, lichen, the bark of a tree, &c.), collected from the same place, and of the same colour, to form one circular layer or ring ; and then having been succeeded by another wasp, or set of wasps, using other substances taken from another spot, and of a different colour ; and so on.

Mr. Hogg states that he has recently seen in the British Museum a very similar nest sent from China by Mr. Say ; but the species of the Chinese wasp, or even its genus, is not stated. He had at first hoped that his nest might have proved the work of the new wasp

taken by him in his garden at Norton some years ago, and described by Mr. Frederick Smith, in his Memoir on British Wasps, under the name of *Vespa borealis*; but on submitting to that gentleman specimens taken alive from the nest, they were determined by him to be neuters of the common wasp, *Vespa vulgaris*.

The author concludes by stating his intention to present the portion of the nest exhibited to the British Museum, where, if deemed worthy of preservation, it may be placed next to the Chinese nest, which it so closely resembles.

Read in continuation a paper "On the Anatomy and Development of certain *Chalcididae* and *Ichneumonidae*," &c. Part II. By George Newport, Esq., F.R.S. & L.S.

The author first read a "Postscript" to the preceding part of this paper, abstracted at p. 277, one object of which was to confirm his statement, which had been questioned by Mr. Westwood, that he discovered the insect, *Anthophorabia*, in 1831, at which time he had made known the fact to D. W. Nash, Esq., now a Fellow of the Society, who permitted him to make known the circumstance. The author also corrected his view with regard to the nature of the food of the larva of the second species he had discovered in the nest of *Anthophora*, which he had named provisionally *Monodontomerus nitidus*, but which is now believed to be *Monodontomerus obsoletus*, which species had been suspected of infesting the genus *Osmia*, although the larva had hitherto been unknown. Having carefully examined the form of its mandibles since the first part of the paper was read, he now finds that they are acute, slender, and fitted only for piercing and not for comminuting food, and consequently he agrees with Mr. Smith that the species is carnivorous, and not pollinivorous as he had supposed. Further examination of this larva, therefore, has tended to confirm the general views which he had maintained, that structure when carefully and accurately investigated is an infallible index to function and habits.

The second part of the paper on the *Ichneumonidae* was then read. This comprised a detailed account of the natural history of *Paniscus virgatus* from the bursting of the ovum to the assumption of the imago state. The egg, as noticed by Degeer in *Ophion luteum*, and by Hartig in other species, is affixed by a pedicle to the skin of the caterpillar on which the larva is destined to feed, and the larva continues attached to it during the whole period of growth. Mr. Newport found the eggs of *Paniscus virgatus* on the full-grown larva of the broom-moth, *Mamestra pisi*, on the 26th of September 1847. They were black, shining, and of a pear-shaped form, and each was attached by a pedicle inserted into the skin of the caterpillar. At the moment of being hatched they were burst in front, by a vertical fissure, like the eggs of the *Iulidae*, and the head only of the larva was gradually protruded, so that at first these ova more resembled the growing seeds of leguminous plants than animal organisms. The anterior portion only of the body was afterwards slowly protruded, but the larvæ gave no evidence of sensation during the whole

of their growth, and scarcely even of vitality. Yet affixed by one extremity to the shell, and by the mouth to the skin of the caterpillar, they grew rapidly until at from the 12th to the 15th day they had acquired their full size, and measured half an inch in length, and then for the first time became detached from the shell. The author then described the form and motions of the stomach as seen through the tegument on the second day of growth, and also the structure of the head, the distribution of the tracheæ, and the mode in which the larva changes its skin while still attached to the egg-shell. This change was now seen for the first time in the apodal larvae of *Hymenoptera*, as noticed in the first part of this paper, in these larvae of *Paniscus*. It occurred at least *three* times in each larva before quitting its shell. The skin is burst as in other insects along the dorsal surface of the thorax, and is gradually carried backwards chiefly by the effect of growth of the larva, but it continues to inclose the caudal segments, which are also included between the two halves of the shell. The fourth change occurs when the insect is transformed to a nymph. It assumes this state inclosed in a leather-like cocoon spun by itself after it has destroyed the caterpillar on which it has fed, and while lying in the earthen chamber which the caterpillar had formed for its own change under ground. The change to a nymph took place in April, and to the perfect Ichneumon fly, *Paniscus virgatus*, in May 1848.

The author then describes the mode in which the alimentary canal is originally developed in the embryo of insects. The first developed portions of the embryo are, first, the ventral, and then the lateral parietes of the segments. The lateral grow from below upwards, until their free margins ultimately approach along the future dorsal surface, meeting first of all in the cephalic, and then in the caudal segments. The termination of the future alimentary canal in the anal segment is the result of a fold on itself of a layer of the first portion of the yolk included by the completion of the two caudal segments, and is the commencement of the column of cells, which afterwards becoming perforated when the larva is full-grown, form the colon and intestine, and which retains the celliform structure to so late a period in the larva of *Monodontomerus*. The remains of the yolk are included within the body by the union of the segments along the dorsal surface, and form the digestive cavity, the last portion included being in the prothorax, at which point the yolk enters the body in Crustacea, as pointed out by Rathke. The mode in which the great digestive cavity, or stomach, and the different structures of the canal are formed is then described, and the general configuration of the organ is shown to be very similar, during the earlier stages of growth, in all embryos of insects. This primary form is longer retained in the imperfect apodal larvae, especially in the parasites, than in other species, and hence the incompleteness noticed in *Monodontomerus*. The structure is completed earlier in *Microgaster* and *Ichneumon*; but although in these a true colon and intestine are formed, these continue closed, and no faeces are passed until the larva is matured. The appendages of the canal follow the same laws of development. The glands which produce

the silk required by the insect for the formation of its cocoon, are formed the earliest. The *Malpighian* vessels are completed at a later period in these parasites than in the herbivorous larvæ, in which they are well formed almost from the moment of leaving the egg. In conclusion the author states, "that in proportion to the more or less early development of any structure or organ, the function or instinct associated with that organ is more or less early evolved; and that in proportion to the completeness of a tissue, such is the degree of perfection of each special function or instinct in the animal."

Read also a paper by J. O. Westwood, Esq., F.L.S. &c., entitled "Description of *Melittobia Audouinii*, a Bee Parasite." The following are the essential characters of this genus, which belongs to the family *Chalcididae* and subfamily *Eulophides*.

MELITTOBIA.

*Antennæ maris 9-articulatae; articulo 1^{mo} maximo subtus ad apicem excavato, articulis 4^{to} 5^{to} et 6^{to} minimis; fœminæ simplices, 8-articulatæ; articulis tribus apicalibus in utroque sexu clavam ovalem formantibus. Mas cæucus. Fœmina oculis ocellisque instructa. Alæ maris abbreviatæ, fœminæ magnitudinis ordinariae; alæ vena ordinaria *Eulophorum* typicorum instructæ. Tarsi 4-articulati.—Habitatio parasitica in nidis apum cæmentariarum.*

Notices of this insect (first observed by the late M. Victor Audouin) had been published by Mr. Westwood in his 'Introduction to the Modern Classification of Insects' and in the Journal of Proceedings of the Entomological Society, and it was also considered by Mr. Westwood as identical with the insect described by Mr. Newport in the preceding paper under the name of *Anthophorabia retusa*, although different from the description published of that insect by Mr. Newport in the 'Gardener's Chronicle' in the major part of its characters, some of which, as the possession of a furcate median vein and 5-jointed tarsi, are foreign to the family and subfamily to which it belongs; whilst the asserted possession of stemmatous eyes by the male was regarded as erroneous, there being no instance of such a structure throughout the whole range of winged insects, whilst it is essentially a character of some of the wingless tribes.

Mr. Westwood also exhibited specimens of the larvæ of *Eulophus Nematici*, which are parasites on the *outside* of the body of the larvæ of *Nematus intercus*, but which are nevertheless destitute of hairs on the surface of the body, although the external parasitism of the larvæ of *Monodontomerus* was considered by Mr. Newport as indicated by the hairs on the surface of their bodies.

ZOOLOGICAL SOCIETY.

Nov. 14, 1848.—Wm. Yarrell, Esq., Vice-President, in the Chair.

The following papers were read:—

1. NOTES ON THE ANATOMY OF THE MALE AUROCHS (*Bison europeus*).
BY PROF. OWEN, F.R.S., F.Z.S. ETC. ETC.

It was with much concern that I received notice at the latter part of September last of the sudden failing of health of the male Aurochs;

the male of the pair munificently presented to the Zoological Society by His Imperial Majesty the Emperor of Russia, at the instance of our distinguished scientific countryman Sir Roderick Impey Murchison, G.C.S.S. The animal had refused its food; it was prostrated by impeded and frequent respiration and a general oppressive feverish state, and died about a week after the first attack.

The morbid appearances, on dissection, were simple and conclusive. The whole right lung had been the seat of active inflammation and congestion; most of the air-cells were filled with a bloody serum, which was infiltrated throughout the connecting tissue. A mass of coagulable lymph had been exuded from the whole exterior surface of the organ, cementing its lobes to each other and to the surrounding parts, especially the pericardium. The mucous lining of the bronchial tubes was of a deep livid red colour, and the same evidence of inflammation extended throughout the trachea, and a little way down the bronchi of the sound lung. Both the liver and spleen broke down more easily under pressure than in the healthy common Ox; the texture of the kidney also was softer, and of a more fuscous colour. The vessels of the pia mater were unusually gorged; but these were probably the secondary consequences of the influence upon the circulation, and the quality of the blood induced by the primary and active disorganization of the respiratory system. The exciting cause of the disease I take to be the influence of the raw cold and heavy fogs, consequent on the undrained extent of clay-ground in which the menagerie of the Society is placed, and by which it is extensively surrounded. The effects of an atmosphere so loaded on the mucous tract of the respiratory organs to which it is applied, has long been manifested in various species of the exotic animals attempted to be preserved in the Zoological Gardens; and the records of medicine bear testimony to similar ill effects upon those human inhabitants of the Regent's Park, whose habits and strength of constitution do not enable them to control and overcome this pregnant but happily remediable source of ill-health.

The male Aurochs, at the period of its death, was two years and five months old. The following was the state of its dentition:—
 $i\ 3-3, c\ 1-1, m\ \frac{5-5}{5-5} = 28$; of which $i\ 1$ was permanent, $i\ 2, i\ 3$, and c were deciduous; the molars were $d\ 2, 3$ and $4, m\ 1$ and 2 . I here use the formula explained in my communication to the British Association at Swansea, the notation used conveying in the space of one line the following facts: viz. that the animal had shed and replaced the median incisors of the lower jaw, but retained all the rest of its deciduous dentition, having gained in addition the first and second true molars of the permanent series.

The tongue presented that deep leaden-bluish colour which Gilibert describes*, but is rough, as in the common Ox, and the inner surface of the sides of the mouth is beset with the same kind of papillæ. The scrotum and testes were much smaller than in the young do-

* Gilibert, *Indagatores Naturæ in Lituania, De Bisonte Lituanico*, pp. 30—49; Vilnæ, 1781.

mestic Bull of the same age : the scrotum is rugous, sessile, not pendulous with a constricted neck, as in the *Bos Taurus*.

As in most Ruminants, the principal viscus which presents itself on opening the abdomen, is the capacious paunch covered by the great omental sac : besides the paunch, some of the small intestines appeared in the right iliac and in the pubic regions.

The paunch is firmly supported by its attachments on the dorsal aspect to the crura of the diaphragm and part of the expanded concavity of that muscle. The part of the serous membrane which answers to the aperture or mouth of the great omental sac in Man is attached to the upper and fore-part of the paunch, not to the lower or greater curvature, so that a free fold of the omentum is spread over the paunch between it and the abdominal muscles : the posterior fold of the omentum is attached to the left side or contour of the paunch, whence it is continued upon the fourth cavity, the duodenum and pancreas, and so on to the right crus of the diaphragm, forming one of the strong suspensory ligaments : the left lumbar attachment is continued more immediately from the long intra-abdominal œsophagus and back part of the paunch and reticulum.

The paunch is sub-bifid, or divided into two principal chambers. The villi of its inner surface are intermediate in character between those of the common Ox and those of the American Bison. The villi of the rumen of the Ox are comparatively large, coarse, flattened, but pointed, except near the reticulum, where they assume the form of laminae with irregular jagged margins. In the American Bison they are longer, and for the most part filiform, and consequently more numerous. In the Aurochs the villi are shorter than in the Bison, and broader, being compressed and clavate, terminating in an even rounded margin : they are smaller and more numerous than in the common Ox. The relative position, size, and mode of intercommunication of the four divisions of the ruminating stomach offer no noticeable differences from that of the common Ox : but the disposition of the lining membrane of the second cavity (reticulum or honeycomb-bag) offers as marked a difference as that noticed on the inner surface of the paunch. In the common Ox the cells of the reticulum are deeper than in any Ruminant excepting the Camel-tribe, and they are of two kinds in respect of their size : the larger cells are disposed between broad parallel septa, and are formed by narrower septa at right angles to these : the smaller cells are subdivisions of the larger or primary cells.

In the Bison only one kind of hexagonal cells can properly be recognized, and their walls are of equal depth as a general rule : the folds developed from the bottom of these cells are much narrower, shorter, and more irregular than those that mark out the secondary cells in the common Ox. The laminae of the third cavity (*psalterium*) are of two kinds, large and small ; the larger kind presenting two sizes which alternate with one another ; but between each of the broader or larger kind of laminae one of the smaller kind intervenes : their surfaces are papillose, but the papillæ are shorter than in the common Ox, which presents a similar arrangement of the laminae.

A thick epithelium lines the whole of the three cavities above-described, as in other Ruminants. The lining membrane of the fourth or true digesting cavity was rather more vascular than usual : the almost smooth mucous membrane is produced into subparallel oblique folds $1\frac{1}{2}$ inch in breadth at its cardiac half : these subside towards the pyloric half, where the chief object is the valvular protuberance which overhangs the aperture leading into the duodenum. The duodenum bends backwards and turns down abruptly before gaining the left lumbar region ; then bends upwards and towards the left side, where it becomes free and carries out a complete investment from the mesentery : in the previous part of its course it is closely attached to the adjoining intestines. The principal mass of the small intestines lies dorsal and sacral of the enormous stomach, disposed in short coils upon the mesentery ; they measured 132 feet in length.

The ilium terminates in the cæcum in the right lumbar region. The cæcum is a simple, cylindrical, non-sacculated gut, about twice the diameter of the ilium ; it is bent upon the beginning of the colon, to which it is attached.

The colon describes an arch at its commencement, ascending from the right side, and curving over to the left behind the paunch, then winding to the right again, and describing the series of subspiral folds characteristic of this gut in the Ruminants. The rectum descends nearly along the bodies of the lumbar and sacral vertebrae to the anus. The total length of the large intestines was twenty-one feet. The liver was proportionally small, and consisted chiefly of one lobe, as in other Ruminants ; not extending into the left epigastrium. There is a small *lobulus Spigelii* on the right and posterior border.

The gall-bladder, large and full, protruded from a fissure in the right side of the liver : its duct receives four or five tributary ducts before it unites with the proper hepatic duct, which brings the bile from the left part of the liver. The *ductus communis choledochus* enters the duodenum where it forms its first bend.

The pancreas lies below the liver, with its larger end across the last dorsal vertebra, and its narrower prolongation accompanying the duodenum ; the duct terminates in that intestine about eight inches beyond the biliary inlet. The kidneys consisted each of about twenty distinct lobes or reñules. The more compact suprarenal bodies also manifested a subdivided outer surface.

The above portions of the notes of the dissection of the male Au-rochs include all that appeared to be in any degree characteristic of the species, or affording any discriminative characters, as compared with its nearest congeners. The thoracic viscera, as far as their morbid condition permitted the comparison, were like those of the common Ox. I do not remember to have been so much impressed in former dissections of Ruminants with the beautiful adaptation of the parts exterior to the large and complex stomach, to its support and the facilitating its movements. Much of what is ordinary inelastic aponeurotic tissue in the abdominal parietes of many

other quadrupeds, *e. g.* the larger Carnivora, is metamorphosed into the yellow elastic tissue—*tissu jaune*—in the Aurochs, as in the common Ox, and in a still greater degree in the Rhinoceros and Elephant. By this change the abdominal muscles are proportionally relieved or aided in the sustentation of the capacious and heavily-laden digestive reservoirs.

In the Aurochs, as in the other Ruminants, the disposition of the omental sac upon the sternal aspect of the paunch, interposed between it and the abdominal walls, makes it perform the office of a serous articular sac, two smooth and lubricated surfaces—the inner ones of the sac—being apposed to each other, and easily and freely gliding on each other; it is like a kind of great ‘*tunica vaginalis*’—facilitating the spiral peristaltic movements of the paunch, and by the layer of fat tending to preserve the warmth of the paunch.

The skeleton of the Aurochs has been well delineated by Bojanus, in connection with an outline of the entire animal, and by Mr. George Landseer separately. The general characters of the framework of this rare species are very accurately rendered in both these figures. The skeleton of the young male Aurochs showed the same characteristic elevation of the spinous processes of the anterior dorsal vertebræ, and the same characteristic number of ribs—fourteen pairs—which are shown in the above-cited figures, and which repeated examination has established as constant peculiarities of the species. With regard to the lengthened spines, I shall only remark on this interesting morphological peculiarity, that it contributes to illustrate the artificial nature of that view of the part commonly called rib, or vertebral rib, as a bone or element of the skeleton, apart from or belonging to a distinct genus from the other vertebral elements. This view originally arose from the contemplation of the proportions of the ribs or pleurapophyses and spinous processes as they exist in Man. A long and slender form is associated with the idea of a rib as an essential character. In the Aurochs we see that the vertebral element called neural spine is longer than the pleurapophysis in the second and third dorsal vertebræ. But it is ankylosed to the other vertebral elements, whilst the pleurapophyses retain their primitive freedom, and the dorsal vertebræ are characterized as ‘articulating with the ribs.’ This, however, is a periodic, not an essential character. At an early period of life the cervical vertebræ also articulate with ribs, *i. e.* pleurapophyses; but these become broad and remain short, and coalesce with the centrums and diapophyses of their respective vertebræ; and the anthropotomist then calls them ‘transverse processes,’ and distinguishes them as being perforated, the foramen being the space included between the centrum, the diapophysis, and the pleurapophysis.

Another remark is suggested by the skeleton of the Aurochs, touching the true value of the character of its fourteenth pair of free pleurapophyses. In the genus *Bos* proper there are only thirteen pairs. In the American Bison there are fifteen pairs. According to the artificial character in anatomy of the ‘dorsal vertebræ,’ the above-

cited *Bovidae* have been supposed to differ actually in the number of their vertebræ, whereas this is absolutely the same in each of them; after the seven cervical vertebræ there are nineteen true vertebræ, *i. e.* nineteen vertebræ between the last cervical and the sacral vertebræ. In the embryos of many Ungulates, rudiments of ribs (pleurapophyses) are found moveably attached to vertebræ, to which they afterwards become ankylosed, and accordingly are called lumbar vertebræ. In the Aurochs these elements retain their freedom and growth in one more vertebra than in the common Ox; in the Bison two more vertebræ have moveable pleurapophyses. Accordingly we find that if the common Ox has but thirteen dorsal vertebræ, it has six lumbar vertebræ; if the Aurochs has fourteen dorsal, it has five lumbar; and if the Bison has fifteen dorsal vertebræ, it has but four lumbar. But the unity of the numerical character of the true vertebræ does not stop here; for when we find, *e. g.* in the Dromedary, the Camel, the Llama, and the Vicugna, only twelve dorsal vertebræ, the typical nineteen is completed by seven lumbar vertebræ; and this number is never surpassed in the Ruminants. Most of the species agree with the common Ox in the number of the true vertebræ that retain their pleurapophyses in moveable connection. The Reindeer and the Giraffe resemble the Aurochs in having fourteen dorsal vertebræ. But what perhaps is still more interesting and usefully instructive as to the true affinities of the hooved quadrupeds with toes in even number, is the fact, that besides their common possession of a complex stomach and simple cæcum, of a peculiar form of astragalus, of a femur with two trochanters, and of a symmetrical pattern of the grinding surface of the molar teeth, they also agree, as I have shown in my paper on the genus *Hyopotamus*, in having nineteen natural segments of the skeleton, neither more nor less, between the neck and the pelvis. The Babiroussa, the African Wart-hogs (*Phacochoerus*), and the extinct *Anoplotherium*, resemble the majority of Ruminants in having thirteen dorsals and six lumbars; the Wild Boar and the Peccari resemble the Aurochs in having fourteen dorsals and five lumbars; the Hippopotamus resembles the Bison in having fifteen dorsals and four lumbars.

This constancy in the number of the true vertebræ in the Artiodactyle Ungulates is the more remarkable, and demonstrative of their natural co-affinity, by contrast with the variable number of those vertebræ in the odd-toed or Perissodactyle group, in which we find twenty-two dorso-lumbar vertebræ in the Rhinoceros, twenty-three in the Tapir and Palæotherium, and as many as twenty-nine in the little Hyrax.

With regard to the vertebræ of the trunk of the Aurochs, I may remark, that the only accessory process in addition to the ordinary zygapophyses and diapophyses is the metapophysis, which appears as a stout tubercle above the diapophysis in the middle dorsals, and gradually advances and rises upon the anterior zygapophyses in the posterior dorsal and lumbar vertebræ. This process is developed to an equality of length with the spinous processes in the Armadillos.

It is commonly associated with another accessory exogenous process, to which I have given the name 'anapophysis' in the Catalogue of the Osteological Series in the Royal College of Surgeons. This process, which in most of the Rodentia rises, at first, in common with the metapophysis, as a tubercle above the diapophysis, separates from the metapophysis as the vertebrae approach the pelvis, and in the lumbar series the anapophysis is seen projecting backwards from the base, or a little above the base of the diapophysis, its office being usually that of underlapping the anterior zygapophysis of the succeeding vertebrae, and strengthening the articulation, whence Cuvier has alluded to it as an accessory articular process; but its relation to the zygapophysial joint is an occasional and not a constant character. The tenth dorsal vertebra of the Saw-toothed Seal, *Stenorhynchus serridens*, affords a good example of well-developed metapophyses; they are also large in most of the trunk vertebrae of the Tapir. The anapophyses are well-developed in the anterior lumbar vertebrae of the Hare and Rabbit.

I have been induced to make this digression at the request of some of my anatomical friends, who have desired me to publish definitions of the terms, or rather of the processes so termed.

Returning to the Aurochs, I shall conclude with some remarks, which the opportunity of dissecting the recent animal enables me to offer, respecting the true structure of the bones of the fore-foot (fig. 1) and hind-foot (fig. 2).

The carpus (fig. 1) consists, as in other Ruminants, of six bones, four in the proximal row, viz. scaphoides (*s*), lunare (*l*), cuneiforme (*c*), pisiforme (*p*); and two in the second row, the magnum (*m*) and the unciforme (*u*).

The os magnum supports that half of the cannon-bone which answers to the metacarpal of the digitus medius (iii). The unciforme supports the other moiety which answers to the metacarpus of the digitus annularis (iv). The rudiment of the proximal end of the metacarpus of the digitus index (ii) articulates with a part of the os magnum, which may therefore be regarded as a connate trapezoides. The rudiment of the proximal end of the metacarpal of the digitus minimus (v) articulates with the cuneiforme, and is applied to the ulnar end of the unciforme.

The distal rudiments of the two abortive digits (ii) and (v) are represented by a middle phalanx (2) and ungual phalanx (3), supported by fasciae extending from the proximal rudiments of their metacarpals, and also by ligaments attaching them to the large trochlear sesamoids behind the metacarpo-phalangeal joints of the two normal digits (iii and iv). These have each three phalanges (1, 2, 3) forming almost symmetrical pairs, with a large sesamoid (*s*) behind the distal joint.

The hind-feet (fig. 2) are longer and more slender than the fore-feet, the greater length being chiefly due to the coalesced metatarsals.

The tarsus includes five bones; it seems to consist of six, but the ossicle (67) wedged between the tibia (66), calcaneum (*cl*), and astragalus

galus (*a*), is the distal epiphysis of the fibula, and the sole representative of that bone. The astragalus and calcaneum conform to the ordinary Ruminant type; according to which, also, the naviculare (*s*) and cuboid (*b*) are confluent. The ectocuneiform (*ce*) is a broad flat bone supporting the moiety of the cannon-bone which answers to the digitus medius (*iii*): a small round sesamoid (*s*) at the back of this joint has not sufficiently distinctive characters to carry conviction as to its special homology. The outer half of the cannon-bone, or metatarsal of the fourth toe (*iv*), articulates with the cuboid part of the scapho-cuboid bone. The second digit (*ii*) and fifth digit (*v*) are represented solely by the rudiments of their middle and ungual phalanges (2 & 3). There are two large trochlear sesamoids (*s*) behind the metatarso-phalangeal joints of the two fully-developed

Fig. 1.

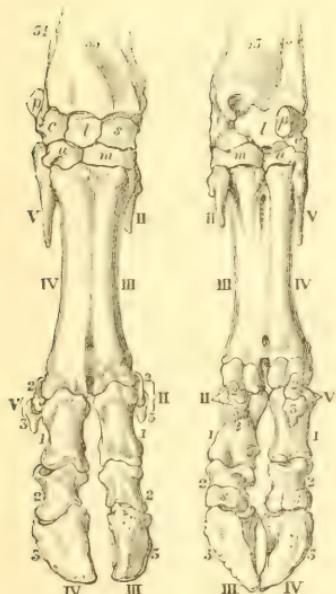
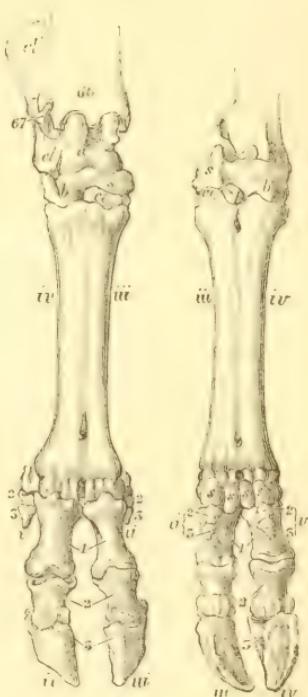


Fig. 2.



Bones of fore-foot (*Bison europaeus*).

Bones of hind-foot (*Bison europaeus*).

toes (*iii* & *iv*), and one sesamoid behind the last joint of the same toes.

In most artificially-prepared skeletons of Ruminants, more or less of the small bones, often regarded as accessory, are lost; but they are really for the most part beautifully indicative of traces of adherence to the archetype, and I have on that account particularized them in this notice of the anatomy of the Aurochs.

Measurements of the Trunk of the Aurochs.

	Inches.
Length of vertebral column from the atlas to the sixth caudal vertebra, measured across the diapophyses	81
Length of vertebral column over the neural spines	88
Length of cervical region over the diapophyses	17
Length of dorsal region ditto	30
Length of lumbar region ditto	13
Length of sacral and six caudal ditto	21
Depth of spine of seventh cervical	8
Depth of spine of first, second and third dorsal, being the three longest, each	11
Length of first rib	9
Length of ninth, or the longest	$18\frac{1}{2}$
Seven ribs articulate by separate haemapophyses to the sternum.	
Length of diapophysis of fourth lumbar, or the longest ..	$4\frac{1}{2}$
Breadth of atlas across the neural arch	7
Extreme breadth across the spines of the ilia	14
Extreme breadth across the pubis, from the inner edge of each acetabulum	6

MISCELLANEOUS.

On the Velvet-like Periostraca of Trigona. By J. E. GRAY, Esq.

In my account of the species of the genus *Trigona* of Megerle, I mentioned that several species were covered with a velvet-like silvery coat hiding the surface of the horny periostraca.

When this coat is minutely examined, it is found to be formed of numerous elongated spicula of a uniform length placed side by side perpendicular to the surface of the periostraca, so as to form a pile like velvet or plush. The length of the spicula, and consequently the thickness of the coat, increases towards the margin of the shell. This coat is generally rubbed off from the more convex part of the specimens which have not been very carefully preserved, but in such examples it is usually to be found near the edge of the valves, or on the lunule and other sunken portions of the surface.

The Rev. Dr. Fleming has lately drawn my attention to the fact, that these spicula are siliceous and similar to those of siliceous sponges; indeed Dr. Fleming is inclined to regard the velvet-like coat as a species of *Halichondria* parasitic on the shell rather than as a portion of the periostraca itself; and Dr. George Johnson of Berwick, who examined Dr. Fleming's specimen with me, is inclined to take the same view of the question.

With these authorities opposed to my view I have reconsidered the question, but I am still inclined to believe that I am correct in considering the spicula as part of the shell formed by the animal as it produces the periostraca on the edge of the shell, and offer the following reasons in support of this conclusion:—

1st. This kind of coat is found on several species of the genus which inhabit different parts of the world.

2nd. That the coat is uniformly spread over the whole surface of the shell; in all parts of the shell it is only formed of a single series of spicula placed side by side parallel to each other and perpendicular to the surface of the shell, and that the spicula gradually increase in length, and consequently the coat in thickness, as the shell increases in size and thickness.

3rd. That this velvet-like coat bears no resemblance to any specimens of sponge that have come under my examination; the spicula are not interwoven or felted together, but are placed parallel to each other in a most uniform manner; and the coat always presents a uniform and even surface, and never shows any inclination to form prominences or branches on the surface, which is the habit of all the sponges I have seen which envelope and are parasitic on shells or other marine animals.

4th. Our previous knowledge of the œconomy of Mollusca has prepared us to believe that they can secrete siliceous bodies and form appendages on the surface of the periostraca separate from the body of the shell. Mr. Hancock has shown that the teeth on the tongue of various Gasteropodous Mollusca are siliceous, and he has shown that the surface of the foot and of various parts of the mantle of different acephalous and gasteropodous Mollusca is studded with siliceous granules, by which these animals are enabled to rasp away the surface of different marine bodies.

Well-preserved specimens of *Lucina pennsylvanicu* have each of the concentric ridges which ornament the surface of the shell fringed with a membranaceous or semicartilaginous expansion, which is edged with a series of most beautiful, regular, thick, convex, pearl-like pieces of shell, and the concentric ridges which cross the whorls of the outer surface of the horny operculum of *Liopa (Delphinula, sp. Lam.)* are fringed with beautiful regular subglobular pieces of shell.

I may further observe, that the outer surface of the periostraca of many shells, both univalve and bivalve, is often covered with short crowded hair-like processes forming a velvety outer coat, as is easily seen in various species of *Pectunculus*, *Buccinum*, *Triton*, &c.

I am therefore inclined to believe that in these *Trigona* every layer or line of periostraca which is added to the edge of the one before deposited is furnished with a series of erect siliceous spicula, which, in conjunction with those previously deposited, form the velvet-like coat of the periostraca found in that genus of bivalve shells.

Though I am not willing to adopt the views of my friends Drs. Fleming and Johnson, yet I think that the discovery of the velvet-like coat of the *Trigona* being formed of siliceous spicula, is a most interesting addition to our knowledge of the œconomy of Mollusca.

THE TORTOISE-SHELL OF CELEBES*.

Amongst the more valuable of the commodities which the enterprising and industrious Bugis annually bring to us from Celebes and

* Translated from the 'Verhandelingen van het Bataviaash Genootschap van Kunsten en Wetenschappen,' vol. xvii. p. i.

other eastern islands, tortoise-shell holds one of the first places. The quantity imported into Singapore sometimes rises above 13,000 and sometimes sinks below 7000 lbs., but the average, one year with another, is about 10,000 lbs. The following account by Mr. Vosmaer of its collection by the Orang Bajo of the south-eastern peninsula of Celebes will interest our readers.

The Orang Bajo distinguish four principal kinds of Tortoise, and name them Kulitan, Akung, Boko, and Ratu. The first-named is the kind which, on account of its costly shell, is the most prized. It is the so-named Karet tortoise. The shell or back of this creature is covered with thirteen shields or blades, which lie regularly on each other in the manner of scales, five on the middle of the back and four on the sides ; these are the plates which furnish such costly tortoise-shell to art. The edge of the scale or of the back is further covered with twenty-five thin pieces joined to each other, which in commerce are known under the appellation of feet or noses of the tortoise. The value of the tortoise-shell depends on the weight and quality of each head, under which expression is understood the collective tortoise-shell belonging to one and the same animal, which is the article of commerce so much in request both for the Chinese and European markets.

Tortoise-shells which have white and black spots that touch each other, and are as much as possible similar on both sides of the blade, are, in the eyes of the Chinese, much finer, and are on that account more greedily monopolized by them, than those which want this peculiarity, and are on the contrary reddish, more damasked than spotted, possess little white, or whose colours, according to their taste, are badly distributed. The caprice of the Chinese makes them sometimes value single heads at unheard-of prices, namely such as pass under the name of white heads, which they also distinguish by peculiar names. It is almost impossible to give an accurate description of these kinds, and of their subdivisions, for these depend on many circumstances which remain inappreciable to our eyes. It is therefore enough for me to remark on this subject, that such heads as, possessing the above-named qualities, are very white on the blades, and have the outer rim of each blade to the breadth of two or three fingers wholly white, and the weight of which amounts to $2\frac{1}{2}$ catties (qualities which are seldom found united), may be valued at one thousand guilders and upwards. The feet of the tortoise-shell are only destined for the Chinese market ; whenever the two hinder pieces are sound and have the weight of $\frac{1}{4}$ catty or thereabouts, which is very seldom the case, they may reach the value of fifty guilders and more. The whole shell of a tortoise seldom weighs more than three catties, notwithstanding it is asserted that there sometimes occur heads of four and five catties. Tortoise-shells are also sometimes found, of which the shell, instead of thirteen blades, consists of a single undivided blade ; the Orang Bajos call this kind, which very seldom occurs, Lojong.

The Akung also furnishes tortoise-shell (Karet), but the shell being thin, and of a poor quality, much less value is attached to it.

The Boko is the same as that which is called Panju by the Malays. It is the common sea-tortoise, which is of no other use than to be eaten. To these sorts the Panjubui ought to be added, being the common tortoise with a thick shell, like that of the proper tortoise, but of poor quality and therefore of trifling value; so also the Akung Boko, which is distinguished from the common Boko by its much larger head.

The Ratu, lastly, furnishes a sort which is distinguished by its peculiarly great size, the Orang Bajos asserting that it is usually twice as big as the largest tortoise-shell tortoise, and therefore 5 to 6 feet long, and even more.

The usual modes by which the Orang Bajos catch the tortoise are principally by the hadung, the harpoon and the net; to these we add the simplest of all, namely falling upon the females when they resort to the strand to lay their eggs. This is also the most usual, I may almost say the only way, by which the inhabitants of the coast catch this animal. They need nothing more, than, as soon as they have got the creature, to turn it on its back, when, unable to turn itself again, it remains lying helpless in their power. It sometimes also falls into the hands of the dwellers on the coast through means of their fishing-stakes, into which it enters like the fish, and from which it can find no outlet, but remains imprisoned in the inner-most chamber.

Whenever the Orang Bajos have caught a tortoise, they kill it immediately, by bestowing some blows upon the head. They then take its upper shield, or the back itself quite off, being the only thing about the animal which is of value. The tortoise-shell adhering so fast to the shield, that, if they at once pulled it off, there would be danger of tearing the shells, they usually wait three days, during which time the soft parts become decomposed and the shells are loosened with little trouble. When they wish to remove the shell immediately after the capture, they separate it by means of boiling water. They also often accomplish this object by the heat of a fire, in the application of which, however, a danger is run of injuring the shell by burning it, for which reason this mode is only adopted by those who do not know its value.—*Journal of the Indian Archipelago and Eastern Asia*, April 1849.

Notice of some Mollusca recently taken by George Barlee, Esq., off Lerwick, and exhibited at the Meeting of the British Association for the Advancement of Science, 17th Sept. 1849. By J. G. JEFFREYS, Esq., F.R.S.

Diphyllidium lineatum, Otto. New to the British seas, but (according to M. Milne-Edwards) only one-fourth the usual size.

Rissoa eximia, nov. sp. Shell oblong, rather solid, white. Whorls 5, the last equal in length to all the rest, rather swollen and ribbed longitudinally. The ribs are sharp, deep, and curved in the direction of the spire. There are about twelve of them on the last or body whorl. The two first whorls are destitute of ribs or any markings.

These ribs are crossed in the middle of each of the last three whorls by other spiral ribs, of which there are three on the last, two on the next, and one on the middle whorl. The spiral or transverse ribs are only half the width and thickness of the longitudinal ribs. Base of the last whorl smooth. Suture deep and distinct, giving the spire rather a turreted appearance. Aperture oval, simple, contracted at the upper angle and smooth within. There is a slight fold on the pillar, forming behind it a small umbilicus. Length $\frac{1}{5}$, breadth $\frac{1}{30}$ of an inch. Somewhat resembles *Odostomia pupa* of Searles Wood in markings, and *Rissoa Zetlandica* in form.

Fusus Berniciensis. From the hooks on fishing lines in deep water.

Rostellaria Pescarbonis, Sow.

Scissurella crispatula. Alive, adhering to stones like *Emarginula*. The shell has no operculum, but it is to be regretted that Mr. Barlee did not observe the animal.

Tellina balaistina. One specimen, half-grown.

Descriptions of new Freshwater Shells. By T. A. CONRAD.

The following new freshwater shells from Georgia were kindly lent me for description by J. Hamilton Couper, Esq.

UNIO.

U. securiformis. Suborbicular, thick, compressed; valves slightly convex; umbo flattened, marked with obtuse, narrow, divaricated plaits; plaits on the lower half of the valves obscure and interrupted; umbonal slope rounded; posterior slope with strong oblique plaits towards the apex; beaks eroded; epidermis black; within white; cardinal teeth large, direct, profoundly sulcated. $1\frac{1}{2} : 1\frac{1}{4}$.

Inhabits Flint River, Georgia.

U. stagnalis. Widely elliptical, ventricose, rather thin; towards the posterior extremity very thin and fragile; anteriorly regularly rounded; posteriorly somewhat pointed, with an acutely rounded extremity; basal margin regularly curved; summits prominent, eroded; posterior margin very oblique and nearly straight; epidermis ochraceous and olivaceous; rays green, not very distinct on the middle and anterior side, but more so posteriorly, some rather broad, others linear; posterior slope dark-coloured, rayed; within white and highly iridescent posteriorly; cardinal teeth much compressed and oblique, double in each valve; lateral teeth very slightly curved, finely granulated. $3\frac{1}{4}$.

Inhabits mill-ponds; Ogeechee River, Georgia.

U. Ogeecheensis. Elliptical, thin, inflated; posterior side somewhat pointed, extremity subangular; valves slightly contracted from beak to base; summits rather prominent, decorticated, slightly undulated; epidermis ochraceous with interrupted green rays, some of them broad; within white, highly iridescent posteriorly; cardinal teeth oblique, compressed; lateral teeth rectilinear. 3.

Inhabits Ogeechee River, Georgia.

Allied to the preceding, but has a lighter-coloured epidermis with

more distinct rays, and is proportionally longer; the cardinal tooth in the left valve is longer and less lobed, and the lateral teeth are straight, without granules, and less oblique than in the preceding species, which is a larger shell.

U. oratus. Widely elliptical, ventricose, gaping at both ends; posterior gape wide; anterior extremity rather acutely rounded; posterior margin sinuous, extremity subangular; basal margin forming a nearly regular curve; summits prominent; umbo and beak eroded; epidermis ochraceous, polished; cardinal teeth compressed, oblique; lateral teeth straight; within white, much stained with waxen yellow. $3\frac{1}{4}$.

Inhabits Flint River, Georgia.

This shell has the polished epidermis of *U. cariosus*, but is without a ray. It is longer in proportion than that species, with very different cardinal teeth, which are much nearer parallel with the margin above; the shell also gapes far wider in the only specimen I have seen.

U. rosaceus. Widely elliptical, ventricose above; posterior margin obliquely truncated, slightly sinuous; extremity subangular or acutely rounded; epidermis ochraceous and dark brown; rays indistinct, frequently broad, but composed of fasciculi of lines; surface with fine radiating wrinkles; within deep rose-purple; cardinal teeth prominent, oblique, compressed, trifid, or three teeth in the left valve. $3\frac{1}{2}$.

Inhabits Savannah River.

Allied to *U. ochraceus*, Say.

U. contrarius. Elliptical, moderately thick; valves somewhat flattened or plano-convex; umbo and beak not prominent, much eroded; umbonal slope acutely rounded; posterior margin straight above, truncated, direct; epidermis deep ochraceous, with linear radiating wrinkles, and obscurely rayed about the umbo; within pale flesh-colour stained with waxen yellow; cardinal teeth direct, thick, sulcated, not very prominent; lateral teeth reversed, or the double tooth in the right valve. 3 1-5.

Inhabits the Ogeechee River.

U. nucleopsis. Obtusely subovate, slightly oblique, thick, not ventricose; umbonal slope rounded; posterior slope with a few obscure plaits; posterior margin subtruncated; basal margin slightly tumid near the middle; epidermis ochraceous, with a series of green spots along the umbonal slope; posterior slope obsoletely striated; within bluish white; cardinal teeth thick, direct, single in the right valve. $1\frac{1}{4}$.

Inhabits Etowah River.

U. limatulus. Subelliptical, convex; posterior side somewhat pointed; umbonal slope angular; posterior slope subcarinated in the middle; posterior margin obliquely truncated; extremity truncated, direct; basal margin regularly rounded; beaks not prominent, eroded; epidermis highly polished, dark brown and ochraceous, obscurely

rayed; within flesh-colour or pale salmon; cardinal teeth oblique, compressed, double in each valve; lateral teeth long, slightly curved. 2.

Inhabits Savannah River.

U. aratus. Trapezoidal, thick; valves flattened on the sides, slightly contracted, marked with irregular arched, obtuse, interrupted folds, extending from the beaks nearly to the base; umbonal slope angular; posterior slope plicated; beaks not prominent, profoundly eroded; ligament margin elevated; posterior extremity truncated obliquely inwards; basal margin contracted; epidermis nearly black; within white, with a purple margin; cardinal teeth direct, very thick, sulcated; lateral teeth slightly arched.

Inhabits Flint River, Georgia.

Allied to *U. Sloatianus* and *trapezoides*, Lea.

MARGARITANA, Schum.

M. Etowaensis. Oblong-ovate, thin and fragile, widely contracted from beak to base; umbonal slope ventricose, with a plano-convex or flattened surface; ligament margin rather elevated; posterior submargin slightly concave; umbonal slope angular posteriorly; beaks eroded; posterior extremity angular; margin rounded towards the base; basal margin subrectilinear; within bluish and purplish, iridescent; cardinal tooth in the right valve rather long, oblique, compressed, curved, prominent; in the opposite valve the tooth is widely bifid, the posterior lobe pyramidal.

Inhabits Etowah River.

Allied to *M. Raveneliana*, Lea.

MELANIA.

M. cælatura. Ovate-oblong, turreted; volutions 6, with longitudinal ribs and unequal prominent revolving lines, subnodulous where they cross the ribs; the ribs on the body whorl do not reach the middle; the colour ochraceous and brown; aperture narrow, elliptical; labium with interior brown bands; superior part of columella somewhat callous.

Inhabits Savannah River.

M. perangulata. Subulate; volutions 9 or 10, with an acutely carinated angle on all except the body whorl, which is subcarinated; on each whorl of the spire is a revolving granulated line above the carina; colour olive-brown.

Inhabits Savannah River.

M. nebulosa. Elongate-conoidal; volutions 6 or 7, with revolving raised lines; whorls of the spire carinated below the middle, above which they are longitudinally ribbed, and have two or three revolving granulated lines; granules compressed; aperture widely elliptical; colour ochraceous, with brownish black stains.

Inhabits Savannah River.

M. percarinata. Elongate-conoidal; volutions of the spire with a carinated line below the middle, and a revolving granulated line above; body whorl with a granulated revolving line near the suture,

and three carinated lines, the superior one largest, the lower one fine; colour dark olive-brown.

Inhabits Savannah River.

M. symmetrica. Subulate; whorls 9, slightly convex, with longitudinal, slightly curved, narrow ribs, interrupted near the suture by a revolving granulated line; ribs on the body whorl not extending as far as the middle; margin of labrum profoundly rounded; colour ochraceous and black.

Inhabits Savannah River.

Near the apex two or three volutions have a fine, granulated, carinated line.

METEOROLOGICAL OBSERVATIONS FOR AUG. 1849.

Chiswick.—August 1. Very fine: clear. 2. Very fine: slight rain. 3. Slight rain: overcast: cold at night. 4. Clear and fine. 5. Fine: cloudy. 6. Cloudless: very fine. 7. Fine: overcast: rain. 8. Clear: very fine: lightning. 9. Foggy: very fine: heavy showers. 10. Hazy: very fine: clear. 11. Clear: cloudy: rain. 12. Overcast: clear: rain. 13. Showery. 14. Cloudy and fine. 15. Very fine. 16. Showery: very clear at night. 17—19. Fine. 20. Cloudy. 21—23. Very fine. 24. Very fine: hazy. 25. Uniformly overcast: very fine. 26, 27. Very fine. 28. Very fine: slight rain at night. 29. Overcast. 30. Dry haze: rain at night. 31. Hazy: cloudy and fine.

Mean temperature of the month	62°.91
Mean temperature of Aug. 1848	58°.74
Mean temperature of Aug. for the last twenty-three years	62°.18
Average amount of rain in August	2.41 inches.

Boston.—Aug. 1. Fine. 2. Fine: rain p.m. 3. Cloudy. 4. Fine. 5—7. Cloudy. 8. Cloudy: rain early A.M.: thermometer 79° 3 P.M. 9. Fine: rain p.m. 10, 11. Cloudy: rain p.m. 12. Fine. 13. Cloudy: rain p.m. 14. Cloudy. 15. Fine. 16. Cloudy. 17. Fine. 18. Cloudy: rain A.M. 19. Fine. 20—23. Cloudy. 24—26. Fine. 27—29. Cloudy. 30. Cloudy: rain p.m. 31. Fine.

Applegarth Manse, Dumfries-shire.—Aug. 1. Fair. 2, 3. Fair: a few drops p.m. 4. Fair and warm. 5, 6. Fair: warm: cloudy p.m. 7. Frequent showers. 8. Fair and fine: beautiful day. 9. Very warm: thunder: showers. 10. Heavy shower: very warm. 11. Very heavy rain: thunder. 12. Rain: river flooded. 13. Heavy rain. 14. Showers A.M.: cloudy p.m. 15. One shower: dull and cloudy. 16. Heavy showers: hail. 17. Wet A.M.: fine: thunder p.m. 18. Frequent showers. 19. Fair: calm: cloudy. 20. Fair and fine. 21. Fair, but dull and cloudy. 22. Light drizzling showers. 23. Showers frequent, not heavy. 24. Fair, but cloudy. 25. Shower during night: cleared. 26. Showers A.M.: fine. 27. Fair and bracing: harvest day. 28. Fair, but dull: rain p.m. 29. Fair and fine all day. 30. Rain throughout. 31. Fair and fine: dull: cleared.

Mean temperature of the month	56°.7
Mean temperature of Aug. 1848	53°.7
Mean temperature of Aug. for the last twenty-five years	57°.1
Mean rain in Aug. for twenty years.....	3.60 inches.

Sandwick Manse, Orkney.—Aug. 1. Drizzle. 2—4. Drizzle: showers. 5. Fog: cloudy. 6. Fog. 7. Cloudy. 8. Rain: fog. 9. Hazy: fog. 10. Hazy: cloudy. 11. Cloudy: rain. 12. Clear: clear, aurora. 13. Bright: clear. 14. Drizzle: rain. 15. Clear. 16. Bright: cloudy. 17. Showers. 18. Bright: cloudy A.M. 19. Damp: cloudy. 20. Drizzle: damp. 21. Rain: fine. 22. Rain: clear. 23. Clear. 24. Clear: cloudy. 25. Rain. 26. Bright: showers. 27. Bright: cloudy. 28. Cloudy: showers. 29. Drizzle: damp. 30. Bright: damp. 31. Clear: fine.

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

Days of Month	Barometer.		Thermometer.						Wind.		Rain.	
	Chiswick.		Orkney, Sandwick.			Dumfries-shire.			Orkney, Sandwick.		Boston.	
	Max.	Min.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	Min.	Max.	Min.	Max.
1.	30°117	29°053	29°53	29°90	30°02	29°95	30°08	74	45	60	64	49
2.	30°139	30°091	29°63	30°01	29°95	30°08	74	55	60	60	46 ¹	50 ¹
3.	29°087	29°905	29°50	29°98	29°97	30°06	67	39	59	59	50	49
○ 4.	29°979	29°900	29°52	29°95	29°88	30°01	29°96	70	41	53	66 ¹	44 ¹
5.	29°939	29°863	29°46	29°87	29°89	29°93	29°95	72	42	60 ⁵	64	51 ¹
6.	30°048	30°041	29°96	30°00	30°01	30°07	80	44	61 ⁵	69	53 ¹	54 ¹
7.	30°062	29°960	29°57	29°94	29°82	30°07	83	60	64	64	52 ¹	52 ¹
8.	29°889	29°838	29°47	29°78	29°75	29°86	29°84	85	54	68	68 ¹	59
9.	29°752	29°681	29°16	29°68	29°60	29°78	29°75	81	56	68	70	57
10.	29°873	29°737	29°16	29°64	29°70	29°74	29°82	80	59	64	69	56 ¹
11.	29°906	29°861	29°30	29°64	29°55	29°82	29°70	81	57	65	68 ¹	57 ¹
12.	29°764	29°679	29°14	29°45	29°42	29°53	29°42	73	56	67	55 ¹	55 ¹
13.	29°624	29°570	29·00	29°19	29°20	29°24	29°14	70	52	64	59 ¹	56 ¹
14.	29°763	29°674	29·12	29°34	29°47	29°14	29°29	70	52	61	60	53 ¹
15.	29°910	29°865	29·39	29°55	29°55	29°41	29°50	72	52	63	59 ¹	51 ¹
16.	29°793	29°763	29·20	29°48	29°54	29·58	29°56	64	42	62	56 ¹	49 ¹
17.	29°945	29°872	29·38	29°68	29°86	29·83	29°72	73	42	60	61	43 ¹
18.	30°016	29°993	29·53	29°90	29°95	29°90	29°02	69	40	60	60	46 ¹
19.	30°272	30°145	29·73	30·03	30·10	29°99	29°99	72	50	59	61	42 ¹
20.	30·337	30·325	29·81	30·13	30·15	29·94	30·06	72	52	63 ⁵	61	53 ¹
21.	30·332	30·330	29·80	30·15	30·10	30·03	30·02	78	58	65	66	55 ¹
22.	30°183	30°126	29·63	30·00	30·40	29·98	29·88	70	57	69 ⁵	63	51 ¹
23.	30·132	30·125	29·62	30·08	29·98	30·06	70	54	63 ⁵	59	54 ¹	52 ¹
24.	30·132	30·115	29·67	30·10	30·02	30·13	30·00	77	53	66	58	37
) 25.	30·190	30·097	29·57	29·93	29·94	29·94	29·82	77	52	66	63 ²	56 ¹
26.	30·100	29·985	29·44	29·83	29·85	29·66	29·56	79	55	64	64	55 ¹
27.	29·983	29·959	29·45	29·78	29·80	29·63	29·78	66	51	58	60	50 ¹
28.	29·975	29·927	29·45	29·79	29·71	29·78	29·71	73	58	68 ⁵	59	48 ¹
29.	29·898	29·883	29·45	29·79	29·81	29·74	29·74	72	65	68 ⁵	56	55 ¹
30.	29·858	29·822	29·45	29·76	29·76	29·73	29·68	76	60	68 ⁵	60 ¹	55 ¹
31.	29·864	29·844	29·30	29·73	29·78	29·80	29·89	75	53	68	66	55 ¹
Mean.	29°993	29°934	29·45	29·807	29·807	29·811	29·819	74·03	51·51	58·00	63·2	63·0
											51·2	54·61
											52·95	52·95

THE ANNALS
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No. 23. NOVEMBER 1849.

XXXI.—*Notice of the occurrence on the British coast of a Burrowing Barnacle belonging to a new Order of the Class Cirripedia.* By ALBANY HANCOCK, Esq.*

[With two Plates.]

I HAVE recently procured a very curious little animal belonging to the class *Cirripedia*, interesting not only on account of its modification of form, but also from its habit of burying itself in the substance of dead shells. The first individuals obtained were concealed in a broken specimen of *Fusus antiquus* procured by the Rev. G. C. Abbes from the fishing boats at Whitburn in the county of Durham, and fortunately preserved on account of the fine specimens of *Cliona gorgonioides* which it contained. Since then I have got this Cirripede alive from the boats at Cul-le-rocks, also in *Fusus antiquus*: it has likewise occurred in *Buc-cinum undatum* from the same locality. And on breaking an old specimen of the former, which has been many years in my collection, it was found to have been extensively attacked by this novel parasite. Indeed almost every dead specimen of the large *Fusus* brought in by the fishermen from deep water is more or less affected by it; and the only wonder is that it should have remained so long undetected. This perhaps may be explained by the fact that this animal only attacks dead shells, and always, as far as I have yet observed, from the inside, so that it is scarcely to be seen until the shell is broken. The columella is the chief seat of the ravages of this creature, though the sides of the whorls do not by any means escape, especially if the individuals are numerous. When quite young they enter the sound shell, and as they grow enlarge their residence, which is always of the exact size and form of the tenant.

It is interesting to remark how completely this animal, toge-

* Read at the Meeting of the British Association for the Advancement of Science held at Birmingham, Sept. 12, 1849.

ther with *Cliona*, destroys the shells of the larger mollusks of our coast. *Cliona* enters by the outer surface of the living shell, and rapidly spreads over the whorls; but it is not until after death that the inner surface becomes much affected by it. Then this Cirripede commences its ravages on the columella, which it soon deprives of more than half its substance, and afterwards so reduces it and the inner surface of the whorls, that this once secure retreat of the mollusk, losing all power to resist external forces, speedily becomes a crumbling ruin.

Little is to be seen externally,—a small slit in the shell or matrix marks the position of the head (Pl. VIII. figs. 1 & 2 b). This slit, which is one-eighth of an inch long, is rounded and gradually enlarged towards one end, and tapers to a tolerably fine point at the other, which is generally a little bent. At this extremity the shell is mostly stained of a reddish hue (Pl. VIII. figs. 1 & 2 a)—the stain being well-defined and of an ovate or fan-like form, increasing in size for about $\frac{1}{2}$ ths of an inch backwards, and having a few pale radiating lines, which converge towards the slit; on these lines there are a few minute punctures irregularly distributed; but whether for functional purposes, or merely accidentally resulting from the close approximation of the animal to the surface, could not be determined: they are not unfrequently partially closed up with calcareous matter.

