R. Hicks

Arthur Henfrey

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

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AND

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VOL. VII.—THIRD SERIES.

LONDON:

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.

SOLD BY LONGMAN, GREEN, LONGMANS, AND ROBERTS; SIMPKIN, MARSHALL, AND CO.; PIPER AND CO.; BAILLIÈRE, REGENT STREET, AND PARIS: LIZARS, AND MACLACHLAN AND STEWART, EDINBURGH: HODGES AND SMITH, DUBLIN: AND ASHER, BERLIN.

1861.

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

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

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

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

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

No. 37. JANUARY 1861.

I.—*On the Natural History of the Lac-Insect* (Coccus lacca). By H. J. Carter, Esq., F.R.S.

[Plate I. B. figs. 1 to 14.]

HAVING had an opportunity of examining the Lac-insect just previous to the evolution of its young, and of watching the latter from this period up to the time at which they become incarcerated in the resinous substance which they secrete around themselves, known in commerce by the name of "lac," and finding that a description of the changes which the insect undergoes still remains unpublished, so far as I am aware, while that which has been stated on the subject is more or less incorrect, I am not without hope that the following observations may prove both new and acceptable.

Thus much is known:—that the substance called "lac" consists of a resinous incrustation partly encircling or scattered over the small branches of several trees and shrubs of different kinds in India; that the incrustation is cellular, and that each cell indicates the position of one of the insects which secreted it; that the insect contains a red colouring matter called "lac-dye," which is also an article of commerce, and is allied to cochineal; and that, at a certain period of the year, vast numbers of young animals leave these cells and, spreading themselves over the neighbouring branches, fix themselves to the bark, which they pierce with their beaks, and then begin to pour forth from their bodies the resinous substance above mentioned.

On the 25th of June last (1860), my attention was drawn to the subject more particularly by a fresh branch of the Custard-apple tree (*Annona squamosa*), bearing portions of the lac, having been presented to me by my friend Major Burke. The branch was taken from a tree growing in the enclosure of the Bombay Mint, within a few yards of the sea, and in the midst of the smoke of steam-engines, smelting-furnaces, and the atmosphere of a crowded population; while the resinous incrustation and the red colouring matter, both in quality and quantity, did not appear to me to be less than that which is produced by the insect in localities widely separated as well from the sea as from all human habitations.

On receiving this branch and observing that it was fresh, and that the insects in the incrustation were also living, my curiosity was directed to ascertaining the form and organology of the latter. Meanwhile the young began to pour forth—that is, on or about the 1st of July; and by the middle of that month the whole branch had become covered with them; but, for want of nourishment, as they became stationary, so they died without apparently secreting any of the resinous substance around them; and thus I was obliged to visit the Custard-apple tree itself for the purpose of examining the subsequent changes which the insect undergoes,—which changes, together with a description of the form and organology of the full-grown insect, so far as I have been able to ascertain them, will now be related.

The first feature that strikes the eye on looking at the surface of the incrustation, when the insects which are within it are alive, is the presence of a kind of white powder, like that observed about the cochineal-insects; this is concentrated here and there into little spots, and on being more closely examined will be seen to be chiefly confined to three bunches of curly, hair-like filaments, which radiate from three small holes in each spot (Pl. I. B. fig. 1 *ff*). The holes are situated triangularly with respect to each other, two (*d*) being closer together than the third (*e*), which is the largest, and which, by and by, will be found to be the anal, while the other two will be found to be spiracular apertures: all three are continuous with corresponding apertures in the insect, from which the white filaments originally proceed, which filaments we shall hereafter observe to be the attenuated extremities of the tracheæ.

If we now examine the contents of the interior, which we may easily obtain entire by dissolving off the lac in spirits of wine (for, from their tenderness, they can hardly ever be extricated without rupture by simply breaking the incrustation), it will be observed that each cell is filled with a single insect, which is now almost as much unlike one as any object can well be unlike another, — consisting of a pyriform sac of a dark-red colour, smooth, shining, and presenting at its elongated end one, and at its obtuse end three papillary processes (fig. 1 *c c*); the former, which is a continuation of the elongated end, is fixed to the bark; and the three latter, which project from the middle of the obtuse end, are respectively continuous with the three holes in the lac above noticed. As with these holes, so with the three processes: one is much larger and longer than the other two, which latter are of the same size; the former is also further distinguished by having several hairs round the margin of the aperture which exists at its extremity,—a point which it is desirable to remember, as it will serve by and by to identify it with the anal extremity of the animal when in its insect form.

So far the spirit of wine assists; but when we come to the contents of the body, it is not only necessary to avoid using spirit of wine, from the disfiguration which it occasions by causing the tissues to contract, but also to extricate the body by fracturing the lac, and dissect its contents as quickly as possible, on account of the rapidity with which they pass into dissolution after death: this is probably the reason why this part of the history of the insect has remained unpublished up to the present time.

Directing our attention to the interior, after the rupture of the insect, which takes place more or less with that of the lac, we are at once struck with the voluminousness of the organ containing the red colouring matter, which organ thus obscures everything else; and it is not before a quantity of it is removed by gentle edulcoration that we can (still under water, for the anatomy of this insect can be studied in no other way) arrive at a view of the other organs of the body, when it will be observed that there is an alimentary canal, liver, tracheæ, and, last of all, the organ containing the red colouring matter, which we shall presently find to be the ovary. To each of these organs, then, separately and briefly, we will now give our attention.

The alimentary canal commences with an attenuated, shapeless œsophagus (Pl. I. fig. 2 *d*), at the elongated end of the body (*a*), which is thus seen to be the oral extremity, and after passing upwards for about two-thirds of the length of the abdominal cavity, where it becomes enlarged and convoluted, turns back to make a single revolution (*e e*), in the course of which it soon becomes diminished in calibre (*g*), and receiving the hepatic duct at this point, terminates at length in the rectum, which opens at the great papillary process (*b*). The liver (*f f*) consists of a single straight, sacculated, beaded tube, of the same size throughout, presenting a yellow colour, and giving off the hepatic duct (*g*) a little nearer one end than the other; while the tracheæ (*k k*) are amassed into bundles, apparently without order, and send forth many of their extremities (*m m*) through the two small (*c c*), as well as through the large (*b*), anal apertures, to terminate on the surface of the lac in the way above mentioned (fig. 1 *d d*).

Lastly, we come to the ovary (*i i i*), which consists of a voluminous tree of tubes apparently branched dichotomously, with each branch, large and small, bearing long elliptical pouches, in each of which, again, is a correspondingly shaped ovum,—the whole nearly filling the body, and terminating in a single oviduct (*h*), which opens (probably through the rectum) at the anal aperture. The ovum (fig. 3), on the other hand, consists of an elliptical transparent envelope (*b*) filled with little cells (*c*), each of which contains oil(?)-globules (*d*) and globules filled with the red colouring matter (*e*). The oil-globules are spherical, uniform in size, and much larger than the red globules, which are also spherical, but distinctly separated from the oil-globules and from each other. Whether these bodies respectively have delicate cell-walls or not, I am ignorant; but while they are both distinctly defined in the ovum when the insect is first opened under water, both soon burst by imbibition, and become lost to view by dispersion of their contents. Thus the red colouring matter exists originally in the form of distinct globules or in cells in the ovum.

The further changes in the ovum, preparatory to the full development of the embryo, I have not followed; but about the beginning of July the young ones are perfectly formed, and, issuing through the anal aperture in the incrustation, they creep on to the neighbouring parts of the branch, and, soon fixing themselves by inserting their beaks into the bark as before stated, commence secreting