The stain is caused by the animal appearing through, which lies immediately below the surface of the matrix. This must be broken before the animal (Pl. VIII. figs. 3, 4, 5) can be removed, and then it is found to be $\frac{1}{2}$ ths of an inch long, and $\frac{2}{3}$ ths of an inch wide at the broadest part, of an irregular ovate form considerably depressed behind, *b*, where it expands into a broad circular disc; and narrow and compressed in front, *a*, forming a sort of produced neck or head with a longitudinal slit, *c'*, on the upper surface;—the general form resembling considerably a Roman lamp, the slit representing the orifice for the passage of the wick. The produced portion or head corresponds to the valvular part of the pedunculate Cirripede, and contains the body and arms or feet,—the slit being analogous to the usual opening for the passage of these prehensile organs: there are, however, no shelly plates whatever, the mantle being soft, fleshy and highly contractile, having the surface distinctly marked with fine longitudinal muscular fibres below; this part arches deeply into the matrix, and joins rather abruptly the under surface of the depressed disc-like portion of the animal considerably behind the posterior end of the longitudinal slit. The margins of this slit are perfectly straight, thickened, and have somewhat the appearance of horn, but cannot be considered as forming distinct plates, though they compose, as it were, two valvular lips (figs. 3 & 5 c),

which can be closed or opened at the will of the animal; in front they gradually blend with the mantle, behind they are deeply notched, and each terminates in a projecting, slightly curved point, *d*. The external surface of these valvular lips is furnished with numerous, minute, irregularly disposed, rather stout, curved spines, very transparent and of a crystalline appearance. The circular, depressed, disc-like portion of the animal, corresponding to the pedicle of the pedunculate Barnacles, is slightly arched below, where it is pale, soft, fleshy, and as highly contractile as the anterior portion or head: the upper surface is flat, and has in the centre a broadly ovate, horny plate (figs. 3 & 5 *c*), most distinct in old individuals, but never entirely covering the part, the margins always extending beyond it. This plate is of a reddish horn-colour, and is generally furnished with a few indistinct radiating ridges and tubercles corresponding to the radiating lines and punctures seen on the surface of the matrix.

The animal, as before stated, lies immediately below the surface of the matrix, and is entirely free except at a point just behind the slit, *g*, and in front of the horny plate where there is a strong muscular attachment to the upper wall of the chamber. The longitudinal opening of the animal corresponds to the slit on the surface of the matrix: this opening is kept pretty accurately plugged by the thickened valvular lips of the animal, except when it is in watch for its prey, at which time a slight opening in front permits the passage of the prehensile arms (Pl. VIII. figs. 3, 6 & 7 *f*, *d* & *e*, and Pl. IX. fig. 1). These occupy the same position within the head or neck as they do in the valvular part of the pedunculate Cirripedes, being placed immediately in front of the mouth. They differ however considerably from those of all other Cirripedes. The arms of this animal are only six in number; they are short and set in a circle on the extremity of a soft, fleshy, cylindrical pedicle (fig. 6 *c*), which is undoubtedly a prolongation of the true body of the animal; the circle opens a little behind in the direction of the mouth. The arms are each composed of three articulations, the first or lowest being much the longest, the last the shortest; they are all furnished with a few hairs on the margins and extremities: the four arms next the mouth have attached to their inner margins at the junctiou of the first and second articulations an oval cushion-like body (Pl. VIII. fig. 9, and Pl. IX. fig. 1 *b b*) placed longitudinally, and wrinkled transversely, most probably for the purpose of prehension. Immediately behind the arms projects a large conical body (Pl. VIII. fig. 6 *f* and fig. 7 *a*) containing the mouth (fig. 6 *e* & fig. 7 *a'*), which is placed near the base in front towards the circle of arms. The greater portion of

this body is composed of the upper lip, which differs considerably from that of the other Cirripedes. In this it is delicate and horny, being enormously developed and surmounted by a sort of rostrum (figs. 6 & 7 *g* & *h*), which projects upwards and forwards and terminates in a slightly produced obtuse point ; the dorsal margin (fig. 7 *c*) is carinated and minutely denticulated. There are three pairs of mandibles as in the other Cirripedes : the outer pair, *f*, are each apparently composed of three articulations, the third or terminal one being much compressed, forming an irregular oval plate, with the upper end terminating in a tooth-like process curved inwards ; the two other articulations are much narrower, but on account of their minuteness and delicacy their form could not be determined with accuracy. Only two articulations were observed in the second pair of mandibles, *g* ; the inner or first articulation is long, thin and straight, with the extremities enlarged, and of an irregular form ; the outer or second joint is very similar to that of the outer pair ; it is however provided with two incurved teeth or spine-like processes at the upper extremity. The innermost or third pair of mandibles, *h*, are rather wide, squarish plates with three or four stoutish hairs on their upper margin.

At each side of the mouth there is a stout arm or palp (fig. 6 *h* & fig. 7 *d d*) which stands erect and reaches a little above the ridge of the rostrum ; the anterior margin of these arms is a little convex, the posterior a little concave ; and they are furnished with stout, rather soft pincers about half the length of the arm, covered with numerous long hairs : at the root of the pincers there is an articulation, so that they can be either bent forward or carried erect ; there is also apparently an imperfect joint at the point where the arm joins the side of the mouth, but this could not be determined with certainty, as the horny membrane of the limb is so delicate that it is impossible to say whether the occasional flexure at this part is owing to its flexibility or to an articulation. It is difficult to say whether these arms represent what Dr. Martin-Saint-Ange names the jaw-feet in the pedunculate Cirripedes, or the two minute processes that are closely attached to the sides of the mouth in these animals, and which are considered palps by some writers. They seem to occupy the place of the latter, though from their form they have much the appearance of rudimentary anterior feet of the higher *Crustacea*.

On each side of the rostrum, extending backwards and a little way below the carinated ridge, there is a series of rather close-set, transverse plates or hairs (figs. 6 & 7 *i i*) which taper towards their points, and are stout at their origin, where they are slightly

bifid, and exhibit for some distance upwards the appearance of two channels (fig. 8). There can be little doubt that these organs are for branchial purposes.

The chamber in which the animal is lodged is partially lined with calcareous matter secreted by the tenant; this lining is very thin, and principally confined to the side walls of that part in which the anterior portion of the animal is lodged: here the lining gradually thickens as it approaches the margins of the slit, and passes a little beyond them, particularly towards its posterior termination. On looking down upon the slit this shelly lining (fig. 2 c) is seen distinctly projecting inwards from the margins, and exhibiting two or three longitudinal ridges marking periods of growth, narrowing the opening backwards as the increase of the animal requires the advancement of the aperture in front. Shelly granules, *d*, may also occasionally be seen filling up the curved posterior extremity of the slit.

Notwithstanding the abundance of this animal I have not yet been able to investigate the internal anatomy, many specimens having necessarily been destroyed in making the external examinations, and others suffered in attempts to remove them from their abode. This important part of the description must therefore for the present be left almost untouched.

The cloak below is free for a considerable way backwards; above, immediately behind the slit, it is united in front with the true body of the animal, and behind, where the broad disc-like expansion is covered with the horny plate, it blends with a thickish layer of parenchymatous matter. The stomach is long and narrow, and passing downwards and backwards from the mouth bends rather suddenly forwards, and gradually tapering is continued into the cylindrical, fleshy pedicle which supports the arms, near to which it probably terminates. No caudal prolongation of this part was observed similar to that which is common to all the other Cirripedes; the generative organs are therefore probably modified in this animal.

Adhering to the parenchymatous matter beneath the horny plate the eggs are found spread out into a leaf-like expansion co-extensive with this part of the animal; but whether or not this is really the ovary could not be determined. It may be that the eggs have reached this position in some such way as they are supposed by certain writers to arrive in the pedicle of the pedunculate Barnacles. However, in this animal it is certain that the ova are never arranged in laminæ at the base of the arms as in the other Cirripedes, but that they are hatched in the position in which they have just been described. Of this I have had ocular proof.

In the early stages of development the eggs (Pl. IX. figs. 5

& 6) are of a yellow ochre colour, and the yolk is round and much smaller than the shell ; the yolk gradually assumes an elliptical form and soon fills the shell, it afterwards becomes a little flattened on one side (figs. 7 & 8), and by-and-by (figs. 9 & 10) three processes develope themselves from this part ; these processes are the rudimentary arms : about this time a black spot, the eye, makes its appearance towards one end, and at the other the tail is seen to be forming ; afterwards these parts enlarge and gradually put on their perfect forms, while the egg mass assumes a full rose-colour.

On examining an individual in which the eggs had been exposed, they were all found to be in a high state of development ; on applying a powerful lens, I was delighted to find that nearly all the little creatures were alive, and most of them struggling for liberty. I soon had the satisfaction to observe several disengage themselves, and launch forth into the surrounding fluid—free, natatory Crustaceans. In the course of a few hours nearly the whole were hatched, and the wine-glass in which they were, exhibited a most animated scene. On holding it up to the light they were quite visible to the unassisted eye as white points ; but with the aid of a magnifying-glass their motions could be accurately observed, and they were seen to resemble some of the *Entomostraca* ; their large, single eye and general conformation showing their relationship to the genus *Cyclops*. They hung as it were suspended in the water, and every now and then dashed rapidly upwards with a fluttering, jerking motion. They commenced their ascent with great abruptness, and as abruptly became quiescent again ; and once more hanging in the water were seen to descend slowly and gradually with their feet spread out above and their back downwards. They seldom or never moved horizontally, their chief object apparently being to ascend either perpendicularly or diagonally, and always in an inverted position.

On placing a few of these minute beings (Pl. IX. figs. 2, 3 & 4) under the microscope, each was found to be provided with a tail, the body being ovate, broad and depressed, having on the back an ovate shield tapering a little backwards and with a broad interrupted line (figs. 2 & 4 a) of bright rose-colour towards the margins : it is to this line chiefly that the general mass of eggs has a rosy hue as they approach maturity. The eye is large and placed in the centre of the forehead ; it is of a very deep rose-colour,—almost black in some lights. The tail is more than half the length of the body, and passes from below the shield, and appears to be composed of two or three articulations : at first it is very stout, but rather suddenly narrowing, tapers gradually to a tolerably fine point and arches upwards ; on the under surface, at the point of contraction, there is a small curved spine. There

are three pairs of natatory legs placed well forwards and indistinctly articulated; the anterior pair are simple and furnished with a few long setæ at their extremities; the other two pairs are bifid, the anterior portion being much the stouter, and marked with several indistinct close-set articulations towards the extremity; each articulation bearing on its posterior margin a long seta: the posterior branch of the limb is also furnished with setæ at its extremity. On each side of the head there is a stout process a little arched backwards with the point obtuse; these I am inclined to look upon as antennæ, for they appear to arise from the head beneath the shield, though this could not be determined with certainty. It is possible enough that they are lateral prolongations of the shield, similar to the "anterior horns" of the larva of the pedunculate Cirripedes. Whether so or not, the larva of this new animal may at once be distinguished from that of this division of the Barnacles by the absence of the long spine projecting from the posterior margin of the shield. In other respects it evidently shows a strong general resemblance to the larva of these animals.

The larva, then, as well as the characters of the animal itself, proves it to be a true Cirripede, while, in the former, we see a confirmation of the relationship shown by Thompson to exist between these creatures and the Crustaceans. Indeed this animal in several particulars exhibits a very close approximation to them. The shape of the arms or palps by the sides of the mouth resembles not a little the mandibles of the Nymphons or the anterior feet of some of the higher forms; and the horny shield overlying the expanded portion of the animal gives somewhat the idea of a rudimentary carapace: the rostrated upper lip, too, and setaceous branchiae have likewise a very crustacean appearance.

In these particulars our new animal differs from the typical Cirripedes; but not more than in general form, which is very unlike that of either of the two great divisions of the class. The prehensile arms or feet, too, are highly characteristic in this, having, in fact, more the appearance of true feet than the cirri of the other Cirripedes; there are only six, or three pairs, while in all the other Barnacles there are double that number, or six pairs. In our animal the last or terminal joint is shortest and is simple, having few and comparatively short setæ: the arms or feet indeed appear to be merely prehensile organs laying hold of prey by the aid of the cushion-like swellings before described as attached to their inner margins.

The cirrigerous feet of the other Cirripedes are also undoubtedly prehensile, but in a very different manner. In these each terminates in a pair of slender, much-elongated and curled cirri composed of numerous, minute articulations, furnished with a

multitude of very long setæ arranged in double rows along the surface next the mouth. These setæ diverge, so that when the cirri are spread out, the tips of the setæ of the adjoining cirri cross each other, making a very complete net which the Cirripede is forever spreading out and sweeping through the water in the direction of the mouth. Its prey is thus secured, and nothing can escape that comes within the range of this simple and beautiful apparatus. It is not then by currents produced by the cirri, as usually asserted, that these creatures obtain their food; the feet form a prehensile net of the most efficient nature, and the only currents produced result from its action.

In habit, too, this animal differs from all known Cirripedes; none I believe but this species bury themselves in hard calcareous bodies: some indeed partially conceal themselves in foreign substances, and all may be said in a certain sense to be parasitical. *Tubicinella* and *Coronula* are well known to sink deep into the skin of whales; but in both cases the whole of the valvular or upper portion of the animal is exposed; and as both are well protected by their shells, it is evident that this habit is not for defence, the object apparently being to avoid that resistance of the surrounding element occasioned by the rapid movements of this huge animal, and the consequent difficulty there would be of maintaining their hold of its smooth, contractile surface. Other genera, *Prygona*, *Crusia* and *Acasta*, are found concealed in corals and sponges; none of them however excavate: these bodies simply grow round the Cirripede, and as it augments in size, which it does by increasing upwards, so does the coral or sponge advance with it. *Lithotrya* is the only genus of the class that has been described as actually excavating a habitation in hard calcareous bodies; there is reason however to doubt the fact, as we shall see by carefully examining Mr. Sowerby's own figures in his 'Genera of Shells.' This creature is a pedunculate Cirripede, and is stated to have at "the base of the peduncle a shelly appendage." For the moment granting this to be true, it is evident that the holes it occupies, if made by itself, can only have been formed by either this appendage, or by the base of the pedicle before the shelly appendage was secreted. But on referring to the figures just alluded to, it would appear that neither hypothesis is correct. In one of these figures there is very correctly delineated a couple of *Serpulae* adhering to the under surface of the basal appendage. Now it is pretty clear, that were this appendage used as a rasping surface, no *Serpulae* could exist as represented; and were the excavations effected before the formation of this appendage, it must necessarily partake of the shape of the base of the newly-formed chamber to which it would be closely adherent, as in the parallel case of *Hipponyx*: it would

therefore be physically impossible for *Serpulae* to develope themselves on the under surface of such appendage. It is probable, then, that the basal plate of *Lithotrya* is nothing else but a broken valve of either *Clavagella* or of some small oyster that has been growing in the deserted abode most likely of *Clavagella* or perhaps of *Lithodomus**.

Clitia verruca, which is unprovided with a shelly base, certainly sinks slightly into the shells to which it adheres; but this cannot be considered a burrowing Cirripede. *Alcippe lampas*, the name by which I propose to designate our new species, is the only one of the class, which, according to our present knowledge, can be so considered. It is the only one, at least, that entirely conceals itself in chambers of its own making in hard calcareous bodies.

I have not been able to examine into the method by which the excavations are effected; a fresh and numerous supply of specimens will be required for this purpose. I shall now only observe on this interesting part of the subject, that in this Cirripede we have a proof that an animal as highly organized as the *Mollusca* can bury itself in hard calcareous substances without the aid of shelly plates; and that the walls of the burrow of this animal exhibit in a peculiar manner the structure of the shelly matrix. This however might result either from a solvent, or from the application of minute cutting bodies on a highly contractile, soft, and pliant surface.

From the above general review of the characters and habits of this animal, we observe at once that it differs in so remarkable a manner from both the *Campylosomata* and *Acamptosomata*,—orders established by Leach for the accommodation of the two great divisions, the pedunculate and sessile Barnacles,—that it becomes necessary to form a new order for the reception of this curious Cirripede. This order I propose to characterize as follows:—

Order CRYPTOSOMATA.

Animal naked, burying itself in some foreign substance, attached by muscular adhesion to the upper wall of the chamber, and communicating with the water by an orifice: arms or feet six, composed of three articulations, the last simple: branchiæ setaceous, attached to the external surface of the upper lip.

Genus ALCIPPE.

Animal depressed and enlarged posteriorly; anterior portion compressed, with the mantle slit longitudinally on the upper

* Whilst this was passing through the press I have been assured by Mr. C. Darwin, and his opinion on this subject is of the greatest value, that the dorsal cup of *Lithotrya* is undoubtedly formed by the animal, and that it has the power of enlarging the cavities in which the larva takes up its abode.

surface: the four arms or feet next the mouth provided each with a prehensile cushion: palpi furnished with pincers; upper lip rostrated.

A. lampas. Animal with the margins of the lips thickened, each being furnished posteriorly with a curved point or process; posterior portion considerably depressed, rounded, and provided with a horny plate on the upper surface: chamber in the shell of mollusks, partially lined with calcareous matter secreted by the animal; opening narrow, enlarged and rounded in front, tapering and curved behind. Length $\frac{1}{2}$ ths of an inch, breadth $\frac{2}{3}$ ths of an inch.

EXPLANATION OF PLATES VIII. AND IX.

PLATE VIII.

Fig. 1. A portion of *Fusus antiquus* exhibiting numerous specimens of *Alcippe lampas* in the columella and sides of whorls: *a*, stain caused by the animal; *b*, slit by which it communicates with the water.

Fig. 2. Much-enlarged view of the external appearance of the chamber of *Alcippe lampas*: *a*, stain produced by the animal seen through the shell, exhibiting pale radiating lines and punctures; *b*, slit in the matrix or shell by which the animal communicates with the water; *c*, calcareous layer partially lining the chamber, and projecting beyond the margins of the slit; *d*, calcareous granules filling up posterior extremity of ditto.

Fig. 3. Upper view of *Alcippe lampas* removed from its chamber: *a*, anterior portion containing the arms and true body; *b*, broad disc-like portion corresponding to the pedicle of the pedunculate Barnacles; *c*, valvular lips; *c'*, the slit or opening; *d*, posterior terminal points of lips; *e*, horny plate; *f*, arms partially exserted; *g*, the point at which the animal is attached to the chamber.

Figs. 4, 5. Under and side views of the same: letters as in fig. 3.

Fig. 6. Anterior portion laid open to show the true body and arms: *a*, one of the valvular lips; *b*, the other cut across and laid back; *c*, fleshy pedicle supporting the arms *d*; *e*, mouth; *f*, upper lip; *g*, rostrated termination of same; *h*, arms or palpi by the sides of the mouth furnished with pincers; *i*, branchiae.

Fig. 7. Portion of the true body as seen in the compressor: *a*, upper lip; *b*, rostrated termination of same; *c*, carinated margin of same; *d*, arms or palps by sides of mouth; *e*, prehensile arms; *e'*, the mouth; *f*, the outer or first pair of mandibles; *g*, second pair of ditto; *h*, third or innermost pair of ditto; *i*, the branchiae.

Fig. 8. A few of the plates or setæ of the branchiae highly magnified, exhibiting a double channel at the broad extremity which is bifid.

Fig. 9. Prehensile cushion of the arms.

PLATE IX.

Fig. 1. The prehensile arms highly magnified: *a*, fleshy pedicle; *b b*, cushion-like swelling of same.

Figs. 2, 3, 4. Different views of the larva of *Alcippe lampas*: *a*, interrupted rose-coloured line surrounding the dorsal shield.

Fig. 5. A mass of the eggs a little magnified.

Figs. 6, 7, 8, 9, 10. Eggs highly magnified, exhibiting different stages of development.

XXXII.—*Note on the genus Siphonotreta, with a description of a new Species.* By JOHN MORRIS, F.G.S.

[With a Plate.]

AMONG the numerous interesting fossils collected by Mr. John Gray from the Wenlock limestone and shale in the vicinity of Dudley, is one which I feel convinced belongs to *Siphonotreta* (de Vern.), a genus of Brachiopoda, hitherto considered peculiar to the Silurian formations of Russia. The genus having been previously unnoticed in this country, and presenting some peculiarities both as regards the structure of the shell and the mode of attachment, it may not be uninteresting to offer a few general remarks on the subject; more especially as this genus, and some apparently allied forms, have been lately made the subject of a special notice by Dr. Kutorga of St. Petersburg. In this memoir* Dr. Kutorga has grouped together in one family (the *Siphonotretæ*) four genera, *Siphonotrela*, *Acrotreta*, *Schizotreta* and *Aulonotreta*, which scarcely present any character in common, and have been in part considered by preceding authors as belonging to different groups or distinct subfamilies of the Brachiopoda.

Differing from Dr. Kutorga upon the relative value of the characters of these genera, as well as their arrangement or the grouping of them in one family, and certainly objecting to that pernicious system of coining new generic names without a sufficiently valid reason, merely for the sake of introducing a more euphonious terminology, I cannot at the same time but freely acknowledge that paleontologists are indebted to him for his elaborate memoir, containing descriptions of some new and interesting forms, illustrated with many beautiful figures of the different species.

Of the above-mentioned genera, two have been known for about twenty years. One of them, remarkable for the immense abundance with which it occurs in the Lower Silurian grits of the north of Russia, its broken fragments disseminated in the plane of stratification, giving the rock a micaceous appearance, was first made known (1829) as a peculiar genus by Prof. Eichwald † under the name of *Obolus* (*Aulonotreta*, Kut.); about the same period (1830), Pander ‡ gave the name *Ungula* to this fossil, which L. von Buch § (1840) considered to be an *Orthis*. The other

* Ueber die *Siphonotretæ*, von Dr. S. Kutorga, Verhandlungen der Kaiserlichen Mineralogischen Gesellschaft für das Jahr 1847, p. 250, St. Petersburg, 1848.

† *Zoologia specialis*, 1829, vol. i. p. 274.

‡ *Beiträge zur Geognosie des Russischen Reichs*, 1830.

§ *Beiträge zur Bestimmung der Gebirgsformationen Russlands*, 1840.

form was also first noticed by Eichwald in 1829 as a *Crania* (*C. sulcata*, *C. unguiculata*), which he afterwards (1843) placed under *Terebratula**; subsequently however M. de Verneuil, in the second volume of the great work on Russia†, recognized the differences which separated these fossils from *Crania* and *Terebratula*, and gave them the very characteristic name of *Siphonotreta*, describing two species, *S. unguiculata* and *S. verrucosa*. Since the publication of the work on Russia, four additional species of the latter genus have rewarded the researches of Hern. v. Volborth and other Russian geologists, which are fully described, as well as those previously known, in the monograph by Dr. Kutorga above alluded to, and from which is extracted the following synopsis of the principal characters of the genera included by Dr. Kutorga in the family of Siphonotretæ.

SIPHONOTRETEÆ, Kutorga.

A. With a tubular closed siphon.

- a. The external siphonal opening passes from the apex towards the anterior margin.

1. *Siphonotreta*, De Verneuil.

<i>S. unguiculata</i> , Eichw. sp.	<i>S. conoides</i> , Kut.
<i>S. fornicata</i> , Kut.	<i>S. tentorium</i> , Kut.
<i>S. verrucosa</i> , Vern.	<i>S. fissa</i> , Kut.
<i>S. aculeata</i> , Kut.	

- b. The siphonal opening is directed from the apex towards the dorsal margin.

2. *Schizotreta*, Kutorga (*Orbiculoidæ*, D'Orbigny).

Opening narrow, slit-like; no area, nor mark of deltidium.

Sch. elliptica, Kut.

3. *Acrotreta*, Kutorga.

Opening elongated, oval; area triangular and flattened, with a deltidium-like furrow.

A. subconica, Kut.

A. recurva, Kut.

A. disparirugata, Kut.

B. With a furrow-like siphon, opened on the whole hinge area.

4. *Aulonotreta*, Kut. (*Obolus*, Eichw.; *Ungula*, Pander).

A. polita = *O. Apollinis*, *siluricus*, *ingricus*, Eichw.; *Orthis ungula*, Von Buch.

A. sculpta = *O. antiquissimus*? Eichwald.

"The Siphonotretæ are free, unattached Brachiopods ‡, whose

* Beiträgen zur Kenntniss des Russ. Reichs, 1843.

† Russia and the Ural Mountains, by Sir R. I. Murchison, 1845, vol. ii. p. 286.

‡ Dr. Kutorga alludes to the shells not being solidly attached by either of the valves.

chief character consists in a short, perfectly straight, perforated beak, never bent towards the ventral valve. The walls of this beak are very thick, and hence it does not appear, as for instance in the *Terebratulae*, hollow within, but solid and perforated by a narrow siphon, which serves for the reception of a cylindrical muscle of attachment.

"The beak presents two chief diversities of form: it is either drawn away, in very different degrees, from the hinge-margin towards the centre of the dorsal valve; that is, is placed at a greater or less elevation above the hinge-margin,—or it lies exactly in the same plane with the hinge-side of the dorsal valve. *In the first case* the dorsal valve has properly the form of a cone more or less inclined towards the hinge-side, and the siphon appears either as a perfect tube (*Siphonotreta*, *Acrotreta*), or as a tube opened up externally for a portion of its length from the apex of the cone (*Schizotreta*). *In the second case* the dorsal valve represents only the half of a cone, in which the shorter hinge or posterior part has been cut away from the apex to the basis, exactly in such a manner that the external opening of the beak is changed into a groove less than a semicircle in depth, and the siphon into a semicylindrical groove open along the whole length of the hinge-surface (*Aulonotreta*). See Pl. VII.

"In no portion of the shell of this group can we observe the slightest indication of a predominance of development; the central part is not distinguished from the marginal portions; hence neither valve shows either a *carina* or a *sinus*; the hinge-sides form together an arch, and pass imperceptibly into the lateral margins; there are no wing-shaped expansions of the hinge-margins, and finally, neither the cardinal nor anterior margins exhibit either folds, serratures, or excision.

"The anatomical structure of the shell of the Siphonotretaceæ is this. The whole inner surface is covered by a continuous layer which is so thin that it welds itself closely to, and takes the form of, all the larger prominences and folds of growth. This layer, from its position and colour, I shall call the *nacreous-layer* (Perlmutterschicht). The external surface of the shell is also covered by a continuous, but considerably thicker, corneous *epidermal-layer*, which is so much developed, and from its horny texture has so great durability, that sometimes, even when all the other layers are dissolved and vanished, it is still perfectly preserved—a peculiarity which, in the whole family of Brachiopods, is found only in this group and in the *Lingulæ*. This *epidermal-layer* also covers the inner wall of the siphon in all its diversity of forms. Lastly, the part between these two layers, and always the thickest, is the proper *calcareous shell*."

Any remarks upon the above characters must be considered

merely provisional, having had but limited opportunities of inspecting specimens, and having seen but three of the four genera above described, and not any showing interior structure. In the collection of Sir R. I. Murchison are specimens of *Siphonotreta* and *Obolus* which I have been kindly allowed to examine: for the loan of *Orbiculoidæ*, D'Orb., I am indebted to Mr. J. Gray of Dudley: with regard to *Acrotreta*, I have not seen the Russian specimens which are included in that genus, but the excellent figures given by Kutorga lead me to infer that they most probably belong to that section of the Spiriferæ constituting the genus *Cyrtia* of Dalman, for the mesial furrow traversing the depressed triangular area in two of the species figured (*A. subconica* and *A. recurva*) indicates a more complex arrangement on the hinge-line than is found in the hingeless Brachiopods.

As to the peculiar structure of the shell of *Siphonotreta*, which is a character of some value and at once distinguishes it from the other genera, it is not a little remarkable that neither M. de Verneuil nor Dr. Kutorga has figured it or alluded to it with sufficient importance. De Verneuil describes the shell as subcorneous, à surface chayrinée. Kutorga states the calcareous part proceeding from the apex to consist of a number of very flat rings or of many oblique cones truncated at the bases, whereas Sir R. Murchison's specimens of *Siphonotreta* exhibit, certainly a shell both calcareous and corneous, but with a distinctly perforated structure, as if composed of a series of oblique tubular layers, the perforated texture being larger than that found in the majority of *Terebratulae*, and resembling that presented in *Ter. Capewelli* (Davidson), *Ter. hamifera* (Barr.), in the genus *Trematis* (Sharpe), and in some species of *Thecidæ*; besides which the surface is ornamented, in all the described species, with numerous tubular spines, generally arranged in a very regular order, and leaving, when broken off, slightly projecting hollow tubercles in their place*. Neither of these characters are found in *Orbiculoidæ*, D'Orb. (*Schizotreta*, Kut.), and *Obolus*, Eichw. (*Aulonotreta*, Kut.); their shells, although more solid and calcareous than the recent allies, are probably formed somewhat as in *Orbicula* and *Lingula*, and which are described by Dr. Carpenter as being "almost entirely composed of laminae of horny matter, which are perforated by minute tubuli, closely resembling those of ivory in size and arrangement, and passing obliquely through the laminae."

The genus *Schizotreta*, Kut., is synonymous with *Orbiculoidæ*, D'Orb., and presents some, but probably only minor, characters

* The genera *Chonetes* and *Productus* are also furnished with tubular spines; in the former they are arranged along the cardinal margin of the dorsal valve, and in the latter are irregularly scattered over the surface.

which separate it from the ordinary *Orbicula*; the shell is generally more solid and calcareous, both valves are nearly equally convex, and the passage for the muscle of attachment, instead of being through a *longitudinal fissure* as in *Orbicula*, is considerably contracted, being confined to a small *tubular perforation* situated at the marginal end of a rather deep closed furrow. The pedunculated form assumed by the muscle of attachment in *Orbiculoidea* must have allowed greater freedom of motion to the animal, and may be the reason for the more conical development of the lower valve in this genus, as distinguished from the compressed form of the same valve in *Orbicula*. The contracted perforation in *Orbiculoidea* is well shown in the figure of *Orbicula Forbesii**, 'Memoirs Geol. Surv. of Gr. Britain,' vol. ii. pl. 26. f. 2, and is alluded to by Mr. Salter in his remarks on this species. This shell appears to be the same as the *Schizotreta elliptica*, Kutorga (1847), and is probably the older form of *Patella implicata*, Sow. 'Sil. Syst.' t. 12. f. 14 a, as well as identical with *Patella antiquissima*, Markl. (His. Let. Suec. t. 12. f. 11, and description), and is a type of D'Orbigny's *Orbiculoidea*.

With respect to *Obolus*, which has not yet been recorded as occurring in this country, I have, by the kind permission of Prof. E. Forbes, examined the fine collection of *Lingulae* possessed by the Museum of Practical Geology, without finding any form distinctly referable to Eichwald's genus. At present this shell is peculiar to Russia, being there widely distributed, and it appears to be one of the most ancient animal forms with which we are acquainted, for the beds containing it are altogether at the lowest limits of the fossiliferous deposits of Europe. It is somewhat remarkable, as mentioned by M. de Verneuil, that notwithstanding the extreme abundance of this shell in Russia, it has never been found on the other side of the Baltic, either in Sweden or Norway, where however exist grits of similar age to those of Russia, below the limestones containing *Asaphus expansus* and *Illeenus crassicauda*. Nor has it been found in America: it appears in that country, as in the British Islands, to be synchronously represented by the genus *Lingula*, with which it has the nearest affinity; for Sir C. Lyell mentions that the lowest fossiliferous strata in the United States (those for instance near Lake Champlain) contain abundant fragments of *Lingula*, giving to the rock, as in the Obolite grits of Russia, a very micaceous appearance.

In the Russian specimens of *Obolus*, I could not detect the peculiar reticulated structure of *Siphonotreta*; the shell is cal-

* Mr. Gray of Dudley possesses beautiful specimens of this shell, from which collection Mr. Davidson described it in the 'Bull. de la Soc. Géol. de France,' vol. v. 2nd ser. t. 3. f. 45.

careo-corneous, more solid than *Lingula*, but closely allied to it, and differing from it in having one valve with a slight furrow for the passage of the pedicle, as well as some modifications in the interior structure of the valves.

The group of the *Siphonotretæ*, Kut., are arranged by M. D'Orbigny, under the families *Lingulidæ* and *Orbiculidæ*, in his first great division of Brachiopoda, with the following characters (*Comptes Rendus*, vol. xxv. p. 267, Aug. 1847) :—

Lingulidæ. A pedicle or exterior muscle passing between the valves ; shell corneous ; animal fixed.

The beaks of both valves hollowed with a furrow for the passage of the muscle *Lingula*, Brug.

The beak of one valve only with a furrow for the passage of the muscle *Obolus*, Eichwald.

Orbiculidæ. The muscle passing out by the inferior valve ; shell free.

Shell testaceous, perforated ; muscle of attachment pedunculated, placed at the summit of the beak. . *Siphonotreta**, De Verneuil.

Shell testaceous, perforated ; muscle of attachment placed by the side of the beak *Orbicella* †, D'Orb.

Shell corneous, not perforated ; muscle pedunculated.

Orbiculoidæ, D'Orb.

Shell corneous, not perforated ; muscle not pedunculated.

Orbicula, Lam.

From the above general remarks, it will be evident that the four genera above mentioned cannot properly be arranged in the same family of which *Siphonotreta* is the type, and from which the other three are readily distinguished ; in fact, as previously observed, they belong to four distinct groups ; *Siphonotreta* being allied to *Crania*, *Schizotreta* to *Orbicula*, *Aulonotreta* to *Lingula*, and *Acrotreta* probably identical with *Cyrtia*.

I shall conclude these notes with the following brief description of the new species of *Siphonotreta* :—

Siphonotreta anglica. Pl. VII. fig. 1 a-e.

Shell of a rather oblong-oval form, depressed, marked by the fine lines of growth ; surface minutely but concentrically reticu-

* Mr. W. King places *Siphonotreta* in the family Craniidæ.

† *Orbicella*, D'Orb. (Aug. 1847), is stated by Mr. Davidson, 'Bull. Géol. Soc. France,' n. s. vol. v. p. 315, to be identical with the genus *Trematis*, Sharpe (June 1847). This can scarcely be the case, if both genera are correctly described ; for *Orbicella* is placed by D'Orb. among the hingeless Brachiopods, whereas Mr. Sharpe describes *Trematis* as having a hinge. The two diverging plates in the non-perforated valve of *Trematis* are somewhat remarkable, as, where they exist in other Brachiopoda, they always form internally the margins of the deltidial area, partly protecting the passage for the muscle of attachment, and forming the dental processes of the hinge.

lated, reticulation regular with quadrangular areolæ, and covered with many slender linear tubular spines or their bases, somewhat quincuncially arranged; spines smooth, dilated at the base, a little above which they remain of nearly uniform size throughout or very slightly tapering, and are regularly and transversely sulcated or contracted, giving the spines a beaded or jointed appearance.

The general form of the shell and quincuncial arrangement of the spines resemble *S. aculeata*, Kutorga, but as that author does not figure or allude to any reticulated structure or the moniliiform spines*, this is considered to be distinct; unfortunately the specimen is much compressed, so that all the characters are not fully shown, and I have provisionally given the name of *S. anglica* until it can be compared with all the Russian species.

Locality. From the Wenlock shale near Dudley. Collection of Mr. J. Gray.

EXPLANATION OF PLATE VII.

- Fig. 1.* *Siphonotreta anglica.* *a.* Shell, natural size. *b.* Shell, magnified view. *c.* Spines enlarged. *d.* Portion of ditto, magnified. *e.* Outer surface of shell, magnified.
Fig. 2 a. *Siphonotreta verrucosa.* *b.* Side view. *c.* Surface of shell, magnified. *d.* Interior of dorsal valve.
Fig. 3 a. *Schizotreta* = *Orbiculoidea*, D'Orb., *O. Forbesii*. *b.* Showing longitudinal furrow and contracted perforation.
Fig. 4. *Acrotreta* = *Cyrtia?* *a.* Dorsal valve. *b.* Ventral valve.
Fig. 5. *Aulonotreta* = *Obolus*.

XXXIII.—*On the Animal of Dentalium Tarentinum.*

By WILLIAM CLARK, Esq.

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

GENTLEMEN,

Norfolk Crescent, Bath, Sept. 1, 1849.

THE animal I am about to present to your notice exhibits a series of characters of the highest interest, in its anatomy and functional developments, some of which are so anomalous that it must be considered one of the most singular of the testaceous mollusca.

From my observations in the September Number of the 'Annals,' it appears that the minute species of the genus *Cæcum*, from their configuration, have generally been located with the *Dentalia*, though it will be seen that there is little concordance

* The moniliiform character of the spines may not be peculiar to this species, but will probably be found to belong to the whole genus, when the spines of the other species are carefully examined by a higher magnifying power than that used by Dr. Kutorga.

between the animals of the two genera. I believe, with the exception of M. Deshayes's monograph, nothing has been done to elucidate this curious molluscum; and as I think that eminent malacologist has mistaken the uses of some of its organs, I am induced, by the facility of obtaining live specimens of the *Dentalium Tarentinum*, to review and augment what is at present known of it: the present species inhabits the coralline zones of the South Devon coasts, five or six miles from land, in twelve or fifteen fathoms water.

Dentalium striatum, Montagu.

— *Tarentinum*, Lamarck.

Animal yellowish white, conically elongated, mantle circular, anteriorly thick and fleshy, edge dentated, posteriorly of the thinnest texture; the penultimate and antepenultimate portions of its margin are bounded by two intense white muscular elastic cordons; the united action of these has the power of completely opening and closing the anterior aperture; when at rest, the animal, including the foot, is entirely inclosed by the tougher part of the mantle which supplies the place of an operculum.

The foot is a very long and singular organ, placed in the centre of the anterior end of the body, and from its position is applicable for use in every direction; it is divided into three parts: the anterior one is a pointed cone acting in some measure as a tentaculum, and lies in the middle portion, which consists of two lateral, situated, symmetrical flaps or tenacula, that are usually protruded simultaneously with the terminal portion, and are the parts subservient to the animal's very confined locomotion, to turn from side to side by using the lateral appendages as *points d'appui*, and also to climb and secure its food from the stems of the foraminiferous polyparia; the third or basal section is a long flattish pedicle deeply grooved on its upper and lower surfaces, extending to the base of the stomach, into which it opens, as it is hollowed out as far as the tenacular flaps, but there is no passage to the exterior surface. I have failed to discover the reason for this connection with the stomach: the hollow part is filled with water, but from what source does not appear, though I think it must come from the buccal aperture; the use of this singular structure is clearly to augment the flexibility of the foot, as the animal frequently and suddenly doubles it up as the elephant does its trunk; and also to withdraw the two anterior parts into the hollow portion: this retractile action is necessary in consequence of the peculiar mouth of the animal and rigid character of the anterior end of the mantle, to convey the sustentation captured by the tenacula into the cavity of the mantle within the reach of the very short foliaceous cirrhi at the buccal

orifice : from the foot an elastic fibrous ribbon runs, on each side of the body, to the posterior terminus, and affords the animal the power of greatly contracting and dilating that end of it, as may be seen by the creases of contraction, which in some degree give the appearance of annulations.

At the base, and above the pedicle of the foot, if that surface of the animal is upwards which lies in the concavity of the shell, and *vice versâ*, in the convexity, is inserted a distinct light yellow tubular buccal appendage, without eyes or tentacula, which can only be considered a kind of external oesophagus, and as regards its accessories and form, has no pretensions to be styled a head ; it is encircled by about eight or ten short dendroid tentacular strands ; its cavity forms two extremely dilatable pouches divided by a longitudinal septum, which become compressed and merge apparently into one at the point of passage into the stomach ; these external receptacles invariably contain from ten to forty, or even more, very minute Foraminifera, a convincing proof of the voracity of these animals. I have never failed to find in them either the *Quinque-*, *Tri-*, or *Biloculinae*, or the *Rotalia Beccarii*, the *Lobatula vulgaris*, *Bulimina pulchella*, *Textularia oblonga*, *Lugena amphora*, or the *Robulina subculturata*, and more rarely a minute bivalve, either the *Kellia suborbicularis* or *Astarte triangularis* : this fact is another proof, if any additional ones were necessary, that an animal inhabits the minute calcareous forms which were formerly supposed to inclose Cephalopoda, or to be inserted in their membranes ; they are not inhabitants of the littoral, but of the coralline zones, and appear to be the sole aliment of this decided zoophagous molluscum. These shells are *in transitu* to be acted on by the appendage within the stomach, which will be noticed shortly, and after having undergone its action the rejectamenta are discharged anteriorly with other mucal and fecal matters, and not at the posterior terminus agreeably to M. Deshayes's determination, and I shall presently demonstrate that the posterior aperture is not for anal uses, but to supply the branchiæ with water.

It is now necessary to mention the figure and situation of the heart and branchiæ ; these points must be carefully kept in mind, as the demonstration I propose rests on a due consideration of them. The heart is a subrotund minute ventricle with a linear depression on its summit, and when opened shows the corresponding ridge ; its surface is fortified with muscular raised lines ; it is fixed centrally on the convex range at the posterior end of the branchial cavity and base of the stomach, and in some transparent animals may be seen in the pericardium ; in the very young pellucid shells seven inspirations and as many nearly isochronal expirations have been counted in a minute, and the

corresponding ingress and egress of the water seen*. I have not detected auricles on each side of the heart, nor near it, as might be expected from the symmetry of the branchiae; there are certainly minute points on each side of that organ, but I demur to call them auricles, and rather think they denote the valvular appendages of the heart to prevent regurgitation into the branchial veins. The blood of the posterior part of the body is brought to the branchial artery which runs at the inner base of the branchiae, by two longitudinal veins, which pass between the branchiae on their convex surface, receiving tributaries; I could not trace those of the anterior part; the arterial blood is then distributed into the ramifications of the branchiae, and after aeration is passed by each principal vein, which coasts the edges of those organs at their dichotomous points, to the heart, which throws out a posterior and anterior short trunk, both of which bifurcate into two smaller arteries, which supply veins infusing a renewed vitality into all parts of the body, from whence the blood is again returned to the arterial centre. Under the microscope the blood of the tributary and superficial veins appears to be in some individuals of a pale pink colour, and in others of a purplish pale red cast. I have preparations to illustrate this order of the organs.

The branchiae are two symmetrical, sublateral, and somewhat post-centrally situated, dark greenish brown, elongated, suboval organs, having their bases fixed on and hanging from the concave surface of the animal with their points vertically parallel to the bases; the two branchiae are united at their inner surfaces by a bridle of branchial strands arranged symmetrically.

The heart in the testaceous Gasteropoda, spiral and otherwise, is always placed at the posterior end of the branchial cavity, or, in other words, is fixed at that extremity of the branchiae furthest from the entry of the aërating fluid: this statement of position is of importance in coming to a conclusion as to the mode of entry of the water. But if the position of the organs of *Dentalium* is examined under the view of the water approaching the branchiae under the mantle, as in the ordinary Gasteropoda, they will be found to be the reverse of what I have stated to be the usual natural position; the heart will be found at the *anterior* end of the branchial cavity instead of at the posterior, and *nearest* to the entrance of the water instead of furthest from it: here is a subversion of the order of nature in respect to the position of these essential organs: how are they to be placed in harmony with her laws? The solution of this question is simple: we have

* Lamarck in the last ed. 'Anim. sans Vert.,' Milne Edwards's, 3rd vol. p. 13, says, "Car, après les animaux vertébrés, la nature n'offre, dans aucun

only to consider that the water in this genus flows to the branchiae by the posterior aperture instead of at the front; this view removes every difficulty, and may be regarded as a demonstration of this fact, which is satisfactory and decisive, because it is founded on the organization which nature has conferred on these animals.

I will state some facts in support of the conclusion that the branchiae in *Dentalium* receive the water posteriorly. I admit that notwithstanding a constriction, it may possibly enter in front under the mantle and be discharged posteriorly, and *vice versa*; but this action would be contrary to the natural position of the organs and the evidence I shall now adduce. But first it will be necessary to mention the mode of fixture of the animal to the shell: this is not at the centre, as in the spiral Gasteropoda, but at the posterior end, a little more than an eighth of an inch from the terminus, where, on the inner surface, may be seen the striae, in the hollows of which the fine filaments issuing through the mantle and proceeding from the longitudinal elastic ribbon running from the foot are deposited, and together with the strong sphincter of the posterior process, which is imbedded in an indentation not visible from without, firmly secure, by constriction, that end of the animal to the shell. This is a striking example of the admirable adaptations of nature of the organs of animals to their wants and economy; for if this animal was fixed to the middle of the shell as in the spiral ones, the contractility of the posterior part of the body would be destroyed, and its vermicular motion to aid and accelerate the passage of the branchial fluid and its expulsion through the comparatively narrow medial duct paralysed. I may state in corroboration of the foregoing observations, that I have removed the posterior hyaline process and enlarged the orifice as much as possible, and then dropped therein some grains of fine sand to irritate the membranous spoon-shaped process, when instantly pure water, without the slightest admixture of faecal substances, was ejected; and this result was invariable in all and many individuals. I have stated that in young transparent specimens an uninterrupted but slow action of systole and diastole might be observed, and was apparent from the distinct ascent and descent of the water in the branchial canal; but this action cannot take place in a merely excretory tube; it can only exist in a circulatory, or inhalant and exhalant one. I have carefully dissected the body from the

animal, ces mouvements alternatifs et mesurés d'inspiration et d'expiration du fluide inspiré," &c.

On this point that great naturalist is in error, as in *Dentalium Tarentinum* I have with a chronometer showing seconds, repeatedly marked nearly isochronal inspirations and expirations of the aërating fluid, the two together amounting to about twenty-six in a minute.

branchiae to its terminus, and submitted its substance to microscopic powers without discovering a trace of an intestine, which is usually the easiest organ to be detected by its colour and distension. I have carefully watched thirty individuals at a time, and never saw any rejectamenta from the posterior process; but in the same period frequent discharges anteriorly from the centre of the mantle, of foraminiferous spoil enveloped in mucus. I finally observe, that on the animal being removed from the shell, the medial branchial canal is distended, but in a short time collapses from the evaporation of the fluid, and exhibits a deep canaliferous groove; and when the canal is not quite full, one or two globules, precisely like those of a spirit-level, may be made with the slightest pressure to float backwards and forwards from the posterior sphincteroid process to the branchiae. Many other circumstances can be added in proof of the posterior entry of the branchial water, but I have already transgressed the limits of conciseness, and it is time to take some notice of the nervous system, salivary glands, the stomach and its contents, and the substances which fill up the body from the branchiae to the posterior terminus.

At the base of the œsophagus is a cerebral mass of four minute, pale pink, subcircular, finely-punctured ganglions, in form somewhat like the letter X, united by a nervous thread or collar, which encircles the œsophagus at the point where it passes at the base of the foot into the stomach, and the fine filaments therefrom are distinctly visible passing to the stomach, and throwing off anastomosing lateral threads anteriorly to the foot, buccal orifice, and the other front parts of the body.

The salivary glands are very large, covering the base of the foot and the œsophageal ganglions, and envelope the buccal pouches so completely that they seem imbedded in them; they spring from each side the base of the mouth, and are two thick fasciculi, which consist of a multitude of very fine, long, light yellow capillary strands; their extraordinary volume is necessary to produce a copious supply of fluid to lubricate the enormous quantity of Foraminifera these animals swallow, especially of the seabrous ones, as *Bulimina pulchella*, and the sharp-pointed *Lagenaria amphora*.

The œsophagus, after emerging from the nervous collar, instantly enters the stomachal cavity, which is composed of a muscular membrane of a broad oval form, the anterior and larger portion thereof being occupied by an extremely strong gizzard, formed of a pair of subelliptical folding jaws with eighteen laminæ bent towards the points on each side, and studded with very strong blunt teeth: this denticular frame is supported by fleshy lobes enceased in corneous plates, and appears to be an organ nearly similar to the buccal mass of the ordinary Gasteropoda;

it is not however placed, as in them, immediately at the anterior orifice of a pharyngeal œsophagus leading to a stomach and fixed thereto by strong elastic threads, but it is the stomach itself most slightly attached to the membrane which envelopes it. This powerful machine undoubtedly acts as a gizzard to grind the testaceous food of this animal; it empties itself by a very short scoop-shaped canal into an intestine of three or four intricate gordian knot-like folds, which, strange to say, often contain a dozen or more shells that have escaped the action of the gizzard; the intestine does not entwine with the liver, but is inclosed within the same cavity as the gizzard; it pierces its inclosure on the right side, passes through the liver, and discharges the rejectamenta at the base of the branchial cavity under the mantle about the middle of the shell, from whence they are passed by the deep groove of the foot, which the animal can by the compression of its sides make canaliferous, as far as the middle section of the foot, around which, when the animals are fresh from the sea, they form repeated collars of mucus, which in a short time, from frequent aggregations of matter, become ponderous, break and fall off, and when examined are found to be composed of the spoil of shells: this circumstance, independent of all others, shows that the feces are not discharged posteriorly.

The liver is an extremely scanty light yellowish green organ placed under the stomach, and is continued under the branchial cavity, and then joins the ovary, with which it becomes almost imperceptibly amalgamated throughout its whole length. The ovary is very long and large, and fills up the whole of the posterior part of the body from the branchiae; it consists of from four to six longitudinal rows of distinct granular yellowish white masses of ova, with scanty interweavings of the liver, which exhibit three stages of development; the more forward ones become broken into six portions, and when ready for exclusion these again break into perfectly round, pale brown globules; all these phases vary in different animals according to the advancement of fecundation. The oviduct is in the centre of the longitudinal rows of ova formed by their junction, and the ova are undoubtedly discharged by the posterior spoon-shaped process, from whence I have seen volleys of fifty or a hundred ejected with considerable force in minute round points: these must not be mistaken for fecal pellets, neither must the oviduct be confounded with the branchial canal, which is the cavity formed between the mantle and the membrane of the ovary. The homogeneity of the masses of this part of the body in many conditions, especially when fecundation is not far advanced, renders the discrimination of organs of this character a matter of some difficulty. I have not discovered any exserted organs of repro-

duction, and I think from various considerations that this animal is an hermaphrodite, but without congression. Under the microscope, in the midst of the general mass, several small egg-shaped globules, having at one of the axes a minute, apparently tubular filament filled with a glary fluid, may be seen in some individuals, but not in all, as I have sometimes searched in vain for them ; these may be the virile fecundating organs, which are perhaps only apparent at certain stages of gestation.

I have extended these observations to an unusual and almost inconvenient length : the curious and anomalous structure of this molluscum, and the multitude of interesting characters attached to it, exhibit such modifications of the organs of the typical Gasteropoda as appear to give it a claim to be considered as the point of transition from the bivalve mollusea to the great change in figure and faculties which nature has produced in the superior developments of the Gasteropoda ; and perhaps from a review of this account of these organs, malacologists may be induced to think that it will appropriately form one of the first, if not the first link, in the chain of the Gasteropoda. The symmetrical subventral position of the branchiae, the posterior flow of water to them, and the resemblance of the foot to that of some of the bivalves, combined with the similar character of its action, appear in a striking manner to show its connection with the Conchiferae ; whilst by its œsophageal cerebral ganglions and completeness of the circulation, it has established its claims as a Gasteropod. There are also traces of alliance with some of the inferior classes : the red blood and vermiform configuration of the posterior part of the animal show some of the characters of the Annelides ; but though we acknowledge these sources of its origin, we cannot fail to see how clearly the animal of *Dentalium* displays at various points the progress of advancement, and the ameliorations nature has so beneficially effected in its animality.

I have only seen one live specimen of the *Dentalium entalis* : the organs have the same characters as those of the present species, but it is very distinct ; the colour is snow-white, and on comparison of two shells of the same size, the *Dentalium entalis* will be found much more slender ; the branchiae are also of a paler green, more scanty, thin and delicate.

I had written thus far when I received from Paris M. Deshayes's memoir on the *Dentalia*, which I had not seen for twenty years, and its contents had nearly passed from my memory ; on looking it over I find that the differences between that gentleman and myself are more important than I was aware of, but I am not inclined to abandon my own views. I am also glad to find that I am enabled to fill up many gaps as regards the functions and habitudes of these animals.

This gentleman, in stating the anus in *Dentalium* to be pos-

terior, observes that it is the only molluseum that has it so situated ; but this anomaly, if it be so, I think I have disposed of.

Those organs which I consider to be the symmetrical branchiae are termed by M. Deshayes the lobes of the liver, each pouring into the stomach the bile by their biliary vessels. I cannot persuade myself that this view is correct ; I have submitted them to the microscope, and in each principal strand I have seen the leading vein distended with red blood as well as in the net-like connecting ramifications ; I therefore consider what are called the biliary vessels to be the branchial veins conveying the blood to the heart instead of bile into the base of the stomach. M. Deshayes in his figure has omitted to mark the vein which runs at the dichotomous points of his organ, which, when viewed under high powers, is very visible, and which I take to be the branchial vein.

What I term the salivary glands, are the branchiae with M. Deshayes, combining the functions of tentacula : he does not mention such glands. I must consider this assumption incorrect ; and to support this opinion I state that the heart is separated the whole length of the stomach from the bases of what M. Deshayes terms the branchiae : this is a position without parallel, as that organ is invariably in the closest contact with one end of the branchiae. That naturalist certainly connects the two organs by stating, as I think erroneously, that the heart sends great and numerous vessels to the branchiae. Now the heart never transmits blood directly to the branchiae, but impels it into the system by arteries and veins, from whence, as I have already stated, it reverts to those organs.

The filaments in dispute I have submitted to microscopical observation ; they only present the appearance of a complicated mass without a trace of particular arterial and branchial vessels, and they have nothing like the symmetry of branchiae ; I believe them to be merely secreting glands, and may perhaps combine tentacular functions.

M. Deshayes is, I think, in error in stating that the aliment undergoes a second mastication : this idea has arisen from his having divided the gizzard into two parts, one of which he describes as "mâchoires," and the other as an "appareil dentaire assez compliqués ;" the fact is, there are no hard parts in the buccal pouch, which, when removed, there being no internal oesophagus, exposes to view the anterior part of the gizzard, which is likened to two spherical black points gaping like a small bivalve : these are only part and parcel of a *whole*—the gizzard, which may almost be called the stomach itself, as it fills the entire stomachal membrane, with the exception of the convoluted intestine at its base, consequently the aliment has no other mastication but of one denticular apparatus.

That there are no errors in these observations would be an undue assumption ; for who, on such subjects and in the examination of these minute objects, can hope to escape from occasional error ? I invite malacologists to offer their corrections, if I have differed on insufficient grounds from so eminent a naturalist as M. Deshayes ; and I conclude with the evocation,

. "Si quid novisti rectius istis,
Candidus imperti."

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

P.S. I beg that the notice relative to the *Venus orbiculata* of Montagu, in my paper on the genus *Cæcum*, in the 'Annals' for August, may be considered as cancelled.

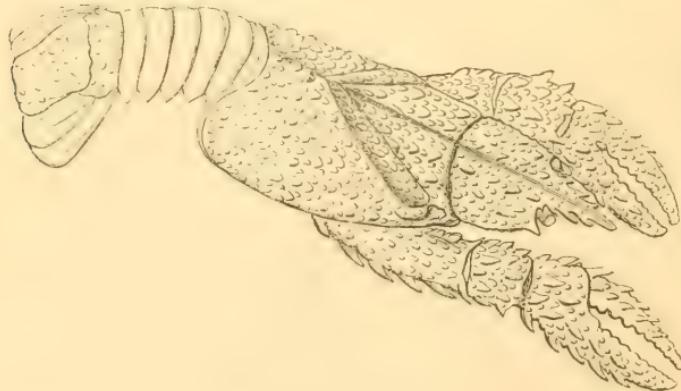
XXXIV.—On the Classification of some British Fossil Crustacea, with Notices of new Forms in the University Collection at Cambridge. By FREDERICK M'Coy, Professor of Geology and Mineralogy in Queen's College, Belfast.

[Continued from p. 179.]

Enoploclytia (M'Coy), n. g.

Etym. ἐνοπλός, *armatus*, and *Clytia*.

Gen. Char. Carapace fusiform, back rounded, sides convex, gently compressed, posterior end slightly narrowed and deeply



Enoploclytia.

notched for the insertion of the abdomen, much contracted anteriorly, the front extended into a long, sharp-pointed depressed rostrum, the sides of which are armed with three or four strong spines ; one strong spine over the upper external angle of the orbit ; eyes on short, thick peduncles ; *nuchal*

furrow strong, slightly arched backwards, the ends reaching each side margin at a point deeply notched by the abrupt narrowing of the margin from thence to the front; *branchial furrows* double, inclosing between them a narrow, pointed ridge on each side, which meets its opposite fellow at less than a right angle (each meets the midline of the back at an angle of about 40°) on a point of the back about halfway between the nuchal furrow and the posterior margin; *abdomen* (including the tail-fins) shorter than the carapace, segments very weak, slightly arched, their ends triangularly pointed (ends of the second one not dilated), sixth longer than the preceding ones, giving origin to the two broad, rotundato-trigonal pair of side-flaps of the tail, which are very large, thin, and undivided by transverse sutures; seventh segment (or middle tail-flap) subtrigonal, thicker than the others and tuberculated; *surface of carapace, legs and chelæ* covered with large spinose tubercles and intervening granules of very irregular size; *first pair of feet or chelæ* very large, subcompressed, fingers slender, with a row of large teeth on the inner edge, carpus very short, tumid, trigonal; *three next pair of legs* slender, compressed (? apparently terminated by a blunt, trigonal, simple claw); *fifth pair* not seen.

In the large, flattened, strongly toothed rostrum, rough spinose legs, the small size of the abdomen, with the general form of its little-arched, weak segments, and the undivided outer pair of tail laminæ, this genus approaches the recent *Galathaea* more than any other recent group, differing in its peculiar branchial furrows and ridges, meeting at an angle on the middle of the back, &c. The long, dentated rostrum, large, rough, spinose tuberculation of the carapace and chelæ easily distinguish those large cretaceous species from the diminutive genera *Clytia* and *Glyphaea* of the oolitic rocks with which they have been hitherto confounded. The type of the genus is the *Astacus Leachii* (Mant.), to which at least the figures marked f. 1 & 4. t. 29 of the 'Geology of Sussex' refer (some of the other figures possibly belonging to the *E. brerimana*, M'Coy). The *E. Leachii* is also well figured and described by Reuss in his 'Versteinerungen der böhm. Kreideformation,' and by Geinitz in his 'Char. der Schich. u. Pet. des sächsisch-böhmischen Kreidegebirges.' It is distinguished by the very long, straight, narrow fingers of the chelæ, which are nearly twice the length of the basal part of the hand, or from their base to the carpus, and set on their inner edge with a row of narrow cylindrical teeth their own length apart; the whole hand (or penultimate joint and moveable finger) nearly one-fourth longer than the carapace. A second species of large size and remarkable form occurs in the chalk of Burwell

and at Maidstone, several specimens of which I saw in the astonishingly beautiful collection of chalk fossils belonging to the Rev. Mr. Image, near Bury St. Edmunds : the hand in this species is much compressed as well as the carpus and arm, and all covered with large scattered curved spinose tubercles (largest on the outer and inner edges of the hand, carpus and arm) with an intermediate smaller tuberculation ; the basal part of the hand is subrhomboidal, slightly longer than its width ; carpus small, its greatest length and width equal, proximal end only half the size of the distal end, abruptly formed by a deep sinus in the proximal half of the inner margin (like that of the right arm of the recent *Callianassa subterranea*) ; penultimate or immovable finger straight, rapidly tapering to an obtuse point, its length only equaling that of the hand from the base of the finger to the carpus ; moveable or last finger a little longer, not tapering so rapidly, and incurved at the apex, each finger with a row of blunt hemispherical tubercular teeth less than their diameter apart. Average length of moveable finger 2 inches 6 lines, from thence to the carpus 1 inch 9 lines, width at base of fingers 1 inch 9 lines, width of carpus 1 inch 1 line, width at distal end 1 inch 3 lines. I have affixed the name of *Enoploclytia Imagei* to this, the largest and most interesting of the mesozoic Crustacea, to commemorate the zeal and taste of the amiable owner, whose exquisite collection of cretaceous fossils would, if more fully known, greatly increase our knowledge of the fossils of this period.

Enoploclytia brevimana (M'Coy).

Sp. Char. Carapace subcylindrical or slightly compressed, averaging $3\frac{1}{2}$ inches long and 1 inch 9 lines deep ; rostrum strong, pointed, with three or four large pointed teeth on each side, margins of the orbits with strong spines ; surface closely studded with small tubercles and large scattered spines ; hands short ovate, length little more than the depth of one side of the carapace, length of the moveable finger about equal to, from its base to the carpus, and a little longer than, the width of the hand, both fingers incurved at the tip and set on the inner edge with a row of blunt hemispherical teeth half their diameter apart ; carpus subtrigonal, a little longer than wide ; arm compressed, about one-third longer than wide ; surface of hand and carpus with many large, curved, spinose tubercles, and an intermediate, close, smaller tuberculation ; length of moveable finger 1 inch 1 line, from thence to carpus 11 lines, width of hand 1 inch.

The very short small ovate hands easily distinguish this species from the other two.

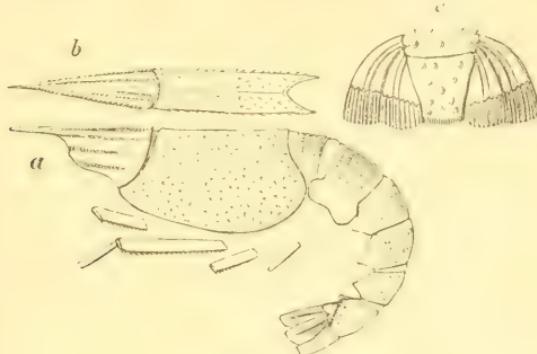
Common in the lower chalk of Cherry Hinton, near Cambridge.

(Col. University of Cambridge and Rev. T. Image.)

(Fam. *Thalassinidae*.)

Meyeria (McCoy), n. g.

Gen. Char. Carapace strongly compressed laterally; *nuchal furrow* very deep, V-shaped, the lateral portions nearly straight,



Meyeria.

a. Side view. b. Carapace seen from above. c. Tail-flaps.

meeting on the back at an acute angle considerably in front of the middle, and extending to the lateral margins at a point deeply notched by the abrupt narrowing of the front from thence to the sharp rostrum: *branchial furrow* forming a nearly straight, delicate, impressed line from near the lower ends of the nuchal furrow to the middle of each side of the posterior margin (never meeting on the midline of the back); portion in front of the nuchal furrow with a few longitudinal, strong, denticulated ridges, rest of carapace rough with small pointed granules: *abdomen* semicylindrical, large, segments sculptured with rows of granules, the ends of the second joint dilated, quadrate, of the others subtrigonal, penultimate joint a little longer than the fifth, carrying the two outer pair of *tail-flaps*, which are strong, truncato-elliptical, with a mesial ridge, ends fimbriated, the outer one on each side divided by a transverse serrated suture about one-third from the end; middle tail-flap oblong, apex truncated, narrower than the base; *legs* slender, compressed, smooth, gradually diminishing in size from the first, the lower edge minutely serrated.

The *Astacus ornatus* (Phil.) is the type of this genus, which, from the great compression of the carapace, size of the abdomen, character and direction of the branchial furrows, &c., seems to

belong to the fossorial family in which I have placed it, the nearest analogue being perhaps the recent *Gebia* which burrows under the mud of Plymouth Sound : the fossils abounding in such a state of perfection in the fine Speeton clay that they must have lived in it and died in the exact spots we now find them, harmonizes with this view of approximating them to those similar little forms which live habitually buried in the mud. The substance of the crust, though very thin, and, in the following species especially, often showing signs of considerable flexibility, seems rather harder than in most of the fossorial types, and the strong fringe of stiff hairs at the end of the tail-pieces is in the fossil replaced by semi-membranous flaps, still however strongly sulcated. I have not seen the extremities of the feet ; but if, as I suppose, the so-called *Crangon Magnevillii* of Deslongchamp (*Mém. de la Soc. Lin. de Normandie*, t. v.) belong to this genus, the four hinder pair of feet would terminate in simple pointed claws, and the first pair form subbeheliform pincers, having the hand dilated and truncated at the extremity, which is toothed and has a small spiniform immovable finger at one end, which is met by the slender moveable finger inflexed from the other end ; this also agrees with the general type of the fossorial *Gebiae*. The carapace may be distinguished from *Glyphaea* by the branchial furrow in it being very delicate and extending obliquely to the posterior margin without meeting its fellow of the opposite side, while in *Glyphaea* they are very strong and meet on the back from opposite sides at an acute angle, without reaching the posterior margin.

Meyeria magna (M'Coy).

Sp. Char. Carapace about $2\frac{1}{2}$ inches long and 1 inch 2 lines deep at the middle of the side ; three strong tuberculated longitudinal ridges on each side of the cephalic part of the carapace ; from about the middle of the deep nuchal furrow a row of small tubercles extends halfway to the posterior margin, and higher up (bordering the intestinal region) a similar row on each side extends from the posterior margin nearly halfway to the nuchal furrow ; rest of the carapace covered with minute sharp granules, about four in a space of three lines at the middle of the sides ; rostrum short, pointed ; abdomen about $3\frac{1}{2}$ inches long, each segment with about four irregular, single, crowded rows of granules disposed longitudinally, the broad intervening spaces nearly smooth ; a few irregular groups of granules on the extremities ; the last segment granulated like the carapace ; tail-flaps broad, rotundato-trigonal, finely fimbriated at the ends, each with a strong mesial ridge ; transverse suture of the outer pair strongly marked, serrated ;

legs subcompressed (section oval), smooth, the lower edge with a row of minute denticles directed forwards; third joint of the first pair nearly 4 lines wide, gradually decreasing to the fifth pair, the third joints of which are about 1 line wide.

Very abundant in the fine Fuller's earth of the "Lobster beds" of the lower greensand of Atherfield, Isle of Wight; also in the Speeton clay of Speeton, Yorkshire coast.

(*Col.* University of Cambridge.)

Note.—As the *Glyphaea rostrata* (Phil. sp.) (*Astacus rostratus*, id., Geol. York) has been referred by Herman von Meyer (Neue Gattungen fos. Krebse) and subsequent authors to the *G. Münsteri*, I may mention, that on comparing an authentic cast of that species with the English one, I find the latter fully distinguished, as a species, by the hind part of the thorax being much longer in proportion to the depth, even slightly exceeding in this respect the *G. pustulosa* (V. Mey.), which it exactly resembles in the character of its branchial furrows and their associated lobes, differing however from it and agreeing with the *G. Münsteri* in the abrupt notch-like narrowing of the margin in front of the nuchal furrow.

[To be continued.]

XXXV.—*Supplementary Notices regarding the Dodo and its Kindred.* Nos. 6, 7, 8. By H. E. STRICKLAND, M.A., F.G.S.

[Continued from vol. iii. p. 261.]

6. *On two additional bones of the Solitaire recently brought from Mauritius.*—We are indebted to the officers of the Royal Society of Arts and Sciences of Mauritius for a valuable contribution to Didine osteology. These gentlemen no sooner heard of the interest which the history of the Dodo had excited in Europe, than they undertook to search in Mauritius and the adjacent islands for such parts of the skeleton of these extinct birds as were wanting to complete our knowledge. Before proceeding to excavate the alluvions and caverns of those islands in quest of bones, they wisely commenced by searching the cabinets of their own museum. Two bones were here discovered, which tradition referred to the Dodo, and these precious specimens the Society, with the most praiseworthy liberality, have sent to Europe.

The bones now sent belong, not to the true Dodo, as was supposed by the Mauritian naturalists, but to that longer-legged species which inhabited the island of Rodriguez, and was denominated the Solitaire. They are both metatarsal bones, and consequently are so far only duplicates of portions of that bird which already existed in Europe. But from their superior state of preservation they supply some valuable information which was

previously unattainable. The three metatarsal bones of the Solitaire figured in the 'Dodo and its Kindred' (plate 15. f. 2, 3, 4) are all more or less defective, one being incrusted with stalagmite, the other two much decayed and broken. The two additional bones now referred to supply in great measure these defects. One of them indeed is incrusted with stalagmite, and is evidently part of the same individual as the similarly incrusted bones in the Paris Museum which are figured in plates 13, 14 and 15. This is evident, not only from comparison with its fellow bone (pl. 15. f. 3), but from the following label attached to it by Prof. Bojer, Curator of the Mauritius Museum:—"Tarsus of the Dronte, being a remaining fragment of a more perfect skeleton sent by M. Julien Desjardins to the Baron G. Cuvier. The said skeleton was found in a cave at the island Rodrigue by M. Roquefeuille, inhabitant of Mauritius."

The second metatarsal now sent is a remarkably perfect bone, the only defective portion being the posterior surface of the ecto-calcaneal process. Being wholly free from stalagmite, and possessing its articular extremities uninjured, it enables us to make many comparisons and measurements which were previously impracticable. This specimen was ticketed by M. Bojer—"Tarsus of a bird, presumed to be a tarsus of the Dronte, discovered by Col. Dawkins in the same cave as No. 1, in 1831."

This bone, though apparently belonging to an adult individual, is considerably smaller in its dimensions than any metatarsi of the Solitaire which have been previously examined. In fact, it is only half an inch longer than the same bone in the Oxford specimen of the Dodo. But notwithstanding the smaller size, it so precisely corresponds in form and proportions with the figured examples of the Solitaire's metatarsus as to leave not the slightest doubt that they all belong to one and the same species. The difference of size is not greater than is often seen to arise from diversity of sex, age, or development, in other species of birds. The following are its precise measurements:—

Right Metatarsus of Solitaire.

	in.	lin.
Length from lower border of middle trochlea to summit of inter-condyloid tubercle	5	8
Transverse diameter of the shaft	0	6
Antero-posterior diameter of do. at the upper portion of articular surface for posterior metatarsal	0	4
Transverse diameter of lower extremity	1	3½
Distance from upper border of posterior metatarsal articular facet to internal intertrochlear notch	1	3
Length from external trochlea to external condyloid fossa	5	1½
" from internal do. to internal do.	5	2½
Breadth of upper extremity	1	2
Antero-posterior diameter of do.	1	1
Projection of ento-calcaneal process	0	5½

The length of this bone being so nearly that of the Dodo's metatarsus, we are enabled to see at a glance those great differences in its shape and proportions, which seem to justify us in asserting the Solitaire to have been generically, as well as specifically, distinct from the Dodo. The shaft of the bone is longer, both absolutely and proportionally, more slender, and less expanded at both extremities; all which characters are indicative of greater speed and activity. There are also several minor distinctions which Dr. Melville has pointed out (*Dodo and its Kindred*, p. 117), and which are beautifully exhibited in the specimen before us. Yet notwithstanding these distinctions, there is no disputing the very close affinity between the two birds to which these osseous fragments belong. The metatarsi of the Dodo and of the Solitaire are both distinguished by the expansion of the trochlear extremity, the elongation of the internal trochlea, the form and development of the calcaneal processes and of the buttress or ridge connected with them, with other characters indicative of near affinity.

The characters alluded to moreover confirm in the strongest manner the affinity of both these birds to the *Columbidae* or Pigeons. If the bone before us were now discovered for the first time, no comparative anatomist could hesitate in pronouncing it to belong to a gigantic species of Pigeon. I need not repeat the arguments which we have already adduced on this head, but will merely point out the single character, peculiar to the Pigeons and to the allied group of *Pterocles*, that the calcaneal canal which transmits the tendons of the *flexor perforans digitorum*, passes on the *outside* of the posterior ridge or buttress, whereas in Gallinaceous and other birds it passes on the *inside* of that ridge.

7. Dr. Cabot's views of Dodo-affinity identical with our own.—
I gladly take this opportunity of doing justice to a short but able article by Dr. Cabot, published at the commencement of 1848 in the '*Boston Journal of Natural History*,' vol. v. p. 490. This paper has only lately come into my hands, and it is hardly necessary to add, that Dr. Cabot's conclusions as to the affinities of the Dodo were arrived at quite independently of those simultaneously deduced by Dr. Melville and myself in this country. Under these circumstances it is gratifying to find that Dr. Cabot, although the data on which he reasoned were far less complete than our own, having only seen casts of the external parts of the Dodo's head and foot, has arrived at precisely the same conclusion as ourselves, viz. that "The Dodo was a gigantic Pigeon," and that it most nearly approached the genus *Treron* (*Vinago*). If the coherence of independent witnesses be any test of truth, we could hardly have had a stronger confirmation of the sound-

ness of our views as to the affinities of the Dodo and its kindred than is afforded by Dr. Cabot's brief and unpretending memoir. Prof. Brandt of Petersburg, in a paper published in the 'Verhandlungen der Russisch-kaiserlichen Mineralogischen Gesellschaft,' 1848, p. 201, still maintains the affinity of the Dodo to the Plovers, but with this exception I believe that all naturalists who have studied the subject are now disposed to regard the Columbine characters of the Dodo as predominating over all others.

8. *Supposed existence of a gigantic Bird in Madagascar.*—I have received, through the kindness of F. R. Surtees, Esq., Her Majesty's Commissioner of Arbitration at the Cape of Good Hope, the following curious statement, which I insert here, as it *may* have some bearing on the subject of the Dodo or of its kindred. I have already alluded in our published work, p. 60, to the probable existence of some large brevipennate bird in Madagascar, and though it has escaped the search of modern naturalists, yet we have the positive testimony of Flacourt that such a bird was known in the island two centuries ago. It would therefore be unwise summarily to reject a story which, however marvellous, may rest on a substratum of truth, and may lead to the discovery of important and valuable facts.

It appears from the information collected and communicated by Mr. Surtees, that in Oct. 1848, when H.M.S. Geyser was cruising off St. Augustine's Bay, Madagascar, a French gentleman named Dumarele, who was a passenger on board, gave the following account, which is extracted from the private journal of Mr. John Joliffe, Surgeon of the Geyser:—"After giving an account of some curious monkeys with white shining silvery hair, M. Dumarele casually mentioned that some time previously, when in command of his own vessel trading along the coasts of Madagascar, he saw at Port Leven, on the north-west end of the island, the shell of an enormous egg, the production of an unknown bird inhabiting the wilds of the country, which held the almost incredible quantity of *thirteen wine quart bottles of fluid!!!*, he having himself carefully measured the quantity. It was of the colour and appearance of an ostrich egg, and the substance of the shell was about the thickness of a Spanish dollar, and very hard in texture. It was brought on board by the natives (the race of 'Sakalavas') to be filled with rum, having a tolerably large hole at one end, through which the contents of the egg had been extracted, and which served as the mouth of the vessel. M. Dumarele offered to purchase the egg from the natives, but they declined selling it, stating that it belonged to their chief, and that they could not dispose of it without his

permission. The natives said the egg was found in the jungle, and observed that such eggs were *very very rarely* met with, and that the bird which produces them is still more rarely seen."

The value of such a statement of course depends on the character of the narrator, and on this head Mr. Joliffe observes—"M. Dumarele is a French merchant of Bourbon, a very respectable gentlemanly man, about sixty years of age, who has for years been trading with his own vessels along the coasts of Madagascar, and is well-acquainted with the different races of natives and with the resources of the country. His very unassuming and quiet manner, and intelligent conversation, much prepossessed us in his favour, and we believed everything he told us to be worthy of credit as far as his judgement and good intention went."

Mr. Joliffe's own opinion seems to be, that M. Dumarele was imposed upon in some way by the roguery of the natives. He judiciously adds however—"M. Dumarele's story should not be despised or discredited in these times, when such extraordinary discoveries are constantly made in every branch of science, but publicity should be given to his statement, that persons visiting Madagascar may, if possible, collect fresh information on the subject, and clear up the mystery. The sight of one sound egg would be worth a thousand theories."

It is a singular circumstance, if nothing more, that Marco Polo refers the *Roc*, of Arabian-Night celebrity, to the island of Madagascar; but as the Roc, however gigantic, was decidedly not *brevipennate*, a discussion of its history would be irrelevant to our present subject.

XXXVI.—Reports on the Progress of Physiological Botany. No. 5. By ARTHUR HENFREY, F.L.S. &c.

On the Phænomena accompanying the Germination of the Spores of Ferns.

IN the year 1842, Nägeli discovered on the pro-embryo (the cellular expansion fruit produced from the spore in germination) of Ferns, peculiar organs which he considered to be analogous to the antheridia of the other Cryptogamic plants.

In the account he published of these structures* he describes them as gland-like organs growing on the under surface, near the margin, very rarely upon the upper surface. They frequently appear as if composed of a single cell; but it may mostly be

* Bewegliche Spiral-fäden (Saamenfaden?) an Farren; Schleiden und Nägeli's Zeitschr. für Wiss. Botanik, Heft i. 168. Zürich, 1842.

recognized that the organ is a sac formed of a single layer of cells. This sac is filled with contents which appear granular and opake. It bursts at the apex and allows a quantity of minute, round cellules to escape. These cellules move about actively in water. Each contains a spiral fibre, which by tearing the membrane of the cellule becomes free, and then exhibits a motion similar to that of the spermatic filaments of the Mosses, Liverworts and Charas.

The course of development of these organs is detailed, and is to the following effect :—Certain cells of the pro-embryo grow out by their free surface into processes which are gradually elongated and become divided by transverse septa, so as to resemble in some measure short and thick confervoid filaments ; the number of superposed cells varies from two to five. Then these cells become multiplied by the formation of vertical septa, so that each is divided into five cells, four forming a peripheral layer inclosing one in the centre. The central cells of all the articulations become confluent into a canal running up the middle of the organ which thus becomes a sac, closed below by the cell of the pro-embryo and above by the four cells of the uppermost articulation. This structure is usual, but slight modifications occur, not only in the number of articulations formed, determining the length of the organ, but in the development of the particular joints, the uppermost and the bottom one sometimes remaining in the state of simple cells.

The organs when fully formed have the central cavity so densely filled with the moving cellules, that they sometimes appear like mere double or even simple sacs, the cells forming the walls being compressed by the internal expansion.

The central canal at first presents an opake granular appearance ; subsequently the contents are converted into the above-mentioned cellules. The mode of development of these is discussed by the author, and the analogous process in the antheridia of other Cryptogamia referred to ; he concludes that it is most probable that they are formed by a succession of developments from parent-cells, the central cell of the five of each articulation being the primary parent-cells.

The organs containing the spiral filaments discharge their contents when placed in water, even before they are fully developed. In an undeveloped condition they appear as round vesicles ·004 to ·005 of a line in diameter, containing homogeneous, or finely granular, colourless mucilage. Sometimes chlorophyll globules present themselves. Many possess a parietal nucleolus. The perfect cellules contain only a spiral filament. This usually has two turns ; sometimes only one and a half, sometimes two and a half or three. The filament has one broad and obtuse end,

while the other is attenuated. The author in some cases distinctly detected a long filiform appendage, like that described by Meyen in the Charas. The thickened end is sometimes quite clavately thickened. When the filament is clearly seen, it is evidently a band with a flat surface applied against the wall of the cellule. The bursting of the cellules allows the filaments to escape, but sometimes the whole or a fragment remains adherent to it and is carried about by it. While the spiral filaments are contained in the cellules in which they are produced, the convolutions are closely approximated; as soon as they become free, they generally extend themselves and become like the turns of a screw.

When the cellules are evacuated from their sac, they often lie from one to ten minutes unmoved; then some of them begin to move. At first they turn around their own axes without change of place. As yet nothing is seen of the emergence of the spiral filament. By degrees they begin to move from their place, at first slowly, then more and more rapidly. The cellule still continues to rotate on its axis. Next, a portion of the filament is seen to protrude from the cellule, which then tears quite open, and the filament thus comes in contact with the water in its entire length. The motion is then considerably accelerated. The cellules frequently begin to move directly they emerge from the sac; sometimes they rotate while still inclosed in it and before it has opened; this happens when they are not in very close contact.

M. Nägeli describes five or six kinds of movement of the spiral filaments which he endeavours to define mathematically, but he states that besides these, the motion often appears quite irregular, especially in being suddenly arrested, diverted to one side or reversed. But he does not consider these irregularities beyond what may be accounted for by interfering influences occurring in the fluid. He considers the motions as by no means voluntary; being much too regular and mechanical for this. He says also that a careful comparison of them with those of the Infusoria shows that they are totally different.

The fundamental type of the movement of the filament is the revolution round the axis, as Schleiden (*Grundz. der Wiss. Bot.*) has explained it in the rest of the Cryptogamia. That this revolution round the axis is proper to it as a primary peculiarity, free from the other motions, is shown by these round and closed cellules, which, with their inclosed filament, revolve merely around their axis in water, or even while still within the organ of the plant. This peculiarity must, from the fact, be at once attributed to the spiral filament; all the other movements may

then be deduced from it. That there is an advancing movement follows from the heliacal shape. That it exhibits various deviations from the straight line is quite as natural a result of the inequilateral construction, since both the thickness of the filament and the diameter of the convolutions, as well as their distance from each other in the same spiral filament, alter successively from one end to the other.

They differ in chemical composition from the spiral fibres of the spiral tissues of plants, as they give with iodine the characteristic reaction of mucilage (a compound which contains nitrogen); the membrane of the cellule remains uncoloured.

After a comparison of these organs with the antheridia of the other Cryptogamia, from which the author arrives at the conclusion that they are to be regarded as identical in their nature, he briefly discusses their import and probable function in the following terms:—

“The antheridia have been compared with the anthers, a misconception which is only applicable by an ignorance or misapprehension of the morphology of the elementary organ. I believe no refutation of this view is now necessary. The antheridia have not been compared with other organs of plants: they do not exhibit even a distant analogy to any of them. The only remaining analogy for the antheridia is with the male organs of reproduction of animals. In favour of this speaks the similar course of development of the spermatic filaments in plants and animals, since even in many of the Mammalia, the spermatozoa originate wound spirally in cellules; further, the resemblance of the motion of the filaments in plants and animals, and, finally, the circumstance that in the Cryptogamia these spermatic filaments are the normal elementary parts of an organ, which, from its situation, must evidently have a relation to the reproduction. These reasons certainly appear to me to have great weight; and if they do not absolutely warrant the assumption that the antheridia are the male organs of the Cryptogamia, they may yet excite further investigation on this ground.

“The most important objections are: 1. that no organ analogous to the antheridia has been found in the Phanerogamia, and that they are themselves wanting in certain Cryptogamia with true spores; 2. that, as the preceding observations show, the antheridia of the Ferns occur upon the pro-embryo; so that it is almost impossible to conceive what relation they can here have to the spore-cells, which are formed not merely at a much later period, but first make their appearance long after the pro-embryo has altogether disappeared.”

The figures illustrating this memoir are taken from *Aspidium*

augescens, Link, *Asp. concinnum*, Link, *Asplenium dissectum*, Link, and other species not specified; but the author states that the phenomena are constant in all the Ferns he has examined.

Nothing further appeared on this subject until December 1847, when Dr. J. Münter communicated to the Berlin Naturforschende Freunde*, the observations of Count Leszczic-Suminski; in January 1848 Prof. Ehrenberg also laid these before the Berlin Academy, and in the same year they were published in detail in a special memoir†.

These researches are in the highest degree curious, and if the facts related prove to be correct, must importantly affect the received views of analogies in the generative processes of plants. As the account scarcely admits of compression, we will give the important passages in the author's own words:—

The Sexual Organs of the Ferns.

"In the year 1846 M. Nägeli‡ made the interesting discovery that the pro-embryo of Ferns exhibits analogues of the antheridia of the Mosses, Hepaticæ and Charas. That observer described these antheridia or spiral-filament organs accurately and completely enough, but he was led away by a false principle in his researches, and thus regarded as differences in the stages of development what were actually different organs; since both in their anatomical structure and physiological import, they are to be distinguished as two completely separate groups.

"In the earliest condition of the pro-embryo are found on its under face, more rarely on the borders, peculiar gland-like cells projecting in a globular form from the surface. In more mature age they increase in number, and occupy more particularly the region among the radicle fibres. Some species, especially *Pteris serrulata*, are remarkable for their great number. These organs originate by a sac-like elongation of particular cells of the pro-embryo, forming globular protuberances from its surface. Each at first contains chlorophyll, but by degrees a free cell is formed, the contents of which exhibit homogeneous mucilage, transparent globules, or distinct nuclei with nucleoli. As soon as this cell has increased in size sufficiently to fill up the original projecting sac, it is parted by a septum from the cell of the pro-embryo. Thus the organ becomes independent. A third cell is often formed between these, flattened above and below, constituting a kind of peduncle to the upper cell. The contents

* A report by Dr. Münter appeared in the 'Botanische Zeitung,' Jan. 21, 1848, to which I shall allude presently.

† "Zur Entwicklungsgeschichte der Farnkräuter;" by Count Leszczic-Suminski; Berlin, 1848.

‡ L. c.

of this latter display, often at a very early period, new minute cellules filled with a granular substance, occurring in an indefinite number and sometimes appearing very regularly arranged. They become more and more distinct, and in the mature condition generally fill up the parent-cell, so that this appears like a sac distended with round granules. By reciprocal pressure they acquire a parenchymatous aspect. When an organ of this kind has reached the proper stage of maturity, it bursts spontaneously at the apex and discharges an indefinite number of minute round cellules enveloped in mucus. In some cases I have observed an uniformly distributed, rhythmical motion of the whole discharged mass. But the cellules usually exhibit a motion round their axis very soon after their emergence; each of them unfolds a spiral filament, which generally remains connected with the delicate cellule by its posterior extremity, and advances with an active revolution round its axis.

"As Nägeli has well described the very various movements of these spiral filaments, it appears to me unnecessary to discuss this subject here. But I must observe that I have seen on the clavately swollen, anterior extremity of the spiral filament, delicate motile cilia of considerable length, which however are only to be perceived distinctly with the help of the strongest artificial illumination. They are best observed when the rapid revolution of the filament is slackened. Then about six such cilia may be observed on each, which after the cessation of the motion of the spiral filament also gradually cease to move, and either stiffly surround this or become in part so applied upon it that it is almost impossible to detect them. The motion of the cilia endures longer than that of the filament, and not unfrequently shortly recommences. The form of the spiral filament cannot be perceived distinctly either during active motion or after this has ceased, because in the first case the form is altered by the continual change of the convolutions and the motion of the cilia,—in the latter by the cessation of the revolution, as the filament then contracts in irregular curves. It is necessary therefore to seek out a moment when the spiral filament, sufficiently mature, still remains in its cellule, and occurs on a free space in the preparation. In such cases it exhibits either two or three convolutions, or appears wound in a semicircle with the swollen extremity applied to the wall. The cilia are not then perceptible. This position often gives a very well-defined figure. It is distinctly seen that the spiral filament incloses a longish vesicle in the above-mentioned clavate thickening of the anterior extremity. The thick end diminishes gradually down into a filiform tail which bears a slightly swollen knob at the end.

"In addition to these spiral-filament organs, we find on the under side of the pro-embryo near the notch of the border, on the cellular protuberance lying in the middle of the frond, other larger and not less important structures. These are hollow, ovate bodies, and consist of a papilla formed of ten to twelve cells, while the other organs seldom exhibit more than one. Their number is indefinite, since there are often only three upon one pro-embryo, while upon another of the same species appear eight or more. They differ from the above-mentioned organs not only in these points, but in their mode of origin and their structure. It is clear from the course of development that they are not spiral-filament organs in a more perfect condition. In the origin of these organs the cellular layer becomes thickened by the formation of new cells; in the course of this process a large globular intercellular space is formed having a contracted orifice at the outer end. This latter is usually hexangular, and is immediately surrounded by green, usually quadrangular cells. The cells further from it are larger and contain less chlorophyll. From the borders of this cup-like orifice arise four largish cells, containing merely a clear fluid, often with nuclei, and arranged in a circle; these leave a square intercellular space between them varying in size. From each of these cells three more are, as a rule, developed vertically one above another, so that the square space becomes elongated into a canal leading to the interior of the organ. The cells at the apex are usually applied together so as to close the orifice. The early origin of the canal causes the still uncovered cavity to be rarely met with.

"These structures, so different in anatomical character, which were formerly regarded as antheridia in a different stage of development, also assume a distinct physiological import.

"By continued observation I have succeeded in discovering in them the sexual apparatus of the Ferns, hitherto regarded as Cryptogamic. In the above-described hollow, ovate organs occurring on the middle of the pro-embryo, I have recognized the female apparatus; a circumstance, the establishment of which claims for the spiral-filament organs the import of male apparatus. The former, which is an ovule without envelopes, therefore a simple naked nucleus, is to be divided into two parts; one, the larger and upper portion projecting from the pro-embryo, the nuclear papilla (*mammilla nuclei*), and the other smaller, buried in the pro-embryo, the cavity for the embryo-sac (*antrum nuclei*). In the former we have again to distinguish: the orifice at the apex, the foramen of the nuclear papilla (*ossiculum mammillæ nuclei*); and the prolongation of it leading into the cavity for the embryo-sac, the canal of the nuclear papilla (*canalis mammillæ*

nuclei seu nuclei). The orifice of the latter is directed toward the base of the pro-embryo.

"Before the formation of the nuclear papilla, there arises at the bottom of the cavity for the embryo-sac a minute transparent cell, the embryo-sac. This is seated like a tubercle on a particular point as its suspensor. Already at this period we find in the cavity containing the embryo-sac from two to five, or even more free spiral filaments, never inclosed in their cellules. For at this period the spiral filaments move by the help of their cilia from the burst spiral-filament organs to the cavity for the embryo-sac, and penetrate into it. In this motion they are assisted by the mucus evacuated with them, and by the moisture always present on the under side of the pro-embryo. It requires some acquaintance with the form and different positions of the spiral filaments to recognise them in the cavity. The still wide opening of the cavity at this period facilitates their entrance (the borders of the organ scarcely project yet above the surface of the frond). At this period of the impregnation it sometimes happens that we notice a quantity of dead spiral filaments around the cavity of the nucleus; they then appear curved like an S, or else wound circularly or spirally. But I have seldom observed this phænomenon. As the embryo-sac grows and thus displaces the spiral filaments, the canal of the papilla of the nucleus is formed, in the manner above described, and receives into it one, two or more, rarely several of them; the rest decay in the bottom of the cavity. Before their entrance into it they exhibit with advancing growth an evident expansion, which occurs especially in those subsequently received into the canal. In the mean time the embryo-sac, filled with blastema, has produced in its interior a parenchyma composed of several cells (endosperm), appears green, and has advanced so much in growth that it almost fills the cavity in which it is contained. One of the spiral filaments penetrates by one end into the part of the embryo-sac turned toward the canal. The penetrating end is that at which the smaller enlargement exists, which at the same time exhibits a greenish tint; the larger, clavate, granular end projects out into the canal; this usually incloses a minute pyriform cellule. An obstacle of no slight importance interferes with the observation here also; the delicate filiform connection of the two ends of the spiral filament is usually torn by the pressure of the covering glass upon the preparation, and thus we see only the separated ends, one in the canal, the other in the cavity for the embryo-sac, totally unconnected. As soon as the smaller expansion has reached the middle of the embryo-sac, it separates from the spiral filament and now forms a closed globule, the germinal

vesicle, in the interior of the embryo-sac. The other end, projecting into the canal, dies away. This phenomenon must not be confounded with the forcible tearing of the spiral filaments just alluded to. Through the union of the germinal vesicle and the embryo originates the embryonal globule, which is only attached below to the bottom of the cavity containing the embryo-sac by a very delicate filiform suspensor. With the growth of the embryonal globule the colourless nuclear papilla dies, dries up, and the canal in particular becomes coloured brown. In this condition it persists for a long time upon the now expanding cavity of the nucleus. Usually only one of the numerous naked ovules produced upon the pro-embryo develops its embryo. This need not appear wonderful, since similar examples are not wanting in the vegetable world, as in many Palms one alone of the three original cavities is regularly perfected. A special reason may be looked for here in the minute size of the pro-embryo, which does not afford sufficient nutriment for several embryos. With the further development of the one embryo the other rudimentary ovules die. In these the foramen of the papilla expands, and allows the dead spiral filaments and the rest of the contents to escape. The canal, and especially the cavity for the embryo-sac, then exhibit a brown colour. The latter may be most distinctly recognized in this condition. In vegetating ovules, on the contrary, this part can only be observed by a most careful extraction of the single organ. For while on the one hand it is covered by the still erect nuclear papilla, the detection of it is on the other hand rendered impossible by the want of any peculiar colour or otherwise distinguishing outlines. Of all the species which I have examined, *Polypodium aureum* is, next to *Pteris serrulata*, the best-adapted. The impregnation follows exactly the above-described type in all families, genera and species; an exceptional occurrence is the appearance, on the margin of the pro-embryo, even in its earliest stage, of a spiral-filament organ differing somewhat in structure, as it loses its uni-cellular aspect. Five or six parietal cells are formed which inclose in the middle a space either filled with spiral filaments, cellules or hollows. These structures must be regarded as monstrosities of the spiral-filament organs, since they occur abnormally and on individuals which never produce an embryo. Such an infertile pro-embryo either decays soon after its origin, or, passing into a succulent state of growth, appears much larger than is natural. In this condition it acquires a resemblance to a *Marchantia*, and usually produces a great number of abortive ovules."

This extract has reached such a length that we have not space to give an account of the author's description of the develop-

ment of the embryonal globule into an embryo. It must suffice to state, that by the multiplication of cells it gradually enlarges and acquires a definite form, producing a frond at one end and a radicle at the other, bursts through the cavity in which it was developed, and grows up, producing new fronds, into the characteristic form of its species. These ulterior stages of the germination from the pro-embryo have been described by other authors, although not so minutely, and our chief business is with the new doctrine of the generation which has already been critically examined and contested.

It must be mentioned here that the terms of Dr. Münter's report * are rather different from the above, which is important, as he gives the facts as witnessed also by himself and Prof. Link. He says with regard to the act of impregnation :—“ Persevering observations of these two essentially different organs gave the following results. The spiral filaments emerged from the spontaneously opened hemispherical cells, two or three of them moved rapidly toward the cup-like cellular protuberance, penetrated through the orifice into the still very short blind canal, and then were converted into a little heap of mucus (schleimklümpchen) after their motion had ceased. After this (often-observed) process the quadratic orifice closed, and it was seen that, in the blind end, one of the cells lying on the inside of the wall of the semi-canal enlarged, and in it new cells originated.”

This cell is said to be the embryo, which, elongating in a direction at right angles to the canal, breaks through in two places, one end producing a frond, the other a root.

In the early numbers of the ‘Botanische Zeitung’ for the present year is contained a long memoir on this subject by Dr. Albert Wigand, who, after extensive investigations, arrives at the conclusion that the above-described process of impregnation does not occur, and that the views of Count Leszezic-Suminski and Dr. Münter are based on errors of observation. His criticisms would occupy too much space for the present article; I shall therefore reserve them for a future notice, and add to them some observations of my own.

In the ‘Annales des Sc. naturelles’ for January 1849, M. Thuret describes the antheridia or spiral-filament organs of Ferns, but he does not appear to have detected the so-called ovules. He also mentions that he has found similar spiral-filament organs on the pro-embryo of the *Equiseta*.

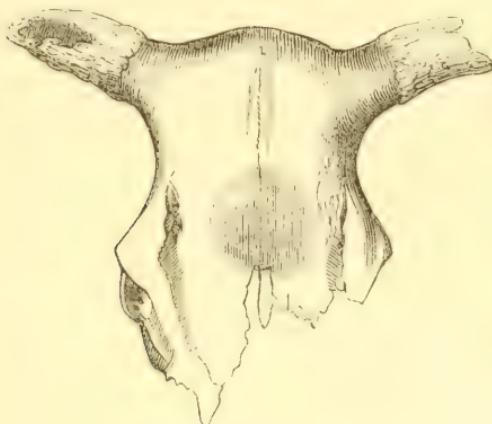
* Bot. Zeitung, Jan. 21, 1848.

XXXVII.—*On the extinct and existing Bovine Animals of Scandinavia.* By Prof. NILSSON of Lund.

[Continued from p. 269.]

2. Ox with high occipital ridge (*Bos frontosus*, n. sp.).

Fig. 3.



Bos frontosus.

Gen. Char. The forehead convex at its upper part; below smooth, rounded, the ridge of the occiput rising high in the centre, convex; horns short, somewhat depressed at the roots, directed outwards and backwards, then bent forwards.

Syn. *Bos frontosus*, Nilss. K. Vetensk. Akad. Öfversigt, d. 14 April 1847.

Description.—This fossil Wild Ox, of whose skull the museum here possesses both an old and a young specimen, forms a very different kind from any I have yet seen. It has however some remote resemblance to the Bison, through its convex forehead and its horn-pedicles. The old specimen, probably a bull, whose cranium is here delineated in face and profile, has the forehead between the horns convex; below, where it is the smallest, flat-rounded; between the eyes broad, hollowed. The ridge of the occiput thick, rounded, in the centre rising and strongly curved. The nasal bones seem to reach up to the line drawn over the sockets of the eyes. The horn-cores, which rest on longer pedicles than among any known species of Ox, are directed outwards and backwards, also somewhat curved downwards in the same direction as the front of the forehead, above which they do not rise. They have the back and front somewhat flat-round, so that a transverse section would form more or less an oval. The outer edge of the zygomatic process of the temporal bone forms above the socket of the under-jaw nearly a right angle.

The concavity of the temple is at the back transversely obtuse, in front it is obliquely pointed; the hind part (as far as the socket of the under-jaw) twice as broad as the front part; the foramen of the occiput more high than broad. Besides the two skulls of this sort which the museum at present possesses, and of which also the younger is represented below, I have seen a third at the British Museum in London, which probably also belongs to the same species.

Fig. 4.

*Bos frontosus.*

	An old Bull (?) from Djurross near Saxtorp in Scania.		A young specimen from a turf-bog in the district of Skytts in southern Scania.		A rather young one in the Brit- ish Museum.	
	in.	lin.	in.	lin.	in.	lin.
Length of frontal bones	12	4				
Length of orbits	3	0				
Length between horn-crown and orbits.....	5	2	4	2	4	4
Breadth between horn-crown above	8	0	6	2	6	2
Between horn-crown below... 10	0		7	5	8	0
Breadth of forehead's smallest part	7	6	7	1	7	0
Breadth between the upper edges of the orbits	10	4	8	3	0	9
Breadth in the centre above the orbits	8	5	6	5		
The circumference of the horn- core near the roots	8	6	6	6		

The size of these skulls denotes a species of Ox, which, although much less than the *Bos primigenius*, is yet considerably larger than the *Bos longifrons*. It seems to have been about the size of our common cow; from which, however, in form it totally differs. In the museum here are to be seen some loose bones which seem to have belonged to this species. They are found in turf-bogs under the Jaravall in southern Scania, and in such a

Fig. 5*.

*Bos frontosus.*

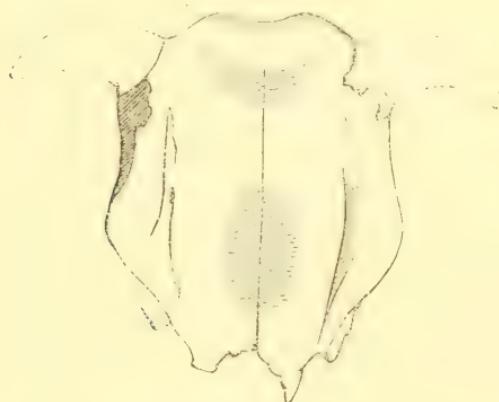
* In the series of remains of the skull and horn-cores of the *Bos longifrons* preserved in the British Museum and that of the College of Surgeons, there

state as plainly shows they belonged to a more ancient period than that in which tame cattle existed in this country.

Abode.—This species has lived in Scania contemporaneously with the *Bos primigenius* and *Bison europaeus*; that it has also often been found in England, the above-mentioned cranium will show, which is preserved in the British Museum. As with us, it belongs to the country's oldest postpliocene fauna: it, like the before-mentioned Ox species, together with the Reindeer, Wild-boar and others, came from Germany during that period when the two countries were joined together. It must, therefore, also be found in a fossil state in Germany, although as yet it has nowhere been observed. If it ever was tamed, and thereby in the course of time contributed to form some of the tame races of cattle, it must have been the lesser large-growth, small-horned, and often hornless race, which is to be found in the mountains of Norway, and which has a high protuberance between the setting-on of the horns above the nape.

3. Dwarf Ox (*Bos longifrons*, Owen), figs. 6 & 7.

Fig. 6.



Bos longifrons.

Gen. Char. The forehead flattened, with a prominent edge standing up along the middle, and a smaller indenting backward; the horns round, small, and directed outwardly upwards, and bent in one direction forwards.

SYN. *Bos longifrons*, Owen's History of British Fossil Mammals and Birds, p. 508, fig. 211 (the forehead with horn-cores).

are intermediate gradations in the convex rising of the occipital ridge and the length of the pedicles of the horns, which affect the value of those characters as specific distinctions between the *Bos longifrons* and *Bos frontosus*. The specimen (fig. 5) would seem to indicate that the typical characters assigned by the learned Scandinavian naturalist to his *Bos frontosus* were similarly modified or departed from in the specimens discovered in Scania.—ED.

Description.—As far as we yet know, this is the smallest of all the Ox tribe which lived in a wild state in our portion of the globe. To judge from the skeleton, it was 5 feet 4 inches long from the nape to the end of the rump bone, the head about 1 foot 4 inches, so that the whole length must have been 6 feet 8 inches. From the slender make of its bones, its body must rather have resembled a deer than our common tame ox ; its legs at the extremities are certainly somewhat shorter and also thinner than those of a crown-deer (full-antler'd red-deer). The skull is long and narrow, even more so than that of the deer ; the forehead upwards (over the eyes) flattened, with an edge going along the frontal seam, which is most prominent upwards, and ends with a rounded indenting backwards ; between the eyes is a more or less considerable depression, above which there is often a rising, and beneath which lies the incision for the nasal bones, which go right up to the line, drawn between the lower borders of the orbits. [Thus the frontal bones are not longer in this species than they are in the *Urus* or *Taurus*.] The horn-cores small, cylindrical, short, curved only in one direction forwards, sometimes, though seldom, downwards in the plane of the forehead ; the nasal bones in front two-pointed, with a deep small intermediate cavity ; the lacrymal bones flat, broadest in the middle, narrower in the orbital and nasal parts : there is always a rhombal opening between the frontal, nasal, and lacrymal bones. The form of the temporal cavity behind transverse-obtuse, before oblique-pointed ; its hinder part (to the angle above the joint of the under jaws) only one-fourth broader than the fore-part. N. B. Herein it resembles the tame Ox, but differs visibly from the *B. frontosus* and *Urus*. The anterior palatine apertures lancet-shaped, at the back oblique inward-pointed, the back ones lie between the palate bones ; the nape transverse, upwards with a vertical indenting, downwards with a vertical edge over the circular foramen of the nape (fig. 7). The skull of this species varies considerably in size and even something in form, according to its age and sex. I have in my possession the fragment of a forehead with horn-cores of a very old individual which seems to have been a *bull* ; the distance between the horn-cores upwards is 5 inches 3 lines, and the circumference of the horn-

Fig. 7.

*Bos longifrons.*

cores near the roots 7 inches 1 line. Another I have measured, whose breadth above the upper margin of the orbits was 7 inches 5 lines : this measured between the horns upward 5 inches 2 lines. The length of the frontal bone 8 inches 4 lines. The horn-cores are sometimes flat above, and rounded underneath. In a younger specimen, probably a cow, the horn-cores are exceedingly small, scarcely more than 3 inches long, and at the root 4 inches 2 lines in circumference. This species is however always known by a protuberance upon the upper part of the forehead in the front, and an indenting behind. The usual dimensions of young specimens are as follows :—

	ft.	in.	lin.
Length of the skull from the edge of the nape to the front edge of the intermaxillary bones	1	4	0
Length from the roots of the horns to the upper edge of orbits	0	3	4
,, of orbits	0	2	4
,, from the orbit to the end of the maxillary bone	0	8	4
,, of intermaxillary bone's front edge	0	10	0
,, from the edge of the nape to the incision of the nasal bones	0	7	2
Length of the horn-core's greatest curvature (behind)	0	4	0
,, of the nasal bones	0	6	0
,, of the row of molar teeth in the upper jaw	0	5	2
,, of the under jaw	1	1	2
,, ,, ,, to the back edge of the condyloid process in a line	1	1	6
Breadth between the horn-cores upwards	0	5	0
,, over the forehead's narrowest part about	0	5	4
,, of the occipital condyles	9	3	2½
,, between the upper edges of the orbits nearly	0	7	0
,, transversely over the centre 5 in. 6 lin., over the chin	0	4	5½
,, over the side projections of the nose	0	5	1
,, over the nose	0	2	6
Height from the upper projection of the forehead to the base of the cranium	0	5	5½
Height from the upper projection of the forehead to the edge of the foram. magn.	0	4	0
Circumference of the horn-cores near the root	0	4	3

The other parts of the Skeleton.—*Atlas* in form like that of the tame ox ; the edges of the wings a little reflected, and behind a little broader ; the posterior articular processes small, short ; the knob of the upper arch large, thick ; of the under arch more compressed over the back edge. *Axis* like that of the tame ox, but the canal in process. odontoid. not so roundly excavated ; the spinous process. spinos. has the front edge angular. The rest of the skeleton most like that of the tame ox, but each bone, in proportion to the length, is more slender and thin. *Atlas*: the breadth over the wings 4 inches 5 lines, under the length of the curve 1 : 3 ; *axis* about 3 inches. The length of *shoulder-blade* 11 : 4, breadth 6 : 1 ; from cav. glen. to spin. 1 : 7 ; os hu-

meri 8:6; breadth of lower joint's superficies 2:4. *Radius* about 10 in. *Metacarp.* 7:3; breadth of lower articular surface 2 in. The pelvis in a right line 1 ft. 2 in. 2 lin. *Foram. obturat.* oval, in front somewhat narrower. *Os femoris* 11:4. *Tibia* 11:4. *Metatarsus* 8:4. First toe-joint 2 in., second 1:2; the hoof 2:2.

Abode.—This slender-built almost deer-like species of Ox has existed wild contemporaneously with the forementioned animals in the south and west of Scania; and, as it appears, was found here in great numbers, probably in large flocks, in the vast forests with which the land was everywhere covered. It is not till within the last few years that our attention has been directed to its fossil remains, and already I have obtained several both of skulls and skeletons. In the Zoological Museum in Lund is preserved a skull which was taken up from a deep turf-bog near the Cathedral in Lund; and the back part of the skull with the horncores of a very old specimen was found, while digging a well, at the depth of nine ells, likewise in Lund. From a turf-bog in the district of Skytts I have obtained a skull; and from a turf-bog belonging to the parsonage of Nöbbelöf, in the district of Ljunit, two skeletons of this species of Ox have been dug up during this summer. At the close of the late meeting of Naturalists in Copenhagen, Professor Steenstrup exhibited a recently dug-up skull belonging to this species found in a turf-bog in Seeland. In Ireland and England several remains have been found in different places, and in relatively older earth-beds. In England they have been found together with the bones of the mammoth and rhinoceros (Owen, p. 510); they have been found in earth-beds over which lay a bed of marine shells, and over that a bed of freshwater shells (p. 511): in Ireland they have been found in freshwater marl under turf-bogs, together with the bones of the *Cervus megaceros*, from which we can form an idea of their great antiquity; but they have also been found in the same turf-bogs, whence Professor Owen draws the conclusion that this species of Ox continued to live there even after the last-mentioned species of animal was already extinct. With us, in the south of Scania, it lived contemporaneously with the Reindeer, *Bos primigenius*, and *Bos frontosus*: it was certainly among the Herbivora that came into the country after the ‘period of destruction,’ when the fields were again clothed with grass, bushes and forests. With us, and, as far as we know, over all Europe, they were, as wild, exterminated before the so-called historic period. That this same species of fossil remains might be found in Germany also is more than merely probable, although none as yet have been noticed. How far this species of Ox in former times has any-

where been tamed, and so as to form the stock now living of any tame race, has not perhaps through any comparisons been fully shown; but Prof. Owen supposes that the small-grown, small-horned, often hornless cattle in Wales and in the Highlands of Scotland descended from that race which he considers was tamed before the invasion of the Romans, by the original inhabitants; when, on the conquest of the country, they fled with their herds to the woody mountain-tracts. If it exists among us in any tame race of cattle, it would seem to be in the so-called *Finn* cattle.

The forehead more broad than long, convex: the horns set on anterior to the ridge which separates the forehead from the occiput. The intermaxillary bones never reach up as far as the nasal bones.

XXXVIII.—*Observations on Mr. Morris's paper on the Excavating Sponges.* By ALBANY HANCOCK, Esq.

To Richard Taylor, Esq.

DEAR SIR,

Newcastle-upon-Tyne, Oct. 15, 1849.

I HAD much pleasure on reading in the last Number of the 'Annals,' Mr. Morris's abstract of the papers published by Dr. Nardo and M. Michelin on the Excavating Sponges, and am only sorry that I was not aware of the investigations of these naturalists at the time I drew up my own observations on the subject. The access to scientific works in the country is very limited, and those referred to by Mr. Morris I have had no opportunity of seeing.

When, in my paper read at the Swansea Meeting of the British Association, I first stated my belief that *Cliona* excavated the chambers it inhabits, the assertion met with such general opposition, that I must confess I am now somewhat surprised on being informed that this subject had been so fully discussed some years ago; so far at least as relates to the question whether or not these sponges make the holes in which they are found concealed. Indeed it seems strange that there should ever have been two opinions on this point; for after the attention has once been called to it, a single specimen, in good condition, is sufficient to convince the inquirer that *Cliona* does really form its complicated habitation. This appeared to me so evident on examining the first specimens I procured, that had this fact not been disputed by naturalists of great eminence, I should never have thought it necessary to have dwelt so long on it. At that time I should have had great pleasure in quoting Nardo or Michelin in confirmation of this part of the argument, which was

preliminary to the discussion on the mode by which the excavations are effected ;—the principal object of my paper being to show a similarity in this respect between *Cliona* and the excavating *Mollusca*.

Dr. Grant, whose opinion I quoted in my paper, and who wrote on the subject many years previous to the appearance of Dr. Nardo's memoir, seems to be the first to have asserted the probability of *Cliona* forming its own abode. He says, " It may be questioned whether the sharp siliceous spicula and constant currents of its papillæ do not exert some influence in forming or enlarging the habitation of this zoophyte." Mr. Wm. M'Calla, too, was quoted as having stated that *Cliona* was " very destructive to the shells that came within its reach." And from the fact that M. Duvernoy had named a species *terebrans*, it was inferred that he also was convinced that these sponges formed the chambers they occupy, though I knew no more of what he had written on the subject than appears in the ' Microscopic Journal.' It is therefore pretty evident that I had no pretension to the discovery of the fact that *Cliona* has the power of burying itself in hard calcareous bodies ; though I found it necessary to put this matter, so far as I was able, beyond a doubt. In this respect the researches of Nardo and Michelini are of the greatest value ; for confirmation is still required, as it appears all are not yet satisfied that a sponge can penetrate shell and stone. It would have been well, therefore, if Mr. Morris had given the abstract at greater length.

It may be questioned, however, how far the Italian naturalist is justified in discarding the name given to these sponges by Dr. Grant, merely because that gentleman did not fully understand the nature of the production he described. Were such a principle to be admitted, nomenclature would be for ever fluctuating, and hundreds of names used by the early writers might be at once superseded. Dr. Grant's description is excellent, full and clear ; so that even the species may be determined. Why then should he be stripped of the honour of his discovery ? Had there been any obscurity,—any difficulty in determining what was meant, then there might have been some plea for adopting the generic appellation of a subsequent observer ; but even Nardo himself does not appear to doubt that his genus is identical with the *Cliona* of Grant.

Neither can I at present assent to Mr. Morris's opinion, that my two species *C. Fryeri* and *C. spinosa* are identical with *Viva Nardina* and *V. Michelini*. This there is reason to doubt. I have certainly not seen the figures referred to, but the descriptions are not full enough for identification ; and indeed, so far as they go, do not very well agree with my species. The charac-

vers of the spicula however are not given, and without a knowledge of these, no very conclusive opinion ought to be formed on the subject. In the abstract of Nardo's report, we casually learn, undoubtedly, that the spicula are "sharp at one end and rounded at the other" in *V. Michelini*; but in the *C. spinosa*, which Mr. Morris considers identical with it, they are of two kinds; one fusiform and bent in the centre, the other with a globular enlargement at one end. It would therefore seem probable that these two species at least are distinct. The fact of specimens occurring in the same species of shell is not of much value in determining their identity: I have already described six or seven species procured from the same matrix.

I remain, dear Sir, yours truly,

ALBANY HANCOCK.

XXXIX.—*Contributions to the Botany of South America.*

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

[Continued from p. 256.]

THINOGETON.

THIS interesting genus was founded by Mr. Bentham upon one of the plants collected on the coast of the Pacific, near Guayaquil, during the voyage of the 'Sulphur'; it is identical with *Dictyocalyx*, proposed by Dr. Hooker for a plant obtained by Mr. Darwin in one of the islands of the Gallapagos group. In many respects its characters approach so closely upon *Cacabus*, that some might feel disposed to consider them as congeneric; its habit, however, is not so herbaceous, its stems are more straggling, terete, and though fistulose, are more woody; the petiole is rounder, thicker, and grows to an unusual length (three or four times that of the blade) after the full growth of the leaf; the corolla is less campanular, more infundibuliform, and after the impregnation of the ovary, coils up spirally as in *Convolvulus*, and remains attached to the calyx until the fruit is matured; the stamens are more unequal and shorter, the filaments less slender and more arched at their origin than in *Cacabus*; the epigynous gland crowning the ovary is much larger, more than hemispherical, being gradually lost in the texture of the more slender basal portion, while in *Cacabus* it is distinct, prominent, and much smaller, rising on the summit of the germen, like a small bulbular expansion of the style. A still more marked difference is seen in the calyx, which in the florescent state in *Thinogeton*, is of much smaller diameter, quite tubular and invests the contracted base of the corolla; it is of thicker texture, and

marked by ten prominent fleshy ribs, tapering gradually into the peduncle: in *Cacabus*, on the contrary, the calyx is at least three times the diameter of the base of the corolla, is more or less globular, of extremely thin and transparent texture, venously reticulated, plicated and deeply 5-angular, the angles being saccate at base; the peduncle in *Thinogeton*, after the impregnation of the ovary, becomes immediately deflexed, grows to four times its former length, and is afterwards much thickened at its apex: the teeth do not increase in size, but the tube, as in *Physalis*, becomes somewhat vesicular, reticulated, and 10-ribbed; expands to three times its former length, and five times its breadth, its texture remaining much thicker, when compared with the greatly inflated and delicately membranaceous web, which encloses the berry in *Cacabus*. The structure of the ovary is similar to that of the last-mentioned genus, but the fureated placentæ are again divided, and secrete an aqueous juice, in which the seeds are nourished; the dissepiment remains membranaceous, but the placentæ at length become hard and woody, and the cells dry and capsular, while in *Cacabus* the pericarp, the placentæ and the dissepiment are all more or less membranaceous. The fruit, though somewhat fragile, does not burst by an opercular line, as in *Hyoscyamus*, because of the very gradual attenuation and absorption of its epigynous gland into the substance of the pericarpial membrane, not less than on account of the thickening and indurescence of the dissepiment and placentæ: for these reasons, it does not open by a sharp horizontal line, as in that genus, but remains a brittle, indehiscent putamen, with a tendency to break by an irregular transverse line in its thinnest part.

THINOGETON, Bth. Char. ampl.—*Calyx* tubulosus, 10-striatus ad medium 5-partitus, lacinias acutissimis, erectis, subæqualibus, persistens et augescens. *Corolla* infundibuliformis, tubo imo coarctato, dein gradatim ampliato, 15-nervio, limbo 5-fido, lobis brevibus subinæqualibus, 3-angularibus. *Stamina* 5, inclusa, inæqualia, corolla 3-plo breviora; *filamenta* in coarctationem tubi inserta, hinc formicata, erecta, gracilia; *antheræ* conniventes, oblongæ, apicifixæ, 2-loculares, loculis parallele adnatis, rima marginali dehiscentibus. *Ovarium* ovatum, 2-loculare, dissepimento tenui, placentis cruciformibus utrinque adnatis, in locellis fureatis, carnosus, undique ovuligeris. *Style* leviter curvatus, filiformis, staminibus excedens. *Stigma* spathulato-dilatatum, compressum, sub-2-labiatum. *Bucca* exsicca, intra calyceum auctum vesiciformem, venoso-reticulatum, 10-costatum inelusa, subglobosa, cortice coriaceo, superne crassiore, inferne subfragili, evalvato, 2-locularis, placentis fureatis coriaceis, seminibus plurimis gerentibus. *Semina* com-

pressa, subreniformia, testa scrobiculata, hilo laterali, marginali. *Embryo* intra *albumen* carnosum teres, subspiralis, radicula angulo basali spectante, hilo evitante, *cotyledonibus* semiteretibus paulo longiore.—Herbae Americe intertropicae prostratae, subpilosae, subcarnosae, *Convoluti facie*; foliis alternis, axillaribus, oblongis, acutis, sinuato-incisis, vel undulatis, longissime petiolatis, petiolo canaliculato, demum producto; floribus solitariis vel binis, pedunculatis subsecundis.

1. *Thinogeton maritimum*, Bth. Voy. Sulph. 142;—viscoso-pubescent, carnosulum; foliis lanceolatis vel linearis-oblongis, sinuoso-lobatis, vel grosse dentatis, basi in petiolum alatum angustatis, crassiuseculis, longiuscule petiolatis, floralibus decrescentibus; floribus solitariis vel geminis, lateralibus, axillis approximatis hinc pseudo-paniculatis et terminalibus, corolla sub-violacea.—Ecuador, ad Tumbez, in littoris maritimis; v. s. in herb. Hooker (Lima, Cuming, no. 972).

This is a prostrate plant, with much the habit of a *Nolana*, its branches measuring a foot and upwards. Its petioles and pedicels are erect, and therefore are all somewhat secund: I have not seen any cauline leaves, but the floral leaves are much smaller, greatly narrower, and upon a shorter petiole than in the following species; the pedicels are 2 to 4 lines long, the calyx is 3 lines long, and 1 line diameter, swelling afterwards to a length of 7 lines and a diameter of 5 lines: the corolla is 15 or 16 lines long, and 10 to 13 lines broad across the border; it is pubescent outside, is persistent, and on withering, coils up in a spiral form, when the peduncle increases to a length of 9 lines and becomes suddenly reflexed. The berry is 4 lines in diameter, enclosed within the enlarged vesiciform calyx.

2. *Thinogeton Miersii*. *Dictyocalyx Miersii*, Hook. fil. Linn. Trans. xx. p. 203;—subpubescens, foliis ovatis, acutis, basi inaequalibus, cordato-auriculatis, et in petiolum angustatis, irregulariter sinuato-angulatis, angulis subobtusis, 3-5-nerviis, crasso-coriaceis, utrinque pilis brevibus rigiduseculis articulatis conspersis, longissime petiolatis; floribus solitariis vel geminis, lateralibus, corolla sub-violacea extus puberula, limbo vix explanato, staminibus corolla brevioribus.—Ins. Gallapagos, v. s. in herb. Hook. (Charles et Albemarle Islands, Darwin.)

This plant possesses a habit similar to that of the former species. The branching stems of woody texture are fistulose, smooth and terete. The leaves are from $2\frac{1}{2}$ to 3 inches long, 2 to $2\frac{1}{2}$ inches broad, on a channeled petiole 5 inches long, that is nearly rectangular with the stem: they are almost smooth, or sparsely covered with very short rigid hairs: the peduncles are slender,

$\frac{1}{2}$ to 1 inch long; the calyx is 5 lines long, 2 lines diameter; the corolla is $1\frac{1}{2}$ inch long, contracted for the length of 5 lines to a diameter of 1 line, and thence gradually swelling into a funnel shape, is 1 inch across the mouth; three nearly parallel nervures extend along the middle of the lobes to the base of the tube; the stamens arise in the contraction of the tube, and the anthers, which are double the length of those of the former species, are connivent around the style in the middle of the corolla; the flower on withering coils up in a spiral form, and the peduncle, subsequently deflexed, increases to a length of $1\frac{1}{2}$ to $1\frac{3}{4}$ inch, becomes thicker, and enlarges considerably at its apex; the calyx swells to an oblong oval form, nearly an inch long, 7 lines broad, 10-angular, with ten prominent costate ribs, vesiciform, with the mouth closed by five short connivent teeth: it encloses a berry 7 lines long, 5 lines diameter; the pericarp is almost a putamen, the upper moiety being thick and coriaceous, the lower half thinner and more fragile; the dissepiment, and especially the lunate placenta, become thickened, coriaceous and almost ligneous; it is apparently void of pulp, enclosing several seeds scarcely a line in diameter and much compressed, which are described by Dr. Hooker as being large; but that term is evidently used in comparison with those of *Nicotianum*, with which this genus was thought to hold a close relation; they are on the contrary smaller than in many other genera of this tribe*.

3. *Thinogeton Lobbianum* (n. sp.) ;—viscoso-pubescent, caule striato, flexuoso; foliis ovalibus, irregulariter sinuato-angulosis et dentatis, ino cordato-auriculatis, et in petiolum longiusculum breviter attenuatis, 3-5-nerviis, tenuioribus, utrinque tomento brevi glanduloso subincano pubescentibus, petiolo tenui valde tomentoso; floribus geminatis, calyce pubescente, corolla sub-violacea, extus puberula, staminibus inaequalibus, corolla 2-3-plove brevioribus.—Columbia et Peruvia; v. s. in herb. Hook. (Columbia, *Lobb.* no. 299. Peru, *Maclean.*)

This species is evidently intermediate between the two foregoing: the stem is much smaller, more striated, far more flexuous, with much shorter internodes, and altogether more pubescent than the last described; the leaves are 2 inches long, $1\frac{3}{4}$ inch broad, on a petiole of $2\frac{1}{4}$ inches, but probably the lower leaves are somewhat larger: the peduncles are 9 lines long, slender and erect, but become suddenly deflexed on the withering of the corolla; the calyx is 4 lines long, $1\frac{1}{2}$ line diameter; the corolla $1\frac{1}{4}$ inch long, $\frac{3}{4}$ inch broad in the mouth; the fructiferous calyx becomes almost globular, 5 lines long and 4 lines in diameter, contracted

* A figure of this species, with generic details, will be given in plate 50 of the 'Illustr. South Amer. Plants.'

in the mouth, with five erect teeth, and enclosing a nearly globular berry 4 lines in diameter.

POLYDICLIS.

The *Nicotiana quadrivalvis* of Pursh, and the *Nicotiana multivalvis* of Prof. Lindley, have long been known as anomalous species, which Don placed in his section *Polydiclia* of that genus, and I propose to adopt that name, or rather its more correct derivation, for a distinct genus, in order to embrace these plants, which are distinguished from *Nicotiana* by the different structure of the fruit and other characters. The first-mentioned plant is a native of Missouri, where it is said to be cultivated as tobacco; it was introduced into England in 1811 and figured in the 'Botanical Magazine.' The latter species was first cultivated in England in 1826 and figured in the 'Botanical Register.' They both differ from *Nicotiana* in their globular, three or more celled ovary, with placenta projecting from the axis into the middle of the cell, where they become thickened and ovuligerous. The capsule is globular, often very large, umbilicate at the apex, three- to eight-grooved, with as many corresponding septicidal valves, which break away from the shriveled dissepiments. In *Polydiclis multivalvis*, which has a six- or eight-celled ovary, the placenta are often pluripartite in each cell, and as they become incrassated, the fruit according to Dr. Lindley presents a series of external spurious cells around the true seminal cavities. Its generic name is derived from πολὺς, *multus*, δικλίς, *valva*, on account of the greater number of the valves and divisions of its capsule.

POLYDICLIS (gen. nov.).—*Calyx* globoso-tubulosus, 10–16-nervis, 5–8-dentatus, dentibus valde acutis, inaequalibus, erectis, persistens et augescens. *Corolla* tubo cylindrico, 15- vel pluri-nervio, basi ventricoso, calyce 2–3-plo longiore, limbo late campanulato, ad medium 5–6-fido, lacinias expansis, obtusiusculis, 3-nerviis, venisque anastomosantibus pictis. *Stamina* 5–6, inaequalia, inclusa, medio corollæ inserta, *filamenta* tubo 3-plo breviora, filiformia, *antheræ* ovatae, 2-lobæ, lobis liberis, appositis, rima exteriori dehiscentibus. *Ovarium* globosum, disco carnoso insitum, 3 ad 6-loculare, placentis ex angulis prominentibus in centro loculorum incrassatis, multiovulatis. *Stylus* erectus, inclusus. *Stigma* clavatum, 3 ad 6-lobum, lobis obtusis, expansis, glanduloso-papillosis. *Capsula* globosa, magna, umbilicata, 3–12-sulcata, calyce aucto arete cineta, 3-pluri-loculari, 3-plurivalvis, valvis septicidalibus dissepimentis dum solutis, saepe locellis aliis spuriis exterioribus donata. *Semina* plurima, parva, oblonga, compressiusecula, hilo laterali. *Embryo* intra albumen carnosum leviter incurvus, *radicula* te-

reti, angulo basali spectante, cotyledonibus ovatis plano-convexis duplo longiore.—Herbae Americæ septentrionalis viscoso-pubescentes, odore faetido; folia alterna, ovato-lanceolata, elliptica, utrinque acuminata; flores axillares, albidi, reticulati-picti.

1. *Polydielis multivalvis*. Nicotiana multivalvis, *Lindl. Bot. Reg.* tab. 833; *Don, Dict.* iv. 466;—viscido-pilosa, foliis carnosis, ovato-lanceolatis, breviter petiolatis, utrinque acuminatis, integris, margine undulatis, demum fere glabris; floribus solitariis, paucis, axillaribus; corolla magna, limbo explanato, albida, venis purpureis picta, 5-6-mera.—Columbia River, in locis saxosis.

This plant is said to be of a strong hirsute odour and viscid; the leaves of the specimens I have seen are 6 inches long, $2\frac{1}{4}$ inches broad, on a petiole not longer than $\frac{1}{4}$ or $\frac{1}{2}$ an inch, which, together with the midrib, is fleshy, broad, and semiterete. The peduncle is scarcely more than $\frac{1}{4}$ inch long; the calyx about $\frac{3}{4}$ inch in length, and $\frac{5}{8}$ inch diameter in its broadest part, contracted above, and divided into five, sometimes six very acute lanceolate teeth, one-third of its entire length; it has ten or twelve prominent nervures with intermediate reticulations. The tube of the corolla is cylindrical, somewhat swollen at the base, $1\frac{1}{2}$ inch long, $\frac{1}{4}$ inch diameter; the border is very broad, expanded, about 2 inches across, and divided to nearly half its breadth into five, sometimes six triangular obtuse segments: it is of a whitish colour, with anastomosing purplish lines. The stamens are equal in number to the segments of the corolla, and the anthers rise to the mouth of the tube. The berry is large, globular, $1\frac{1}{4}$ inch diameter, marked with deep grooves, corresponding with the number of cells, which vary from six to twelve; it is umbilicate at the summit, and crowned by the persistent style, its lower half being closely invested by the swollen calyx.

2. *Polydielis quadrivalvis*. Nicotiana quadrivalvis, *Pursh, Fl. Am. Sept.* i. 141; *Lehm. Hist. Nicot.* c. 45. tab. 4; *Don, Dict.* iv. 466; *Bot. Mag.* tab. 1778;—viscido-pilosa, caule herbaceo, ramoso; foliis oblongis, utrinque attenuatis, integris, superioribus lanceolatis, subsessilibus; floribus 5-meris, ovario 3-4-loculari, calyce pilosiusculo, corolla genitalibusque glabris, stigmate 3-4-lobo.—Missouri.

The leaves of this species appear somewhat smaller than in the foregoing species, and are slightly ciliate on the margin, with jointed articulated hairs; the corolla is also much smaller, and the globular, usually 4-celled capsule, wholly enclosed in the persistent calyx, is about half an inch in diameter.

The *Nicotiana nana*, Lindl. Bot. Reg. tab. 833, referred by Don to his section *Polydiclia*, cannot belong to this genus, as its ovary is bilocular, and as it corresponds in few respects. The plant has certainly nothing of the habit of a *Nicotiana*, and it is difficult, in the absence of a satisfactory specimen, to determine to what genus it should be referred.

BIBLIOGRAPHICAL NOTICES.

Antiquités Céltiques et Antédiluvienues ; Mémoire sur l'Industrie primitive et les Arts à leur origine, avec 80 planches représentant 1600 figures. Paris, 1849.

THIS very curious and interesting work is the result of the labours and researches of a gentleman of independent fortune, and of taste, science and public spirit, residing at Abbeville. He has been from the first commencement of the Société d'Emulation in that city its active, liberal, and munificent President. During the last ten years he has gone to the expense of ascertaining what remains of primitive art could be discovered underneath the beds of peat, gravel and other materials, which cover the bottom of his own valley, that of the river Somme, and he has extended his inquiries also into the valley of the Seine. The deposits which he has turned over have not been simply alluvial in the strict geological sense of the word, but have also presented those appearances, especially in their fossil contents, which have always been considered as distinctive of *diluvium*. In these deposits to a great extent and in numerous instances M. Boucher de Perthes has found articles of bone, horn and flint, evidently fashioned by human labour, and intended to serve the purposes of arms, tools, utensils and symbols. He has discovered these objects both in the midst of and several metres below the *débris* of elephants, mastodons, saurians, and other extinct species, specimens of which, presented by him, are exhibited in the Museum of Natural History at Paris. Collections of the rudely shaped, but indisputably artificial objects so situated may be seen in the museums at Abbeville and Amiens; and in addition to his ample relations of his researches, the author has given outline figures of many hundreds of them in the numerous plates which illustrate his volume. Such is the importance attached to his labours by the best judges in his own country, that the Académie des Sciences has at his request appointed MM. S. Cordier, Dufrénoy, and Elie de Beaumont as a commission to investigate the subject in its relation to geology, and the Académie des Inscriptions et Belles Lettres has named another commission, including MM. Jomard and Raoul-Rochette, to examine the matter as archæologists (pp. v, vi, x).

The subject of this remarkable volume is one, in the treatment of which archæology and geology join hands. It consequently embraces a great variety of considerations bearing upon history, physiology, and other branches of science. The numerous questions

thus arising are discussed by M. Boucher de Perthes with clearness and elegance, with comprehension of mind, and with the calmness of a philosopher and a lover of truth.

That among the author's numerous speculations there should be some liable to objection was to be expected. We certainly dissent from his novel hypothesis on the subject of Celts, the *haches Celtaiques*, or *haches Gauloises* of the French. In addition to the great variety of suppositions which have been advanced concerning their use, and which he disavows, M. Boucher de Perthes imagines, that the Celts both of stone and metal may have been used as weights and measures, and may have served as a medium of exchange.

For more than 150 years the objects called Celts have attracted the attention of antiquaries; but whilst they have made extensive and very curious collections of spear-heads, arrow-heads, and instruments resembling wedges, chisels or hatchets, which have been wrought in stone, and exactly resemble those still used by North American Indians, South-Sea Islanders, and other nations in a very low state of civilization; they have until very lately omitted to notice those implements of still more simple construction, which are to be discovered in similar situations. But undoubtedly there were such tools, the use of which was adopted in the earlier stages of the arts of life. A New-Zealander's battle-axe, made of hard tough jade, polished, and shaped with exact symmetry, could only be produced by great labour, skill and perseverance; and such weapons were found by Cook and other navigators to be highly prized by their possessors. Many ages before the rude savage could attain to such a degree of perfection in the working of stone, he must have invented easier and simpler methods of operation. If we do but strike one nodule of flint against another, we produce fragments with points and sharp edges, which only require to be fixed in handles of hollow bone or horn in order to be of great service in the fashioning of wooden implements of various kinds. Of this class are many of the tools which M. Boucher de Perthes has collected, and he has produced them in the different stages of manufacture, showing the transition from the splinters as they first flew from the block of stone to the more exact shapes of spear-heads, arrow-heads, hatchets, chisels, and other implements. But what were the quadrupeds which fell before these weapons? Not the sheep or the goat. It appears that they had not yet reached these western borders. But the elephant, the mastodon, the rhinoceros, the aurochs, and the gigantic Irish elk.

Dr. Mantell, in the first volume of his 'Wonders of Geology,' has mentioned various circumstances which show that the last-named animal was the contemporary of man. Some further observations, which have been made in Ireland, and which tend to establish the same fact, have been recorded by Mr. Charlesworth. Professor Ansted observes, that the mastodon may possibly have reached down almost to the human period*; and it will be remembered, that, when the magnificent and complete skeleton of that animal, now preserved

* Picturesque Sketches of Creation, p. 301.

in the British Museum, was first shown in London at the Egyptian Hall, its exhibitor asserted that Indian arrow-heads were found among the diluvian bones.

We are anxious to call the attention of British geologists to this subject, in order that we may concur in the pursuit with our French neighbours, and under the impression that our own valleys and beds of diluvian gravel will supply evidence of the same kind. Mr. Wetherell of Highgate has a most beautifully formed and perfect spear-head of flint, which was lately found by the workmen employed in the parish of Hornsey on the Great Northern Railway. The account given of it was, that it was found in a bed of gravel 3 or 4 feet below the surface. How came it there? Many will say, that after being placed on the surface of the ground, it had in the course of ages worked its way downwards. We do not think such a change of position possible. Not even a pebble could have travelled that short journey, much less a long, thin, finely-wrought instrument, with sharp edges. Wherever it was originally laid in the gravel, there it must have rested for hundreds, nay thousands of years. We ought therefore rather to suppose that, when that part of Hornsey was a river-bed, perhaps 3000 years ago, a fisherman lost his spear, and after the wintry floods had covered it with a load of gravel brought down from the higher land, the wooden shaft and its fastenings of cord or leather underwent decay, and were dissipated, whilst the stone was preserved in its original state. But by further attention we shall probably discover in the British Isles not only those finished productions, which our antiquaries have hitherto collected, but weapons and tools of a more primitive form, in an unfinished state, and in all the stages of progress from the original fragments of rock to the polished Celt; and it is by pursuing these researches, as M. Boucher de Perthes has done, that we may carry back British history to its earliest date, and re-establish the old title, "Homo Diluvii Testis."—J. Y.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

February 6, 1849.—E. Forster, Esq., V.P., in the Chair.

A series of specimens of the natural order *Cycadeæ* was exhibited, and a portion of them presented to the Society, by James Yates, Esq., F.R.S., F.L.S. &c.

In his catalogue of these specimens Mr. Yates followed the arrangement and adopted the names of Miquel in his 'Monographia Cycadearum,' 1842, and of Brongniart in the 'Ann. des Sc. Naturelles,' sér. 3. tome 5, 1846.

In the course of his communication the author offered the following remarks:—

Genus CYCAS.

Cycas revoluta.—Since the year 1799, when a female plant of this

species flowered at Farnham, as described by Sir James Edward Smith in the 6th volume of the Linnean Transactions, a considerable number of the same sex have flowered in this country. Five individuals might be mentioned, which are now in a flowering state. On the other hand, only one male plant is known to have flowered in our island. This was formerly at York, and is now in the Botanic Garden at Sheffield. Its cone, or rather spike, nearly a metre in length, is preserved in the museum of the Yorkshire Philosophical Society, and exhibits in a very striking manner the affinity of this genus to the rest of the *Cycadeæ*, whilst the female cone of *Cycas* differs greatly from that of all the other genera.

Genus MACROZAMIA.

Macrozamia spiralis.—The genus *Macrozamia*, the scales of whose cone, whether male or female, are distinguished by terminating in a single spine, directed upwards, appears to be very closely allied to the *Dioon* of Professor Lindley. It is difficult to distinguish the young seedlings of these two genera. The only perceptible difference is, that in *Macrozamia* the leaflets are contracted at the base, and are more remote from one another than in *Dioon*. Also in both of these genera the leaves of the young plants differ most remarkably from those of the same plants in the adult state. *Macrozamia*, as well as *Dioon*, approaches *Cycas* in the circumstance, that the leaflets are decurrent, whereas in the remaining genera, *Encephalartus*, *Zamia* and *Ceratozamia*, they are not at all decurrent, but are contracted at the base and join the midrib of the leaf by a distinct articulation. The decurrent leaflets of *Macrozamia spiralis* are especially apparent in the young plants.

Genus ENCEPHALARTUS.

Encephalartus brachyphyllus.—A male plant flowered last year at Chatsworth. The cone appeared early in May, and was full-grown in two months.

Encephalartus Altensteinii.—There are at Chatsworth two splendid specimens of this species, which are labeled as such. Some of their leaves are two metres long. One of these two specimens has thrown out bulbs, producing offsets of considerable size. On comparing the leaves of the offsets with those of the parent plant, the former are observed to be much more spinous and smaller than the latter, the number of the leaflets also being much less. This individual therefore affords a decisive proof that such diversities in the leaves may depend upon the age of the plant, or upon other circumstances. Hence it may be inferred, that many individuals, which in our conservatories are distinguished by other names, and especially many of those called "*Zamia pungens*," or "*Encephalartus pungens*," belong to the *Encephalartus Altensteinii* of Lehmann and Miquel. Lehmann assigned this name and made his description of the species from the study of specimens directly imported from South Africa. But if the view here taken be correct, the species was already common in Europe under other names. A plant called "*Zamia pun-*

gens," in the Botanic Garden at Birmingham, agrees exactly in appearance with Lehmann's plate of *E. Altensteinii*, in his 'Pugillus Sextus' (Hamburg, 1834). The history of two of these plants called "*Zamia pungens*" is remarkable. They are a male and a female, of about equal size and similar appearance, and formerly belonged to Lord Tankerville's collection at Walton-on-Thames. When they were sold, the male plant went to Kew, the female to Chatsworth. Both have flowered, and the flower of each has been represented. An engraving of the female with its cone, produced in 1832, was published by A. B. Lambert, Esq. (see Buckland's 'Bridgewater Treatise,' i. 494; ii. plate 59), and Mr. R. Horsemann Solly obtained a fine drawing of the flower of the male in 1839 (Proceedings of Linn. Soc. p. 52; Annals of Nat. Hist. v. 46). This male cone is preserved in the collection of the Linnean Society, and a cone afterwards produced by the same plant is in the museum at Kew. This plant is now putting up a new crown of leaves. Its fellow, the female at Chatsworth, has been in fruit many months*.

* Of the cones of this plant and of the female hereafter mentioned of *Enc. horridus*, Mr. Robert Scott of Chatsworth has furnished the following measurements and observations taken at two different periods of their growth. The cone of *Enc. pungens* appeared on the 14th of June, and that of *Enc. horridus* on the 13th of July 1848. The measurements of October were coincident with the perfect disengagement of the cones; and although Mr. Scott has made repeated measurements since those taken in December, he does not find, up to the 9th of March (the date of his communication), any further increase of size. They were then full-grown, and the scales appeared likely to drop from the axis in a few weeks.

ENCEPHALARTUS PUNGENS.

Oct. 9, 1848.	Dec. 25, 1848.	
Length of cone, outside measure.....	18 $\frac{1}{2}$ inches	21 $\frac{1}{2}$ inches
Circumference, 9 in. from top	33 —	36 —
Circumference, 3 in. from base	33 —	37 $\frac{1}{2}$ —
Number of spires	15	
Number of fertile scales in one spire ...	14 or 15	
Number of barren scales in one spire ...	8 or 9	
Perpend. diameter of a fertile scale.....	1 $\frac{4}{10}$ inch	1 $\frac{7}{10}$ —
Transverse diameter of a fertile scale ...	2 —	2 $\frac{3}{10}$ —
Perpend. diameter of a barren scale ...	0 $\frac{7}{10}$ —	0 $\frac{7}{10}$ —
Transverse diameter of a barren scale... ..	1 $\frac{4}{10}$ —	1 $\frac{1}{10}$ —

Each spire performs one revolution.

ENCÉPHALARTUS HORRIDUS.		
Oct. 9, 1848.	Dec. 25, 1848.	
Length, outside measure	10 inches	14 inches
Circumference at base	14 —	17 $\frac{1}{2}$ —
Circumference, 3 inches from top	14 —	16 —
Number of spires	8	
Number of scales in one spire	14	
Perpend. diameter of one scale	1 $\frac{1}{10}$ —	1 $\frac{3}{10}$ —
Transverse diameter of one scale	1 $\frac{7}{10}$ —	2 —

Each spire performs one revolution.
There are no apparently barren scales.

Miquel observes, that this species was formerly cultivated in European conservatories under the name of "*Zamia spinulosa*," or "*Z. spinosissima*." Both he and Lehmann assign the name of "*Encephalartus pungens*" to an entirely different species.

Encephalartus Caffer.—This species, which in Miquel's arrangement immediately follows *E. Altensteinii*, differs from it distinctly in the form of the leaves. Also in both species the form of the leaves, and more especially the obliquity with which the leaflets are set upon the midrib, and which increases regularly from the base of the leaf to its apex, may be traced to the imbricate vernation. In all *Cycadeæ* the vernation affords important aids for distinguishing both genera and species, and these characters are the more deserving of attention on account of the rare occurrence of the flowers.

The next species to *Encephalartus Caffer*, in Miquel's arrangement, is *E. longifolius*. He however represents these two species as scarcely differing except in habit. The plant in the great conservatory at Kew, named "*Zamia longifolia*," seems to me undistinguishable from *E. Caffer*. Specimens of the same may be seen at Chelsea and at Chiswick, which in those gardens are called "*Zamia elegans*." At Sion House there is a remarkably fine plant of this species, called there "*Encephalartus Caffrorum*."

Probably no finer specimens of *E. Caffer* have ever been known than two, which are at Chatsworth. They were sent to the Duke of Devonshire's collection by the late Baron Ludwig, from his own garden at the Cape of Good Hope, together with all the Chatsworth specimens of this genus, excepting that already mentioned, which was brought from Walton-on-Thames. These two plants cannot be less than 100 years old.

On a close examination of the cicatrices, which are arranged in spirals on their trunks, appearances present themselves which make it probable, that not the leaflets only, but the leaves also are articulated. Many of these cicatrices are concave, smooth within, but showing the marks of bundles of vessels, which have closed after the separation of the petioles. Although, therefore, the longevity of these leaves is certainly very great, as it is in all *Cycadeæ*, yet they appear to have their natural term of life, perhaps ten years or more; after which they are thrown off by an effort of the plant resembling that which in common cases takes place every year.

One of these two specimens is a female, and having recently borne fruit, requires a more detailed description.

The cone made its first appearance in the spring of 1847. In the following September it had attained so great a size, that it was thought desirable to take a cast of it in plaster, and models, made from this cast, are now in the museum at Kew, in the collections of the British Museum and of the Linnean Society, and in other collections both public and private. At the time when the cast was taken, the prevailing colour of the cone was a dark shining green, the pyramidal extremities of the rhomboids being of a lemon-yellow, streaked with brown. These colours were afterwards blended or changed, so that the surface of the cone assumed a pretty uniform bronze colour.

For a long time the cone was as compact as possible; but at the end of the year a fissure might be discerned round the base of some of the pyramids, especially of those near the top of the cone. The cone had then become twice as large as it was in September. But the rhomboids which terminated the scales, rising in the form of truncated and tuberculated pyramids, had increased much less in the upper part of the cone than in the lower. Accordingly the scales in the upper part, extending a fourth of the way down the axis, were afterwards found to be barren. Moreover, as the rhomboids in the middle and lower part increased, they extended themselves laterally much more than vertically, and there arose thus a remarkable swelling or protuberance in the part of the cone below that, which consisted of the barren scales. In this respect the cone assumed the appearance of that of an *Encephalartus*, which is figured in Jacquin's 'Fragmenta,' plate 27.

Although the barren scales at the upper part of the cone became gradually less close and compact, they continued firmly attached to the axis until the following midsummer. Had a male plant been present, it appears probable that under these circumstances fertilization would have taken place. Although the *Cycadeæ* are classed as gymnospermous, their ovules, with the exception of the genus *Cycas*, are so covered and guarded in the earlier stages of their development, that it is difficult to imagine how the pollen can possibly obtain access to them. But, after the barren scales at the top of the cone have begun to separate, a shower of pollen, falling on it, would easily make its way through the fissures between these barren scales, and, going in the direction of the axis, would come into immediate contact with the summits of the ovules, which are all directed towards the axis and placed at a very short distance from it. In considering the mode of impregnation, it is also important to observe, that, whereas the male cone quickly comes to maturity, sheds its abundant pollen, and decays, the female cone, being of much slower growth, remains for many weeks in that state, in which the provision here described is made for the admission of the pollen.

About July 1848, all the scales separated from the axis, beginning at the top of the cone. A coloured wax model having been made of a scale with the fruit upon it in the mature state, copies of it accompany the before-mentioned models of the cone.

The scales were arranged in eight spirals, each spiral consisting of forty scales, and making two revolutions round the axis. The number of drupes, containing nuts, was probably about 400, two upon each perfect scale. The scales were weighed as they fell from the cone, and their entire amount was 46 lbs.

After all the scales had fallen, the axis was found to be supported by a very short thick peduncle, not exceeding fifteen millimetres in length, and covered with down. A section having been made across the axis in its thickest part, the centre was observed to be pith, without cells, vessels, or woody fibre. This central portion was surrounded by pith, abounding in cells and bundles of woody fibre. The cells were filled with gum, and very different from the bundles

of woody fibre. These latter, being destined to supply the scales, first pursued a course parallel to the axis, and then turned outwards to the bases of the scales.

The following are the dimensions of this magnificent plant, expressed in metres and centimetres, one metre being equal to 39·371 English inches :—

Dimensions of the trunk.

	M.	c.
Length	2	30
Girth at the narrowest part	1	2
Girth just below the leaves	1	8
Girth at the thickest parts, viz. at the ground and a little } above the middle	1	16

Dimensions of a large leaf.

Length of leaf, including foot-stalk	1	10
Length of foot-stalk		25
Length of largest leaflets		14
Greatest breadth of ditto		$3\frac{1}{2}$

Dimensions of the cone.

Length, including peduncle	58
From the apex to the base, measured outside	65
From the apex to the termination of the smaller rhomboids	17
Girth in the middle	92
Girth at the base	50
Greatest girth of the axis	26
Transverse diameter of a rhomboid	5
Vertical diameter of ditto	$3\frac{1}{2}$

In relating the history of this plant, it is to be observed, lastly, that some time before the scales began to fall from the axis, a set of young leaves made their appearance on one side of its base. They were invested with a thick, silky, olive-coloured pubescence. They at first took a horizontal direction, but on the removal of the cone their tendency was upwards.

Encephalartus horridus.—A male plant flowered in 1839 at Kinmel Park, the seat of Lord Dinorben, who presented the cone to the Linnaean Society. (Proceedings, p. 9; Annals of Nat. Hist. S. 1. vol. iii. p. 58.)

A female bore fruit at Chatsworth in 1846, and is now in fruit again. Another female, formerly in the garden of the Horticultural Society at Chiswick and now in Mr. Yates's possession, has twice produced a cone supported by a short peduncle. Among the distinctions, to which allusion has been made already, between the genus *Cycas* and the other genera of the same Natural Order, it is remarkable that the female cone of *Cycas* is sessile, and that after it has arrived at maturity its scales diverge and assume a tendency to a horizontal direction, corresponding with that of the leaves; after which the next set of leaves rises from the centre of the cone. In other Cycadæ, the cone, whether male or female, is pedunculated, and the new tuft of leaves appears by the side of the peduncle.

Genus ZAMIA.

Zamia furfuracea.—There are two fine old plants in the Botanic Gardens at Cambridge and Chelsea, which are males, and bear cones almost every year. Their stems are short and branched. In the Botanic Garden at Liverpool is a female, which produced a cone in 1848. These three plants agree quite as well with Miquel's description of "*Zamia muricata*, var. *angustifolia*," as with his description of *Zamia furfuracea*.

Zamia integrifolia.—A fine female plant in the Botanic Garden at Cambridge produces a cone every year, and one is now appearing. Five or six bulbs grow from the stem, some of them bearing leaves*.

Genus CERATOZAMIA.

Ceratozamia mexicana.—A male plant flowered at Chatsworth in 1847, and another of the same sex at Kew. The cone of the last is preserved in the museum. Two fine plants of this species are now flowering at Kew, and there are two in the garden at Chiswick, also in a flowering state. At Kew and Chiswick these plants are called "*Dipsacozamia*." In these gardens the plants differ so much in the size and form of their leaves, that they may be presumed to belong to some of the four new species preserved at Amsterdam, which Miquel describes in the 'Tijdschrift voor de Wetenschappen,' 1847, p. 38–43. The same observation applies to the Ceratozamias in the conservatory of Mr. Loddiges at Hackney.

ZOOLOGICAL SOCIETY.

Nov. 14, 1848.—Wm. Yarrell, Esq., Vice-President, in the Chair.

DESCRIPTION OF A NEW GENUS OF ACEPHALOUS MOLLUSCA, OF THE FAMILY PECTINACEA, COLLECTED BY CAPT. SIR EDWARD BELCHER DURING THE VOYAGE OF H.M.S. SAMARANG. BY ARTHUR ADAMS AND LOVELL REEVE, F.F.L.S.

Genus HEMIPECTEN.

HEMIPECTEN FORBESIANUS. *Hem. testū orbiculari, Anomieformi, tenuissimā, hyalind, concentricē lineatd, linearum interstitiis eximiē reticulatis; valvā inferiore planulatā, posticē auriculatā, auricula longitudinaliter radiatā, sinu infra profundo, margine opposito subtiliter denticulato; valvā superiore convexā, extus interdum decussatim rugosd, vix auriculatā; cardine edentulo, ligamento angusto, marginali, cartilagine parvo solido in cavitatem centralem superficiariam valvis ambabus ligamentum intersecante; pellucido-albd, valvd superiore interdum rufo-aurantio radiatā.*

Hab. Sooloo Archipelago, Eastern Seas.

The subject of the foregoing description, which constitutes an extremely interesting discovery in the acephalous family *Pectinacea*, is an inequivalve shell, partaking of the characters of *Pecten* and *Ano-*

* Four Zamias of other species are now flowering at Kew.

mia. Like *Anomia*, it is a thin, hyaline substance, of which the upper valve is a rude convex plate, distorted according to its situation of growth, but slightly notched on one side. Like *Pecten*, the under valve is characterised by a prominent auricle on the left side, the sinus beneath being very deeply cut in the direction of the hinge-margin, and furnished along the edge with a row of fine erect denticles. The hinge, similar to that of *Pecten*, consists of a slight marginal ligament intersected in the middle by a solid triangular cartilage, situated in the hollow of a superficial depression in each valve. Apparently the nearest approximation to this shell may be found in some of the fossil *Pectens* of the carboniferous limestone, distinguished by a nearer relation with *Anomia*, of which it presents a reversed condition of growth.

From the circumstance of one of the valves being perforated by a deep sinus, of which there is no corresponding growth in the other, it may be compared with *Pedum*, but there is no indication of the umbonal area which characterises the hinge of that genus, and it does not appear to be the production of an animal of the same peculiar habits.

In texture and composition the valves consist of a transparent, semipearlaceous lamina, exhibiting a series of closely-arranged concentric lines, the interstices between which are minutely rayed with much finer lines. If any importance can be attached to the variations in the microscopic structure of shells for the purposes of classification, the observations with which we have been kindly favoured by Dr. Carpenter on the genus, tend rather to show its affinity with *Pedum*. There is some uncertainty in the result. "The flat valve," says Dr. Carpenter, "in both specimens is permeated by copious tubuli, a character in which the species agrees with *Pedum* and with certain species of *Lima*, and differs from *Pecten*. This tubularity exists also in the convex valve of the colourless specimen, but is absent in the other (at least in the portion of it which the Bryozoon covering its surface allows me to examine), and I would direct your attention to the fact that the coloured shell possesses a rudimental sculpturing over the whole of its visible external surface, which is totally wanting in the other. Is not this sufficient as a specific difference?"

The two specimens here spoken of, collected during the voyage of the Samarang, were dredged by Captain Sir Edward Belcher in the Sooloo Sea, from a coral and stony bottom, at a depth of about fourteen fathoms. The under valve of each is smooth, showing it to have been attached; the upper valve, covered in part in both specimens with particles of coral and parasitic shells, is in one individual smooth and colourless, in the other decussately corrugated, delicately rayed with reddish-orange. The two shells so entirely agree in all other respects that we have not ventured to describe them as distinct species.

Trusting that this interesting subject may assist the developmental views of Professor Edward Forbes, we have the pleasure of distinguishing the species by his name.

November 28.—Professor Owen, Vice-President, in the Chair.

The following papers were read :—

1. DESCRIPTIONS OF SOME NEW SPECIES OF OVULUM IN THE COLLECTION OF MR. CUMING. BY G. B. SOWERBY, JUN.

1. OVULUM UMBILICATUM (Thes. Conch. pl. 101. f. 88, 89). *Ovul. testa globosa, subpyriforme, albâ, roseo pallide tincto, dorso ad extremitates rubro lineato, ad terminum posticum umbilicato; aperturâ subaperta; labio externo angustato umbilicato; aperturâ subaperta; labio externo angustato intus crenulato posticè labium internum superante; labio interno posticè tumorem elevatum denticulatum ferente, ad canalem linearis, anticè bicostellata, ad canalem uniplicato.*

Agreeing with *O. margarita* in general appearance, but the outer lip is thinner, the mouth wider, the upper callosity elevated and denticulated. There is also a small umbilicus behind the posterior termination of the outer lip.

Hab. Ticao, Philippines; by Mr. Cuming.

2 OVULUM LANCEOLATUM (Thes. Conch. pl. 100. f. 35, 36). *Ovul. testa elongatâ, angustatâ, minutissimè striata, aurantio-rubescente, seu albida, canalibus subproductis, emarginatis; aperturâ angustatâ; labio externo planulato crasso, breviusculo, anticè angulatum flexuoso; labio interno tumido rubro longitudinaliter marginato, posticè ad canalem producto, subtortuoso, anticè intus longitudinaliter sulcato, uniplicato, ad canalem angusto, rectiusculo, acuminato.*

A remarkable shell, presenting the appearance of *O. aciculare* very much lengthened. The aperture is narrow, excepting towards the anterior, where the outer lip is bent out: the under surface is flat, the inner lip edged with a reddish line. Collected by Mr. Cuming.

Hab. Sorsogon, Isle of Luzon, Philippines.

There is a white variety of this species (?) from Molucca.

3. OVULUM UNIPLICATUM (Thes. Conch. pl. 100. f. 30, 31, 32). *Ovul. testa elongatâ, subcylindrica, pellucida, minutissimè striata, aurantiâ, seu violacea, anticè subacuminata, posticè subrotundata; dorso margine distincto; aperturâ subaperta; labio externo paululum incrassato, ad extremitates recedente, anticè subangulato, ad canalem emarginato; labio interno intus subdepresso, posticè spiraliter uniplicato, ad canalem tortuo, versus labium externum deflecto, anticè subtortuo acuminato.*

Specimens of the pale violet variety were obtained by Mr. Cuming from near Charleston, South Carolina; a darker one from Rio Janeiro.

This species resembles *O. aciculare*, but is more acuminate at the anterior extremity; it is rather more ventricose, and finely striated. The spiral fold near the anterior canal is more decided and less oblique, and the edge of the canal above it invariably leans towards the outer lip.

4. **OVULUM DEFLEXUM** (Thes. Conch. pl. 100. f. 57, 58). *Ovul. testa ovali-elongatá, lavigatá, albida, extremitatibus deflexis; aperturá angustatá; labio externo crasso, lato, complanato, anticé arcuato, breviusculo; labio interno longitudinaliter tumido, complanato, posticé uniplicato, anticé ad canalem acuminato.*

Resembling *O. aciculare*, but with a broad, flattened outer lip, and the extremities turned downwards. Brought from Ticao, Philippines, by Mr. Cuming.

5. **OVULUM PHILIPPINARUM** (Thes. Conch. pl. 100. f. 57, 58). *Ovul. testa elongatá, gradatim rostratá lavigatá, fulva, subtus albida; aperturá angustatá, ad canales truncatá; labio externo lavi, albo, rectiusculo, anticé angulatum contracto; labio interno lavi, intus anticé submarginato.*

The contraction towards the extremities is more gradual, and the outer lip straighter, than *O. birostre*, and the canals are truncated at the extremities. The colour is pale fawn, darkened in the aperture, and nearly white at the lips.

Several specimens were brought by Mr. Cuming from the island of Capul, Philippines.

6. **OVULUM SUBROSTRATUM** (Thes. Conch. pl. 100. f. 39, 40). *Ovul. testa oblonga, lavi, rubro-violascens, ad extremitates subproducta, acuminata; dorso margine distincto; aperturá angustatá, anticé subangulata; labio externo lavi, ad extremitates recedente; labio interno tumido, intus unicarinato, posticé spiraliter uniplicato, ad canales rectiusculo, producto.*

Resembling *O. secale*, but with the extremities more produced and straightened.

From Honduras Bay; collected by Mr. Dyson.

7. **OVULUM SIMILE** (Thes. Conch. pl. 100. f. 28, 29). *Ovul. testa oblonga, ovali, spiraliter striata, fulva; canalibus subproductis, emarginatis; labio externo crasso, lavi, anticé subarcuato, utrinque breviusculo; labio interno tumido, posticé spiraliter uniplicato, ad canalem subtortuo, acuminato, anticé subdepresso, intus longitudinaliter unicarinato, ad canalem rectiusculo, acuminato.*

Mr. Cuming's collection; locality unknown.

Resembling *O. secale*, but spirally striated.

2. DESCRIPTIONS OF SOME NEW SPECIES OF CANCELLARIA IN THE COLLECTION OF MR. H. CUMING. BY G. B. SOWERBY, JUN.

1. **CANCELLARIA UNDULATA** (Thes. Conch. pl. 92. f. 12; pl. 95. f. 79). *Canc. testa ovali, lineis undulatis paululum elevatis cincta; costis crassiusculis subnoduliferis; anfractibus subangulatis; aperturá internè striata; columelli crassæ, granulosæ; colore fulvo, fusco (principù ad angulum unfractuum) interruptim fasciato.*

Hab. Van Diemen's Land. Var. *truncata*, Philippines; H. Cuming.

This species was originally included in the *C. granosa*, Sowerby, Conch. Illustr., but the general aspect of the shell, especially the

banded variety, is so different, owing to the greater fineness of the striae, that on examining a number of specimens I think they may well be separated.

2. CANCELLARIA TÆNIATA (Thes. Conch. pl. 95. f. 75, 76). *Canc. testa elongata, turrita; costis numerosis, transversè striatis, ad angulum anfractuum acutè angulatis; spiræ acuminata, apice mammiferæ; aperturæ internæ levigata; margine acuto; columella lœvi, biplicata; colore pallide fulvo, fusco tæniato.*

Hab. —? Mus. H. Cuming.

3. CANCELLARIA MELANOSTOMA (Thes. Conch. pl. 95. f. 78). *Canc. testa ovali, longitudinaliter striis noduliferis et transversè striis alternatis minute decussati; spiræ acuminata, anfractibus paucis, rotundatis; aperturæ ovali, magna, internè costata; labio externo denticulato; columelli expansa, antice granulata, triplicata; colore pallide fulvo, fusco latè fasciato; labio externo bimaculato, columella fusca nigricante.*

The smoothness of the decussating striae, the more oval form, the peculiar dark colour and granulation of the columella, serve to distinguish this species from the preceding.

Mr. Cuming possesses the only specimen which we have seen. Its locality is unknown.

4. CANCELLARIA EXCAVATA (Thes. Conch. pl. 93. f. 18). *Canc. testa ovata, lœvi; spiræ acuminata, turrita; anfractibus ad suturam profundè excavatis; aperturæ breviusculæ, angulata; labio externo lœvi, internè costato; columelli triplicata, umbilicata; colore nullo.*

Hab. South Australia.

It resembles *C. spirata*, but the aperture is shorter in proportion to the spire, and the upper part of the whorls more deeply excavated. The shell is umbilicated behind the columella, and of a white colour.

5. CANCELLARIA FOVEOLATA (Thes. Conch. pl. 103. f. 30, 31). *Canc. testa oblongo-ovali, turrita, levigata, obsoletè striata; spiræ producta, anfractibus angulatis, ad suturam excavatis, ad angulum subcoronatis; aperturæ triangulare, lœvi; columella triplicata; umbilico mediocri; colore fusco, vel fulvo tæniato.*

From the sands in Algoa Bay. One specimen is of a uniform brown colour, and the other beautifully lineated.

6. CANCELLARIA SEMIDISJUNCTA (Thes. Conch. pl. 95. f. 62, 63). *Canc. testa ovali, ventricosa, turrita, spiraliter sulcatæ; anfractibus angulatis, ad suturam profundè excavatis, ultimo disjuncto; umbilico maximo, costato; aperturæ triangulare, columelli triplicata; colore fulvo, fusco longitudinaliter fasciato.*

Collected by Mr. Cuming in sandy mud, at twenty-five fathoms' depth, at Cagayan, Isle of Mindanao.

3. DESCRIPTION OF TWO SPECIES OF MAMMALIA FROM CARACCAS. By J. E. GRAY, Esq., F.R.S. etc.

The British Museum have lately purchased from M. Sallé, through Mr. Cuming, a Monkey and a Squirrel, which appear to have been

hitherto unnoticed in the catalogues ; I have therefore sent a short description of them to the Society.

MYCETES PALLIATUS (Mantled Howler).

Black brown ; hair of the middle of the back and upper part of the sides yellow brown, with black tips ; of the lower part of the sides elongate brownish yellow, forming a kind of mantle on each side.

Hab. Caraccas.

The hair of the forehead short, reflexed, forming a slight crest across the middle of the head ; of the back of the head rather longer ; of the cheeks few, scattered, short and greyish ; of the hinder part of these rather longer than those on the rest of the head, and forming a slight beard, which is more distinct in the males ; the lower part of the hairs on the shoulders is sometimes yellowish.

SCIURUS DORSALIS (Black-backed Squirrel).

White, hairs black, with, more or less, long white tips ; the eyebrows, back of the head, nape and middle of the back brownish black, forming a very broad, well-defined dorsal streak.

Hab. Caraccas.

The black of the hairs of the sides of the body and tail show through the general white colour ; the black occupies all except the tip of the hairs. The hairs of the lower part of the legs and feet are white to the base ; ears rounded, not bearded, and with scattered hairs.

This may be only a variety of some other American species, but the two specimens which were sent home were exactly alike.

4. DESCRIPTION OF A NEW SPECIES OF HERPESTES, FROM ABYSSINIA.
By J. E. GRAY, Esq., F.R.S. etc.

Mr. F. H. Hora having kindly presented to the Museum a specimen of a male Herpestes which he lately caught in Abyssinia, and as it is different from any of the species of the genus described by Dr. Rüpell in his Fauna of that country, original specimens of which are in the British Museum collection, I have the pleasure of laying a short description of it before the Society.

HERPESTES OCHRACEUS (Ochraceous Herpestes).

Pale brownish yellow, very minutely mixed or punctuated with a darker tint ; chin, throat and under part paler, not punctuated ; end of tail bright yellow, with an elongated black tip.

Hab. Abyssinia.

The hair of the back short, yellow, with a short blackish base and a narrow dark brown subterminal band ; of the throat and under part of the body longer uniform pale yellow, with a short dark band at the base ; of the lower half of the tail longer pale yellow, with three or four rather narrow, equidistant darker bands ; of the end of the tail uniform bright yellow, and of the hinder end all black, forming a terminal tuft. Ears rather large, rounded, covered with short close-pressed hairs. The soles of the hind-feet bald to the heels.

The skull is rather elongate and narrow : the false grinders are 3-3.

the first being very small and conical; the third are subtriangular, with a slight tubercle on the inner side: the orbit not quite complete, but with a short interruption in the middle of the hinder side.

Length of skull $2\frac{1}{2}$ inches, width $1\frac{1}{2}$; length of palate $1\frac{1}{5}$ inch; of face from front of orbit $5\frac{1}{2}$ lines; of lower jaw 1 inch $3\frac{1}{2}$ lines.

5. DESCRIPTION OF A NEW SPECIES OF CINCLOSOMA.

BY J. GOULD, Esq., F.R.S. ETC.

CINCLOSOMA CASTANEOTHORAX, n. sp.

Sp. Ch.—Crown of the head, ear-coverts, back of the neck and upper tail-coverts brown; stripe over the eye and another from the base of the lower mandible, down the side of the neck, white; shoulders and wing-coverts black, each feather with a spot of white at the tip; all the upper surface, the outer margins of the scapularies, and a broad longitudinal stripe on their inner webs next the shaft, deep rust-red; primaries, secondaries, and the central portion of the scapularies dark brown; tail black, all but the two central feathers largely tipped with white; chin and throat black; chest crossed by a band of rich rust-red; sides of the chest and flanks brownish grey, the latter blotched with black; centre of the abdomen white; under tail-coverts brown, deepening into black near the tip, and margined with white; bill and feet black.

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

Hab. Darling Downs, New South Wales.

Remark.—Nearly allied to *C. castanotus* and *C. cinnamomeum*, from which it is however easily distinguished by the colour of the chest and back.

Dr. Macdonald communicated orally his ideas on the Vertebral Homologies as applicable to Zoology, of which observations he has furnished the following abstract:—

"Dr. Macdonald gave a short sketch of the characters of the typical vertebra, as proposed by Professor Owen and several continental zoologists and comparative anatomists, and then contrasted it with one which had been the result of many years' study, and which he considered more in accordance with the vertebra and its auto-gogenous and exogenous elements as traceable in the endoskeleton of the Vertebrate classes, and also as showing its analogy in the Annelid animals. The table which he exhibited points out these, from which it would appear that Dr. Macdonald considers the bodies of the vertebræ, as described by anthropotomists,—continued downwards through the sacrum and coccyx to the top of the tail, and the basilar process upwards to the sella turcica,—as so many portions or segments of a central axis formed around a centrochord,—and not a notochord as usually described,—from which the auto-gogenous elements spring and radiate to the periphery, and, converging mesially along the dorsal aspect, enclose within the tunnel of the *Neuro-Camera* the whole cerebro-spinal axis, of varying dimensions in the different regions, and another set of radii meeting sternally, and forming the three

thoracic regions, having a costal region interposed. The Rachedian development from the sella turcica to the tail, with its mesothorax and metathorax, is the longest, and forms the Rachal type; the anterior towards the nose—the facial or proboscidian—is the shorter, and has only one thorax, the cephalothorax, formed by the mandibular costæ and palatine sternum.

“ This framework, like a large trunk, is enclosed by three cycloid or segmental zones :—

1. The *Temporal*, formed by the squamo-temporal, zygoma and malar bones, and supporting its membral or epicycloid *ramus*, formed by the maxilla.

2. The *Humeral* or scapular clavicle and manubrium sterni, with its epicycloid *ramus*, the brachium, cubit and carpodactyle portions.

3. The *Coxal* or ilio-pubic, with its epicycloid *ramus*, femur, crus and tarso-digital portions.

“ In so extensive a subject Dr. Macdonald restricted his present communication to the consideration of a portion of the epicycloid ramus of the metathoracic or coxal zone, and pointed out the strong analogy which might be traced between the tarsus and the bones of the arm in the human skeleton, in order to facilitate the examination of the same organs in the lower classes, and more especially in the osseous fishes, where, from an early prejudice, resulting from what appears to Dr. Macdonald as the hasty observation of preceding observers, it has long been overlooked and considered as the homologue of the pectoral limb. This great error has rendered the whole subject confused and complicated, and has given rise to many of what Dr. Macdonald considers the extravagances of Geoffroy St. Hilaire and his followers in the French school, and constrained them to mistake the true respiratory or humeral epicycloid ramus, and superadd to this class the additional zone and membral ramus, under the vague idea of its being greatly developed tympanic bones; whereas, had they seen the analogy of the human tarsus and carpus, they never would have mistaken the tibia for the scapula or brachia, or the calcis for the ulna, and the scaphoid for the radius; and had they even examined the higher or cartilaginous fishes, they would have seen the opercular bones removed somewhat further down the trunk, and the pelvic or coxal zone and epicycloid ramus more distant. This would have led Professor Owen not to have considered the posterior extremity or coxal zone and limb as the divergent appendages of the occipital vertebra. As to the homologies of these parts, the Doctor postponed the consideration of them till another opportunity, and proceeded simply with the tarsus. This consists in Man and many mammals of seven bones, which are arranged in two rows; each row has developed from it one or more digital phalanges when most developed; with the first row the thumb or great toe is developed, while the other toes having metatarsal and digital phalanges are connected with the anterior row or distal end of the tarsus, where the tarsal bones are fused or developed in a single bone. This is beautifully seen in many of the birds, especially the Curores and Grallatores: in the Apteryx, as figured in the ‘Zoological Transactions’ by Prof.

Owen, vol. iii. pl. 49, the tarsus is seen to consist of a single bone, terminating in three distinct knuckles, for the articulation with the metatarsal phalanges; while the thumb is seen with its different joints on the posterior and inner aspect, and in its natural position. This part of the leg has long been mistaken by ornithologists: Prof. Owen calls it tarso-metatarsal, and Dr. Melville views it as the metatarsal, which Dr. Macdonald asserts is surely more erroneous than even Prof. Owen's view.

"The thumb or great toe very often disappears in the endoskeleton, but may sometimes be seen in the exoskeleton, as in the leg of the Horse and some other mammals, where the metatarsus is fused into a single or shank-bone, terminating in a single phalanx as in the Horse, or double phalanx as in the Llama.

"Dr. Macdonald also briefly alluded to the nomenclature adopted by entomologists and other annulose zoologists, and maintained, that if the nomenclature of the anatomist was to be appropriated by them, they were bound to use the terms anatomically; and then submitted the following sketch of the homologies of the posterior leg:—

Coxa = Cotylon.

Trochanter = Femur.

Femur = Tibia.

Tibia = Tarsus and great toe.

Tarsus = Metatarsus and phalanges.

"These homologies are easily traceable in all the six legs of the Entomoid classes, and also in the thoracic legs of the Crustacea, and are particularly well-marked in the large claw of the Crab, where the lines and markings point out the metatarsal and digital phalanges, terminating in the large claw; where the thumb or opposable claw is jointed to what may be viewed as homologous to the tarsus, while the rest is the fused terminal phalanges."

The communication was also accompanied with a verbal explanation of the several diagrams exhibited.

December 12.—R. C. Griffith, Esq., F.G.S., in the Chair.

The following papers were read to the Meeting:—

1. ON THE HABITS OF A LIVING SPECIMEN OF NANINA VITRINOIDES (DESH.). BY H. E. STRICKLAND, F.G.S.

On the 2nd of December, 1847, Capt. W. J. E. Boys presented me with three specimens of a terrestrial mollusk, named *Nanina vitrinoides*, by Mr. Gray (P. Z. S. pt. 2. p. 58; *Helix vitrinoides*, Desh.). Capt. Boys had procured them a considerable time before, certainly not less than a year, in the district of Ajmeer in Upper India. The animals still remained within the shells, but from the length of time during which they had been kept dry they were greatly reduced in bulk, and had almost wholly retired from the outer volution, as was easily seen from the transparency of the shell. Like many of the *Helicidae* of hot climates, especially those which are exposed to long intervals of drought, the *Nanina vitrinoides* secretes a calcareous *poma*, or deciduous operculum, every time that it retires into a state of

torpor. The specimens in question had formed two or three successive *pomata*, one within the other, during the process of their desiccation.

In hopes of restoring their animation, I placed them upon some wet moss in a warm room. Two of them proved to be past recovery, but the animal of the third was seen through the transparent shell to be gradually enlarging in bulk by the absorption of moisture, and at the end of a week it finally reached the door of its dwelling, threw off the *poma*, and began to crawl. A morsel of boiled carrot was presented to it, which it greedily devoured, and speedily increased in health and vigour. I have now kept this interesting creature a twelvemonth, and have often been tempted to exclaim with Oken, "What majesty is in a creeping snail; what reflection, what earnestness, what timidity, and yet at the same time what confidence! Surely a snail is an exalted symbol of mind slumbering deeply within itself."

Since its revival my *Nanina* has greatly increased in size, and has added half a volution to its shell, which now measures $\frac{7}{10}$ inch in diameter. Its favourite food is boiled carrots and raw lettuce-leaves. It generally remains quiet during the day, but crawls forth and shows considerable activity in the evening, and has never shown any inclination to hibernate or become torpid for a lengthened period.

The shell of *Nanina vitrinoides* is brown, glossy and pellucid, and in shape and colour closely resembles the shells of the European genus *Zonites*, from which, without examination of the animal, it seems to be generically undistinguishable. The animal however is very different, and is more allied to, though quite distinct from, that of the genus *Vitrina*. The foot, when contracted, is too large to be withdrawn into the shell, except after a considerable period of desiccation. When expanded, and at full stretch, the foot is remarkably long and narrow, measuring about two inches in length and $\frac{1}{5}$ inch in breadth. The hinder extremity is abruptly truncate, surmounted by a short horn-like appendage, similar to that in the larvae of certain Lepidopterous genera. But the most peculiar character in the animal of *Nanina* is that of the two elongate pointed lobes or flaps which project from the margin of the mantle, one on each side of the mouth of the shell. These lobes possess a certain amount of lateral motion, and a considerable power of retraction and expansion, but are always kept in close contact with the surface of the shell.

The animal is in the frequent habit of performing the following singular operation, which, as far as I am aware, has not before been noticed in any terrestrial mollusk. Crawling to the top of its prison (which consists of an inverted tumbler, with a small aperture for air), it suspends itself to the glass by the hinder half of the foot, and twists the anterior part round, so as to bring its lower surface into contact with the shell. By the great length and flexibility of the anterior half of the foot, it is enabled to twist in a variety of directions, and thus to crawl as it were over every part of its own shell in succession, the hind-part of the animal remaining all the while firmly attached to the surface of the glass. During this operation the

horns are partially contracted, and the mouth of the animal is applied closely to the shell, and is seen to be alternately expanded and contracted, as if in the act of suction. In fact the whole process closely resembles the action of a cat when licking its feet and body, and is performed with just the same appearance of systematic determination. The object of this operation is no doubt the same in both animals,—that of clearing their persons from extraneous matter, and producing that aspect of cleanliness and beauty which is one of the laws of organic nature in its normal state. Hence that brilliant gloss which distinguishes the shell of the mollusk here referred to.

It would be desirable to ascertain whether any analogous habit is possessed by the allied genera *Vitrina* and *Zonites*. The shells of the British species of *Zonites* (*Z. nitens*, *alliacea*, *cellaria*, &c.) closely resemble *Nanina vitrinoides* in form, colour, and glossiness of surface, and their brilliancy must apparently be due to some polishing action similar to that here described. On the other hand, it is difficult to understand how the animals of *Zonites* and *Vitrina*, whose foot is much broader and shorter than in *Nanina*, should be able to reach every part of their shell and to purify its surface.

The animal of *Nanina vitrinoides* is of a deep cinereous, the mantle yellowish, its lateral projecting lobes darker, the under surface of the foot pale grey, with a yellowish stripe along each side.

2. DESCRIPTION OF TWO NEW SPECIES OF CRUSTACEA. BY ADAM WHITE, F.L.S., ASSISTANT ZOOL. DEPT. BRIT. MUS.

CANCER (GALENE) DORSALIS, White, n. s. *C. pallidè carneus hepatico-rubris punctulis confertim sparsus, thorace macula magnâ hepatica dorsali, media, anticè angulati, posticè rotundata; thorace parte posticè dimidiata immaculata; pedibus carneolo-suaviter variegatis; pedibus penultimis longissimis; chelis magnis, pallidis, supernè punctulis hepaticæ sparsis, subtus et infra immaculatis; fronte planâ, medio duobus tuberculis, thorace, lateribus anterioribus, tuberculis quatuor minime elevatis.*

This singularly pretty species was sent home by Mr. John MacGillivray, the naturalist attached to Capt. Stanley's expedition: its beautiful dotted surface, the large liver-coloured mark on the middle of its carapace, and the great length of the penultimate pair of legs, as well as its semi-nodose, semi-crenate, latero-anterior edge, well determine it.

SQUILLA MULTICARINATA, White, List of Crustacea Brit. Mus.

S. thorace, et segmentis abdominalibus, multis carinis, sœpè parallelis, carini singulis, posticè productâ in spinam brevem; ordinibus duobus carinarum utriusque lateris, paulò majoribus.

This species comes in the second section of M. Edwards, and in his first subsection of it, in which the rostral plate does not cover the ophthalmic ring: the very numerous nearly parallel crests on each segment of carapace and abdomen, each crest produced slightly behind into a spine, at once indicate its distinctness from all *Squillæ* with the description of which I am familiar. Two specimens were

found in the Philippine Isles by Mr. Cuming (an indefatigable Fellow of this Society), and one, but a very small and badly-preserved one, was obtained on the voyage of H.M.S. Samarang, in Nangasaki Bay in the Eastern Seas.

MISCELLANEOUS.

GALLINAGO BREHMI.

Two specimens of *G. brehmi* have been shot at Jardine Hall on the 9th and 10th of October, being the first time that this species has been noticed as visiting our islands. We have no doubt that it has hitherto been overlooked, but one distinction is very easily noticed. On comparing the tail with that of the common snipe, it will be seen that the outline of the latter is rounded, while in *G. brehmi* the outer feather exceeds the length of the second. At this season of winter migration we would invite sportsmen to attend to the finding of this bird.—W. J.

Jardine Hall, Oct. 11, 1849.

MR. WILLIAM MACCALLA.

It is too often our painful duty to record the loss of some naturalist who has shown himself well qualified to advance science, had he been spared to us, but who is called away in the prime of life. Such is now our position, since we have to announce the death of Mr. W. MacCalla, the well-known young Irish naturalist. We had the pleasure of forming an acquaintance with him many years since in his native district of Conamara in the county of Galway, and then recorded his promise of distinction in the journals of the day. At that time he had only commenced his career by making himself acquainted with the zoology and botany of that wild country, and we believe that his first discovery of note was the heath afterwards named, at the desire of Sir W. J. Hooker, *Erica Maccallana*, in compliment to our distinguished friend Dr. J. T. Mackay, who was, we believe, poor MacCalla's first master in botany, and who had kindly encouraged him in his early and otherwise unassisted course of study.

We cannot do better than by adopting the language concerning him of Dr. W. H. Harvey, who speaks of him as follows in his beautiful 'Phycologia Britannica' (cclxiii.) when describing an Alga (*Enteromorpha Hopirkii*, MacCalla) named by him. His words are—

" In now adopting Mr. MacCalla's specific name I wish to record the regret I feel, in common with all naturalists acquainted with his merits, that death should so soon have closed a career which opened with so much promise of future fame. The readers of the 'Phycologia' must be well acquainted with the name of Mr. William MacCalla, in connection with the habitats of many of our rarest Algæ. It is therefore almost superfluous to say that he was well acquainted with the species, and had a most acute eye to detect a minute spe-

cies, and a most accurate judgement to discriminate one varying form from another. But though Algae were the natural objects in which of late he chiefly delighted, he had a very extensive knowledge of marine zoology, and has made large additions to the Irish fauna. Born in very humble circumstances, imperfectly educated, and always with narrow means, he had to struggle through life with many hindrances to progress. That he overcame many of these hindrances is a proof of his talents and energy; that he did not overcome all may well be forgotten by those who have not had to struggle with any, and yet do not fear to criticize the short-comings of others. Mr. W. MacCalla fell a victim to cholera in May 1849, aged about 35."

METEOROLOGICAL OBSERVATIONS FOR SEPT. 1849.

Chiswick.—September 1. Heavy rain: lightning, with fine rain 10 p.m. 2. Fine: thunder and lightning, with rain 8 p.m. 3. Very fine: lightning, with rain at night. 4. Fine: cloudy: very clear at night. 5. Hazy: very fine: clear. 6. Clear and very fine. 7. Cloudy: very fine: cloudy. 8, 9. Fine. 10. Cloudy: heavy showers in the evening. 11. Hazy: very fine: clear. 12. Heavy rain. 13. Overcast: rain: clear. 14—16. Fine. 17. Clear and fine. 18. Clear and cold: cloudy. 19. Very fine. 20. Fine. 21. Showery: fine. 22. Fine. 23. Dusky haze. 24. Foggy: very fine: clear. 25. Foggy: exceedingly fine. 26. Foggy: fine: clear. 27. Fine: rain at night. 28. Clear: very fine: overcast. 29. Overcast: fine: heavy rain. 30. Rain.

Mean temperature of the month	57°·76
Mean temperature of Sept. 1848	55 ·96
Mean temperature of Sept. for the last twenty-three years	57 ·23
Average amount of rain in Sept.	2·73 inches.

Boston.—Sept. 1. Cloudy: rain p.m. 2. Cloudy: rain early a.m., with thunder and lightning. 3. Fine: rain early a.m., with thunder and lightning. 4. Cloudy. 5. Fine. 6. Fine: rain p.m. 7, 8. Cloudy. 9. Fine. 10. Cloudy: rain a.m. and p.m. 11. Cloudy. 12. Cloudy: rain a.m. and p.m. 13. Rain: rain a.m. 14, 15. Cloudy. 16. Fine: rain a.m. 17—20. Fine. 21. Fine: rain and hail early a.m. 22, 23. Fine. 24. Cloudy. 25—27. Fine. 28. Rain: rain a.m. 29, 30. Rain a.m. and p.m.

Applegarth Manse, Dumfries-shire.—Sept. 1. Dull a.m.: cleared: fine harvest day. 2. Hail: thunder: rain a.m.: fine p.m. 3. Dew-like shower a.m.: fine: sultry. 4, 5. Beautiful harvest day: sultry p.m. 6—8. Fine. 9. Showery all day. 10. Very wet a.m.: cleared and fine p.m. 11. Fair a.m.: shower p.m. and thunder. 12. Fair: dull p.m. 13. Fair: high wind. 14. Dull and threatening rain, but cleared and was fine. 15. A shower: looking unsettled. 16. Heavy rain early a.m.: thunder. 17, 18. Fine: very beautiful day. 19, 20. Fine: cloudy: fine harvest day. 21. Fine: cloudy: bar. falling. 22. Fair still. 23—26. Fair. 27. Fair: clear and cold. 28. Rain nearly all day. 29. Rain. 30. Storm of wind and rain.

Mean temperature of the month	53°·5
Mean temperature of Sept. 1848	53 ·1
Mean temperature of Sept. for the last twenty-five years .	53 ·0
Average amount of rain in Sept. for the last twenty years	3·13 inches.

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

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

THE ANNALS
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[SECOND SERIES.]

No. 24. DECEMBER 1849.

XL.—*On the Primrose-leaf Miner: with notice of a proposed new Genus, and characters of three Species of Diptera.* By Mr. JAMES HARDY*.

THE Primrose is perhaps the most popular of our native plants, associated as it is with bright skies, the song of birds, and spring-tide anticipations. What youthful bard has not attuned his lyre to the inspiration of the pale features of

“The ae flower, the ae first flower,
Springs either on moor or dale?”

and grave and reverend sages have written, experimented and surmised, till the poor flower may be said to be put fairly out of countenance. But although thus a theme of general regard, and one in which most, simple or sage, at one time or another have been interested, there is one portion of its history as yet unassayed, or if touched, still left in conjecture and obscurity. I allude to the curious and beautiful appearances, that every close observer must have remarked, which many of the leaves of the plant put on, long after the frail blossom that first drew willing eyes has withered and passed away, and which still preserve for it a claim on more than passing attention. On picking up one of the leaves, sometimes the middle part of the upper surface will be found of nearly a pure white, which, where it is limited by the original green, presents a wavy and exceedingly fantastic outline; at other times small undulating bands issue from the colourless central area, like streams

“Devolving from their parent lakes:”

at times we have before us the representation of a serpent untwisting its many coils, and at others a congeries of minute worms, inextricably intertwined, of which we can trace a general

* Read before the Berwickshire Naturalists' Club, at their Meeting of the 17th October 1849.

source, but whose terminations are quite a maze. On turning up the underside of the leaf, however, none of these appearances are perceptible; the tint being of a uniform green. On holding it up to the light, we see in the interior a number of dark specks placed at widish intervals, generally following the several windings, and like so many guide-posts stationed to indicate a thoroughfare through the intricacies. Here then are characters of no ordinary kind, tastefully designed, and evincing lengthened operation; how shall we decipher the legend? and by whom, and with what intention was it inscribed? What a strange tale superstition unfolds respecting these mysteries! June 1825. "In some parts of Dorsetshire and Devonshire a species of blight or grub* has settled on the blackberry [bramble] leaves, gnawing them in a serpentine manner, so that the dead fibre shows through the remaining green. This circumstance has produced, in consequence of a certain prophecy, a great degree of alarm in the minds of the lower classes residing on the borders of Dorset and Devon. It has gone forth that a 'flying serpent' will poison the air, which, becoming impure, will cause the death of nineteen out of twenty; and that the time will be known by this particular appearance on the leaves, which the pseudo-prophet calls the reflection of the serpent. The serpent whose pestilential influence is to be felt, is Satan, whose period of bondage is expired. The deaths will take place principally among persons under thirty years of age. Hundreds of individuals have paid for charms to secure themselves from danger and infection." (Annual Register for 1825, Chronicle, p. 89.) But from the ravings of folly, let us now turn to the explications of fact. In Rennie's interesting little work on 'Insect Architecture,' vol. i. p. 223, 2nd ed., there is a short account of this phænomenon, with a representation of one of its variable configurations. It is there ascribed to the work of a mining caterpillar, which excavates the pulp from beneath those parts of the upper membrane of the leaf, which are left colourless. The small granular bodies already referred to are its ejectamenta, and they follow, although the author rather denies this, the track the miner has taken during its labours. This is so far correct; but from the connexion of the statement,—the mining caterpillars of small Lepidoptera being treated of, and the use of the word "Caterpillar,"—one would infer, that the author imagined that it belonged to some minute moth; and such, till I recently had an opportunity of investigating the subject, I always understood was the meaning implied. But this is a mistake, for the little miner is the maggot or larva of a small, black, two-winged fly belonging to the genus

* This is occasioned by the caterpillar of a minute moth.

Phytomyza of Meigen, of which many of the species in their early stage are known to feed on the parenchyma of leaves. Having traced its states as larva, pupa, and at length a perfect fly, I have been enabled to ascertain the characters of each ; and these, as I am not aware of the field being pre-occupied, I shall proceed to detail ; and although description is often a barren region to travel through, some interesting features of its œconomy will occur at intervals to lighten the footsteps and reward perseverance.

The *larva* is minute, of a pale glassy green, with the interior darker from the colour of its food ; it gradually tapers away behind and is truncate at the tip, but widens towards the front, and is then rather suddenly brought to a point ; the segments are regular, distinct, the edges rather elevated, crenulate ; about four or five of the anterior ones are protuberant on the sides, the third being the most prominent ; the first is provided with two bent black oral hooks, which unite interiorly with an apparatus connected with the muscles which put them in play ; [the two fore spiracles have been omitted to be noticed, but they are probably, as in other species, situated behind the head, above ;] the posterior end is shaped like the stern of a boat, and is furnished above with two projecting, white spiracular processes, which are barbed like fish-hooks ; the anus is a slit at the tip, between two tubercles. Length $\frac{5}{4}$ line. It is by means of the hard oral mechanism that it executes its pretty workmanship, which it does, while lying like a true miner, on one of its sides, by a rapid and continuous rasping or "raking" of the green matter indispensable to it as food. I have not ascertained when it first commences its proceedings, but on the 13th of August I could only detect a single specimen in the larva state. Usually a leaf is tenanted by only a single occupant ; but there are instances when two have obtained possession, and then the space from which the colour is discharged is proportionally enlarged, and the convolutions are considerably more tortuous. Upon arriving at a condition suitable to a change of state, which depends greatly upon the quantity and quality of the food that remains to be supplied, the larva leaves the side of the leaf to which it has hitherto been confined, cuts through the pulpy part of the inferior membrane, till it has reached the lower cuticle, through which it thrusts the tips of its posterior spiracles as well as those of its head, and in this position becomes converted into a small light-coloured pupa, the case being formed of the indurated skin of the larva. It has the instinct almost invariably to fix itself alongside of the midrib or one of the secondary fibres ; perhaps being induced to this by the obstacles they present to its progress in mining ; and the case being covered with the thin

hairy integument of the leaf, is so like a portion of its substance, as sometimes to elude even a very close inspection. The *pupa* is of a light yellow or straw colour, with the seams of the segments brownish, and sometimes it is entirely light brown; slipper-shaped, being rather tapered behind, a little swollen before the middle, conic and somewhat abruptly contracted anteriorly, where the edges of each of the wider segments overlap the one immediately preceding it; smooth; convex above, although sometimes rather compressed, suddenly sloping down in front; segments very distinct, considerably convex, the division lines crenulate, scarcely continuous across the flattish underside, being indicated by transverse punctures and abbreviated lines; the brown sharp-pointed fore-end projects a little beyond the line of the under surface of the body, and is tipped with two longish slender bent black spines, which approximate at their origin, but diverge outwardly; these, in perfect specimens, have at their apices an armature like a fish-hook, both the barbs being reverted; beneath these on the under surface there is a brown or rufous spot; the last segment posteriorly has a channel down the middle with two ridges to bound it, and externally to these two corresponding depressions; the apex is stern-shaped or subtriangular, with two long projecting points, one on each side, above; each of which has a black spinous point, near the base of which a sharpened barb branches out, directed towards the upper surface of the body; the apex is a tubercle halved by a fissure. Length $\frac{3}{4}$ line. The object of the barbed hooks with which the fore and hinder spiracles are accessorially provided, and which are more distinct in this than in any other species I have observed, seems to be to insure the pupa-case from being separated from the leaf by ordinary accidents. The hooks invariably project beyond the cuticle, and are often snapped asunder and left behind in attempts to disengage the pupa-case. On the eve of assuming its final condition a breach is made in the case towards the anterior part, through which the imprisoned inmate obtains access to the open air; destitute of wings at first, but soon equipped with these appendages, that enable it to pursue its destinies under a new and higher degree of development. The *fly*, whose early life and ultimate *début* we have thus traced, presents the following characters:—Black; face black, but when alive gray in some lights, with a deeper shade of black round the eyes and down the face; front black, its edges gray, with a row on each of black bristle-bearing dots; vertex also bristled; a grayish patch above the antennæ, which as well as the bristle are black; third joint large, circular, flattened, finely griseous downy; trunk white, palpi black; thorax subquadrate, considerably convex, and as well as the scutellum slaty black, with several lines of black bristles along

its surface, and two long ones at the apex of the scutellum ; abdomen shining black, its hairs also black, the hinder edges of its segments narrowly lighter or subcinereous ; a white band along each side when alive ; beneath with a black, gradually widening band down the belly, composed of a series of shining black spots set in a whitish edging, the first square, the succeeding parallelogrammic, the last situated on the hinder edge, anal segment black ; legs black, tip of the anterior thighs whitish, in the other pairs less distinctly paler ; poisers white ; wings nearly hyaline, with fine iridescent tints of purple, blue, green, orange and brown ; their insertion whitish ; the costal cell has a cross nerve, and is inclosed by two short curved nervures, the upper very faint, the lower strong and black : there are five longitudinal nervures, of which the two upper are strongest, and a faint sixth or anal one that does not reach the lower edge of the wing ; the third has a small cross nerve betwixt it and the second before the junction of the latter with the first, and is united with the fourth by a small transverse line near the base of the wing ; the fifth springs from the root of the wing and unites with the sixth by an arched cross line that runs to the short stronger one that combines the third and fourth. Length $\frac{3}{4}$ -1 line. Expansion of the wings 2 lines. The female is the larger, and has the abdomen ovate and sharp at the tip ; that of the male is more cylindric, with the apex obtuse. When dried the white lateral lines of the abdomen are generally obliterated, and the belly and upper surface become of a uniform black. The first of these flies appeared on the 15th of August, the day on which I gathered the pupæ ; others came out on the 27th, and again on September 3rd. The earliest period at which I have taken them in the woods was in the beginning of April, when they frequented the trunks of some recently felled birch-trees to feast upon the sap. The larva is infested by a small parasitic *Ichneumon* that attacks several other species, and must considerably diminish their numbers ; those that become pupæ late in the season being almost as likely to produce parasites as flies.

The fly belongs to the Acalyptratae division of the Muscidæ, and owing to the comparative imperfection of its organization is placed near the termination of the series. Its position in the arrangement is with the Heteromyzidæ : in the present instance, however, the nervures of the wings present an exceptional character ; the mediastine nerve being double, and not simple, as it is said to be in this family. The species appears to be the *Phytomyza nigra* of Meigen, *Europ. Zweif. Insekt.* vi. 191, which he designates briefly as "nigra ; thorace cimerascente ; halteribus genibusque albis ; alis hyalinis." The only doubt as to this, arises from another species occurring, which, as a fly, it is almost

impossible to separate from the present, but which, in its pupa state, is very distinct; and the mode of mining adopted by the larva supplies another diversity. It is probably the *Ph. obscurella* of Fallen (Phytomyz. iv. 8), which is characterized in nearly the same terms: "nigricans; proboscide halteribusque albis; tibiis genubusve subpallidis." Mr. Haliday bred *Ph. obscurella* from the holly (Ent. Mag. iv. 147), and I obtained my specimens from pupæ inclosed in the leaf of a honeysuckle, growing in the shade of that tree. In addition, I may remark, that a species supposed to be *Ph. nigra* was procured by Mr. Curtis (Brit. Ent. fol. 393) from pupæ found by a lady under the leaves of the columbine; and that Rennie observes that the leaves of the polyanthus are occasionally affected in a manner similar to those of the primrose.

From the examination of several species of these miners in their various states, I have been led to perceive that there are at least two generic forms included under the term *Phytomyza*, and which, although I do not find any tangible distinctive character in the perfect insects, I propose to separate on account of differences in the pupa state, accompanied by a corresponding variation in habit. To those with slipper-shaped pupæ, whose transformations take place entirely within the leaf, I propose to apply the name *Chromatomyia* ($\chi\rho\omega\mu\alpha$, color; $\mu\nu\alpha$, musca); while the name *Phytomyza* may be retained for the species whose pupæ are barrel-shaped, and whose larvae enter the ground to pass the period antecedent to their final change. The larva of one species, *Ph. lateralis*, is said to live and undergo its mutations in the interior of the heads of *Pyrethrum inodorum* (Curt. Brit. Ent. fol. 393); but whether this departure from the general habit is attended with a change of structure we are not informed. The species, whose complete history has been ascertained, stand as follows:—

CHROMATOMYIA, Hardy MSS.

1. *Ch. flaviceps*. Phytomyza flaviceps, Macq. Dipt. (S. à Buffon) ii. 616. Larva subcutaneous in the leaves of the honeysuckle.
2. *Ch. nigra*. Phytomyza nigra, Meig. vi. 191. Larva found in the leaves of the primrose.
3. *Ch. obscurella*. Ph. obscurella, Fall., Meig. vi. 191. Larva lives in shapeless blotches in the leaves of the honeysuckle.
4. *Ch. cinereofrons*, Hardy MSS. Nigro-cinerea; hypostomate albo-infuscato; proboscide albida; fronte cinerea; marginibus oculorum punctis nigris notatis; palpis, antennis, punctoque verticis nigris; thorace scutelloque cinereis, opacis; abdomine griseo-nigricante, nitido; margine postico segmenti penultimi

arcte subalbido; vitta laterali parva albo-flavescens; ventre, plaga minime interrupta gradatim laxata nigra nitida, instructo; pedibus nigris, genubus strictius albidis; halteribus albis; alis hyalinis, ad bases exalbidis, nervo transverso singulo. Long. corp. lin. $\frac{3}{4}$.

This is nearly allied to the next. The larva mines the leaves of barley. Two examples of the fly have been obtained.

5. *Ch. Syngenesiae*, Hardy MSS. Nigro-cinerea; hypostomate proboscideque albis; fronte albo-flavescens; marginum oculorum punctorum serie, puncto verticis, antennis palpisque nigris; dorso thoracis, cumque scutello, cinereis, opacis, lateribus autem cinereo-nigricantibus; abdomine griseo-nigricante, marginibus posticis segmentorum quatuor primorum, anguste, quinti paulo amplius exalbidis; vitta laterali late alba; ventre nitido, incisuris albis, medio, plaga longitudinali macularum nigrarum, ornato, quarum prima quadrata, reliqua parallelogrammicae, margine postice quintae interdum circulatim sinuato; segmento ultimo toto nigro; pedibus nigris, genubus albidis; halteribus albis; alis hyalinis, ad bases exalbidis, nervo transverso singulo. Long. corp. lin. $\frac{3}{4}$ -1.

The larva subsists within the leaves of the groundsel (*Senecio vulgaris*), of the ragwort (*S. Jacobaea*), of the field-thistle (*Cnicus arvensis*), and of the sow-thistle (*Sonchus oleraceus*). The winding galleries which it traces in such an elegant manner round the edges of the leaves of the smooth-leaved maritime variety of the plant last-mentioned, appear to be represented in the 'History of Insects,' i. 298. fig. 1 (Family Library, no. 7); but the figure scarcely gives any idea of their exceeding neatness. I have it likewise from leaves of *Cineraria*, sent from Linlithgowshire. The size is constant, which will separate it from the next, said to be $1\frac{1}{2}$ line long; and the colouring of the head, halteres, &c. appears to be much fainter than in *Ch. nigricornis*.

6. *Ch. nigricornis*. Ph. nigricornis, Macq. Dipt. (*S. à B.*) ii. 618. Larva lives in the interior of the leaves of cinerarias and turnips. *Curt. Gard. Chron.* Feb. 22, 1845, p. 117.
7. *Ch. ? Ilicis*. Ph. Ilicis, *Curt. Gard. Chron.* July 4, 1846, p. 444. Larva found beneath the leaves of the holly. *Curt. l. c.*

I have likewise obtained the pupæ of a species from the leaves of *Holcus lanatus*, but they proved abortive; and I have others from the leaves of the holly, from which the fly has not yet proceeded.

PHYTOMYZA, Fallen, Meig.

1. *Ph. flava*, Fall., Meig. vi. 196. Larva a miner of the leaves of the buttercup (*Ranunculus repens*), of the bachelor's buttons

(*R. acris, flore pleno albo*), and of the lesser spearwort (*R. Flammula*). Found by Mr. E. Doubleday in the leaves of the hart's-tongue (*Scolopendrium vulgare*). *Ent. Mag.* iii. 414, 415.

2. *Ph. albiceps*, Meig. vi. 194. Larva subcutaneous in the leaves of the cow-parsnip (*Heracleum Sphondylium*), and the field-thistle (*Cnicus arvensis*). Pupa-case black.
3. *Ph. Aquilegiae*, Hardy MSS. Nigricans; hypostomate sordide subflavo, proboscide alba; fronte flava; antennis palpisque nigris; thorace brevi, subrotundato, convexo, nigrogrisecente, subnitido, lincis dorsalibus longitudinalibus duabus obscuris ægre distinguendis, adumbrato; scutello conceolare; abdomine griseo-nigricante, nitido, incisuris interdum stricte albescentibus; vitta laterali parva alba; ventre nigro; pedibus nigris, genubus perobscurius pallidis; halteribus albis; alis hyalinis, ad bases exalbidis, nervo transverso singulo. Long. corp. prope lin. 1.

The larva forms blotches in the leaves of the common columbine (*Aquilegia vulgaris*). It is closely allied to *Ph. albiceps*, but is darker, with the thorax shorter and rounder, and the white dashes before the wings not developed. The pupa-case is brown.

To these may be added others whose changes are still incomplete, found within the leaves of the bean (*Vicia Faba*), the burdock (*Arctium Lappa*), the field-thistle (*Cnicus arvensis*), the wild angelica (*Angelica sylvestris*), the red clover (*Trifolium pratense*), the red hemp nettle (*Galeopsis Tetrahit*), the climbing buckwheat (*Polygonum Convolvulus*), the quickeen (*Triticum repens*), the meadow-sweet (*Spiraea Ulmaria*), and the kidney-vetch (*Anthyllis vulneraria*).

Penmanshiel, by Cockburnspath, Oct. 13, 1849.

XII.—*On the Classification of some British Fossil Crustacea, with Notices of new Forms in the University Collection at Cambridge.* By FREDERICK M'Coy, Professor of Geology and Mineralogy in Queen's College, Belfast.

[Continued from p. 335.]

Ord. EDRIOPHTHALMA.

(Trib. *Isopoda*.)

Archæoniscus Brodiei (M. Edw.).

As this interesting Wealden Crustacean (first I believe taken for an oolitic Trilobite) has not yet been fully described, the following notice may be acceptable :—

Char. Oval, moderately convex; *head* semicircular, the angles rounded, bearing two large oval or slightly reniform globulated masses of minute round *eyes*; *thoracic segments* seven, broad, slightly granulated, with obtusely rounded ends, each extremity having a long triangular facet on its anterior margin (to facilitate rolling into a ball); *abdomen* of five segments, the first three abruptly smaller than the thoracic rings, the fourth a little larger, and the fifth forming a semicircular caudal shield, rather smaller and more convex than the head, bearing along its middle a narrow, defined, semicylindrical axial lobe, its rounded termination not reaching much more than halfway to the margin, the anterior end extending a variable distance towards the thorax.

I have not seen any trace (after examining about fifty specimens) of the lateral notches in the caudal shield for the articulation of lateral appendages, which Dr. Milne-Edwards says he thinks he saw. The only known species averages 6 lines long and $3\frac{1}{2}$ lines wide.

(*Col.* University of Cambridge.)

Ord. ENTOMOSTRACA.

(Trib. *Paeциlopoda*.)

This group being distinguished from other Entomostraca by having crustaceous, didactyle, ambulatory thoracic feet as well as membranous, respiratory abdominal ones, is I think clearly the place for those remarkable genera, *Eurypterus* and *Pterygotus*; I cannot conceive why Dr. Burmeister should imagine the first of those genera to have no shell, and overlooking the didactyle structure of the larger crustaceous chelæ, &c., place it in his group *Palæadæ* (Dal.), which, as he observes (*Organiz. Trilob.*, Ray ed. p. 53), might be united with the *Phyllopoda*. The figure and description given by Römer of the American species of *Eurypterus* in his paper in Dunker and Von Meyer's 'Beiträge zur Naturgeschichte der Vorwelt,' powerfully favour this view of approximating the genus to *Limulus*. With regard to the second genus, *Pterygotus*, M. Agassiz having renounced his original opinion of its being a fish, has, in his work on the Fishes of the Old Red Sandstone, referred it to the Entomostracea without indicating any particular division. Some years before the appearance of the 'Poissons fossiles des vieux grès rouge,' I had an opportunity of examining some much more perfect examples of this Crustacean than are there figured, which were brought before the Geological Society of Dublin by Dr. Scouler under the name *Lepidocaris* (from the scale-like sculpturing of the cephalic shield)*, and except the enormous difference in size, and perhaps

* See Dr. Apjohn's President's Address.

a difference of superficial sculpturing, I see nothing in it different from *Eurypterus*; and when we bear in mind that the *Idothea* of Scouler* is avowedly a *Eurypterus*, I cannot see how *Pterygotus* is to be separated as a genus, at least on any better grounds than the above. The tribe *Paecilopoda* might be resolved into two families: 1st, *Limulidæ*, having, besides the head, a second shield formed by the ankylosis of all the abdominal segments (*Limulus*); 2nd, *Eurypteridæ*, having all the abdominal segments distinctly separated (*Eurypterus*, *Pterygotus*, *Bellinurus*). The first division has not, I believe, been found lower than the oolites, the *Limuli* quoted by several British geologists from the coal-measures of Coalbrook Dale, &c. belonging clearly to the second division, and should rather be referred to *Bellinurus* of König.

Pterygotus leptodactylus (M'Coy).

Sp. Char. Large pincers having the hand about 5 lines wide, sculptured with fine short, irregularly flexuous, elevated lines; the penultimate or immovable finger exceedingly slender, compressed, about 2 inches 10 lines long, and only 2 lines wide at base, gradually tapering to less than a line towards its obtuse point, nearly straight, or with a scarcely perceptible inward curvature; sides divided into ridges by three or four longitudinal furrows, thicker towards the back; last joint or moveable finger similar to the immovable one, but rather smaller; inner edges of both fingers destitute of teeth or tubercles.

The pincers, instead of being excessively thick and strong, and armed with great teeth on the inner edge as in the *Pterygotus Anglicus* (Ag.), are perfectly unarmed, and so long and slender as possibly to indicate a separate subgenus, which might be named *Leptocheles* ($\lambda\epsilonπτὸς$, *tenuis*, $\chiηλῆ$, *forceps*). It strikes me (judging from the figures) that the *Onchus Murchisoni* (Ag.) is not an Ichthyodorulite, but the long finger of the chelæ of this Crustacean,—the size, form and sculpturing agreeing very nearly—while the base presents no trace of the abrupt diminution for insertion into the flesh, which would occur in all true *Onchi*. In the same bed with the long chelæ was found a specimen of the terminal or moveable finger, and one perfect claw with both fingers *in situ* of a much shorter form than the other; the hand being about 3 lines wide, the penultimate immovable finger about 1 inch long, and rapidly tapering from $2\frac{1}{2}$ lines wide at the base to the obtusely pointed apex; it is longitudinally sulcated like the longer one above described; the last joint or moveable finger is very different, being perfectly flat, triangular, 7 lines long, $1\frac{1}{2}$ line wide at base, and tapering rapidly to

* See Edinb. Journal of Science, vol. iii.

a point, the inner edge being straight and simple, the outer edge slightly convex. The hands of both kinds of chelæ are similarly sculptured with short, fine, sharp, irregularly curved, longitudinal plicæ, proving their identity, and that thus, like the recent *Pæcilopoda*, more than one pair of feet were didactyle.

In the fine olive schists (of the age of the Upper Ludlow rock) of Leintwardine.

(*Col.* University of Cambridge.)

Trib. *Phyllopoda* (= *Branchiopoda*, M. Edw.).

This tribe might be divided into the five following families, all having membranous feet :—

1. DAPHNIADÆ (= *Cladocera*). *Carapace* oval, compressed, the posterior portion bivalve, inclosing the body, the anterior end forming a separate beak-shaped hood for the head. *Eye* single, semicom pound*. *Feet*, only four pair, foliaceous. *Antennæ*, first pair small; second pair very large, branched and bristled for swimming. (Type *Daphnia*, &c.)

The *Daphnia?* *primæva* (M'Coy), Syn. Carb. Foss. Irel. t. 23. f. 5, is the only probable example of this family I know in the fossil state.

2. BRANCHIPODIADÆ. *Carapace* none, all the body-rings distinct and naked. (Type *Branchipus*.)

I know of no fossil example of this group.

3. TRILOBITADÆ (= *Palæadæ*). Head and abdomen covered by separate dorsal shields, thoracic segments naked, separately moveable, generally trilobed by two longitudinal depressions. *Eyes* two, large, semicom pound, or absent.

This very extensive group is only known in the fossil state, and apparently confined to the palæozoic rocks. I will offer some observations of detail below.

4. APODIADÆ. *Carapace* a semi-oval, horizontal shield, not covering the abdominal segments, which are distinct. *Eyes*, one simple and two large semicom pound ones. *Feet*, about 60 pair. (Type *Apus*.)

The carboniferous genus *Dithyrocaris* is I think referrible to this group, though I have not yet detected the eyes. (See Syn. Carb. Foss. Irel. t. 23. f. 2.)

* I use this term to particularize that type of eye so common among the Entomostraca, in which a mass of minute eyes are covered by one simple, undivided, external cornea, being thus intermediate between the simple eye, and the true compound eye in which the external cornea is faceted, and divided into as many portions as there are eyes beneath.

5. LYMNADIADÆ. *Carapace* a vertical, bivalve, oblong shell inclosing the whole body. *Eyes* two, semicom pound, either separate or united in one medial mass. *Feet* 20 to 30 pair. (Type *Lymnadia*, &c.)

(Fam. *Trilobitadæ.*)

Homologies of the 'cephalic shield' of Trilobites.—This has been less attended to than almost any part of their structure. The apparently anomalous nature of the facial suture has been spoken of by Burmeister, who saw no clue to its nature; the nature of the parts outside the eye-line, or 'wings' as they were called, has also been alluded to as inexplicable; while those who, comparing the Trilobites with *Branchipus*, supposed the body of the animal to occupy the axial lobe only, have expressed their astonishment at the eyes being placed on the lateral lobes, or 'cheeks.' When we bear in mind that the carapace of a crab, for instance, is a great backward prolongation of one of the rings of the head, and is quite distinct from the posterior cephalic and the thoracic segments which it covers, and which exist in a membranous state beneath it, we are prepared to admit, that though the segmental furrows on the glabella of many Trilobites indicate cephalic rings, they by no means prove the cephalic shield to be formed of the ankylosis of such rings, which may only exist below, impressing it like the various regions on the back of a crab. To determine of what rings it is composed, I started with the main characteristic of the first ring of all Crustacea, which is, to bear the eyes when they are present; the second and third bear the antennæ, and the remainder of the cephalic rings bear the parts of the mouth. The eyes of Trilobites, when they exist, are always connected with the piece anterior and external to the eye-line; this piece is usually continuous from side to side at the front margin, and I think is probably the first or ophthalmic ring; its lateral portions produced backwards, and bearing its peculiar appendages, the eyes, with it: every ring being theoretically divisible into six pieces, affords an explanation of the suture which sometimes separates the two parts in front, and even of the rostral shield of *Calymene* (if it belongs to this ring). On this view the facial suture becomes at once intelligible as the line of separation between the first and second cephalic rings, analogous to the divisional line between one thoracic ring and another. The piece within and behind the eye-line should on this supposition be the second or antennary ring; and as remarkably supporting this, I must refer to p. 42 of my 'Synopsis of the Silurian Fossils of Ireland,' where I announced the discovery of the remains of antennæ, as a deep pore on each side of the

front of the glabella, in the furrow which surrounds it, and in which, when clear of matrix, I have observed them in *Trinucleus*, *Acidaspis*, *Calymene*, *Ampyx*, *Griffithides*, &c. We would thus have the cephalic shield of Trilobites composed of an extension of the two first cephalic rings. The protuberance called the glabella probably contains the stomach, which is always in Crustacea large and over the mouth ; the segmental furrows indicating the rings which bear the parts of the mouth.

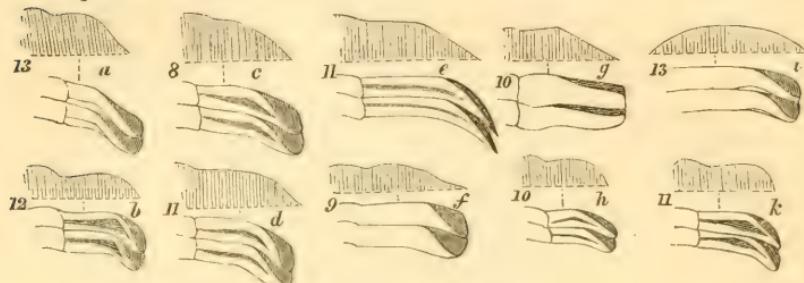
After much labour in investigating the characters of Trilobites, I venture to propose the following classification of the group, founded in the first instance on a consideration of the variations in structure of the *pleuræ* or lateral portions of the thoracic segments, which I find to afford definite characters, easily found in all moderately well-preserved specimens. The two principal methods hitherto proposed fall far short of a natural or satisfactory classification ;—that of Dr. Burmeister taking as the principle of division, the presence or absence of the power of rolling into a ball ; and Hawle and Corda resting their great divisions on the integrity or denticulation of the edge of the pygidium. The latter I believe to be of only specific importance ; and the former, though of imperfect application as stated by the author, becomes included in the following arrangement. An extended examination of the subject will show that Quenstedt, &c. cannot be followed in the attempt to base the primary divisions on the *number* of the thoracic segments—I have satisfied myself at least that that character loses among the Entomostraca the importance which it bears among the other Crustaceans, and that in the present family it is only of subgeneric value. In the following remarks I introduce two new terms—“*facet*” for the smooth, flat, triangular space at the extremity of the anterior margin of the *pleuræ* of certain Trilobites—and “*pleural groove*” for the shallow sulcus which extends from the axis a variable distance towards the extremity of each of the *pleuræ* ;—it is to the under side of this latter, as suggested by Burmeister, that the gill-feet were probably attached*. To facilitate the appreciation of those characters, I subjoin sketches of the *pleuræ* of the more important genera, as the needful information is not given in the greater number of figures and descriptions of Trilobites hitherto published ; the numerals prefixed to each figure indicate the number of thoracic segments in each genus.

I propose dividing the family of Trilobites into the five following subfamilies :—1. *Asaphinæ* ; 2. *Paradoxinæ* ; 3. *Ogyginæ* ;

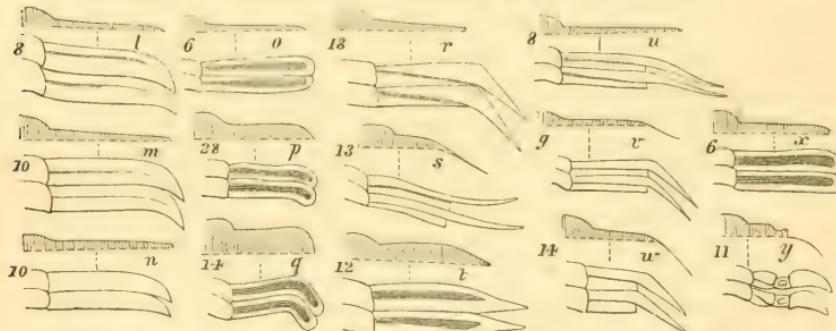
* The term ‘*fulcrum*,’ as sometimes applied to a point on the anterior edge of the *pleuræ*, clearly conveys a false mechanical notion, besides being synonymous with the already current term ‘*knee*’ used by Pander and Portlock.

Faceted pleuræ of Trilobites.

- a*, Calymene; *b*, Ellipsocephalus; *c*, Asaphus; *d*, Phacops; *e*, Odontochile; *f*, Dysplanus; *g*, Illænus; *h*, Forbesia; *i*, Homalonotus; *k*, Trimerocephalus.

*Non-faceted pleuræ of Trilobites.*

- l*, Ogygia; *m*, Lichas; *n*, Bronteus; *o*, Ampyx; *p*, Harpes; *q*, Conocephalus; *r*, Paradoxides; *s*, Zethus; *t*, Cryphaeus; *u*, Acidaspis; *v*, Stau-rocephalus; *w*, Olenus; *x*, Trinucleus; *y*, Ceraurus.



4. *Harpedinæ*; 5. *Agnostinæ*. The British genera would arrange themselves as follows, and where the value of any of the groups was not previously settled, I have added a few explanatory words.

1st Subfam. *ASAPHINÆ*.

Pleuræ bent down at the ends, each with a distinct trigonal facet at the anterior edge.

These are the most perfectly organized Trilobites; they have a compact ovate form, and from the deflexion of the margin are of considerable depth; they all, I believe, have the power of rolling into a ball, and are the only Trilobites having the triangular facets at the anterior edges of the ends of the pleuræ. The following are British genera and subgenera:—

Gen. 1. *PHACOPS* (*in a wider sense than Emmerich*). Lateral cephalic angles prolonged backwards; glabella wider in front than at base; sides with three large segmental furrows; eyes

largely faceted; facial suture cutting the lateral cephalic margin in front of the angles; eleven thoracic segments.

Subgen. 1. *Phacops* (Em.). Pygidium with eight to twelve joints in the axis; hypostome simple.

Subgen. 2. *Odontochile** (H. & C.). Pygidium with twelve to twenty-two joints in axis; hypostome dentated.

Subgen. ? 3. *Chasmops* (M'Coy). Eyes small, "hiant;" middle pair of lateral glabellar lobes obsolete.

Subgen. 4. *Portlockia* (M'Coy). Two anterior pair of lateral glabellar lobes obsolete; lateral cephalic angles rounded.

2. CALYMEENE (*in a wider sense than Brongniart*). Lateral cephalic angles not prolonged, exactly bisected by the facial suture; eyes small, "hiant;" glabella narrower in front than at base; thirteen thoracic segments.

Subgen. 1. *Calymene* (Br.). Axis of body strongly defined from the lateral lobes; three segmental furrows to each side of glabella.

Subgen. 2. *Homalonotus* (König). Axis not defined from lateral lobes; no segmental furrows to glabella.

3. TRIMEROCEPHALUS (M'Coy†). General character of *Portlockia*, but without eyes or facial sutures.

4. ASAPHUS (*in a wider sense than Brong.*). Cephalic and caudal shields nearly equal; external cornea thick, smooth; facial suture cuts the posterior margin within the angles; eight thoracic segments.

Subgen. 1. *Asaphus* (as restricted to the type of *A. cornigerus*, not British) = *Hemicrypturus* (Gr.).

Subgen. 2. *Isotelus* (DeKay).

Subgen. 3. *Basilicus* (Salt.). General character of *Isotelus*, but with many simple segmental furrows to pygidium.

5. ILLÆNUS (Dal.). Head and tail nearly alike, axial furrows only indenting their margins; facial suture cutting the posterior margin; pleurae with long, narrow, obscure facets and no pleural grooves.

Subgen. 1. *Illænus* (Dal.). Ten thoracic segments, lateral cephalic angles rounded.

Subgen. 2. *Bumastus* (Murch.). Resembling *Illænus*, but the thorax not trilobed.

Subgen. 3. *Dysplanus* (Burm.). Like *Illænus*, but cephalic angles prolonged and only nine thoracic segments.

6. FORBESIA (M'Coy). Glabella distinct; facial suture cutting the middle of posterior margin; pygidium with articulated axis

* *Dalmannia* of Emmerich, not of Robineau-Desvoidy.

† For characters see below.

and duplicate lateral furrows; thoracic segments ten, pleural grooves slightly oblique, facets large.

Subgen. 1. *Forbesia* (M'Coy) = *Aenaria*, Burn. Cephalic angles produced; glabella with three pair of segmental furrows; ends of neck-segment forming large tubercles.

Subgen. 2. *Prætus* (Stein.). Cephalic angles not produced; no segmental furrows to glabella.

7. **PHILLIPSIA** (Portk., extended). General character of *Forbesia*, but only nine thoracic segments. (Carboniferous.)

Subgen. 1. *Phillipsia* (Portk.). Base of glabella wide, sides with three segmental furrows.

Subgen. 2. *Griffithides* (Portk.). Base of glabella contracted, sides without segmental furrows.

2nd Subfam. PARADOXINÆ.

Head large; pygidium diminutive; thorax long; pleuræ flat, not bent down at the end, terminating in long spines; pleural grooves straight; no facets.

An easily recognized group of long-bodied, flat Trilobites with large heads, the angles of which and the ends of the pleuræ are produced backwards into sharp spines. None of these can roll into a ball.

1. PARADOXIDES (not British).

Subgen. 1. *Olenus* (Dal.). Fourteen thoracic segments; pygidium small, with entire margin.

2. **CERAURUS*** (Green, emended by Hall). Glabella cylindrical, reaching the front margin, with three pair of segmental furrows; facial suture cutting the outer margin considerably in front of the angles; eleven thoracic segments; pleuræ each with a short oblique pleural groove dividing its tumid origin, ends flat, falcate; pygidium moderate, the margin with six or eight thick spines; cephalic angles prolonged.

3. **CRYPHÆUS** (Green) = ? *Eccoptochile* (Hawle and Corda). Head as in *Ceraurus*; twelve thoracic segments; pleuræ wide, divided by a long mesial pleural furrow not reaching the margin; ends thickened and each extended in a slender spine; pygidium of three thin flat lobes on each side.

4. **SPHÆREXOCHUS** (Beyrich). Glabella hemispherical; posterior pair of segmental furrows very large, circular, two anterior pair rudimentary or absent; lateral angles rounded, divided

* *Chirurus* (Beyrich) is I think certainly a synonym of this genus; the recently published figures by Hall (Palaeontology of New York), of Green's original specimen of *Ceraurus*, showing all the characters of the Bohemian genus.

by the facial suture ; eleven thoracic segments ; pleurae simple, obtuse ; pygidium as in *Ceraurus*.

5. ACIDASPIS (Murch.) = *Odontopleura* (Em.).
6. STAUCHEPHALUS (Bor.*).
7. REMOPLEURIDES (Portk.†).
8. ZETHUS‡ (Pand., as defined by Volborth) = *Cybele* (Lovén) + *Atractopyge* (Hawle and Corda).

3rd Subfam. OGYGINÆ.

Body flat, broad oval ; thorax about as long as the head ; pleurae flat, falcate, with a pleural groove not reaching the margin ; ends not bent down, nor produced into spines ; no facets ; pygidium nearly as large as the head.

This group would include (so far as I know) all flat-sided Trilobites not entering into the *Paradoxinæ*, but, unlike them, the body is wide and short, the pygidium instead of being diminutive is nearly as large as the head, and the segments are remarkably few and never extend into spines. The eyes are small or absent.

1. TRINUCLEUS (Murch.). Head surrounded by a wide, pitted margin ; six body-rings ; no eyes, cheeks not diagonally cut by the eye-line.

Subgen. 1. *Tetrapsellum* (H. & C.). Only four body-rings.

2. TRETASPIS (McCoy). Resembling *Trinucleus*, but the cheeks divided by a diagonal eye-line, and with an ocular tubercle in the middle ; five body-rings. (See description below.)

3. AMPYX (Dal.).

4. OGYGIA (Brong.).

Subgen. 1. *Barrandia* (McCoy). (For characters, see below.)

5. BRONTEUS (Gold.).

6. LICHAS (Dal.).

Subgen. 1. *Trochurus* (Bar.).

Subgen. 2. *Acanthopyge* (H. & C.).

4th Subfam. HARPEDINÆ.

Head large ; pygidium very small ; body long, rapidly tapering ; pleurae abruptly bent down and obtuse at the ends ; no facets.

* I have recently noted the *S. Murchisoni* in the Rhiewlas limestone.

† I suspect the thoracic segments in this genus are only six to eight in number, terminating at the long spines of the *R. laterispinifer* and *R. dorso-spinifer* (Portk.), which I think probably mark the origins of the pygidium ; but not having access now to perfect specimens of those rare Trilobites, I can only offer these remarks as suggestions founded on analogy.

‡ The genus *Encrinurus* seems closely allied in many respects to *Zethus*, but differs by its simple, obtuse, thoracic segments ; not however being quite sure of the structure of those latter, I am unwilling to assign the genus a place in the system.

1. HARPES (Gold.).

? 2. HARPIDELLA (M'Coy). See below.

? 3. AMPHION* (Pand.).

5th Subfam. AGNOSTINÆ.

Minute, blind ; only two thoracic segments ; head and abdomen covered by nearly equal and similar rotundato-quadrata shields.

This subfamily includes both the families *Phalacromides* and *Battooides* of Hawle and Corda, distinguished solely by the serration or smoothness of the margin of the tail,—a point in my mind of generic value at most.

From the absence of eyes, and the very slight powers of locomotion argued by so small a number of thoracic, feet-bearing, rings, it occurs to me that the *Agnostinae* may hold the same position among the Trilobites that the *Suctorria* do among the Crustacea generally ; that group being similarly distinguished from its allies by the want of eyes, few body-rings, little or no powers of locomotion, and abnormally and variously shaped bodies ; being parasitic generally on fish. *Bophyrus*, the analogous group among the Isopod Crustacea, is always parasitic on the gills of the larger Crustacea, under their carapace ; and such I strongly suspect were the habits and mode of life of the *Agnosti*, living in all probability attached to the gill-feet on the under side of Trilobites, some of the largest known species of which accompany those little animals.

1. TRINODUS † (M'Coy) = *Arthrorachis* (Hawle and Corda).

2. AGNOSTUS (? British).

Subgen. 1. *Diplorhina* ‡ (H. & C.).

* This genus and *Encrinurus* present some points of analogy, and may serve to indicate the passage from this subfamily to the *Paradoxinæ* by means of *Zethus*, but I unfortunately cannot refer to any specimens of the body-rings of either *Amphion* or *Encrinurus* at present, and have therefore some uncertainty about them. I may here remark on the great apparent inequality of extent or numerical value of the five groups into which I have distributed the great family of Trilobites, that it results chiefly from a peculiarity of geographical distribution, and in great measure disappears when the large number of recently described foreign genera are included : thus the *Harpedinæ* and *Paradoxinæ*, which seem so meagrely represented in the above list of British genera, acquire a prodigious development in the Silurian rocks of Bohemia.

† I originally defined this genus in 1846 in my 'Synopsis of the Silurian Fossils of Ireland,' and pointed out its differences from *Agnostus* ; subsequently Hawle and Corda have figured and described the group under the title of *Arthrorachis* in their 'Prodrom.' on Bohemian Trilobites, without knowledge of what I had done, also pointing out its obvious differences from *Agnostus* (or *Battus*).

‡ I have noticed the *Diplorhina triplicata* in the black Llandeilo shale of Builth.

(Descriptions of new genera and species of Trilobites.)

Chasmops (McCoy), n. g.

Etym. $\chi\alpha\sigma\mu\alpha$, hiatus, and $\omega\Psi$, oculus.

Gen. Char. Cephalic shield subsemicircular, lateral angles produced backwards in triangular spines; glabella large, clavate, frontal portion very wide, transversely oval, only two distinct pairs of lateral segmental lobes, the anterior pair very large triangular, posterior pair small, middle pair obsolete or reduced to a minute tubercle; neck-segment strong: cheeks small triangular: eyes small, rounded, "hiant," corresponding in height to the middle portion of the first lateral lobe of the glabella; eye-line encircles the front of the glabella close to the margin, descends with an inward inclination to the eye, extending from behind the eye directly outwards to the lateral margin, which it cuts considerably in advance of the angles; thorax of eleven joints (*fid. Eichwald*); pygidium obtusely rounded, posterior margin deflected, anterior margin wider than the posterior; axis of about ten ribs, lateral ribs about two less, duplex.

The *Calymene Odini* of Eichwald may be looked upon as the type of this genus. It differs from *Calymene* in the glabella being so much wider in front than at the base, in the anterior lateral lobes being largest, in having but eleven (?) body-segments, and in its eye-line cutting the external margin in front of the angles, agreeing only in the structure of the eyes; these differences become agreements when compared with *Phacops*, from which it differs in the structure of the eyes. Of those organs in the present genus and in *Calymene* nothing is known beyond that they were of so tender and delicate a nature as readily to fall out after death, and are never found in the fossil state, their position being indicated by a hole, roughly filled by the matrix, forming the "hiant" eyes of systematists; in *Phacops*, on the contrary, the cornea is of extraordinary strength, and so firmly united to the rest of the cephalic shield, that no matter how much crushed the specimens may be, the eye always remains, and from its constant presence, coarse reticulation and large lenses, gives an appropriate name to the genus, and one which is in antagonism with that I have adopted for the present group: *Chasmops* differs besides from both those genera in the almost complete suppression of the middle pair of segmental lobes of the glabella.



Cephalic shield of
Chasmops.

Trimeroceraspis (M'Coy).

Etym. τριμερής, *tripartitus*, and κεφαλή, *caput*.

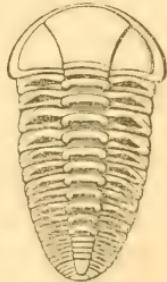
Gen. Char. Elongate ovate : *cephalic shield* semicircular, with the lateral angles obtusely rounded : *glabella* very broad, gently convex, widely rounded and touching the margin in front ; sides straight, converging to the narrow base ; neck-furrow strong, and one fine, directly transverse, segmental furrow a little above it across the base of the glabella ; *cheeks* smaller than the glabella, triangular, evenly convex, without eyes or facial sutures ; *limb* almost wanting in front of the glabella, forming a narrow margin to the cheeks, and being rounded at the lateral angles forms the thick posterior margin of the shield and neck-segment ; *thoræ* of eleven joints, lateral lobes wider than the axis, bent down at their margin ; each of the axial segments with a strong tubercle at each end ; *pleurae* of equal width throughout, blunt at their ends, which are bent downwards and a little backwards, each marked along the middle by a pleural groove, angularly bent backwards about the middle, but not reaching the margin ; trigonal facets small, narrow ; *pygidium* small, obtusely rounded, entire, axial lobe distinctly rounded with about four or five segmental furrows ; lateral lobes with about five flattened segments, each divided by a furrow.

This genus has been confounded by Count Münster, in his 'Beiträge zur Petrefactenkunde' for 1842 (only knowing the head), with *Trinucleus*, from which the structure of the body and tail, as well as the absence of the punctured border of the head, remove it very far ; and it has been referred by Prof. Phillips (Palaeozoic Fossils) to *Calymene*, from which the form of its cephalic shield and glabella, want of eyes and facial suture, and the different number of the body-segments, will I think sufficiently distinguish it.

I only know the genus in the Devonian rocks, the type being the *Trinucleus laevis* of Münster (*Calymene laevis*, Phil. Pal. Foss., not of Münster, whose *Calymene laevis* is a true *Portlockia*, M'Coy). It is perhaps most allied to *Ellipsocephalus* of Zenker, which has however twelve body-rings, eyes at the sides of the cheeks, a glabella pointed in front, and a little pygidium without segmental furrows.

Illænus latus (M'Coy).

Sp. Char. *Cephalic shield* more than twice as wide as long, mo-



derately gibbous towards the base, but about one-half of the front arched over to a vertical position (or at right angles to the basal portion or plane of the body); *axal furrows* considerably less than half the length of the head, width of the included space, or glabella, equal to two-thirds the length of the head; *eyes* small, near the lateral angles, their own length in front of the posterior margin, two-thirds the width of the glabella distant from the axal furrows. Length of head 10 lines, width 1 inch 9 lines.

This is only likely to be confounded with the *I. crassicauda* (Dal.), from Gothland specimens of which it differs by the greater width of the head and less depth of the deflected front, and most remarkably by the very small size of the cheeks, resulting from the eyes being removed almost to the lateral angles; in the *I. crassicauda* they are only half the width of the glabella distant from the axal furrow, and the portion of the cheeks from the eye to the lateral angles is nearly one-third more than from the eye to the axal furrow, while in the present species the cheek beyond the eye is little more than half the width of from thence to the sides of the glabella. Heads of the *Dysplanus centrotus* (Dal.) sp. differ in their much greater proportional length.

In the Lower Silurian limestone of Wray quarry, Upper Tweed.
(Col. University of Cambridge.)

Isotelus affinis (M'Coy).

Ref. *Isot. gigas*, *I. planus*, and *I. Powisii* of Portk. Geol. Rep. (omit synonyms) t. 6. f. 1, and t. 9. f. 2 & 3.

Sp. Char. Axis of the body only slightly exceeding the pleurae in width; *pleure* gently arched downwards at a very obtuse angle from about halfway between the axis and the extremity; a large pleural furrow reaches from the axis to about one-third of the truncated extremity of each; *pygidium* flattened, semi-elliptical, or slightly trigonal from the straightness of the sides; axis narrow, sharply defined, gently convex, reaching as far as the concave space round the margin.

In general proportions this resembles the *Isotelus gigas* (DeKay), from all the varieties of which it is distinguished, when specimens of the same size are compared, by the much greater flatness or depression of all its parts, the long, narrow, sharply defined axal lobe of the pygidium, and the much greater length of the pleural groove of the pleurae (nearly double that of the *I. gigas*), as well as the distance of the knee from the axis, and slight degree of deflection of the pleurae (being bent nearly at right angles at one-third from the axis in *I. gigas*). The pygidium differs from that of the *I. Powisii* (Murch. sp.) by the absence of all seg-

mental furrows, except the first, on the lateral lobes, and by the more pointed outline and narrow margin.

Not uncommon in a Lower Silurian schist over the iron-works at Tremadoc; very similar in appearance to that at Pomeroy, co. Tyrone, which afforded the species to Col. Portlock.

(*Col.* University of Cambridge.)

Griffithides meso-tuberculatus (M'Coy).

Sp. Char. *Cephalothorax* 10 lines wide; *glabella* widely pyriform, broadly rounded in front, gently convex and narrowing posteriorly with concave sides, very minutely granulated, length 5 lines, width 4 lines; *cheeks* triangular, flat, smooth; *eyes* large, reniform, very minutely reticulated, with a large convex eye-lobe * connected with the base of the glabella by a small, oblique, oval nucleus; *limb* broad, convex, with nine or ten imbricating striae, two-thirds concealed in front of the glabella, ending posteriorly in acute spines as long as the glabella; *neck-segment* broad; *pygidium* 6 lines long and $7\frac{1}{2}$ lines wide; *axal lobe* 2 lines wide, cylindrical, slightly tapering, of sixteen rings, each ornamented with about ten lengthened oval tubercles; *lateral lobes* depressed, of ten broad, flat divisions, each having a fine impressed line running close to its posterior margin, smooth to the naked eye, but with a strong glass one or two rows of minute crowded granules are seen; margin wide.

The axal lobe of the pygidium being strongly tuberculated and the lateral lobes nearly smooth, distinguish the species from all other carboniferous Trilobites I know of. It is allied to the *G. calcaratus* (M'Coy) and *G. longispinus* (Portk.).

Common in the shales of the carboniferous limestone of Derbyshire.

(*Col.* University of Cambridge.)

Cryphæus Sedgwickii (M'Coy).

Sp. Char. *Cephalic shield* subsemicircular; *glabella* slightly clavate, smooth, three segmental furrows on each side, the posterior pair longest, turning backwards and inwards nearly to the neck-furrow, inclosing a triangular space on each side longer than wide, the width rather less than that of the undivided portion of the glabella between their bases, the two anterior pair of furrows shorter; *cheeks* broad, gently convex, closely and coarsely pitted; *thorax*, *axal lobe* very convex, narrow, slightly tapering, nearly parallel-sided, smooth, of twelve seg-

* *Eye-lobe* seems preferable to *eye-lid* for the lobe covering the inner and upper aspect of the eye.

ments, three similar ones belong to the pygidium, the terminal one being obtusely trigonal ; the side lobes are flattened, and more than double the width of the axial lobe ; *pleurae* nearly straight, narrow, and for the greater part of their length flattened, and having a broad, nearly mesial pleural sulcus deeply punctured like the cheeks, dividing each into two parts, the posterior largest and forming a thick, smooth, rounded ridge, bent down and a little backwards in the distal third of its length, swelling to a thick narrow ridge in the middle, the sides and extremity expanding into a broad, thin, foliaceous appendage ; the pygidium terminates in six broad ovate, leaf-like, semimembranous flaps. Length of thorax and pygidium 2 inches 2 lines, width 2 inches 3 lines, width of axial lobe 6 lines.

This magnificent Trilobite can only be confounded with the *Eccoptochile clavigera* (Beyrich sp.), from which it is distinguished by the much greater width of the lateral lobes of the thorax, and the thin, flat, leaf-like appendages of the pygidium, which in that species resemble thick pear-shaped clubs. A comparison with the old description and casts published by Green induces me to place this Trilobite in his little-known genus *Cryphaeus*, and to doubt very much the propriety of separating *Eccoptochile* of Hawle and Corda from it, the only difference being the thickness of the marginal appendage in the Bohemian genus.

The nearly entire specimen described was collected by Prof. Sedgwick from the Wenlock shale two miles north of Builth.

(Col. University of Cambridge.)

Ceraurus octo-lobatus (M'Coy).

Sp. Char. Pygidium transversely elliptical, twice as wide as long, two first rings of the axis narrow, distinct, third or terminal one large, terminating in four flattened elliptically pointed lobes ; two rather larger similar lobes on each side. Length 2½ lines.

This curious little species differs from all of this and the allied genera in having the terminal segment of the pygidium quadri-lobate, so that the margin of the pygidium exhibits eight marginal pointed lobes in all.

It is figured in the 'Memoirs of the Geol. Survey' from Sholes Hook, under the same reference as the cephalic shields there called *Sphaerexochus juvenis* (Salter)*, but not alluded to in the text.

In the limestone of Rhiwlas.

(Col. University of Cambridge.)

* Corrected to *S. clavifrons* (Dal.) in the list of plates prefixed to the same work.

Ceraurus Williamsii (M'Coy).

Sp. Char. *Cephalothorax* semielliptical, length rather more than half the width; *gabella* semicylindrical, gibbous, rounded in front, with nearly parallel sides, three nearly equidistant, curved, segmental furrows on each side, the basal pair nearly confluent at their ends with the neck-furrow, inclosing a tumid ovate space on each side, separated by an undivided space about one-fourth of the width of the *gabella*; *thorax* twice the length of the *gabella*, axal segments large, two-thirds the width of the *pleurae*, each of which has a very large, diagonally cleft, oblong tubercle at its origin, beyond which there is a neck-like contraction of the margin, followed at one-third from the axis by a hemispherical tubercle about half its diameter distant from the first, beyond which the distal two-thirds of each *pleura* is uniformly dilated into a thin, flat, fin-like appendage, the anterior margin of which is very convex, posterior margin slightly concave, extremity pointed; *pygidium* small, the six marginal spines small, all extending to about the same distance backwards, the anterior pairs therefore longest; they are thick, triangular, and three or four times wider than the others. Length of entire animal 1 inch 4 lines, of *gabella* 5 lines, width about 9 lines.

The disconnected, broadly falcate, paddle-shaped *pleurae* help to distinguish this beautiful little species, which by its narrow elongate form resembles a *Remopleurides*. One entire specimen collected from the schists at Golen Goed, Myddfai, by Mr. Williams of Llandover, and presented to Prof. Sedgwick by him.

(Col. University of Cambridge.)

Ogygia radians (M'Coy).

Sp. Char. *Pygidium* nearly semicircular, slightly convex; axis conical, undefined at the end, having three narrow segmental furrows at the anterior end, lateral lobes with three broad radiating ribs faintly divided at their axal ends by a small pleural furrow; margin tumid, entire. Length 4 lines, width 7 lines.

I provisionally give this name to a small pygidium not unlike that of the *Barrandia Cordai*, but, from the duplicate lateral furrows, belonging more probably to *Ogygia*; probably confirmatory of this view I observe in the 2nd Decade of the 'Geol. Surv.' t. 7. f. 5. a small eight-jointed true *Ogygia* from Builth, having the pygidium almost identical with the present species, if, as I suspect, the duplicating furrows have been accidentally omitted (the figure alluded to is given as the probable young of the *Ogygia dilatata* (Phil.), a trilobite which has not been found at Builth, but abounds in the schist at Waterford).

Not uncommon in the black Wenlock shale of Pen Cerrig, Builth.

(Col. University of Cambridge.)

Barrandia (McCoy), n. g.

Gen. Char. Body ovate, depressed; *cephalic shield* semicircular, with the lateral angles produced backwards into short spines; *glabella* widely clavate, the axal furrow strong and nearly parallel at the base, becoming obsolete towards the front; *eyes* large, narrow, reniform; *eye-line* behind the eye cutting the posterior margin about the middle, in front of the eyes arching forwards, first outwards and then inwards; *thorax* of seven segments; *axis* convex, nearly as wide as the pleurae, tapering towards the pygidium; *pleurae* flat, their ends slightly falcate and bent backwards, no facets, a slightly oblique submesial pleural furrow not quite reaching the end; *pygidium* semicircular, entire, having very few simple segmental furrows placed near the anterior margin (one to three in number); *axis* short, having one to three small segmental furrows.

This I conceive to be a subgenus of *Ogygia*, from which it differs in its fewer thoracic segments, and having but very few and simple ribs to the tail. The genus agrees with the description given by Hawle and Corda of their genus *Alceste*, with the exception of this having seven thoracic rings and that having but four; it is remarkable that *Alceste* is figured by those authors with three segmental furrows to the pygidium, while this has only one, making the *total* number of segments visible the same in both; the number of the pygidial segments is however of course liable to vary with the species, while the thoracic ones are supposed to be constant. I know but one species, the following*.

Barrandia Cordai (McCoy).

Sp. Char. Length one-fourth more than the width, length of

* Since the above was written Mr. Salter has figured (2nd Decad. Geol. Surv. pl. 7. f. 4) a species of this genus, with three segments to the pygidium, which he gives without any apparent reason as the young of an Irish species of *Ogygia* (*O. dilatata*, Phil., *O. Portlocki*, Salt.). My reasons for dissenting from this view are, 1st, it is contrary to analogy of other allied Trilobites to suppose that the young and adult differ in the number of their thoracic segments; 2nd, in the Cambridge collection, specimens of the *Ogygia Buchi*, half an inch wide, have exactly the same number of segments and other characters as an adult six inches long; 3rd, the supposed young has only been found at Builth, where the Irish species, his supposed adult thereof, has never been found, being only known in the schists at Waterford, where it abounds, but where the supposed young have not occurred.



Barrandia.

head, thorax and pygidium almost equal; *cephalic shield* slightly more than twice as wide as long, lateral angles very short; *eyes* half their length from the axal furrow; *pygidium* depressed, length rather more than half the width, axis two-thirds the length, conical, segmental furrows one on each side, obtuse. Length 11 lines.

Black Wenlock shale of Builth.
(*Col.* University of Cambridge.)

Ampyx latus (M'Coy).

Sp. Char. Entire animal transversely ovate, length one-fifth less than the width; *cephalic shield* smooth, front margin regularly curved, width three-fifths the length; *glabella* moderately tumid, pyriform, having a narrow vertically elongate (? ocular) swelling close to the middle third of each side, and two short, minute segmental furrows at each side of the narrow base; *thoracic segments* five, pleurae of each side twice the width of the axal lobe; *pygidium* very obtusely and regularly rounded, four times wider than long, axis with about seventeen minute segmental furrows, sides with about eight. Length of entire animal $3\frac{1}{2}$ lines.

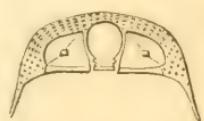
This rare species is most allied to the *A. parvulus* (Forb.) and the *A. nasutus* (Dal.), from both which the perfect animal is easily known by its transversely oval form; the regular curvature and great width of the cephalic and pygidial shields easily distinguish those parts when found separate; the latter agrees nearly in form with that of the *A. parvulus*, from which it differs equally with the former in all the other characters of cephalic shield, &c.

Rare in the black Wenlock shale three miles north of Builth.
(*Col.* University of Cambridge.)

Tretaspis (M'Coy), n. g.

Gen. Char. General characters of *Trinucleus*, but having only five body-rings, the base of the glabella having two short segmental furrows at each side, and the cheeks being traversed diagonally by a nearly straight eye-line, extending on each side from the junction of the cheeks and glabella in front, towards the lateral angles cutting the posterior margin a little within the angles, and usually exhibiting a small ocular (?) tubercle in the middle. Types of the genus *Trinucleus seticornis* (His.) sp., *T. Bucklandi* (Bar.), &c.

In my 'Synopsis of the Silurian Fossils of Ireland' I pointed



Tretaspis.
Cephalic shield showing the eyes and diagonal facial sutures.

out the course of the eye-line in this genus, which separates it at once from *Trinucleus*, and renders it probable that the small tubercle in the middle of the cheeks in the *T. seticornis*, *T. fimbriatus*, &c. are true eyes. The furrows at the base of the glabella also are distinctive for the genus*.

Trinucleus gibbifrons (M'Coy).

Sp. Char. Cephalic shield nearly semicircular, length rather more than one-third of the width; glabella pyriform, rounded in front, gradually narrowing towards the base, compressed, exceedingly gibbous, its height above the cheeks nearly equaling its width; on each side of the neck-furrow (in casts) there is a deep puncture and another similar a little in front of it, a small spine on the middle of the neck-furrow; cheeks spherical triangles, height and width about equal, moderately convex; border of moderate width, three rows of punctures in front of the glabella, and five rows in front of the cheeks, more numerous at the sides, generally connected in front by radiating furrows, forming an imperfect fimbriation. Usual length of cephalic shield 3 lines. Surface very minutely granulated.

This very common species is figured without a name by Col. Portlock (Geol. Rep. pl. 1 B. f. 13 & 14). The fine granulation of the lobes of the head, and the extreme prominence of the gradually narrowing, pyriform, compressed glabella, separate this at once from either the *T. Caractaci* or *T. latus*, with which it seems to have been confounded; it is wider than the former, less so than the latter. From the two little punctures on each side of the base of the glabella, this strongly approximates the *T. scyllarus* (His.) as distinguished from *T. seticornis*; but although with abundance of specimens I cannot find an ocular tubercle or eye-line in the midst of the cheeks as in *Tretaspis*, to which those species belong; those punctures indicate no doubt the existence of the muscles of the jaws and their appropriate rings, but are not extended into transverse segmental furrows as in those last-named species; in the radiation of the border and number of rows of pores in front it approaches slightly the *T. radiatus* (Murch.), but is distinguished by the head being rounded, the

* The statement of Mr. Salter (Mem. of the Geol. Surv. vol. ii. pt. 1. p. 335), speaking of Hawle and Corda's work, that " *Tetrapsellum* is distinguished from *Trinucleus* solely by a swelling in the axial furrow of the head; it is almost identical else with *T. seticornis*"—might mislead the English reader with the idea that the present genus was identical with *Tetrapsellum*; the fact is however, in his stricture on the Bohemian authors, Mr. Salter seems to have overlooked the grand character of their genus, namely its having but four body-rings (" vier Leibringe," H. & C. Monog. p. 42. 8th line); it agrees otherwise with the common type of *Trinucleus*.

cheeks wider, and the border not being more than half the depth, as well as being by no means so distinctly radiated.

Common in the lower Silurian limestone of Golden Grove ; the schists of Tre Gil ; and Caradoc sandstone of Alt y Anker, Meifod ; also at Pen y Craig. A variety with a shorter shield, the lobes of which are more spherical, perhaps from pressure, occurs in the black Wenlock shale three miles north of Builth.

(*Col.* University of Cambridge.)

Harpidella (M'Coy), n. g.

Gen. Char. Cephalic shield subtrigonal, surrounded by a thick, narrow, flattened border ; sides nearly vertical, compressed ; cheeks entirely surrounding the glabella in front, forming there a narrow tumid border, widening backwards as they descend into tumid, broad, triangular, nearly vertical wings, having large prominent eyes near the middle of their posterior margin, and from them on each side an obscure impressed line extends upwards and inwards to about the first third of the glabella (perhaps indicating the eye-line) ; glabella very convex, semielliptical, obtusely rounded in front, surrounded by a strong defining sulcus ; two segmental furrows on each side, the first very strong, curving, from about the middle of the sides of the glabella, inwards and backwards into the neck-furrow, so as to include a large tumid ovate lobe on each side ; a little above this, the very short and faintly marked anterior segmental furrow curves in the same direction ; surface granulated. (Type of the genus *Harpes*? *megalops*, M'Coy, Syn. Sil. Fos. Irel. t. 4. f. 5.)

The head alone of this genus is known, which differs from *Harpes* (Gold.) in its small size, narrow unpunctured rim, absence of the ocular tubercle on the anterior part of the cheeks, great size and basal position of the eyes, &c.

(Fam. *Lymnadiadæ*.)

Ceratiocaris (M'Coy), n. g.

Etym. κεράτιον, *siliqua*, and καρίς, *squilla*.

Gen. Char. Carapace bivalve, the dorsal line simply angulated (? undivided), with a slight furrow beneath it on each side ; sides semielliptical, much elongated from before backwards, evenly convex, ventral margin gently convex, posterior end abruptly truncated obliquely ; on each side near the anterior end considerably below the hinge-line is an ocular (?) spot, sometimes raised and distinct, in some spe-



Ceratiocaris.
a. The ocular spot.

cies flat; surface marked with fine, imbricated striae, obliquely longitudinal.

In their pod-like form some of the species resemble such shells as *Solenocurtus* and *Solenimya*, except in the abrupt truncation of the posterior end; others resemble the Crustacean genus *Dithyrocaris*, with which I think their affinity lies, though they differ in form and want the peculiar ridges of that group. I conceive they were phyllopodous Crustaceans allied to *Lymnadia*; the peculiar texture and kind of lineation of the surface resemble what we find in Crustacea allied to *Apus* rather than in Mollusca; the general pod-like form, large size, and posterior truncation separate them from any of the large species of *Cythere* or *Cypridinia*, and the two ocular spots separate them from all others. I suspect from some of the specimens that the two sides meet along the dorsal line at an angle of 45° , with probably little power of motion. The ocular spots even when flat may generally be recognized with care from the difference in their mineralization; they are often dark-coloured as if retaining some of their pigment, and have a slightly granular aspect, corresponding in fact very closely, both in position on the shell and in apparent structure, with the double-eyed *Cypridinia* of the Indian Ocean. In one species there is a short sulcus extending on each side from the medial line behind the eye obliquely backwards and outwards, reminding us of the perhaps somewhat similar nuchal furrow of *Apus*. I only know the genus in the upper Silurian rocks.

Ceratiocaris solenoides (M'Coy).

Sp. Char. Sides meeting along the back at an acute angle, each being nearly four times longer than wide, the ventral margin nearly straight and parallel with the dorsal line; anterior end narrowed and truncate obliquely forwards and outwards from the dorsal line; posterior end scarcely narrowed, truncated obliquely backwards and outwards; valves evenly convex, the edge slightly thickened; *ocular spot* a little depressed, close to about the middle of the truncated anterior margin; from the internal (dorsal) anterior angles a small furrow extends a little way obliquely backwards and outwards; oblique longitudinal striae very close and fine; *eyes* two-thirds of a line in diameter; width of each side from dorsal to opposite margin $5\frac{1}{2}$ lines.

This much resembles a little *Solen* in form. The ocular spot is generally dark-coloured.

Common in the Upper Ludlow rock of Benson Knot.
(*Col.* University of Cambridge.)

Ceratiocaris ellipticus (M'Coy).

Sp. Char. Each side longitudinally elliptical, evenly convex,

about twice and a half longer than wide, greatest width of the side and curvature of the margin about one-third from the anterior end, which is elliptically pointed; posterior end obtusely rounded, the oblique truncation nearly effaced; ventral margin convex; ocular spot elevated like a small tubercle, twice its diameter from the dorsal line, and about one-fourth the length from the anterior end; I believe the striae of the surface have the direction usual in the genus, but they are very delicate. Length 1 inch 3 lines, greatest width of the sides 6 lines.

The elliptical form, prominence of the eye-spot, and its distance from the anterior end, mark the species well.

Rare in the Upper Ludlow rock of Benson Knot.
(*Col.* University of Cambridge.)

Cytheropsis (M'Coy).

Syn. *Cytherina* (Burm., not of Lamarck).

I provisionally propose this name for the little bean-shaped bivalve Entomostraca of the palaeozoic rocks, which were formerly referred by myself and others to *Cythere*, but which Dr. Burmeister suggests should rather be referred to the *Phyllopoda*. As apparently the same forms of carapace exist both in the *Phyllopoda* and *Lophyropoda*, it is clearly more logical to refer those fossils to the former group, which we believe to have abounded at the palaeozoic period, than, by placing them with the analogous types of the *Lophyropoda*, to quote the occurrence of that tribe at those early periods without sufficient reason.

In M. Bosquet's memoir on the Entomostraca of the Maëstricht Chalk, he proposes to refer all the ornamented species which I have described and figured in my Synopsis of the Mountain Limestone Fossils of Ireland, to the recent genus *Cypridina*; this I suppose is on the supposition that the tubercles represent the lateral eyes of that genus; but though the eyes were possibly lateral also in the fossil group, there is no evidence of the fact, nor reason for supposing they were not similarly placed in the plain ones; I therefore think the plain and ornamented species should not be divided, and for the above reason think they are both better placed with the Phyllopodes. It is singular that Prof. Burmeister, in establishing this genus and stating that the palaeozoic limestones contained the only representatives of it, should have applied to them the Lamarckian name *Cytherina*, which is a mere *double emploi* of Latreille's recent genus *Cythere*. The carboniferous genus *Bairdia* (M'Coy) is distinguished from the above by its attenuated recurved extremities.

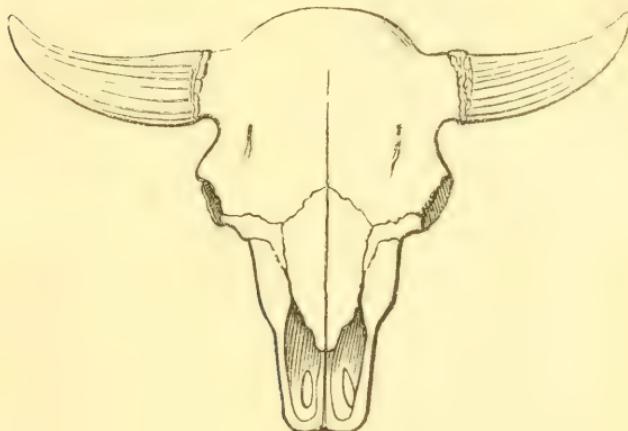
XLII.—On the extinct and existing Bovine Animals of Scandinavia. By Prof. NILSSON of Lund.

[Concluded from p. 355.]

4. Bison Ox (*Bos Bison*, Linn.), fig. 8 & 9.

The Wisent or the Bison of the ancients ; the Aurochs of the moderns.

Fig. 8.



Bos Bison.

Gen. Char. The forehead convex, the distance between the crown of the horns and the orbits a little longer than its diameter. The horn-cores directed outward and somewhat backward, also curved in a direction forward upward.

SYN. *Bos Bison*, Linn. Syst. Nat. xii. 1. p. 99 ; Gesn. Hist. Animal. i. p. 128, with figure. *Jubati Bisontes*, Plin. viii. 15. *Bisontes setosi, colla jubis horrida*, Solin. *Villoosi Bisontes*, Senec. *Bison*, Gilbert Opuscul. p. 70. *Zubr*, V. Jarocki, Versam'l. der Naturforscher in Hamb. 1830, with two figures. *Bos Ursus*, Eichwald, Zool. special. i. p. 342, with figures. *Auer*, Eichw. Natur. Histor. Skizze, p. 241, with figures. Idem, *Urus* (Zubr), Fauna Caspio-Caucas. p. 31. *Aurochs*, Cuv. Recherches s. l. oss. foss. iv. p. 108 et seq. Id. pl. 9, fig. 1, 2; pl. 10, fig. 1, 2; pl. 12, fig. 6, 7. *Aurochs des Allemands*, Cuv. Règn. anim. i. p. 279.
Fossil: Cuv. Rech. iv. pl. 12. fig. 1, 2, 4; pl. 9. fig. 5. *Bison priscus*, Owen, Brit. Foss. Mam. p. 491. fig. 205. *Uroxe tjur*, Retz. Vet. Akad. Handl. 1802, p. 280. In Lithuania : Zubr (Schuber). In Germany : *Aurochs*; *Aurthier*: in ancient times, *Wisent* or *Wisund*.

Exterior description.--This colossal Ox of former times, of whose form and locality we can judge, not from its fossil skeleton alone, but also from its yet living descendants, was in many

respects unlike not only all the foregoing, but also our tame cattle. The fore-part of the body was very thick and broad, with a high hump over the shoulders, from which the back went strongly sloping downwards; the hinder part was on the contrary quite slender and thin, so that the same proportions were far from prevailing between the fore and hind parts of the body, as in the tame ox. The legs above the knees were thick and strong, but on the contrary under the knees slender and lean. On the front of the head and under the neck was long close curly hair, which along the back of the neck formed a mane, and under the under-jaw a long beard. All the rest of the hairy covering was shorter. The head, which was carried low, was shorter and broader than that of our common oxen; the muzzle was less broad, and the nostrils were more open at the sides; the forehead between the horns about 11 inches broad and convex; the horns small, about 12 inches long; near the roots 12 inches in circumference, their direction outward and backward, thence crescent-shaped, curved forward in one and the same direction, yet sometimes the points were turned upward; in colour they are black, somewhat white-speckled. The colour of the animal dark brown or sooty brown.

Remarks.—When one sees an ox of this species, of which well-stuffed specimens are now to be found in most museums, it is impossible to admit that Cæsar could mean this animal by his *Urus*, which he describes, *specie et colore et figura tauri*, and is only distinguished from the common ox through its magnitude and *amplitudo cornuum*.

With respect to the fossil skeleton, it is thus: the forehead convex, for the most part above, between the roots of the horns; the nasal bones short, broad (only $3\frac{1}{2}$ times as long as broad; in the *Urus* they are 5, in *B. longifrons* near 6, and in the tame ox $6\frac{1}{2}$ times as long as broad), going up to the line which is drawn right over the sockets of the eyes; these are produced into tube-shaped processes. The lower, or front part of the lachrymal bones, much narrower than the upper; the distance between the orbit and the base of the horn a little longer than the orbit's diameter. The forehead upward, strongly shelving backward;

Fig. 9.

*Bos Bison.*

the border of the occiput lies about $3\frac{1}{2}$ inches behind the roots of the horns; at the back of this border the occiput is more transverse and not so concave as in the foregoing species of true *Bos*. The foramen of the occiput smaller towards the front, almost triangular, with the front angle obtuse. The horn-cores, resting on pedicles, are directed outward and somewhat backward, also curved in a crescent, in one direction only, which is forward and somewhat upward. The temporal cavity very small in the centre, the ends widened, the front somewhat broader than the back. *Atlas*: the wings transverse, of equal breadth in front and back, 8 in. 4 lin., with obtuse back lobes; the upper curvature strongly convex with a transverse knob in the centre; the lower with a round knob in the middle (somewhat more distant from the front than the back margin). *Epistropheus* short, broad; its process. spinos. forms a high ridge, which is highest and most projecting towards the back (its hind margin broad), and forms an angle towards the front projecting over the process. odontoideus. Along the under side is a ridge, which does not go backward past the margin of the concave posterior articular surface. Foramen medullæ spinalis in front three-sided, almost heart-shaped. The process. transversi of the cervical vertebrae curved upwards. In other respects it differs from the *Urus*, which in bulk it most resembles, through the spinous processes of the anterior dorsal vertebrae, which are longer in the *Bison*, about 1 ft. 6-7 in., in the *Urus* about 1 ft. and a couple of inches; by its larger, and particularly longer shoulder-blades; narrower rib-bones, of which it has fourteen pairs, the broadest of which is 2 in. (in the *Urus* quite 2:5); on the other hand it has not more than five lumbar vertebrae*.

Foram. obtur. oblong-oval. Extremities generally somewhat higher and less stoutly built than in the *Urus*. In order that we may form some idea of the magnitude of this extinct animal as compared with the present, we will insert here the measurement of some of the bones in that beautiful skeleton of a Lithuanian Aurochs, which was killed a few years ago, and presented to the British Museum by the Emperor of Russia, and a fossil skeleton of the ancient period, dug up from a turf-bog at Bjersjöholm, in southern Scania near Ystad, and now preserved in the Zoological Museum in Lund†. (Compare further the skeleton of the *Bos primigenius*, pp. 258-261.)

* The Reindeer has the same number of ribs and lumbar vertebrae. The Stag, on the contrary, has the same as the *Urus*.

† This remarkable discovery from antiquity, the like of which, as far as I know, no other museum in Europe can show, was sent as a present to the University's Museum in Lund in the year 1812, by the then possessor of the estate Bjersjöholm, Major Cock.

	(1.)			(2.)				
	Fossil specimen in the Univ. Museum at Lund.	ft.	in.	lin.	ft.	in.	lin.	
Length from the ridge of the occiput to the intermaxillary bone's anterior edge		2	1	4		1	10	4
Length from the orbit to the same place... " between the roots of the horns and the orbits		1	1	0 near	1	0	0	
Length of the nasal bones		0	9	0		0	3	4
" of the horn-cores in the curve backward		1	3	0		0	8	4
Length of the horn-cores in a right line ... " of the under-jaw to the angle		0	10	4		0	8	4
Breadth between the upper border of the roots of the horns		0	17	4		0	9	0
Breadth between the lower borders of the roots of the horns		1	2	0		0	10	4
Breadth of the orbit upwards		1	2	4		1	1	4
" of the nasal bones, each		0	2	5		0	11	4
Circumference of the horn-core at the root								
The line drawn between the points of the horn-cores falls behind the roots of the horns.								
<i>Atlas</i> : the wing's breadth		0	8	4		0	8	3
Length of process. spinos. of the second back-vertebra.....		1	7	0		1	5	6
Length of process. spinos. of the foremost lumbar vertebra.....		0	4	2		0	3	6
Length of shoulder-blade		1	9	0		1	6	4
Its breadth upwards		1	0	0		0	3	6
Distance between the spine and the glenoid cavity		0	3	0		1	2	0
Length: os humeri		1	3	4		1	1	4
" radius		1	2	6		0	7	6
" metacarpus		0	8	5		1	6	0
" pelvis		2	1	4 near	2	0	0	
" os femoris.....		1	8	0		1	5	0
" tibia		1	7	0		0	9	6
" metatarsus		0	10	5		0	1	7
Least breadth of metacarpus.....		0	2	2		0	1	7
" " of metatarsus		0	1	7		0	1	7

If we now compare this measurement with that of the *Urus*, (*Bos primigenius*) which will be found in p. 260, we shall there see, that while all the other bones in the extremities are longer in the Aurochs (*Bison priscus*) than in the *Urus*, this relation is reversed with regard to the *metacarpus* and *metatarsus*; for these are certainly longer in the *Urus*. They are not only longer—they are also thinner, although the whole skeleton in the remaining parts is stouter. When we consider the peculiar character of these bones, namely that they are remarkable for their uncommon length and slenderness in the swift-footed deer-race; and that the same bones also in the horse are much longer than in the ox, in proportion to the magnitude of the rest of

the body ; we may hence, perhaps, with tolerable certainty conclude, that the Urus, although in general more stoutly built, and therefore stronger than the Bison, was nevertheless much swifter-footed*.

Remark: (1.)—Professor Owen has expressed a different opinion, in his excellent work ‘On British Fossil Mammals and Birds,’ p. 497, which, without doubt, is founded on the circumstance of the want as yet of a fossil skeleton of each species in London.

Remark: (2.)—If we measure the Bison skull, of which we have here given a drawing, with the one Professor Owen has given p. 491. fig. 205, and which he calls *Bison priscus*, we shall find a great dissimilarity, particularly in the length and direction of the horns ; it does not however hinder us from seeing that it is one and the same species, since we are convinced by many data that the older the strata in which the fossil bones of the same species occur, the larger are they. Compare the remarks on *Bos primigenius*, p. 261.

Place of abode, &c.—This species of Ox, which in size formerly vied with the Urus itself, was in ancient times spread over the forests in almost all Europe, from Italy and France to the south of Scandinavia, and from England far into Asia. In all these places its fossil bones are found in the earth, but in most of them the animal itself has already long been extinct. In Scandinavia, the Bison lived contemporaneously with the Urus, yet, like the latter, it has never been found in any other tracts than in the southern parts of Scania, and there, even before the historic period, it had ceased to exist. It is true, the monk Adam of Bremen, who lived in the eleventh century, speaks of two sorts of wild oxen, the Uri† and Bubali, in the north (Adam Bremens. Chorograph. p. 32) ; but his accounts are evidently not to be relied upon ; he places them in Lapland’s northern tracts, and in Sweden proper‡, where it is certain they were never found ; which shows that they were not met with in the parts he visited and was acquainted with, and that his account either was grounded on tradition, or derived from other places and times long since past.

To conclude : from the few fossil bones hitherto found in

* It ought to be remarked, that the old Romans, who saw this colossal animal in the arena at Rome, characterized the Urus not only for its superior strength, but also for its superior swiftness, “ excellenti vi et velocitate Uri.” Plin.

† It is to be remarked he makes the *Uri* to live in the water, like the *White Bear*.

‡ It is to be remembered that Adam of Bremen never reckoned *Scania* as belonging to *Sveonia*, but always to *Dania* ; though he nowhere speaks of wild oxen being found in his *Dania*—the only place in which it ever occurs in the north.

Scania's turf-bogs, the Bison was much less common there than the *Bos primigenius* and *Bos longifrons*, whose fossil remains are found in much greater number. The few fossil bones of the Bison which have hitherto been noticed with us, consist of one old and one young cranium, and also one skeleton, all which have been dug up from a turf-bog in the districts of Skytts and Herresta, therefore in the most southern districts of the country. It ought also to be observed, that in Denmark numerous fossil bones of the *Urus* have been found, but hitherto not one single bone of the *Bison* has been discovered.

In a great part of Europe this colossal Ox has existed during the historic period ; but in the English isles it appears to have been extinct already at the time they were first known to history. For in Cæsar's time, when the Roman legions traversed the forests of France, part of Germany and Belgium, they there found both the Bison and the Urus ; but in no place is it mentioned that the victorious Romans in England met with any species of large wild ox ; which seems to show that both the Urus and Bison were already extinct in that country. On the continent, where they continued to be found in the large wild forests even long after Cæsar's time, they seem to have disappeared by degrees, through the increase of population and culture, first in the west and afterwards in the more eastern tracts of the country. In the Vosges and the Ardennes, wild oxen were found even in King Gontram's time ; and history informs us that he put to death one of his chamberlains, the nephew of the same, and a forester, because, without permission, they shot a *Bubalus* (Wild Ox) in the Vosges (Cuv. Recherches, iv. p. 117). In the Wilkina Saga*, hunts are described in the forest of 'Wals-lunga' (probably the forest of Thuringia) and the 'Ungara' forest, in which several young (ten), and one old and very large *Visunt* were killed. One sees by this whole account that princes hunted these large animals in their forests, and were exceedingly careful of them. In the old *Leges Allemannorum* (from the 6th and 7th centuries) it is enacted, that if any one stole or killed a Bison, Buffalo (*Urus* ?), or Deer, he should be mulcted in a large sum of money (see Baer in Wiedem. Arch. 1839, p. 75). In the poem of the Nibelungen from the 12th century, the Bison is spoken of (*Visent*) as among the animals which were killed at a hunt in the forest near Worms : Lucas Dawid relates in the 'Preussens Kronik,' that about the year 1240 there was found in the land much game, consisting of *Uroxen*, *Visents*, wild *Horses*, *Elks* and others (see Baer, *ut sup.* p. 71). The prince Wra-

* Peringskiold's edition, Stockholm, 1715, p. 229. Peringskiold translates, quite improperly, *Visunt* by *Kronhjort* (Crown-deer), which misrepresents the meaning of the Saga.

tislaf V. killed, at a hunt in Hinter-Pomerania about the year 1364, a "Wysant," which was stronger and larger than an Ursus. In East Prussia, between Liebau and Tilsit, the Bison was found as late as the last century; and formerly it was found in the whole of Lithuania, even in the neighbourhood of the city of Wilna (Eichwald, *loc. cit.*). In the forest of Bialowieser in Lithuania, Augustus III. king of Poland held a great hunt on the 27th Sept. 1752, in which were killed forty-two Bisons (!) and thirteen Elks. In ancient times the Bison was also found in the north of Greece, Macedonia and Thrace. In Aristotle's "Bonasos," which is found in Paeonia, that part of Thrace now called Bulgaria, we easily recognise the Bison (Cuv. *l. c.* p. 111), which formerly was also found in Moldavia; and it is probable that the story of the giant-like ox, which Philip of Macedon killed at the foot of Mount Orel, and whose hide he hung up together with the horns in the court of the temple of Hercules, belonged to this same species.

The Bison is now found on the wooded northern side of Mount Caucasus, where it appears to exist in large numbers, and is an object of the chase to the Tscherkesser and Abchaser, in whose language it is called *Dombei* or *Adompe*. In Moldavia and in the Carpathian mountains it is no longer found. Now that it is no longer to be met with in East Prussia, it is more and more confined to the forests of Lithuania. At the present time it is only found in one large forest, Bialowesha, where in a wild state it is enclosed and preserved by the command of the Emperor of Russia. As this colossal animal formerly lived also in the forests of southern Scania, it may not be uninteresting to know the nature of the place where it now lives and what manner of life it there leads*.

Bialowesha-forest, which lies on a large level expanse, is surrounded by plains, comprising 5 Swedish miles in length and 4-4½ in breadth. The forest consists chiefly of fir and pine trees interspersed with birch. Grassy pastures are there not unfrequent; but in many places the ground is swampy, and almost a twelfth part consists of reedy fens. Here the Elk chiefly takes up its abode; but these fens are avoided by the Bisons, who on the contrary seek high land with aromatic grass, also sharp and bitter herbs; they likewise gnaw off the young bark of trees; in the spring they consume the young leaves of the lime, poplar, elm, and willow, but not the leaves of birch or oak, and least of all the leaves of the pine. On the other hand they devour some sorts of mosses: they always avoid places without trees or that are cultivated; they never go into fields, but keep in thickly

* What I have here communicated is mostly taken from Eichwald's *Nat. Hist.* p. 211.

grown forests. In winter they rarely leave the pine forests; they lie still during the day, and at night go out in search of food. They seldom seek water, sometimes not for a whole day; rarely they approach the small forest-rivulets, but usually drink out of the small puddles in the forest. If pursued, they can swim easily. They live to the age of ten to twelve years in small herds of twenty to forty; the old ones separate themselves from the herd and live apart. During the rutting time they again join the herd, and live with them all through the month of August.

The Bison is more timid than bold; it is frightened at bright colours, particularly red, and will run away from it. Only when provoked will it attack man; though not always the assailant who has irritated him, but him who happens to be nearest. Its pace is not lasting; it cannot run more than from half to one verst (900 to 1800 ells) without being so tired that it must rest. The further it is chased, the oftener it stops and stretches out its blue tongue to get breath. Three wolves can kill him.

The scent of the Bison is extremely acute, and they scent a man at a considerable distance. Far off, their stamping and roaring may be heard, as they stand in the thick wood-land, and as soon as they perceive any danger they flee into the forest with a tremendous rush, throwing down or breaking numbers of trees that stand in their way as they pass them. They run with depressed head and tail raised. During the rutting time they are very much given to frolic; thus they drive one of their horns into the ground, and in that position run round a young tree till it becomes loose and falls on their heads. In this manner they will uproot trees of 4-6 inches in diameter; and as they generally get their horns entangled in the roots, they run about with this "nuptial wreath" on their heads, and thereby make a great rattling and rustling in the forests. Where they have remained for any time, they leave behind them a smell something between violets and musk.

Their rutting time is in August, and lasts two or three weeks; during this period violent conflicts take place between the bulls, and they often wound each other mortally*. Their offspring are but few, for among forty full-grown animals one sees not more than four or six of a year old. A natural enmity exists between them and common cattle, and never will a Bison pair with a tame cow. He runs away from her, or kills her with his horns. He cannot bear her presence, while her exhalation is most repugnant

* The fossil skeleton of the Bison, which is found in our museum here, shows that the animal during its lifetime had many ribs broken, probably by being pierced with horns, but which by means of the callus had again healed.

to him. Hence we may conclude that the Urus and Bison never lived together in the same tracts; perhaps seldom in the same forest.

Having thus, from the fossil bones which are found in our post-pliocene strata, given a short account of the Wild Ox, which with us is now extinct, it remains to speak of our *tame horned cattle*, of which several perceptibly different races occur with us; and, as far as we are able, to indicate from which wild species each tame race chiefly derives its origin. These investigations are however rendered particularly difficult by the circumstance, that the tame races by crossings are so mingled, that their original stock is sometimes scarcely to be recognised.

As a beginning we may notice, that it is solely from the division of the Ox family which have a flat forehead with the horncores sitting at the extremity of the edge between the forehead and the nape, that our tame cattle spring; and that the ox with a convex forehead, the Bison, which no one could ever make to pair with a tame cow, has not in the least contributed to the formation of any tame cattle. Besides, we can take for a given and general rule, that the tame race is always less than the wild species from which it springs.

We believe we come nearest to the truth in this difficult subject, if we assume—

1. That the *large-sized lowland races*, with flat foreheads, and for the most part large horns, descend from the Urus (*Bos primigenius*) and at length came into the country with a race of people who immigrated from the south and west.

2. The somewhat small-growth highland races, with high occiput and small or no horns, descend from the *High-necked Ox* (*Bos frontosus*).

3. How far the small-grown hornless *Finn ko* race (Noring, pp. 213–229) descends from the *Dwarf Ox* (*Bos longifrons*, Owen), may be more fully determined through future investigations.

Notices of the Wild Oxen of Britain in the Historians of the Middle Ages.

In the third volume of the ‘Annals,’ p. 356, will be found, besides the notice from a MS. record communicated by Sir P. Grey Egerton, a passage also from the Lives of the Abbots of St. Albans by Matthew Paris, in which he mentions the wild cattle of the forests of the Chiltern district. To these may be added the following:—

Fitzstephen, whose *Descriptio nobilissimæ civitatis Londonie* was written about the year 1174, thus describes the country beyond the suburbs: “*Proxime patet ingens foresta, saltus nemorosi, ferarum latebræ, cervorum, damarum, aprorum, et taurorum sylvestrium.*”

Upon which passage Dr. Pegge, in his edition, observes: "These bulls were probably buffaloes; see King Cnut's *Constitutiones de Foresta* in Spelman's Glossary, p. 241," [more correctly given in Thorpe's *Ancient Laws of England*, 8vo. vol. i. p. 429. c. xxvii.] The passage is as follows:—"Sunt et alia quam plurima animalia, quæ quanquam inter septa forestæ vivunt, forestæ tamen nequaquam censeri possunt, qualia sunt *bubali*, *vaccæ*, et *similia*." Dr. Pegge adds:—"The forest of Middlesex was not deaforested till A. 1218, Hen. III. This forest is not mentioned in the Catalogue of forests given us by Spelman in his Glossary; *Enfield chace*, however, is thought to be a small remainder of it." He also cites the following authorities:—"Whitaker's History of Manchester, p. 340. 'The wild cows and bulls of the country continued very frequent among us in the 4th century, and even for several ages afterwards. These were merely of the usual size, but all milk-white in their appearance, all furnished with thick hanging manes like lions, and almost as fierce and savage as they.' Boëtii Seot. Reg. Desc. fol. 6, and Leslæi Hist. p. 18; and hence is the popular story of the fierce wild cow of Dunsmore in Warwickshire, slain by Guy Earl of Warwick."

Whitaker gives several passages from Roman authors relative to the animals of Britain.

The Charter of Hen. I. recognises the right of the citizens of London to hunt not only in Chiltern, but in Middlesex and Surrey.

R. T.

XLIII.—*On two new species of Testaceous Mollusca.*

By WILLIAM CLARK, Esq.

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

GENTLEMEN,

Norfolk Crescent, Bath, Nov. 1, 1849.

I BEG you to record the discovery, by myself, last summer, of two new species of *Testaceous Mollusca* in the coralline zones of the Devon coast, at Exmouth. I have submitted these discoveries to the ordeal of an examination by my friends Messrs. Jeffreys and Barlee, to whom I believe every British shell is familiar, and I have their united testimony that the shells in question are entirely new to them: such a test, from gentlemen of the highest authority in conchological statistics, affixes the impress of almost certainty that these objects are novelties.

Skenea Cutleriana.

S. testa suborbiculari, albida, aliquantulum producta, anfractibus tribus spiraliter exaratis; striis subtilibus, undatis, transversis, hic et illic sparsis, notata; sutura simplex; apertura subrotunda, integra, superne in canalem brevissimam desinens; umbilicus inconspicuus, margine columnari paululum obtectus; animal et operculum adhuc latent. Longitudo et latitudo circa $\frac{1}{8}$ unciae.

At first view I thought that this elegant minute species might

be the *Helix serpuloides* of Montagu, at present involved in some obscurity, but the completely striated condition of the volutions forbids this idea. From *Skenea divisa*, which by some conchologists is considered synonymous with the *Helix serpuloides* of Montagu, it differs in its much more globular form, and in the volutions being distinctly striated throughout; it cannot for a moment be confounded with the recently discovered *Margarita pusilla*. As the animal and operculum of this new species have not been observed, it may be either a *Margarita* or an *Adeorbis*, or be referable to the *Skeneæ*, or to the so-called *Trochus subcarinatus*. I prefer to place it, *ad interim*, with the *Skeneæ*, as the principal characters of that small group, though artificial, consist in the aperture being suborbicular, and with an entirely scarcely interrupted by the very short and small canal at its upper part; for these reasons I consider the *Margarita pusilla* and the *Trochus subcarinatus* to be *Skeneæ* or *Adeorbæ*, or whatever other appellation may be applied to them. The *Trochidæ* have an invariable angularity in the aperture, which in them, as well as in *Margarita*, is never entire, and has no trace of a canal. I do not know the *Adeorbis*; it is I believe a genus of the *Trochidæ*; if it partakes at all in the angular form of the aperture of that family, it has no connection with the present species.

The *Margarita vulgaris*, *M. pusilla*, *Skenea divisa*, *S. depressa*, *S. bicolor*, have light corneous opercula, of three or four lax volutions, which have nothing of the aspect of the numerous, compact and close-set ones of the *Trochidæ*.

I have done myself the honour to attach to this new and elegant object the name of a lady residing at Budleigh-Salterton, Devon, whose services in the various walks of natural history have been of great value: her retiring disposition would have declined, if she had known it, even this small tribute of consideration, and mention of qualifications of no ordinary stamp.

Fusus Branscombi.

F. testa elongata, pallide lutea, anfractibus octo repente attenuatis; varicibus validis novem striis spiralibus confertis perspicue cælata; sutura simplici; apertura subovalis, in canalem branchialem subrectam producta, superne vix emarginata; animal ignotum; operculum? Longitudo $\frac{5}{8}$, latitudo $\frac{1}{8}$ unciae.

This species as to novelty rests on the same grounds as the *Skenea Cutleriana*: I am at a loss to liken it to any congeneric species.

I name it *Fusus Branscombi*, as a memorial of the thirty years' services of my dredger, Wm. Branscomb, a very honest man, "ab-normis sapiens," "of mother wit, and wise without the schools."

I am, Gentlemen, your most obedient servant,
WILLIAM CLARK.

XLIV.—*On the Botanical Productions of the Kingdom of Algiers, followed by a short notice of the supposed Manna of the Israelites.* By GILES MUNBY, Esq.*

SINCE the occupation by the French in 1830 of the kingdom of Algiers, but little has been done to advance the knowledge of its natural-history productions, and, if we except the 'Travels' of our own countryman Dr. Shaw, who visited Barbary about a century ago, and the 'Flora Atlantica' of Desfontaines, no work has ever been published devoted to the natural history of this country. The vegetation of the coast of Barbary resembles in a great measure that of the Spanish and French shores of the Mediterranean; but although the general features of its flora are the same, many species of plants are found in Barbary which are unknown to the continent of Europe.

A botanist of the North of Europe is struck by the quantity of prickly pears (*Cactus Opuntia*) and American aloës (*Agave americana*), which, with a few date-palms scattered here and there, give a tropical appearance to the vegetation. The same feature is however observed on the Spanish coast near Malaga and the southern provinces.

The dwarf palm (*Chamaerops humilis*) is another plant common to both regions, and in Algeria covers immense tracts of country, resembling fields of grass or young corn, as this palm very seldom produces a trunk. They sometimes rise to the height of 20 feet in the neighbourhood of some Marabout or Saint's tomb, which may probably depend on the care taken of them in such a situation. This plant is one of the most useful that the country produces. The leaves are made into baskets, cords, fans, sacks, sleeping mats, &c. The fibre which surrounds the stalks of the leaves, spun with camels' hair, serves to make the Arab tent. The centre of the plant, consisting of the tender foot-stalks of the leaves and the young flowers and their sheaths, forms one of the principal articles of food for the Arabs during a certain season of the year, and I have seen wandering tribes going about with their donkeys loaded with these roots and no other provision. The fruit ripens in autumn, and is eaten by jackals and by the Arab shepherds; but although sweet, its astringency renders it unfit for a European palate.

The *Cactus Opuntia*, called in the country *Kermous ensârah*, or Christians' fig, is another plant which furnishes in due season the Arab his nourishment. This fruit ripens in July and continues until the autumnal rains in September or October; it is

* Communicated by the Author; having been read before the British Association at the Meeting held at Birmingham, Sept. 12, 1849.

sweet and very nutritious, although it is apt to disagree with European stomachs, bringing on severe constipation, not from any astringency in the fruit, but probably from a mechanical cause, namely the seeds, which are very numerous, lodging in the colon.

The *Agave americana* serves to make hedges of, and the flowering stem is much used in constructing huts, but no part of the plant is edible : the fibres of the young leaves make a very durable cordage, and many objects of ornament and utility are made from it by the *condamnés militaires*, or soldiers condemned to hard labour for infraction of military discipline.

The brushwood which covers the hills in Barbary is principally composed of the following plants : *Cytisus spinosus*, *Pistacia Lentiscus*, *Quercus coccifer*, and many species of *Cistus*, the most common of which are *C. heterophyllus*, *C. monspeliensis*, *C. salvifolius*, and in certain localities *C. ladaniferus* and *C. albidus*. Two species of heath are also common, *Erica arborea* flowering in spring, and *E. multiflora* which covers the hills near Algiers and flowers in October and November, *Rhamnus Alaternus*, *Arbutus Unedo*, the fruit of which ripens in winter, and is very good though not delicious ; *Osiris quadridentata*, *Phillyrea latifolia* and *P. angustifolia*, *Asparagus albus*, with occasionally, near Algiers, some groups of *Pinus halepensis*. These plants form the chief features of the vegetation of the uncultivated hills.

The natural meadows in the neighbourhood of Algiers, and indeed all the hilly parts of Barbary, afford excellent forage, being composed almost entirely of Leguminous plants, amongst which the genus *Medicago* holds the first rank, and is very rich in species. Different species of *Scorpiurus*, *Astragalus*, *Ornithopus*, *Hedysarum* and *Onobrychis* complete the list of meadow plants as far as Leguminous species are concerned. *Hedysarum coronarium* deserves a special notice, as it grows in immense quantities in certain districts, and is much relished by horses. This plant grows several feet high, and bears a beautiful spike of scarlet flowers : it is cultivated extensively at Malta, under the name of *Silla*.

In the moist and marshy plains, such as that of the Mitidja, the gramineous plants predominate, and the hay is not so much prized. The principal species are *Phalaris cœrulescens* and *Dactylis glomerata*, with many *Junci* and a few *Carices* in moist places. The hay harvest begins towards the end of April, and is succeeded by the cutting of barley in May, and the wheat is got in in the month of June. The principal cereal crops are barley and wheat, the former being of the variety called *six-rowed*; and the wheat is red wheat, which is better suited for making the national dish of *couscoussou*. White wheat is

only cultivated by Europeans, and even by them on a very small scale, as all the fine flour used in the colony comes from Marseilles or other French ports. Rye is also cultivated by the colonists, but principally for its straw. A field of oats is a great rarity, as barley is the only corn given to horses. In reaping the corn the ear only is cut off, and the straw left for the cattle : what is left by them is burnt at sowing time, and the ashes afford the only manure supplied to the land. There is no preparatory tillage of the ground before sowing : the grain is thrown on the ground and ploughed in by a very simple plough drawn by oxen or horses, and sometimes by a horse and a cow yoked together. The furrows run in all directions, and by their frequently crossing one another, leave sometimes small triangular spaces unploughed.

Maize or Indian corn is only cultivated in small quantities, as it requires to be watered. The heads of maize are generally eaten before they are ripe, by being roasted on hot cinders. Broad beans are commonly cultivated in the open country. Peas and potatoes are cultivated in inclosed gardens. Potatoes are planted in September and are gathered in December ; a second crop is put in in March and taken up in June ; and in gardens which are easily watered, a third crop is planted in June and gathered in September. The European colonists sow large quantities of haricots or French beans, which are eaten either green or ripe, but only in the latter state by the natives : chick peas or garbanços are principally cultivated by the Spanish colonists, but the Moors and Arabs eat great quantities of them ; they cook them by roasting in an oven. Artichokes are very common in the gardens, and are much used by the Moors both raw and cooked : the Arabs, who have no fixed gardens (except in some localities near springs of water), employ as a substitute for artichokes the heads of *Cynara Cardunculus*, which is very abundant in certain clayey soils of the Mitidja. Onions and carrots are much used, and different kinds of lettuce.

Asparagus is abundant in autumn and spring ; it is found in the hedges, and is the produce of *Asparagus albus* and *A. acutifolius* : the former species produces larger turions, but they are rather bitter to the taste ; whilst those of *A. acutifolius* are as sweet as the cultivated *A. officinalis* : this last-named species I have discovered in the marshes of the plain of Mitidja, but I never observed the turions.

Melons are not very abundant ; they are brought from Spain at so low a price that no encouragement is afforded for their cultivation. Water melons are more common, and are a valuable fruit in the warm summer months. Gourds of various kinds are cultivated in great quantities by the Arabs in those gardens which are situated near springs of water. Cucumbers are also common :

the natives eat them as we would eat an apple, without any condiment.

A pot-herb much used in Barbary is the *Hibiscus esculentus*: the tender seed-vessels are cut in small pieces and boiled, or stewed with meat: it is a tasteless vegetable. Very different is the *Capsicum annuum*, whose pods are used abundantly: the green fruit of *Capsicum grossum* is eaten raw with oil and vinegar, and forms a dish, either served alone or with slices of tomato or love-apple: this last-mentioned plant is very extensively cultivated both by natives and colonists.

A great many plants are used by the Arabs to season their dishes, amongst which we may mention coriander, whose green leaves have a strong smell of bugs; both leaves and seeds are used. Parsley, basilic, sweet savory, chervil, fennel, mint, marjoram, are all in great demand. The Arabs who live in tents, and have no gardens, procure their pot-herbs from the plains, which furnish them with *Cynara Cardunculus*, *Cynara acaulis*, *Atractylis gummosa* (of this plant they eat the midribs of the leaves), *Ammi majus*, *Ferula communis*, Borage, and a host of other plants.

I will now mention the principal fruits properly so called: they are not so varied nor yet generally so delicious as in Europe. The apricot must hold the first rank: the tree grows without any care or even pruning, and ripens its fruit in June. There are several kinds of apricot, of which the best is one called *Chachi*: it is very juicy, and the flesh adheres to the stone. The kind called *Boreulbi* is considered very inferior; it resembles the one commonly cultivated in England. The peach and nectarine are less abundant, although with only the care of properly pruning, and the proper choice of varieties, they would be as good as in Europe.

The fig-tree is a native of the country, and in certain districts is cultivated to a great extent. The early figs, or *bakhor*, ripen in June, and the second crop in August and September: it is only this last kind which is dried, the bakhor being too watery for the purpose. There are many varieties of fig, and they are all good; one kind which ripens in September and October, called *Verdarola* by the Spaniards, is much esteemed, as well for its luscious taste as for its late ripening. Fig-trees are propagated from branches about a yard long, stuck in the ground: these, if they live, bear fruit about the third year. Pomegranates are abundant, and the tree, when covered with scarlet flowers, is a most beautiful object: the fruit ripens in September, and may be kept through the winter. When of a good kind, it is a most delicious fruit; otherwise it is very insipid.

The jujube-tree is very common, and the fruit ripens in Octo-

ber : it is seldom eaten by Europeans, but the colonists sometimes make of it an agreeable kind of cider. The tree has a very remarkable appearance in winter, as most of the branches terminate in thickened clubs, instead of gradually tapering towards their extremities, like almost all other trees. These clubs appear to be reservoirs of elaborated sap, as from them proceed small annual deciduous branches which bear the fruit, the growing part of the tree being covered with strong prickles, and these branches taper like those of ordinary trees.

There are several vineyards in the neighbourhood of Algiers, but the vine was more commonly cultivated by the Arabs in the interior, as near Medeah, Milianah, Mascara, &c. As wine is forbidden to Mussulmen, the grapes were only used for eating, and consequently in the same vineyard will be found grapes of all kinds and colours. I have tasted wine made by the Jews before the French occupation ; it was a dry white wine and very spirituous. The French colonists, in the neighbourhoods of Medeah near Algiers, and Mascara near Oran, have made a considerable quantity of wine during the last few years ; this wine is made from the old vineyards of the Moors, which had been neglected for many years, and become almost barren. The culture of the vine has not been sufficiently practised by the French colonists : as the plants do not produce fruit before three years, few could be found who would hazard their money for so long a period, in a country where 10 per cent. per annum is the legal rate of interest, and as high as 30, 40, or 50 per cent. are often taken. Vines, when trained on trellis-work, produce enormous crops, and of very delicious quality. The usual price of grapes in the market is about $2d.$, or 4 sous per lb., whereas in the South of France $\frac{1}{2}d.$ or 1 sou is a common price. Great quantities of fresh grapes are brought from Spain, and in the province of Oran, at least on the sea-coast, are the only ones to be had. Near Algiers I have often eaten the fruit of wild vines which climb the hedges, and they only differ from the cultivated grapes by their size, the flavour being equally good.

We will now mention the orange-tree and its allied species. In the immediate neighbourhood of Algiers, the bitter or Seville orange-tree was almost the only kind cultivated by the Moors, as the sweet oranges were brought from Blidah and the Mitidja, and sold at the rate of a penny a dozen ; whilst the bitter orange-tree was cultivated for the sake of its flowers, which are much better than those of the sweet orange-tree. There are not better oranges in the world than those of Blidah, both for size and flavour. The groves are yet very extensive, but an immense number of trees were cut down in 1840 by order of General Duvivier, as the Arabs concealed themselves amongst these trees

to fire on the inhabitants. The usual height of orange-trees is about 30 ft., and a grove of them covered with flowers and fruit at the same time, that is, in the month of April, is a splendid sight. Lemon-trees are equally common, as are also sweet lemons or bergamots. The citron (in French *cédrat*) is much less common, and is only used for making preserves: the rind is more than an inch thick, and is eaten raw by the Arabs. Other varieties have been introduced by the French, such as the *Chinois*, a very small kind used for preserves, and the Mandoline, a very small delicious orange from Malta introduced by Mr. St. John, English Consul in Algiers. The orange-tree is generally brought from Genoa, although some grafts are made in the country; and I possess trees sown from seeds, which after ten years' growth produced delicious oranges without grafting, not a flower having been produced before that period.

The silk mulberry-tree was not cultivated before the French occupation, but has since been planted to almost an excess;—I say excess, because their leaves are left to dry on the trees instead of being employed in the cultivation of the silk-worm. The silk produced in Algeria has been acknowledged by a commission at Lyons, appointed for the purpose of examining it, to be of a superior quality, and fetches as high a price in the market as some of the finest silks of the Cevennes. However, Algiers possesses advantages in the rearing of silk-worms which are not to be found in France. The mild temperature dispenses entirely with artificial heat, and the leaves have not to dread the late frosts which so frequently injure the trees in France. The black mulberry is cultivated by the Moors for the sake of its fruit. The caroub or locust-tree, *Ceratonia Siliqua*, is found wild on the hills; its wood is considered imperishable, and the fruit is sold in the shops, and eaten by the natives: in southern Spain this fruit is used very extensively for feeding horses and mules. This tree and the wild olive-tree are the largest in the country. The wild olive is the most common tree in the neighbourhood of Algiers; the fields are divided by hedges formed principally of it: the olive it produces is very small, but makes excellent oil; its small size renders it too tedious to gather, and it is left to fall from the tree, or become the food of starlings which visit the country in winter in immense flocks. The oil consumed in Algiers is brought by the Kabyles from the mountains between Algiers and Bougia, and is the product of the grafted olive-tree.

The most ordinary food of the Arabs is bread sopped in oil, when they can get it. The sweet acorn, the product of the *Quercus Ballota*, which grows to a very large size, is much used as an article of food: when raw it has very much the taste of chestnuts: it is either eaten in this state or boiled: the French

have used it roasted to imitate coffee. Chestnuts are very rare, as I have not seen a dozen trees in the country. Cherry-trees grow wild in some of the shady ravines of Boujareah near Algiers, but I never saw any fruit on them : the cherries consumed in Algiers are brought from Spain. Plums are more common, but not of a good quality. Apples are very poor, although in certain districts near Algiers a small kind of summer apple is very common. Pears are better, but there existed very few varieties until the French occupation. The loquat, or fruit of *Mespilus japonica*, ripens perfectly and is much esteemed ; it has rather the taste of an English gooseberry : this last shrub is cultivated in a few gardens as an object of curiosity, but I never saw the red currant, although many French colonists have imported the tree, which seldom survives the first year. The service-tree, *Sorbus domestica*, is rather common in gardens. Strawberries have been introduced by the French, and produce fruit in gardens which have a good supply of water : in such places they are to be had at all seasons, even in December. The Moors call them *tout ensàra*, Christian mulberries.

There are very few gardens without a few banana or plantain-trees : the fruit ripens perfectly, but always fetches a high price. In certain parts in the interior, as Tlemcen, the walnut-tree is common, but it is rare near the coast : the bark of the root is very much used by the natives to dye their feet and hands on feast-days. Almond-trees are very common ; they flower in January and ripen their fruit in September. I can scarcely count the myrtle as a fruit-tree, yet the ripe berries are much eaten, and even brought from Spain ; they have a sweetish but powerfully aromatic taste, resembling juniper berries. Of the same flavour are the berries of the lentisk-tree, which are eaten by both Moors and Spaniards.

Many opinions have been given as to the fruit called *Lotus*, described by Herodotus, Pliny, Theophrastus, and other ancient writers, and which gave its name to a whole people, who were called *Lotophagi*. Some believe it to be the fruit of the *Celtis australis* common in the Mediterranean region ; this tree however does not answer to the description of the lotus-tree, which was described as being a low prickly shrub, nor does the fruit possess the quality attributed to it, of making a man forget his country, "tam dulci ibi cibo, ut nomen etiam genti terræque dederit, nimis hospitali advenarum oblivione patriæ, &c." (Plin. l. 13. c. 17.) Shaw and Peyssonel fancied that it was the *Ziziphus Lotus* or *Sidra* of the Arabs : the description of the shrub agrees with that of the real lotus ; but its fruit, which resembles very much that of our common hawthorn in flavour, can neither by its taste nor any other property, cause a man to forget his country. The date

is another fruit which has been thought by its luscious flavour to be the lotus, but the sweetness of the date is the only point which agrees with the description of the fruit in question. I have received from M. Pelissier, Consul of France at Soussa, near Tripoli, specimens of a plant called *Nitraria tridentata*: it is a small prickly shrub agreeing in description with the lotus of the ancients, and moreover the fruit is pleasant to the taste, and has a slightly intoxicating property, quite sufficient to make a man forget his country whilst under the influence of it: it is called by the Arabs *damouch*. I think this plant has greater claims than any other to be the lotus, both from the description of the plant and fruit, and also from its geographical position, the region of the Lotophagi, being to the eastward of the kingdom of Algiers.

I shall only just mention the date-palm, as it is cultivated rather as an object of curiosity, at least on the littoral, than of utility: the date-eating people live many hundred miles in the interior. Cotton has been tried with success, but the high price of manual labour prevents its extensive cultivation. The sugar-cane grows without care, but is not used in the making of sugar: some of the colonists are in the habit of planting it to serve as green food for the cattle in summer, when the meadows and pastures are dried up. Tobacco is cultivated both by natives and colonists: the French have lately introduced several varieties of tobacco, and have drawn the attention of the settlers to the cultivation of this plant. The variety grown by the Arabs is very mild, and resembles in a great measure the Latakia or other Oriental tobaccos. The French government have established an Experimental Garden on a large scale near the town of Algiers; and here may be seen growing, without any artificial covering, indigo, tea, coffee, sesamum, and a great number of ornamental plants, which, under an English climate, would require the protection of a stove. The *Bougainvillea spectabilis* flowers against a wall in February: *Erythrina Crista Galli* attains a height of 20 feet. *Cassia tomentosa*, the Guava plum, *Lantana Cammara*, the bamboo cane, *Sparmannia africana*, *Justicia Adhatoda*, and a host of other tropical plants, flower perfectly in the open air and are left out all winter. Except the two native species of heath, I never saw any plants of this tribe in Algeria.

The kingdom of Algiers has not any particular kind of vegetation to distinguish it from the Mediterranean region in general. Its flora is almost identical with that of the South of Spain, and of Andalusia in particular: the two species of *Phelipaea* which are found near Oran are remarkable by the immense size of their fleshy stems. The richest harvest for a botanist is on the low dry hills in early spring, as the meadows and plains often yield only

many of the common European species. The old Roman roads which still exist in the immediate neighbourhood of Algiers are rich in rare species: under the shade of the wild olive-trees which overhang these roads are found *Lycopodium complanatum*, *Grammitis leptophylla*, *Asplenium palmatum*, *Trachelium cæruleum*, *Campanula dichotoma*, *Sedum heptapetalum*, *Scrophularia trifoliata* and *mellifera*, *Allium triquetrum*, many *Ophryses*, and other interesting plants, whilst the trees themselves are festooned with *Clematis cirrhosa*, which is covered with flower in December, *Smilax mauritanica*, *Convolvulus sepium*, wild vine, *Tamus communis*, *Aristolochia altissima*, *Rosa sempervirens*, and in some parts *Ephedra altissima* and *Equisetum ramosissimum*.

The province of Oran affords the richest harvest of rare plants, both on the coast and in the interior. In the sandy plains of that province the *Cynomorium coccineum* is common, and in the brackish water lakes are found *Duriea helicophylla* and *Ruppia trichodes*, two new species of plants found by M. Durieu. Near Saida is found the curious *Otocarpus virgatus*, a new plant of the family of Cruciferæ. This family has some very curious representatives in this province, and which are not found except in Algeria; such are *Condyllocarpus muricatus*, *Psychine stylosa*, *Lonchophora Capiomontiana*, and *Bunias prostrata*. The greatest number of species of plants in Algeria may be reckoned in the family of Leguminosæ. The neighbourhood of Oran furnishes several new species of *Genista*, such as *G. cephalantha*, Spach, *G. Duriei*, Sp., *G. spartioides*, Sp., *G. numidica*, Sp., *G. ulicina*, Sp., *G. atlantica*, Sp., *G. erioclada*, Durieu, all of which are figured in the splendid work now publishing by the French government, upon the labours of the Scientific Commission sent to Algeria a few years ago to explore its productions in natural history. The family of Leguminosæ also presents us with a number of species of *Medicago*, some of which are new, viz. *M. corrugata*, Dur., *M. plagiospira*, Dur., *M. secundiflora*, Dur., which are figured in the work above-mentioned. In the same family we have some interesting plants amongst the pea tribe, such as *Orobus atropurpureus*, Desf., which covers the meadows in certain localities on the plain of Mitidja near Algiers, and flowers in April. In my catalogue of the plants of Algiers I have described a new species of *Lathyrus*, under the name of *L. luteus*; it climbs the hedges near Algiers, and resembles very much *L. sylvestris*, L., but its yellow flowers and filiform stipules constitute it a distinct species. *Lathyrus Cymenianus* and *L. tingitanus*, L., the latter of which is commonly cultivated in our gardens under the name of Tangier pea, are both very common in the hedges and brushwood.

It was my intention to have passed in review each family of

plants, and of pointing out the most remarkable species which occur in Algeria, but I find that it would only draw out this paper to an immeasurable length.

I cannot however pass over a new species of *Stapelia*, named by Decaisne *Boucerosia Munbyana*, and discovered by me in the neighbourhood of Oran, interesting in a geographical point of view; it is well known that the great seat of *Stapelias* (which is a most distinct and perfectly natural genus) is at the Cape of Good Hope, and until lately only one species occurred in Europe as a representative of this genus; I speak of *Stapelia europaea*, which is found in Sicily and the southern coast of Spain. The discovery of an allied species on an intermediate point is I conceive very interesting, and will in all probability form the second link in a chain which will connect the humble *Stapelia europaea* with the remarkable Cape species.

I shall conclude this paper by noticing a lichen called *L. esculentus*, and which agrees, at least more nearly than any other substance hitherto discovered, with the description of the Manna on which the Israelites fed during their wanderings in the desert.

This lichen is found on the sand of the desert, which it covers in some parts, and grows during the night, as do many mushrooms. The French soldiers during an expedition towards the south of Constantine actually subsisted upon it for some days, cooking it in various ways, and even making it into bread. I do not pretend to explain the miraculous portions of the history of the Manna, but it is very probable that if gathered when alive or in a soft state, it would in a very short time ferment if placed in a heap, and from the rapid development of animal life in that warm climate, "breed worms and stink" in a very few hours. Neither would I attempt to explain the double quantity gathered on the sixth day. The description given by Moses is this: "Upon the face of the wilderness there lay a small round thing, as small as hoar-frost on the ground;" and again, "it was like coriander seed, white; and the taste of it was like wafers made with honey." There are a few characters in this account of it which disagree with the substance I present to you, yet the discovery of a substance springing up in the short space of a night on the surface of the sandy desert, and that substance capable of sustaining human life, is, to say the least, a remarkable fact, and one well worthy the examination and researches of botanists.

XLV.—Observations on the Synonymy of the genus Nomada of Fabricius, belonging to the family of Cuckoo or Parasitic Bees.
By **FREDERICK SMITH.**

THE revision of the European species of the genus *Nomada* by Dr. Herrich-Schäffer, published in Germar's 'Zeitschrift,' is by far the most elaborate and complete essay on the genus which has hitherto appeared, and is probably that to which the entomologists of the continent would refer as the most correct nomenclature extant. Our author has paid particular and careful attention to the descriptions of Kirby, but in many instances has arrived at erroneous conclusions: my office of Curator to the Entomological Society of London, in whose collection are deposited the original specimens from which Kirby drew his descriptions, gives me a constant opportunity of examining and determining the species; and it is in the hope that my remarks and emendations may prove of general utility which induces me to publish a revision of Schäffer's paper. I have published elaborate descriptions, with remarks on all the known British species, in the second volume of the 'Zoologist,' published in London 1844. A further inducement, if any were wanting, has been the observations of Dr. Schaum in the 'Entomologische Zeitung,' where he expresses a desire that English entomologists would set themselves to the task of studying individual families, so as to bring about in them an agreement between English nomenclature and that employed on the continent. The almost exclusive attention which I have for some years paid to the aculeate Hymenoptera, more particularly our native species, will I trust enable me to follow out with some success the objects so earnestly advocated in the paper referred to. I follow for the sake of convenience the arrangement of Herrich-Schäffer, although it separates in my opinion some closely allied species: an arrangement founded on colour in so variable a genus as the present must of necessity separate sexes of the same species in some instances, and in others remove varieties from their legitimate position.

Genus NOMADA, Fab.

Species 1. *ferruginata*, Linn.

Nomada ferruginata, Schäffer, Germ. Zeits. vol. i. p. 275. 1; Smith, Zool. vol. ii. p. 600. 14; Nylander, Mon. Ap. Boreali, Acta Soc. Scient. Fennica, p. 183.

Nomada Germanica (male), Fab. Syst. Piez. p. 394. 78; Panzer, Fn. Ins. Germ. n. 72. tab. 17; St. Farg. Hist. Nat. Ins. tom. ii. 477 (male and fem.).

Apis ferruginata, Linn. Syst. Nat. ed. 12. p. 2779. 35; Vill. 3. 28;

Forst. Cat. 723; Kirby, Mon. Ap. Ang. vol. ii. p. 218. 34. tab. 16. f. 4.

There can be no doubt I think of the male of this species being the *Nomada Germanica* both of Panzer and Fabricius.

Sp. 2. *pleurosticta*, Schäffer, Germ. Zeits. vol. i. p. 276. 2.

Amongst a long series of *Nomada ferruginata* captured together parasitic upon *Andrena fulvescens*, I have four examples which answer exactly to Schäffer's descriptions of *pleurosticta*; I am therefore induced to consider it merely a variety of that species.

Sp. 3. *Germanica*, Panzer, Schäffer, Fab., St. Farg.

The male of *ferruginata*.

Sp. 4. *argentata*, Schäffer, Germ. Zeits. vol. i. p. 276. 4.

I am unacquainted with this species.

Sp. 5. *lateralis*, Panzer, 96. 20 et 21. Revis. p. 236; Schäffer, Germ. Zeits. vol. i. p. 2. 277; Smith, Zool. vol. ii. 601. 16.

Schäffer is in error in supposing *A. Hillana* to be the male of this species; *Hillana* is a variety of *ochrostoma*: nor is the *A. xanthosticta* a var. of the female, but a good and distinct species which I possess in my collection; it is smaller than any example which I have seen of *lateralis*.

Sp. 6. *Fabriciana*, Linn.

Nomada Fabriciana, Fab. Ent. Syst. Em. n. 10; Piez. 397. 10; Spin. 1. 154. 4; Illig. 26; Schäffer, Germ. Zeits. vol. i. pt. 2. 277. 6; Smith, Zool. vol. ii. 598; Nylander, Mon. Ap. Boreali, p. 183.

Apis Fabriciana, Linn. Syst. Nat. ed. 12. p. 2794. 17; Vill. 3. 14.

Apis Fabriciella, Kirby, 2. 213. 29. tab. 16. fig. 3.

Ap. 4-notata, Kirby (male).

Nomada 4-notata, St. Farg. Hist. Nat. Ins. vol. ii. p. 494. 26.

Sp. 7. *furva*, Panzer.

Nomada furva, Panz. Faun. Germ. 55. fig. 25 (male); St. Farg. Hist. Nat. Ins. vol. ii. p. 495. 27; Smith, Zool. vol. ii. 599. 13.

Nomada minuta, Fab. Syst. Piez. 394. 19 (female)?; Schäffer, Germ. Zeits. vol. i. pt. 2. 278. 7; Nylander, Faun. et Flora Fennica, p. 184.

Nomada Dalii, Curtis, Brit. Ent. (male), vol. ix. 419.

Apis rufocincta, Kirby, Mon. Ap. Ang. tom. ii. p. 216. 32 (fem.).

Apis Sheppardana, Kirby, Mon. Ap. Ang. vol. ii. p. 217. 33 (fem.).

Nomada vaga, Panz. 55. 22. var. male?

Both Kirby's species quoted are undoubtedly females of *furva*, but the *flavo-guttata* of that author is a distinct species, as is also the *A. leucophthalma*, which is a small variety of *N. ruficornis*, male. This species is parasitic upon *Colletes*, as well as upon *Andrena nana*.

Sp. 8. *conjugens*.

Nomada conjugens, Schäffer, Germ. Zeits. vol. i. pt. 2. 279. 8.

I must consider this species to be one of the numerous varieties of

N. ruficornis; the distinguishing characteristic of the male, the first joint of the antennæ yellow in front, and one-third of the joints black behind, distinguishes the male of *ruficornis*; and the female, distinguished by having the entire region of the eyes red, and the yellow spots on the third and fourth segment of the abdomen distinct, are usual characteristics of the female of *ruficornis*, which is by far the most abundant species in the neighbourhood of London.

Sp. 9. *ruficornis*, Linn.

Nomada ruficornis, Fab. Ent. Syst. Em. n. 7; Syst. Piez. 390. 2; Panz. Fn. Ins. Germ. Init. no. 55. tab. 18; Schäffer, Germ. Zeits. vol. i. pt. 2. 279. 9; St. Farg. Hist. Nat. Ins. vol. ii. 498. 29; Smith, Zool. vol. ii. 596. 9; Nylander, Mon. Ap. Boreali, p. 180.

Apis ruficornis, Linn. Syst. Nat. Gmel. p. 2795. 34; Syst. Nat. ed. 12. n. 34; Fn. Suec. 1707; Vill. Ent. Eur. 3. n. 27; Geoffr. Hist. Ins. Par. tom. ii. p. 381. 18; Kirby, Mon. Ap. Angl. vol. ii. p. 210. 27.

Nomada conjungens, Schäffer, no. 8 (male and fem.).

Nomada flava, Panz. 53. 31 (male); Fabr. Syst. Piez. 391. 4; Kirby, vol. ii. 186. 8; Schäffer, no. 18.

Apis leucophthalma, Kirby, vol. ii. 197. 16.

Probably the most variable species of the genus, particularly the male. This insect is parasitic upon *Andrena Trimmerana*, *tibialis*, and *nigro-aenea*.

Sp. 10. *armata*, Schäffer.

Nomada armata, Schäffer, Germ. Zeits. vol. i. pt. 2. 279. 10; Smith, Append. Zool. vol. vii. p. 41.

This species I have described in the 'Zoologist'; it has hitherto only been taken twice in this country in Devonshire. I have seen examples from Nova Scotia, and also from Albania.

Sp. 11. *rostrata*, Schäffer.

Nomada rostrata, Schäffer, Germ. Zeits. vol. i. pt. 2. 280. 11.

This species I think is without doubt the male of Kirby's *A. flavoguttata*.

Sp. 12. *melanostoma*, Schäffer.

Nomada melanostoma, Schäffer, Germ. Zeits. vol. i. pt. 2. 280. 12.

On examining a long series of *N. lateralis*, male, I feel satisfied that this is only one of its varieties; small specimens have sometimes the labrum black as well as the clypeus, and the scutellum is black in nearly all the males which I have seen; these peculiarities are only variations to which the species is subject.

Sp. 13. *ochrostoma*, Kirby.

Nomada ochrostoma, Schäffer, Germ. Zeits. vol. i. pt. 2. 280. 13; Zetterst. Ins. Lapon. p. 470. 2; Smith, Zool. vol. ii. 596. 9 (male).

Nomada vidua, Smith, Zool. vol. ii. 602. 18 (female); Nylander, Mon. Ap. Boreali, p. 179.

Apis Hillana, Kirby, vol. ii. 208. 25 (var. male).

This species is closely allied to *N. lateralis*, the males of the species most closely resembling; but the abdomen of *ochrostoma* is more

convex, and the basal joint of the antennæ is entirely rufous: the females are readily distinguished; *lateralis* by having angulated maculae on the abdomen, whilst those on *ochrostoma* are round. The male is widely distinct from that of *ruficornis*.

Sp. 14. *zonata*, Panzer.

Nomada zonata, Panzer, Faun. Germ. 53. fig. 20; Schäffer, Germ. Zeits. vol. i. pt. 2. 281. 14; St. Farg. Hist. Nat. Ins. vol. ii. 491. 23.

This species has not to my knowledge yet been discovered in England.

Sp. 15. *pallescens*, Schäffer, Germ. Zeits. vol. i. pt. 2. 281. 15.

This species is unknown to me.

Sp. 16. *alboguttata*, Schäffer, Germ. Zeits. vol. i. pt. 2. 282. 16.

I have frequently seen examples of this species from the continent, but it has not been found in England.

Sp. 17. *modesta*, Schäffer, Germ. Zeits. vol. i. pt. 2. 282. 16.

This species is unknown to me.

Sp. 18. *flava*, Schäffer, Panzer, Fab., Nylander, Kirby, &c.

This is the true male of *ruficornis*.

Sp. 19. *Roberjeotiana*, Panzer.

Nomada Roberjeotiana, Panzer, Fn. Germ. 72. tab. 18; Fab. Syst. Piez. 391. 6; Schäffer, Germ. Zeits. vol. i. pt. 2. 283. 19; Smith, Zool. vol. ii. p. 603. 19; Nylander, Mon. Ap. Boreali, p. 178. 7.

Nomada neglecta, Schäffer (male).

Some years ago I captured this species for the first time in England; altogether I have not seen more than a dozen examples captured in this country: it is an autumnal species. The *N. neglecta* of Schäffer is I think the male.

Sp. 20. *neglecta*, Schäffer. The male of the preceding.

Sp. 21. *basalis*, Schäffer, Germ. Zeits. vol. i. pt. 2. 284. 21.

I am unacquainted with this species.

Sp. 22. *fucata*, Panzer.

Nomada fucata, Panz. Fn. Germ. 55. tab. 19; Fab. Syst. Piez. 390. 3; Schäffer, Germ. Zeits. vol. i. pt. 2. p. 284. 22; Smith, Zool. vol. ii. p. 593. 5 (male and fem.).

Nomada varia, Panz. Faun. Germ. 55. fig. 20 (male).

Apis varia, Kirby, Mon. Ap. Angl. vol. ii. p. 185. 7 (male).

I doubt very much if Schäffer was acquainted with the male of this species, since he says it varies in having the spots on the collar and scutellum obsolete. Although I have seen great numbers, and once met with the species in profusion, I never saw the spot either obsolete or partially so; it is even more constant than in the opposite sex.

Sp. 23. *solidaginis*, Panz.

Nomada solidaginis, Panz. Faun. Germ. 72. tab. 21 (male); Fab.

Syst. Piez. 392. 7 (male); Schäffer, Germ. Zeits. vol. i. pt. 2. 284. 23 (male and fem.); St. Farg. Hist. Nat. Ins. vol. ii. 472. 8 (male and fem.); Smith, Zool. vol. ii. 595. 8 (male and fem.); Nylander, Mon. Ap. Boreali, p. 176. 3 (male and fem.).

Apis solidaginis, Kirby, Mon. Ap. Angl. vol. ii. 204. 22 (male and fem.).

Apis picta, Kirby, Mon. Ap. Angl. vol. ii. 204. 22 (fem.).

Apis rufo-picta, Kirby, ditto 207. ditto.

The colouring of the male of this species is very constant, whilst that of the female varies greatly; on the abdomen the colour ranging from black to pale red. These varieties embrace the *picta* and *rufo-picta* of Kirby.

Sp. 24. *sexfasciata*, Jurine.

Nomada sexfasciata, Jurine, Panzer, Faun. Germ. 68. 18 (male); Illiger, no. 37; Schäffer, Germ. Zeits. vol. i. pt. 2. 285. 24; St. Farg. Hist. Nat. Ins. vol. ii. p. 471. 7; Smith, Zool. vol. ii. 258. 18.

Apis connexa, Kirby, Mon. Ap. Angl. vol. ii. 199. 19 (male); Schäff. Icon. 81. 7.

Apis Schafferella, Kirby, Mon. Ap. Angl. vol. ii. 199. 18 (fem.).

This is the largest species of the genus found in England; it is very local, being parasitic upon *Eucera longicornis*, from the cells of which I have extracted both sexes.

Sp. 25. *Marshamella*, Kirby.

Nomada Marshamella, Schäffer, Germ. Zeits. vol. ii. pt. 1. 285. 25; Smith, Zool. vol. ii. 590. 3; Nylander, Mon. Ap. Boreali, 177. 5.

Apis Marshamella, Kirby, Mon. Ap. Angl. vol. ii. 188. 10.

Apis alternata, Kirby, Mon. Ap. Angl. vol. ii. 182. 5 (var. male).

Schäffer supposes the *A. cornigera* and *subcornuta* to be varieties of this species, but in this he is quite mistaken; *subcornuta* is a variety of *cornuta*, but the latter is a good and distinct species, having a different male to *Marshamella*, and much more rare or local, and not appearing so early in the season. The *A. alternata* of Kirby is merely a variety of the male in which the spots on the scutellum are obsolete.

Sp. 26. *affinis*, Schäffer.

Nomada affinis, Schäffer, Germ. Zeits. vol. i. pt. 2. 286. 16.

I think this is undoubtedly a variety of the foregoing; the slight differences pointed out come within the range of variation to which this species is subject.

Sp. 27. *Jacobææ*, Panzer.

Nomada Jacobææ, Panz. Faun. Germ. 70. fig. 20 (male); Schäffer, Germ. Zeits. vol. i. pt. 2. 286. 27; St. Farg. Hist. Nat. Ins. vol. ii. 479. 15; Smith, Zool. vol. ii. 594. 7; Nylander, Mon. Ap. Boreali, 176. 3.

Apis Jacobææ, Kirby, Mon. Ap. Angl. vol. ii. 201. 20 (male).

Apis flavo-picta, Kirby, Mon. Ap. Angl. vol. ii. 202. 21 (fem.).

The *Apis flavo-picta* of Kirby is undoubtedly the female of *Jacobææ*,

as I can assert, having frequently examined the original specimens in the Kirbyan cabinet. With us it appears in the autumn, as do also *solidaginis* and *Roberjeotiana*.

Sp. 28. *interrupta*, Panzer.

I am unacquainted with this species.

Sp. 29. *nobilis*, Schäffer.

Nomada nobilis, Schäffer, Germ. Zeits. vol. i. pt. 2. 278. 29.

I have seen specimens of this species from Albania; it has not hitherto occurred in England.

Sp. 30. *succincta*, Panzer.

Nomada succincta, Panzer, Faun. Ins. Germ. 55. tab. 21.

Very nearly allied to the *Apis Goodeniana*, Kirby, but I think distinct, as the male of Kirby's insect has neither yellow legs nor a black spot on the posterior tibia, both strong specific characters.

Sp. 31. *cincta*, Schäffer.

Nomada cincta, Schäffer, Germ. Zeits. vol. i. pt. 2. 288. 32.

This is a species that is unknown to me.

Sp. 32. *alternata*, Kirby.

Apis alternata, Mon. Ap. Angl. vol. ii. 182. 5.

This is a variety of the male of *Marshamella*, in which the usual yellow spots on the scutellum are obsolete.

Of the species which were unknown to Herrich-Schäffer, it may be probably useful to offer a few observations, although the synonymy will point out their true position.

First, the *Apis caprae* of Kirby is only a small variety of *A. cornuta*—the rufous fascia on the first abdominal segment reduced to two minute rufous spots, the two yellow spots on the scutellum obsolete, and the horn on the lip nearly so; the abdomen beneath rufo-piceous, and not marked with yellow. The *Apis lineola* of Panzer and Kirby is also a variety of *A. cornuta*; or rather I should say, *A. cornuta* is the variety, Panzer's name being the oldest.

Apis Lathburina: the *A. rufiventris* is the female of this species. It is parasitic upon *Andrena labialis*.

Apis picta and *rufo-picta* are both varieties of the *N. solidaginis* of Panzer, which varies so greatly in colouring, as I have already observed.

Apis sexcincta, Kirby, is the male of *N. lineola*; it is very much like the male of *N. Marshamella*, but is quite a distinct species; the most obvious differences are, that it has bright yellow tegulae, the legs mottled more or less with yellow, and the abdomen more convex; it is also usually a larger insect, and is of much rarer occurrence.

BIBLIOGRAPHICAL NOTICES.

Principles of Scientific Botany; or Botany as an Inductive Science.

By Dr. M. J. SCHLEIDEN, Extraordinary Professor of Botany in the University of Jena. Translated by EDWIN LANKESTER, M.D., F.R.S. &c. London, Longman and Co., 1849. Pp. 616. Woodcuts and 6 Plates.

WHATEVER may be the opinion as to the correctness of Professor Schleiden's views upon certain questions, in connexion with which his name is best known in this country, there can be no doubt that he ranks among the first original observers of the present day, and this work is undoubtedly the most valuable systematic exposition of the structural department of botany which has yet been given to the world. The thanks of the botanists of this country are therefore due to Dr. Lankester for the present translation, which although by no means free from blemishes, may be received, on the whole, as a fair average rendering of a work which is admitted to present considerable difficulties.

We cannot afford space, supposing even it were desirable in this place, to enter upon the discussion of the many points on which Prof. Schleiden is at issue with many other celebrated botanists ; we must simply indicate that these are fully considered in this work. An appendix contains some important changes given in a third edition of the first part of the original, which appeared while this translation was in the press. From this it will be seen that Prof. Schleiden has greatly modified his earlier views on cell-development, and now approaches to an agreement with his opponents.

The work is divided into four books :—1. The Chemistry of Plants, on which subject the author goes into much greater detail than was usual with botanical writers until the publication of this treatise. 2. On the Plant-cell, under which head all the forms of the elementary tissues are treated, as also the physiology of these structures. 3. Morphology, divided into general and special ; the second comprehending a minute account of the organization of all the great classes of plants, the Cryptogamic being examined separately and successively, while the Monocotyledons and Dicotyledons are reviewed together under sections founded on their different organs. This portion of the work is very rich in original observation, and is particularly characterized by the peculiar views of the author, especially by the strict definition of *axial* and *foliar* organs, the views entertained respecting placentation, the nature of ovules, and the doctrine maintained concerning the origin of the embryo. The 4th book is entitled Organology, by which we understand Physiology. Sect. D. contains some very important matter on the subject of the processes of Nutrition. While arguing strongly in favour of the views of Liebig and others, that the chief portion of the carbon and ammonia required by plants is received by them in an inorganic condition, he admits the possibility and even the probability of the absorption of organic compounds, as urged by Mulder : the possibility is evident from the physiology of parasitic plants, and the plants

peculiar to peat-bogs are instance as cases where it is not unlikely that organized substances are imbibed. Moreover, the author dwells upon the fact that it is only the *root-cells* which really assimilate inorganic substances; he upholds the opinion that assimilation takes place in the very act of the primary absorption, and that thus there does not exist any which can be properly called *crude sap*; the assimilated matter derived from the roots is modified by the various organs into which it passes, according to their special character. He rejects *in toto* the idea of a circulation of the sap, regarding the passage of fluids through all plants as a mere distribution from cell to cell, such as takes place in wholly cellular structures. It appears to us that this hypothesis is too sweeping. There can be no doubt that the ducts or large tubular forms of the tissue frequently open into each other after they have attained a certain age, thus forming continuous canals, and it is equally certain that these occur in the vascular bundles, especially in the wood. There seems to be no reason to doubt that mere capillarity will cause the fluids to ascend in these ducts when a current is maintained by the evaporation from the leaves. With respect to a descending current, there is great likelihood that Profs. Schleiden and Mulder are right in denying it, and asserting that all the phenomena supposed to result from it are to be explained by the process of endosmosis, which is indeed the principal cause of the ascending current. We can hardly imagine a current upward *and* downward in the vessels; but in endosmosis there is an interchange,—a passage in both directions with an ultimate tendency to equilibrium. Careful experiments are still wanting on this subject.

In the appendix to the translation are: A. Analytical papers; B. A list of old trees; C. The extracts from the third German edition of books 1 and 2 already referred to; and D. An article on the use of the Microscope from the "Methodological Basis" prefixed to the original work, but which is omitted in the translation in order to diminish the bulk of the volume.

The volume is well illustrated wholly from the author's own drawings, a rather unusual circumstance, but of course greatly adding to its value.

No one interested in scientific botany should be without the work.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

December 12, 1848.—R. C. Griffith, Esq., F.G.S., in the Chair.

Dr. Melville communicated orally the first part of his paper "On the Ideal Vertebra." He commenced by defining this as "the most complete possible segment of the endo-skeleton," or in the words of his friend Mr. MacLise, "the plus vertebral quantity;" and it was illustrated by a diagram showing the body, neural arch and

spine, and two concentric arches or circles below, the inner one consisting of three elements, to which he gave the names *haemapophyses* and *haemal spine*, and the outer one formed by the ribs and sternum.

He had arrived, he said, at this idea by observing the inner or true haemal arch coexisting with the costo-sternal arch in many animals, and referred especially to the skeleton of a lizard in the British Museum as illustrating his discovery; and regretting that the laws of that Institution prevented his exhibiting it at the Meeting, he showed the haemapophyses in enlarged diagrams of the cervical and dorsal vertebrae, and contrasted his ideal vertebra with diagrams of those given by Geoffroy St. Hilaire and Professor Owen. The bones, which Dr. Melville stated Sir P. Egerton had rediscovered in the *Ichthyosaurus*, and called 'wedge-bones,' were the true haemapophyses, and he referred to a work by Camper, in which the cervical haemapophyses had been previously described.

The bone which had been called the body of the atlas was the haemapophysis of the occipital vertebra; and the 'odontoid process' was the true body of the atlas. The bones which Professor Müller had defined as the inferior transverse processes in fishes, and which Professor Owen had called 'parapophyses,' were the true haemapophyses, and the term 'parapophyses' ought to be abolished, as it had been applied to several distinct elements. True haemapophyses were sometimes autogenous, sometimes exogenous.

Adverting to the pleurapophyses or pleural elements of the vertebrae, Dr. Melville alluded to Müller and Thirles' discovery of these in the lumbar and sacral region, where they had been called 'transverse processes,' and he exhibited the sacral vertebra of an '*iguandon*,' showing the articular cavity for the sacral rib.

With regard to the exogenous processes of the vertebrae, which Professor Owen had called 'diapophyses,' Dr. Melville exhibited the vertebral columns of some quadrupeds, showing that they sent off a process backwards in the dorsal vertebrae, and were continued into the lumbar region by such posterior processes, and not by the processes which Professor Owen had called diapophyses in the lumbar region. Understanding that Professor Owen had proposed names for these mere subdivisions of the diapophyses, Dr. Melville strongly deprecated the overloading this difficult part of anatomy with unnecessary names. He also animadverted on Cuvier and M. De Blainville for having neglected to describe these modifications of the transverse processes. Dr. Melville pointed out in the vertebrae of an ant-eater and armadillo the processes which project forwards from the anterior zygapophyses, and which he believed Professor Owen called the 'epizygapophyses'—(the Professor here stated that he had given that name to the superior articular processes in serpents, which were not homologous with the processes alluded to by Dr. Melville, and to which Professor Owen had assigned a distinct name). Dr. Melville went on to demonstrate these anteriorly projecting processes, and stated that the Edentata had no posterior or backwardly projecting processes from the diapophyses. With regard to the parts called 'parapophyses' by Professor Owen in the cranial vertebrae,

Dr. Melville totally dissented from that author, and with regard to the 'paroccipital,' he stated that Rathké had proved it by tracing the development of the bones of the skull to be a mere dismemberment of the petrosal. After eulogising the labours of Müller, Rathké, Geoffroy, and other foreign authors, by whom the truths of that science—sneered at in this country as 'Philosophical Anatomy'—had been discovered and established, Dr. Melville awarded praise to Professor Owen for having first introduced them in a systematic form in an English work, the value of which however was lessened by many grave errors, which it was important to have corrected, and to effect which was the chief object of his present communication. The second part of this communication would be ready for the next Meeting.

The Chairman proposed a vote of thanks for Dr. Melville's paper on the Ideal Vertebra, and called upon Professor Owen to reply, when the Professor inquired whether Dr. Melville's paper had been received; and the Secretary having stated that the paper had not been received, as had been expected before the preparation of the *Agenda*, Professor Owen remarked that the absence of such a document, vouching for the precise nature and terms of Dr. Melville's present views, and the actual grounds of his objections, rendered him averse to entering upon a refutation of those that had just been urged *viva voce*. So far, however, as the author's views were represented by the diagrams exhibited, he thought it due to the Meeting to offer a few brief remarks on these.

Professor Owen then observed, that if the modification of the ideal vertebra now proposed had originated, as it might seem to those present who were unacquainted with his work 'On the Vertebrate Archetype,' from the discovery of new facts by Dr. Melville, of which Professor Owen had not had cognizance when he formed his conclusions on the nature of the typical vertebra, there might then have been a *prima facie* probability of his idea needing some modification in conformity with such alleged new facts. With the exception, however, of the coexistence in nature of a second hæmal arch internal to the costo-sternal arch, he had long been cognizant of the parts called by Dr. Melville 'hæmal arches' and 'hæmapophyses' in the cervical and dorsal regions of the species cited. Professor Owen then inquired whether the lizard at the British Museum referred to by Dr. Melville actually exhibited the perforated hæmal arch beneath the bodies of the cervical and dorsal vertebrae, as shown in the diagram, and Dr. Melville replied that it did not, but explained that the subvertebral processes in the trunk being serially homologous with the perforated hæmal arches in the tail, he was justified in introducing such arch along with the costo-sternal arch in the diagram.

Professor Owen then resumed, that the main question turned upon a difference of interpretation of known facts, and stated that even had the structures adduced by Dr. Melville in support of his views been new, it would not therefore follow that his interpretation of them was the true one.

All those structures had, however, been described by Professor

Owen, and duly considered by him prior to the publication of his work 'On the Archetype and Homologies of the Vertebrate Skeleton,' 8vo, Van Voorst, 1848, from which he quoted the following passages regarding their true nature and homologies. Viewing them as processes from the cortical part of the centrum, Professor Owen states : "The centrum may develope not only parapophyses, but inferior median exogenous processes, either single, like those of the cervical vertebrae of saurians and ophidians (which in *Deirodon scaber* perforate the œsophagus, are capped by dentine, and serve as teeth*), or double (atlas of *Sudis gigas*† and the lower cervical vertebrae of many birds); or the fibrous sheath of the notochord may develope a continuous plate of bone beneath two or more nuclei of centrums, formed by independent ossification in the body of the notochord, these nuclei being partially coherent to the peripheral or cortical plate." (p. 96.)

To this view Professor Owen had been led chiefly by the coexistence of these inferior exogenous processes in the anterior abdominal vertebrae of certain fishes with the true hæmal arches, the nature and modifications of which were so plainly demonstrated in the caudal region of fishes. Besides the species cited in which these 'processus inferiores' had been noticed by previous authors (Agassiz e. g. in the case of *Sudis gigas*), Professor Owen had discovered other modifications of the same nature, and referred to his description and figures of the confluent subvertebral processes in the anterior trunk-vertebrae of the *Bagrus tachypomus*, a large siluroid fish (Vertebrate Archetype, p. 92, pl. 1. fig. 3; Annals of Natural History, vol. xx. 1847, p. 217, fig. 1).

He had shown in his memoir on the so-called wedge-bones of the Enaliosauria, that the subvertebral processes in fishes were homologous with those autogenous wedge-bones, with the exogenous inferior processes of the cervical and dorsal vertebrae of ophidians and saurians, and with the body of the atlas in anthropotomy; and in his work on the Archetype, Professor Owen had summed up his views of their nature in the following words : "The continuous bony plate supporting those centrums was perforated lengthwise by the aorta, offering another mode of formation of a hæmal canal (*c h*), viz. by exogenous ossification in and from the lower part of the outer layer of the capsule of the notochord. The carotid hæmal canal in the necks of birds seems to be similarly formed; and the neck of the ichthyosaurus derives additional strength and fixation from apparently detached developments of bone in the lower part of the capsule of the notochord, at the inferior interspace between the occiput and atlas, and at those of two or three succeeding cervical vertebrae‡.

"The so-called 'body of the atlas' in recent saurians, birds, mammals and man, is the homologue of the first of these subvertebral

* Jourdan, cited in Cuvier's *Leçons d'Anat. Comparée*, ed. 1835, p. 340, and *Odontology*, p. 179.

† Agassiz in Spix, *Pisces Brasilienses*, 4to, 1829, p. 6. tab. B. fig. 8.

‡ Sir Philip de M. Grey Egerton in *Geol. Trans.* 2nd Ser. vol. v. p. 187, pl. 14.

wedge-bones, and represents only the inferior cortical part of such body. The odontoid process of the axis is the central and main part of the body of the atlas." (pp. 92, 93.)

But in fishes these subvertebral processes coexisted with the parapophyses in the same vertebrae (Archetype, pl. 1. fig. 4. pp. 3, 4, 5, 6, &c.), and likewise with the haemal arches in the tail, with which Dr. Melville contended that they were serially homologous; in other words, the homotypes.

The caudal haemal arches in fishes were, however, manifestly formed by other and true vertebral elements. Here Professor Owen explained by diagrammatic sketches the various ways in which the haemal arch in the caudal vertebrae of fishes was formed, as he had described in his work. "The best marked general character of the vertebral column of the trunk in the class Pisces is that which Professor J. Müller first pointed out, viz. the formation of the haemal arches in the tail by the gradual bending down and coalescence of the parapophyses; the exceptions being offered by the ganoid *Polypterus* and *Lepidosteus* and the protopterous *Lepidosiren*. The pleurapophyses are sometimes continued in ordinary osseous fishes from the parapophyses, after the transmutation of these into the haemal arches. The dory, tunny and salmon yield this striking refutation of the idea of the formation of those arches in all fishes, by displaced, curtailed and approximated ribs. In some fishes, however (e.g. the cod), reduced pleurapophyses coalesce with the parapophyses to form the haemal arches of the caudal vertebrae." (p. 90.)

"Thus the contracted haemal arch in the caudal region of the body may be formed by different elements of the typical vertebra, e.g. by the parapophyses (fishes generally); by the pleurapophyses (*Lepidosiren*); by both parapophyses and pleurapophyses (*Sudis*, *Lepidosteus*); and by haemapophyses, shortened and directly articulated with the centrums (reptiles and mammals)*." (p. 91.)

The last conclusion was that which was now called in question, or rather the sense in which Professor Owen here used the term *haemapophyses* was altered by Dr. Melville to the signification which some anatomists expressed by the terms 'wedge-bones' and subvertebral processes, and which Professor Owen expresses by the term *hypapophyses*. Professor Owen had concluded that as the haemal arches in the tail of fishes were formed by more or less of the modified elements of the more expanded haemal or costal arches in the abdomen, the haemal arches in the tail of batrachians, saurians and mammals were also formed by modifications of more or less of the expanded haemal or sterno-costal arches of the trunk.

The coexistence of the subvertebral or inferior processes of the centrums (hypapophyses) with the true haemal arches in fishes, proved that these arches could not be the homotypes of these processes in the tail any more than in the trunk; and a conclusion so established in fishes was good for batrachians, saurians and mammals.

* By a misconception of the sense in which Professor Owen uses the term 'haemapophyses,' M. Agassiz has applied it to the laminæ of the inferior or haemal arches in fishes. (Recherches sur les Poiss. Foss. tom. i. p. 95.)

Arriving thus at the demonstration, that the hæmal arches in the tails of the air-breathing Vertebrata were formed like those in fishes, by a modification of the true hæmal arches of the trunk, the question remained to be decided, which of the elements of such arches were continued into the caudal region of reptiles, cetacea, &c. in order to constitute those arches; and Professor Owen had shown that the solution was given by the adult perennibranchiate batrachia and by the immature crocodiles, in which diapophyses and pleurapophyses coexisted with such hæmal arches in the tail: the laminæ of these arches therefore must be the hæmapophyses as defined in his diagrams of the typical vertebra, and consequently they must be the homotypes of those hæmapophyses which had received in the trunk the special names of 'ischia,' 'pubes,' 'abdominal ribs,' and 'sternal ribs.' But the sternal ribs coexisted in the same vertebra with the inferior exogenous processes from the centrum, to which processes Dr. Melville proposed to transfer Professor Owen's name of '*hæmapophyses*.' Professor Owen had, however, proposed a proper name for these commonly exogenous growths from the cortical part of the centrum, as he had likewise found himself reluctantly compelled to do for analogous exogenous processes from the neural arch, which were independent of and superadded to the ordinary 'diapophyses' and 'zygapophyses.' Professor Owen called the attention of Dr. Melville to a series of drawings in which he had proposed to illustrate his descriptions of these accessory processes, and alluded to his description of them in the Catalogue of the Royal College of Surgeons.

Professor Owen finally dissented from the definition of the ideal vertebra, which Dr. Melville had adopted from his friend Mr. Mac-lise.

Professor Owen considered that a typical structure might be departed from by excess as well as deficiency. As an example of such excess, he regarded those vertebrae which, in subserviency to muscular attachments, developed hypapophyses, anapophyses, metapophyses and diapophyses, or which in like adaptive subserviency to stronger union developed epizygapophyses, in addition to the ordinary *præ-* and *post-zygapophyses*; or which developed from the upper part of the centrum epi-apophyses, which in the cranial vertebrae had received the special denomination of clinoid processes, and were for the special protection of an appendage to the neural axis. In certain human crania these latter exogenous developments actually formed a secondary and minor neural arch internal to or concentric with the larger and normal neural arch; and Professor Owen drew a diagram of a section of such a vertebra, showing the small neural canal close above the centrum (*basisphenoid*) of the parietal vertebra, answering to, or homotypical with, the small hæmal canal formed by exogenous growths from the under part of the centrum (*basi-occipital*) of the occipital vertebrae of the carp, and from the centrums of certain cervical vertebrae of fishes and birds, and which Dr. Melville had transferred to his diagram of a thoracic vertebra, and made it to consist of three distinct elements. Professor Owen stated that he had not presumed to depart wholly from nature, either by addition or sub-

traction, in the figures of the typical vertebræ, in his work (p. 81, fig. 14, p. 82, fig. 15) criticised by Dr. Melville; and that he knew of nothing in nature which corresponded with Dr. Melville's diagram, showing distinct hæmapophyses and a hæmal spine coexisting with vertebral ribs, sternal ribs, and sternum, in the same segment. On the principles on which Dr. Melville had constructed his ideal vertebra, viz. by the addition of mere adaptive processes of the centrum, exaggerated and artificially subdivided, to true and constant vertebral elements, such ideal vertebra might with a good reason be made symmetrical by the addition of a second concentric neural arch, as in Professor Owen's sketch of the human parietal vertebra, to the true expanded neural arch, and in his opinion such superadded internal neural arch might, with as good reason, be viewed as the true neurapophyses and neural spine, and had as good title to be diagrammatically represented as subdivided into those three separate elements, as the second internal hæmal arch, which Dr. Melville had superadded to his (Professor Owen's) figure of the second form of the typical vertebra (On the Archetype, &c., p. 82, fig. 15). Such an 'ideal vertebra' would then truly exhibit what Dr. Melville had defined as "the most complete possible vertebra," and what Mr. Macilise called "the plus vertebral quantity."

Dr. Melville rejoined by reiterating his conviction that his 'ideal vertebra' was the true one, and would ultimately be accepted as such by all anatomists.

BOTANICAL SOCIETY OF EDINBURGH.

Nov. 8, 1849.—Professor Balfour, President, in the Chair.

Numerous donations were announced.

The President, in taking the chair, made a few remarks on the progress of botany since the Society last met in July. He alluded especially to the encouragement afforded to the science in the new Irish colleges, and to the great discoveries recently made in India by Dr. Joseph D. Hooker and Dr. Thomas Thomson. He read a letter from Dr. William Jameson of the Saharampore Gardens, giving an account of his botanical researches, and stating that he was proceeding to survey the country between the Kelum and the Indus. His botanical collections are very extensive, and will ere long be transmitted to Europe. He mentions that Dr. Thomson's collections were ready for transmission, and that Major Madden had made some interesting observations on the botany of the Himalayas. He states that the catalogue of the Saharampore Garden will be published soon. Dr. Jameson's letter was accompanied with some seeds for the Botanic Garden, and a few dried specimens.

The following papers were read :—

1. "Notice of Plants found in the neighbourhood of Durham and Lancaster," by John Townley, Esq. In this communication, Mr. Townley mentioned that he had noticed nearly 400 species of phanerogamous plants and ferns in the neighbourhood of Durham.

2. "Notice of plants found in the neighbourhood of Lincoln," by Benjamin Carrington, Esq. Mr. Carrington noticed the occurrence of *Anacharis Alsinastrum* in great abundance in Lincoln, and exhibited specimens to the meeting. Among other plants noticed by him in the district, and of which examples were exhibited, may be noticed the following:—*Thalictrum flavum*, *Ranunculus parviflorus*, *Nasturtium amphibium*, *Erysimum cheiranthoides*, *Camelina sativa*, *Vicia tetrasperma*, *Lathyrus aphaca*, *L. Nissolia*, and *L. maritimus*, *Hippocratea comosa*, *Onobrychis sativa*, *Cicuta virosa*, *Sison Amomum*, *Œnanthe Phellandrium*, and *Œ. fistulosa*, *Sium latifolium*, *Orchis fusca*, *O. pyramidalis*, and *O. Morio*, *Potamogeton rufescens*, *P. pectinatus*, *P. gramineus* and *P. prælongus*, &c., *Bromus erectus*, *Onopordum Acanthium*, *Serratula tinctoria*, *Butomus umbellatus*, *Hydrocharis Morsus-ranae*, *Gentiana Pneumonanthe*, and *Lysimachia Nummularia* and *ciliata* naturalized.

3. "Account of Excursions last Autumn, with notices of localities for some rare Scotch plants," by Dr. Balfour. This paper embraced a short notice of an excursion made in August with botanical pupils to Bracmar and Clova, during which many of the rare alpine species of Scotland were gathered on Lochnagar, Ben Aven, Ben-na-Muich-Dhui, Glen Callater, Glen Fee, Glen Dole, &c. The season was stated to be very backward, there being much snow on the hills, and many plants, such as *Mulgedium alpinum*, were not in flower. Dr. Balfour also noticed the following plants as having been gathered by him in the west of Scotland:—*Impatiens noli-me-tangere* in Castle Milk Glen, near Glasgow; *Hymenophyllum Wilsoni*, near Dunoon; *Raphanus maritimus* and *Œnanthe Lachenalii* near Toward Point; *Elatine hexandra* in Loch Fad, in Bute; and *Hymenophyllum tunbrigense* in woods in Bute. A growing specimen of *Elatine hexandra*, from Bute, was also shown.

Dr. Balfour showed a specimen of roots which had penetrated drains, and remarked that the plant whose roots had entered drains in the Carse of Gowrie was *Polygonum amphibium*, and not *P. Biserrata*, as stated at a former meeting.

Mr. John M'Laren noticed the occurrence of *Sedum album*, *S. reflexum*, and *Verbascum Lychnitis* on the Castle rock at Stirling, and *Melilotus leucantha* near Dunblane, besides many interesting plants which he had gathered in Bute.

Dr. Balfour exhibited a specimen of *Carduus eriophorus*, gathered in the vicinity of Muirhouse by Mr. Kelly, nurseryman.

A note was read from Mr. James Backhouse, jun., in which he stated that he had gathered *Carex leporina* abundantly in autumn, on Lochnagar. He remarked—"Its till recently undisturbed tranquillity depends on the unlikely place in which it grows. There is scarcely any company for it in the way of vegetation. Its scattered tufts contrast almost alone with the granite rocks." He gathered a considerable quantity of *Woodsia Ilvensis* in Glen Fee; also *Draba rupestris*, *Poa montana*, *Gentiana nivalis*, *Juncus castaneus*, and *J. biglumis*, in Canlochan. Mr. Backhouse also stated that he had received good specimens of *Lychnis alpina* from Hobcaster Fell, in Cumberland.

MISCELLANEOUS.

What is the best plan to be adopted for the destruction of the Cossus ligniperda and Scolytus destructor? By C. J. Cox, M.D.*

EVERY person at all conversant with merely an outline of gardening, must be perfectly aware how seriously trees are sometimes wounded, and yet perfectly recover, but that the presence of a few obnoxious insects, on the least derangement of the soil, inimical to its habits, very speedily causes it to languish, sicken, and die; from the accurate knowledge we possess of the habits of these insects, and from the fact that a tree suffers comparatively nothing from a wound, we have carried out, with most perfect success, the following method of treatment to remove or destroy the larvæ of the *Cossus*.

Having ascertained that a tree is infested by these insects, and knowing by their habits that they are sure to be more or less about its base, we ought immediately to commence by removing the soil from around it to the depth of at least a foot, scraping off all the old and decayed bark above and below; numerous perforations will appear on its removal, these ought to be carefully examined—their character, as regards size, colour, or depth; if small and fresh, the insect is only a short distance in; it may be destroyed or extracted by inserting a piece of wire; if the channel winds so that the wire cannot reach it, it must be followed until the larva is killed, as the incision into the stem is of less danger than the corrosion of the insect; having cleaned the wounds well by removing all refuse matter, a compost of clay and cow manure ought to be inserted. The tree requires watching for a week or fortnight to see if any yet remain; their exuviaæ protruding from their channels being sure to lead to their detection. To destroy the ova and very young larvæ, yet in the crevices of the bark, treat the same as for the *Scolytus*.

To destroy the *Scolytus*, remove all the old infected bark; the entrance to the parent tubes is then exposed; as soon as we find the parent channel, and knowing it always proceeds directly upwards, and is always superficial, we must, with the angle of the scraper, cut out a small piece of bark; the lateral tubes are thus destroyed with the young larvæ; the tree must afterwards be washed with a strong solution of lime-water, coloured by soot; the tree ought to be watched for a fortnight. Should any of the parent insects have escaped, the exuvial dust falling from their tubes on the stem will lead to their detection.

By carrying out this plan in our gardens, we have saved the remainder of our ornamental elm-trees; and when we consider that one man can partially bark eight or ten trees in the day, by means of a double-handled scraper, similar to that used by coopers, it has been a most inexpensive process; thus, instead of gazing on a blighted foliage and stag-horned trunk, the withered and sickly tinge has given place to a most luxurious green and healthy appearance.

* From a paper read before the Royal Botanical Society of London, Aug. 10, 1848.

DISCOVERY OF THE WILD STATE OF RYE.

Both history and botany agree in rendering it probable that the Cerealia (wheat, barley, rye, and oats) come originally from Asia, especially from the western and central regions of that part of the world. Unfortunately it is difficult to prove the truth of the hypothesis by facts. This would require the discovery of specimens apparently wild in such conditions that they cannot be suspected to have escaped from cultivation, or to have been sown by travellers. Michaux the elder found spelt (*Triticum Spelta*) on a mountain four days' journey from Hamadan*. Olivier†, travelling with a caravan from Anah to Latakia, on the right bank of the Euphrates, says, "We found near the camp, in a kind of ravine, wheat, barley, and spelt, which we had already seen several times in Mesopotamia." Linnæus‡ gives as the country of summer corn (*Triticum aestivum*) the country of the Baschirs, *apud Baschiros in campis*, on the authority of a traveller named Heinzelmann. I am not acquainted with any other certain testimony as to the origin of the Cerealia. M. Dureau de la Malle§ does not consider them sufficient, because the travellers did not remain long enough in the country to distinguish with certainty the wild individual from the individual derived from forsaken cultivation. I would however observe that the countries in question are mountainous, very sterile, and thinly peopled by unsettled tribes. The assertion of Linnæus, which is accompanied by no details, is that which deserves the least confidence, the more so as the country of the Baschirs has been frequently visited within a century. Link|| does not admit it. M. Loiseleur-Deslongchamps¶, in a modern and special work, does not bring forward any new facts. He states, with reason, that the primitive country of these species may have originally been very extensive, but that cultivation having been early established in Sicily, Greece, Syria, &c., it has always been difficult to distinguish the wild specimens from those which have escaped from cultivation. He adds, with still greater reason, that if the Cerealia were different primitively from what they now are—if, for instance, they had had the form of certain *Aegylops* or *Lolium*,—man would never have had the idea of cultivating them. The species must have been very much like what they now are to have led to any being at the pains to sow them. Has any barbarous people ever been observed to attempt the cultivation of *Aegylops* or of darnel (*Lolium temulentum*)? Naturalists may have the curiosity to do so: the primitive peoples never had: it is much, indeed, that they essayed to eat the grain of wheat, and to cultivate it, after having ascertained its nutritious properties.

In all the works above quoted, rye is not mentioned unless to

* Lamarck, Dict. Encyc., Part. Bot. ii. 560.

† Voyage dans l'Empire Ottoman, iii. 460.

‡ Species Plantarum, 2nd edit. 126.

§ Recherches sur l'Histoire ancienne, l'origine et la patrie des Céréales, Ann. Scien. Nat. Ser. 1. ix. 61.

|| Die Urwelt und das Alterthum, &c. ed. 2. p. 407.

¶ Considérations sur les Céréales, 1843, p. 22.

state that its country is unknown, but that from analogy it is probably Western Asia. "Rye is supposed to come from the Levant," says M. Eude Deslongchamps, in the 'Dictionnaire des Sciences Naturelles,' vol. xlviii. p. 310. According to M. Kunth* it is a native of the countries near the Caucasus and the Caspian Sea, but he does not cite any proof. All this is as vague as the assertion of other ancient and modern authors relative to the Isle of Crete. The rye which Marshall of Biberstein found on the Caucasus, and which he supposed to be common rye, is now found to be the *Secale fragile*, a different species. M. C. Koch†, a traveller who has traversed Anatolia, Armenia, the Caucasus and Crimea, now affirms that he has found rye under circumstances where it appears to be really spontaneous and native. I quote verbally: "On the mountains of Pont, not far from the village of Dshmil, in the country of Hemschin, upon granite, at an elevation of 5000 or 6000 feet, I found our common rye alongside my road (*an Rändern*). It was thin in the ear, and about 1 to $2\frac{1}{2}$ inches long. No one remembered that it had ever been cultivated in the neighbourhood; it was not even known as a cereal. I have received the same ears, thin and short, from M. Thirke, at Brussa. If I am not mistaken, he had gathered them on Mount Olympus or in the neighbourhood. I but seldom found that rye was cultivated, for example in the countries of Kur, of Arataban, &c."

The question appears to be decided by the details given by M. Koch, and in the way that history and botanical geography rendered most likely.—*A. DeCandolle in the Bibliothèque Universelle de Genève*, June 1849.

PRESIDENCY OF THE LINNÆAN SOCIETY.

The 'Athenæum,' in noticing Mr. Robert Brown's acceptance of the unanimous invitation of the Council of the Linnæan Society to allow himself to be nominated for the presidency, favours the Society with the following sapient suggestion:—"It has not transpired whether the invitation has or has not been received conditionally by Mr. Brown. There is a strong feeling among the Fellows in favour of a biennial election to the presidency." We need hardly say that this statement is wholly without foundation, and merely the impudent assertion of the anonymous writer who has obtruded it upon the public.—R. T.

On the pulverulent matter which covers the surface of the body of Lixus and other Insects.

Several insects exhibit, on their surface, various pulverulent substances, very analogous to cryptogamic vegetations, but merely in abnormal cases, which terminate in the death of the animal. The species of *Lixus*, and some exotic Coleoptera, exhibit, in their healthy state, a quantity of a yellow powder on their elytra, which is reproduced when artificially removed.

From the observations of MM. Boullène and Follin it appears that this powder presents sporules, filaments, and, in a word, all the

* *Enumeratio Plant.* vol. i. p. 449. † *Linnæa*, vol. xxi. p. 427, 1848.

characters of a true mould. They are not reproduced at the death of the animal. This substance differs moreover by its internal characters from the parasitic Cryptogamia, which are in other insects signs of disease and of death.—*Bibliothèque Universelle*, June 1849.

METEORS.

On the 24th, about $8\frac{1}{2}$ P.M., I saw two fine meteors in a north-east direction, one about ten minutes after the other. The former seemed to burst like a sky-rocket and fall a little way; the latter to shoot in a north direction and fall to the horizon in pieces of blue colour. On the 30th, a little before 7 P.M., a very splendid one was seen in this parish and also in Kirkwall, which is nearly twenty miles off. Here it appeared first near the zenith and travelled westward.—Rev. C. CLOUSTON, *Sandwick Manse, Orkney*.

METEOROLOGICAL OBSERVATIONS FOR OCT. 1849.

Chiswick.—October 1. Drizzly: overcast. 2. Cloudy. 3. Constant heavy rain. 4. Heavy rain in the morning: showery. 5. Clear: fine: overcast. 6. Fine: rain at night. 7. Hazy: cloudy: rain. 8. Cloudy and cold: clear: slight frost at night. 9. Clear: very fine: frosty at night. 10. Dense fog: very fine: clear. 11. Cloudy: clear. 12. Cloudy and cold: clear. 13. Rain. 14. Cloudy and cold. 15. Fine: clear at night. 16. Foggy: hazy: overcast. 17. Cloudy and fine. 18. Very fine: clear at night. 19. Slight fog: exceedingly fine: clear. 20. Very fine. 21. Hazy: clouds: rain. 22. Foggy: fine. 23. Cloudy and fine. 24. Overcast: fine. 25. Showery. 26. Cloudy. 27. Drizzly. 28. Overcast: very fine. 29. Foggy: exceedingly fine. 30, 31. Very fine.

Mean temperature of the month $49^{\circ}58$

Mean temperature of Oct. 1848 $49^{\circ}59$

Mean temperature of Oct. for the last twenty-three years $50^{\circ}51$

Average amount of rain in October 2·58 inches.

Applegarth Manse, Dumfries-shire.—Oct. 1. Fair, but damp and raw. 2. Frost, hard: clear and fine. 3. Frost: rain P.M.: snow on the hills. 4. Frost A.M. 5. Frost A.M.: shower P.M. 6. Frost still harder: thermometer $24\frac{1}{2}^{\circ}$. 7. Frost milder: wind high. 8. Cold, but little frost: fine. 9. Frost hard again: shower P.M. 10. Frost hard: fine day. 11. Frost slight: a few drops. 12—14. Frost slight: clear and fine. 15. Frost: cloudy. 16. Little or no frost: cloudy. 17. Frost hard again: rain P.M. 18. Mild: rain: cleared P.M. 19. Mild: cloudy: threatening rain. 20. Fair: variable: high wind P.M. 21. Showers, but mild. 22. Slight frost A.M.: heavy rain P.M. 23. Mild: rain during night: rain P.M. 24. Rain all day: flood. 25. Rain all day: fog: flood. 26. Fine: one shower: cleared. 27. Rain again: thick weather. 28. Fine: clear. 29. Frost A.M.: fine: cloudy P.M. 30. Dark and cloudy: rain P.M. 31. Showery all day: mild.

Mean temperature of the month $44^{\circ}0$

Mean temperature of Oct. 1848 $46^{\circ}5$

Mean temperature of Oct. for the last twenty-five years ... $46^{\circ}6$

Mean rain in October 3·25 inches.

Rain, number of days in which it fell, 15. Average rain

in Oct. for twenty years 3·56 "

Sandwick Manse, Orkney.—Oct. 1. Bright: hail-showers. 2. Sleet-showers. 3. Clear: frost. 4. Showers: clear: frost. 5. Clear: showers. 6. Bright: clear: frost. 7. Clear: aurora. 8. Clear: showers. 9. Sleet-showers: clear. 10. Fine: very clear: aurora. 11. Frost: fine: very clear: aurora. 12. Fine: very clear. 13. Cloudy: aurora. 14. Bright: clear: aurora. 15. Showers. 16. Cloudy. 17. Bright: showers: cloudy. 18. Drizzle: cloudy. 19. Bright: showers: cloudy. 20. Showers: cloudy. 21. Cloudy: showers. 22. Cloudy: fine: showers. 23. Showers: clear: aurora. 24. Fine: aurora. 25. Rain: fine: aurora. 26. Showers: clear. 27. Bright: showers. 28. Bright: showers: clear. 29. Rain: cloudy. 30. Cloudy: showers: aurora. 31. Bright: fine.

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

Days of Month.	Barometer.				Thermometer.				Wind.				Rain.			
	Chiswick.	Dunfries-shire.	Orkney-Sandwick.	Dunfries-shire.	Chiswick.	Dunfries-shire.	Orkney-Sandwick.	Dunfries-shire.	Chiswick.	Dunfries-shire.	Orkney-Sandwick.	Dunfries-shire.	Chiswick.	Dunfries-shire.	Orkney-Sandwick.	
1st.	Max.	Min.	a.m.	9 th	9 th	a.m.	p.m.	9 th	9 th	a.m.	p.m.	9 th	9 th	a.m.	9 th	
O 2.	29.598	29.427	29.59	29.61	29.62	57	45	49 ¹	43	42	ne.	n.	.02	.....	.04	
3.	29.723	29.686	29.59	29.60	29.57	55	38	51	38 ¹	41	ne.	n.	.12	.....	.40	
4.	29.520	29.206	29.47	29.54	29.45	61	45	50 ¹	31	36	sw.	n.	.07	.....	.07	
5.	29.479	29.027	29.18	29.33	29.35	53	33	50 ¹	36	40	w.	n.	.07	.....	.08	
6.	29.719	29.682	29.46	29.50	29.49	56	57	50	28	41	40	nw.	.02	.....	.....
7.	29.770	29.654	29.62	29.67	29.79	55	44	49	24 ¹	40 ¹	36	sw.	.46	.....	.23	
8.	29.306	29.128	29.51	29.60	29.86	29.9	64	48	34	45	49	ne.	n.	.02	.....	.43
9.	29.916	29.516	29.80	29.80	29.94	30.91	54	29	50	37 ¹	43	42	nw.	n.	.20	0.5
10.	29.818	29.951	29.86	29.80	29.69	29.85	56	28	51	27	41	42	w.	n.	.....	.28
11.	29.877	29.692	29.79	29.70	29.90	29.90	56	31	48 ¹	26 ¹	46	47	ne.	n.	.....	.03
12.	29.520	29.475	29.63	29.68	29.89	29.94	54	42	51	32	39 ¹	40	ne.	e.	.....	.....
13.	29.819	29.690	29.73	29.81	29.98	29.08	53	39	48	33	44	41	ne.	calm	.02	.....
14.	30.074	29.987	29.91	30.03	30.14	30.21	48	53	47 ¹	33	44	41	ne.	calm	.06	.....
15.	30.074	30.055	30.18	30.21	30.24	30.28	51	39	49	34	47	46	ne.	nww.	.....	.40
16.	30.057	29.981	30.20	30.14	30.20	30.11	50	34	48	29	48	47	ne.	calm	.....	.10
17.	29.955	29.888	29.58	29.53	29.50	29.40	66	52	49	29 ¹	49	53	s.	s.	.02	0.00
18.	30.104	30.130	29.79	29.88	29.52	29.71	67	44	57	50	59	51 ¹	s.	s.	.....	.07
19.	30.000	29.944	29.78	29.65	29.58	29.63	69	46	62	47 ¹	55	51 ¹	s.	n.	.....	.05
20.	29.963	29.874	29.63	29.65	29.30	29.45	65	48	55 ¹	44 ¹	47	51	sw.	ssw.	.12	.20
21.	29.034	29.769	29.50	29.70	29.39	29.58	57	33	56	48 ¹	49	48	w.	.08	.....	.03
22.	30.071	30.053	29.84	29.58	29.82	29.42	59	51	53 ¹	31 ¹	48	49	sw.	sw.	.04	.....
23.	30.121	30.068	29.78	29.79	29.53	29.92	65	50	55	49	49	48	sw.	nww.	.....	.60
24.	30.124	30.095	29.77	29.80	29.60	29.97	60	49	52	46	46	44	sw.	calm	.....	.14
25.	30.033	29.873	29.66	29.50	29.61	29.48	62	52	54 ¹	49	50	50	sw.	s.	.06	.34
26.	29.800	29.780	29.51	29.59	29.40	29.54	60	42	51	47 ¹	51 ¹	48	sw.	w.	.01	.10
27.	30.035	29.715	29.65	29.82	29.78	29.67	62	51	53	48 ¹	53	53	sw.	sw.	.04	.....
28.	30.030	30.285	30.15	30.46	30.08	30.38	65	41	54	48	50	48	sw.	nww.	.....	.11
29.	30.036	30.535	30.43	30.30	30.25	30.06	60	31	53	45 ¹	52	52	s.	w.	.45	.....
30.	30.315	29.990	29.95	29.72	29.65	29.43	61	39	55	50	55	45 ¹	sw.	calm	.245	.....
31.	29.802	29.495	29.49	29.30	29.41	29.47	54	31	51	42	48 ¹	42	sw.	sw.	.07	.....
Mean.	29.925	29.779	29.411	29.409	29.728	29.726	58.32	40.84	51.9	37.7	46.75	45.19	2.18	2.25	2.85

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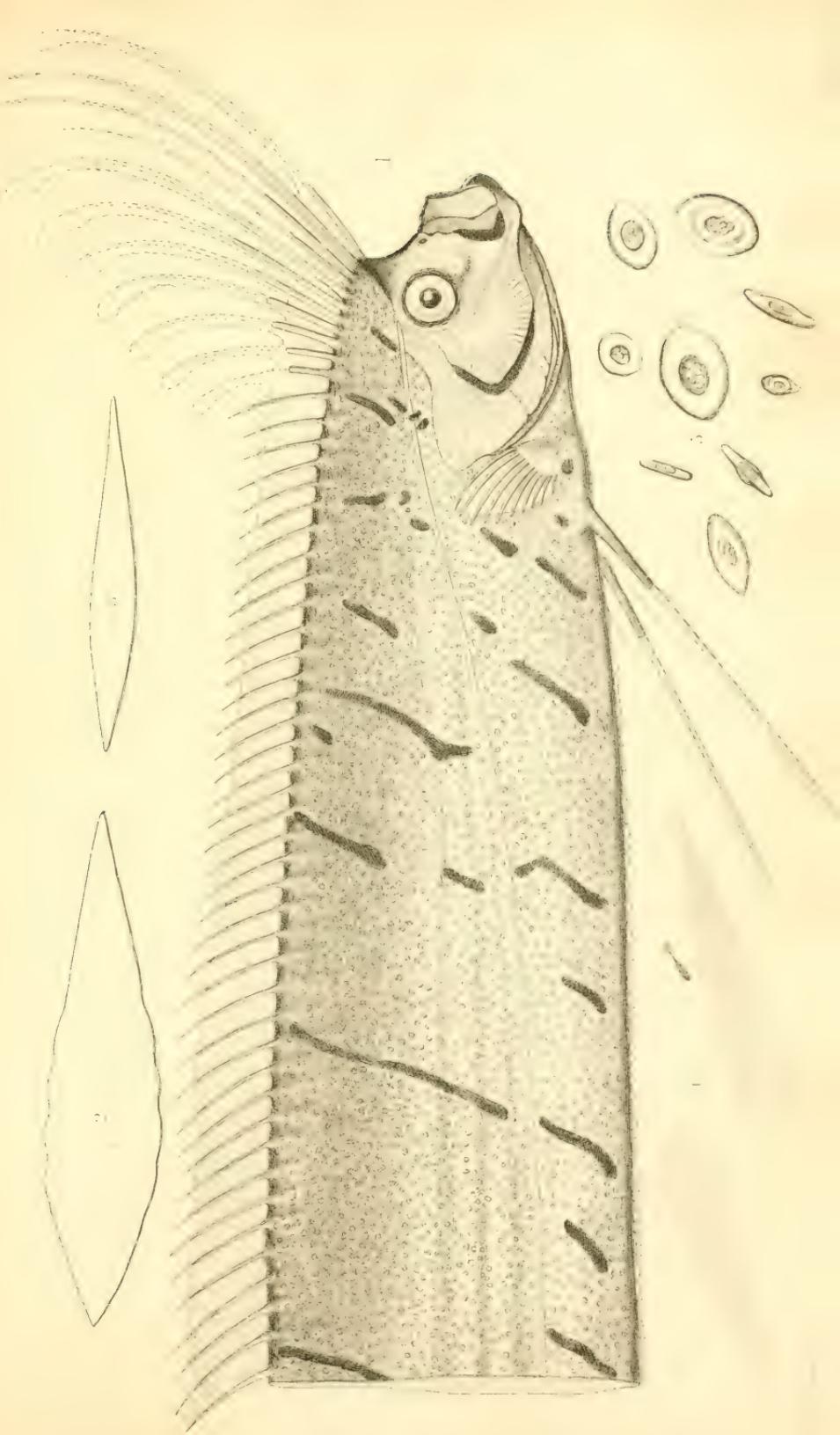
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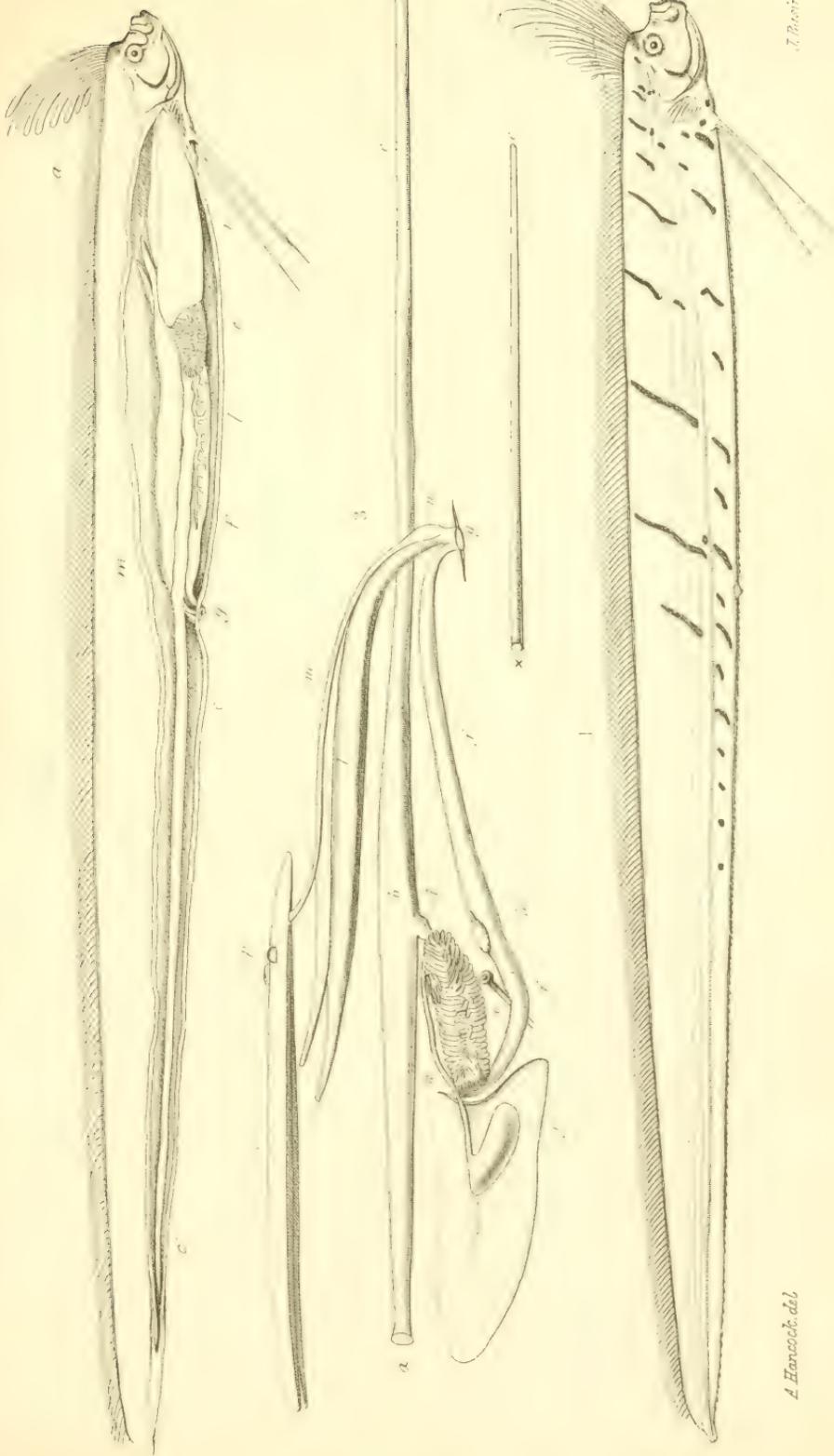
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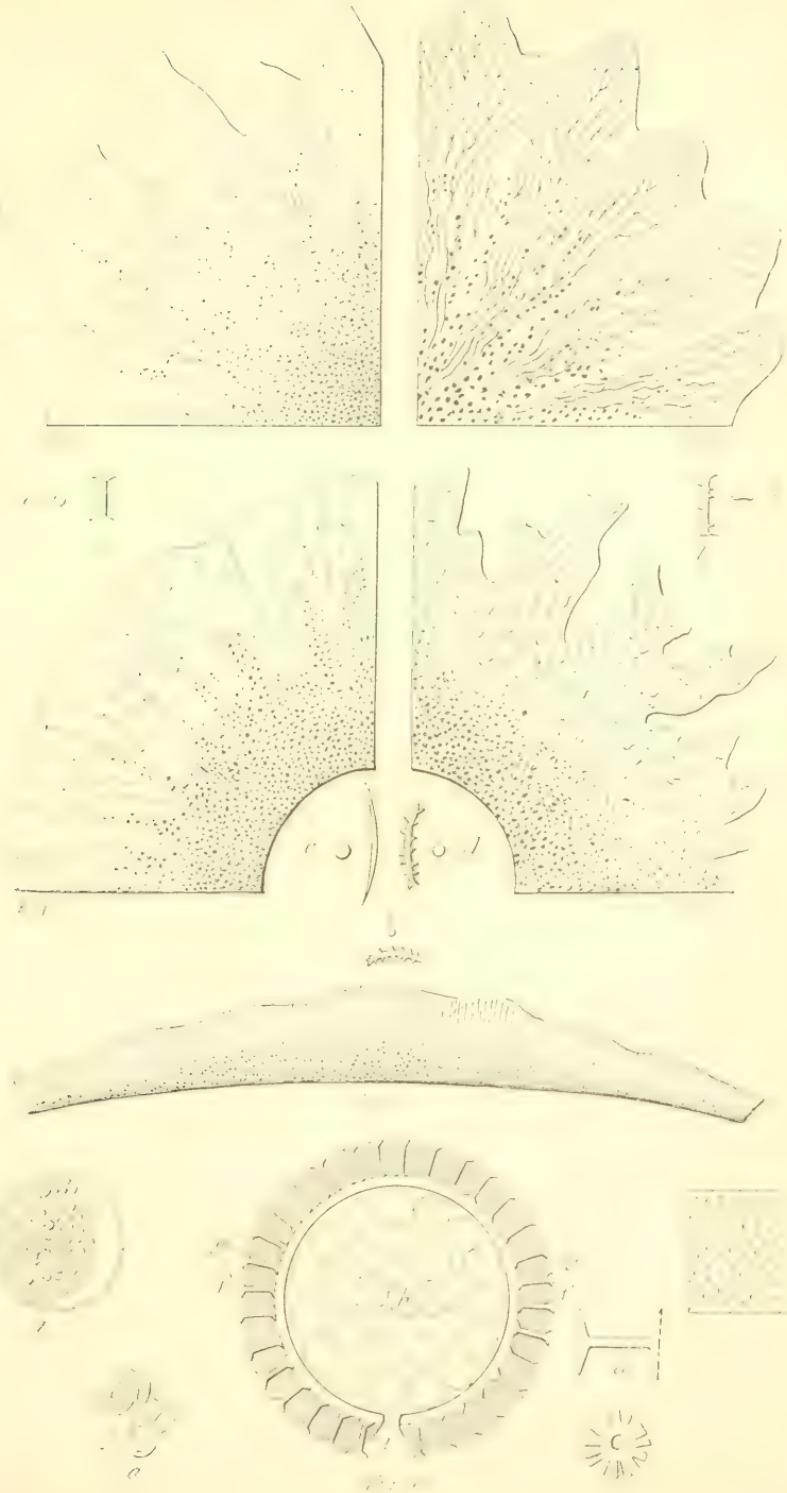
END OF THE FOURTH VOLUME.

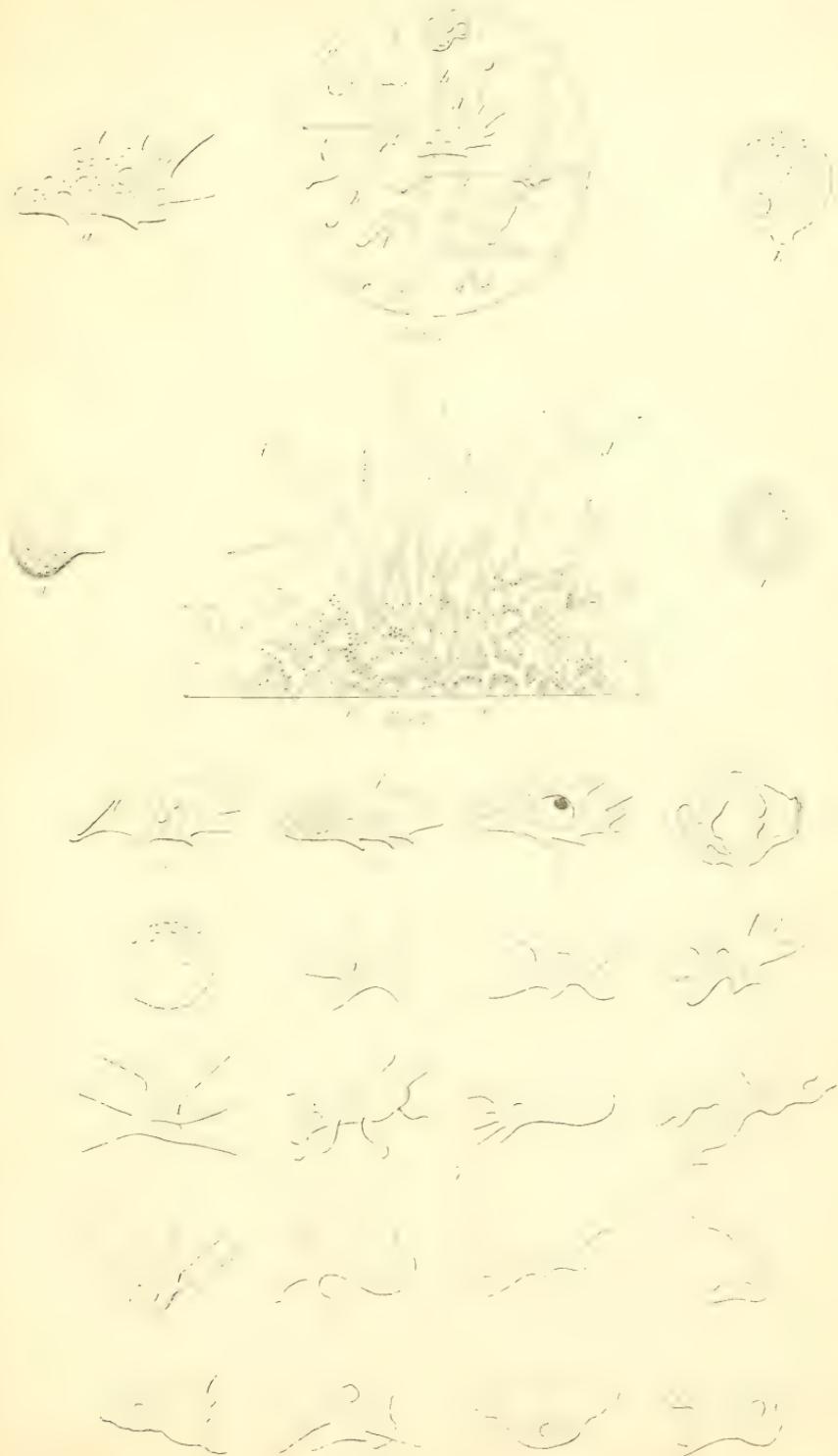
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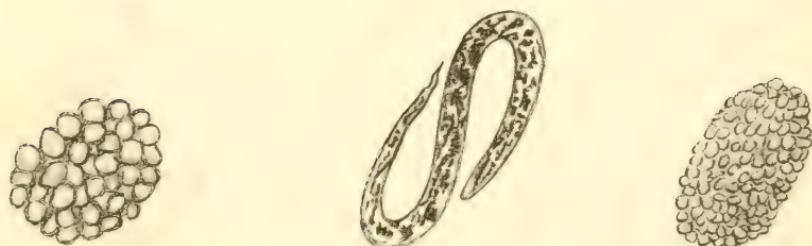
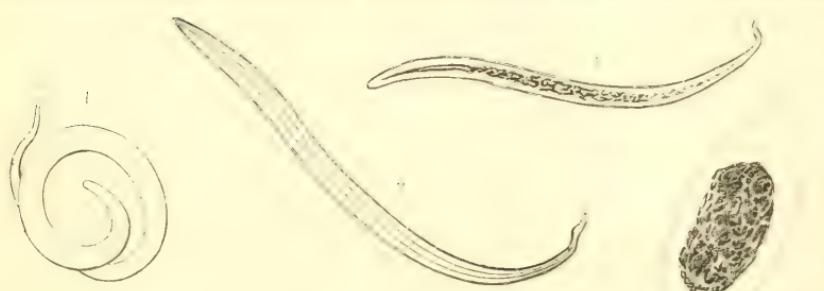
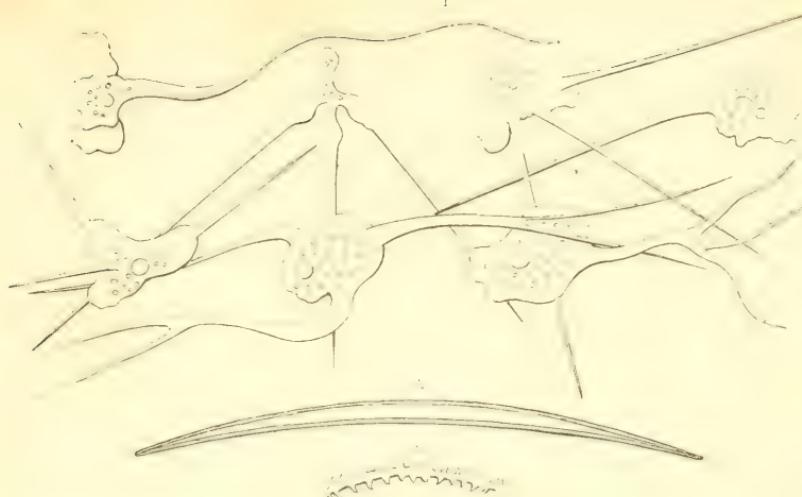




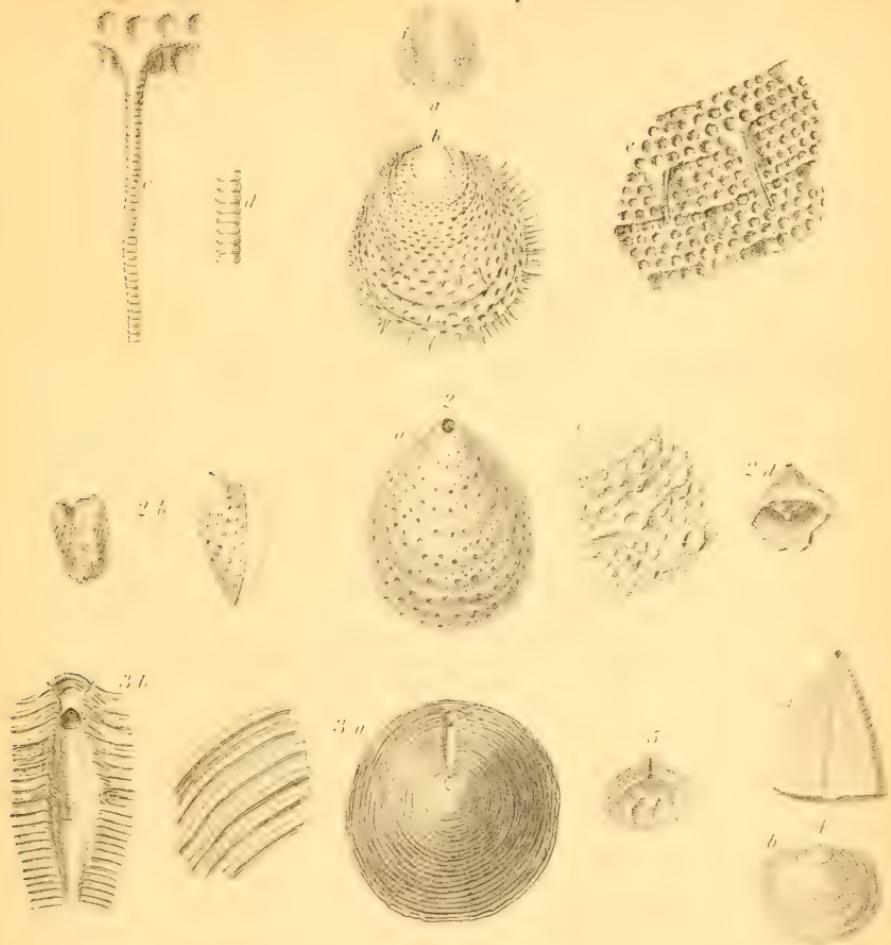


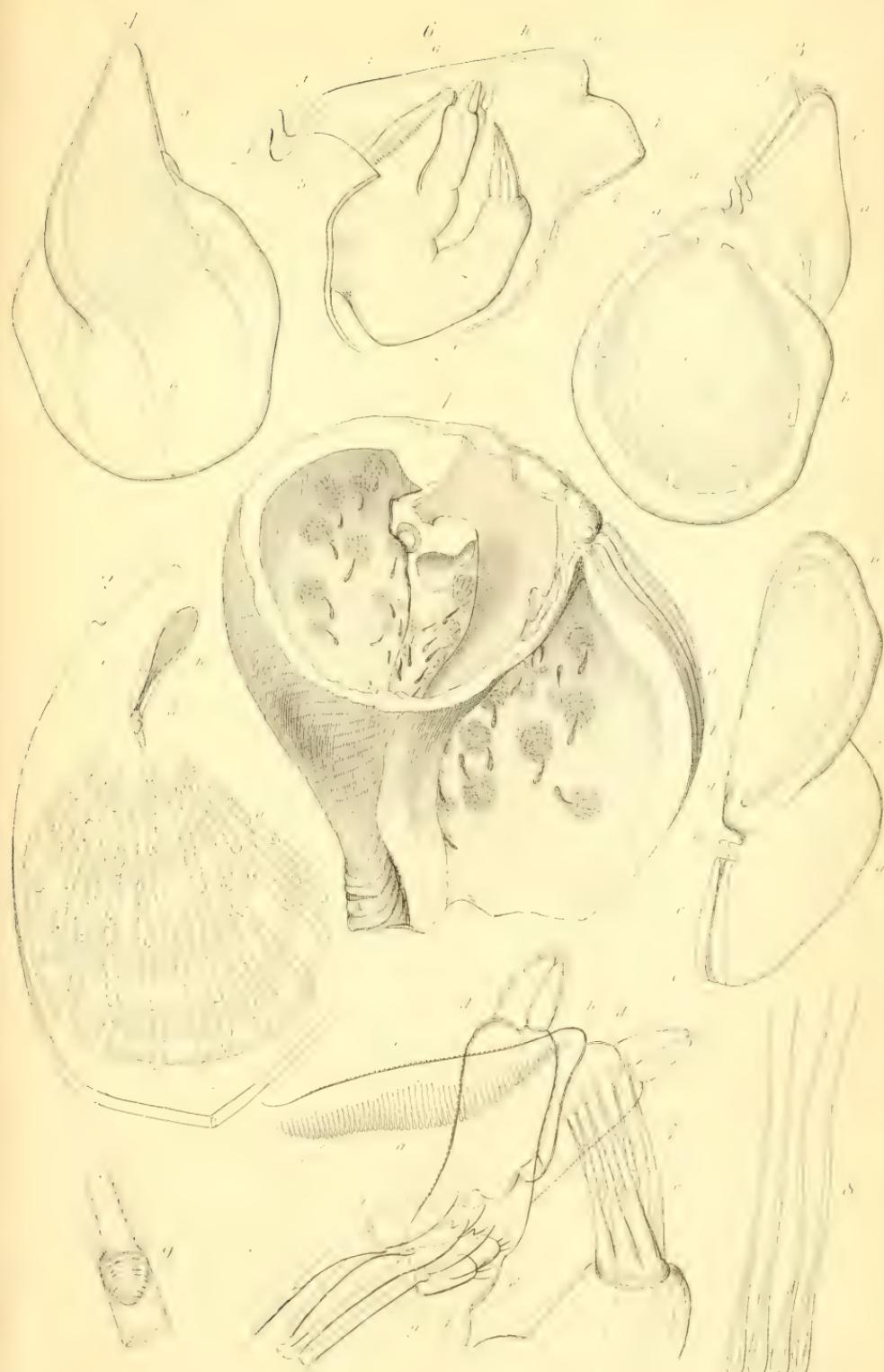


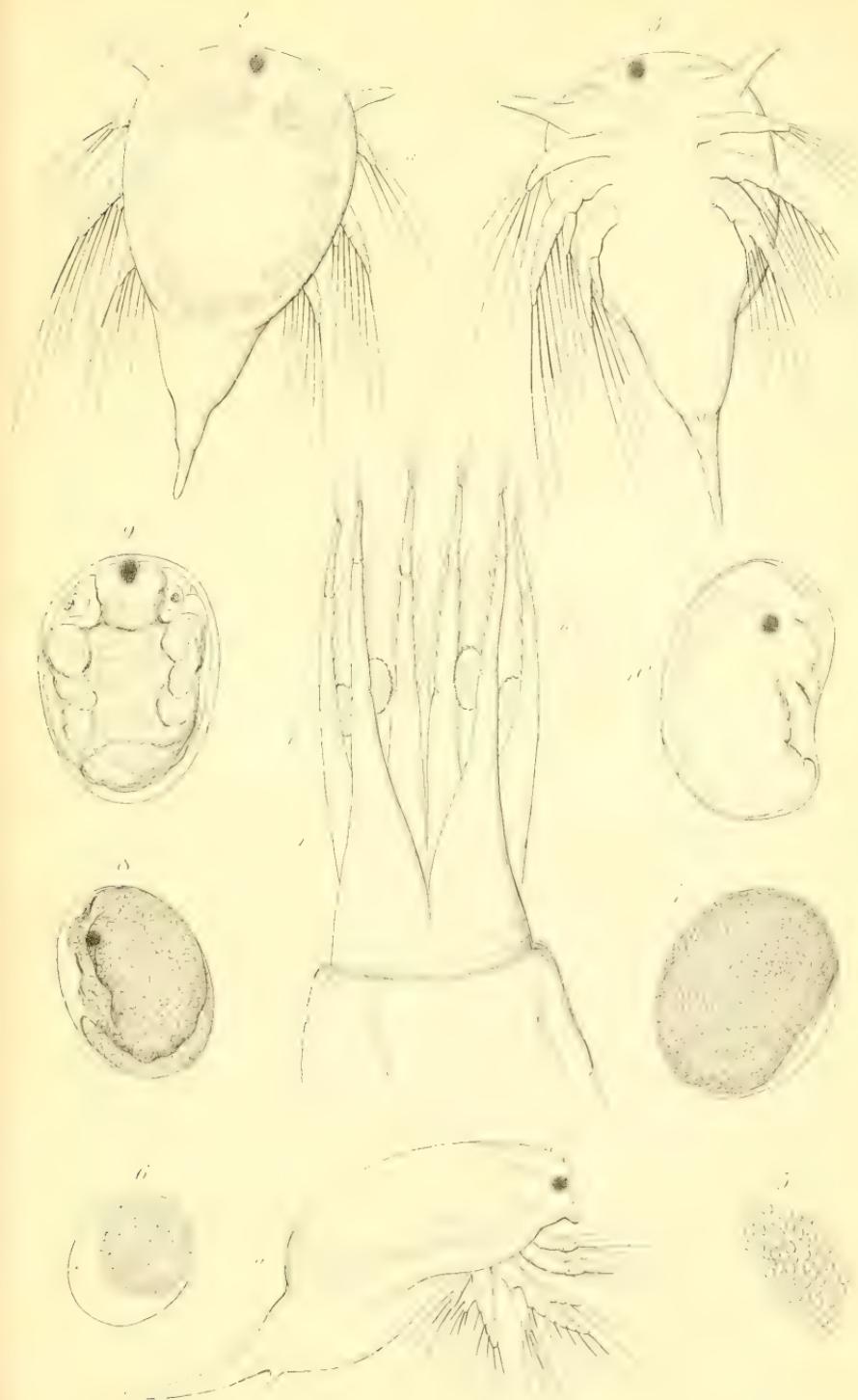
















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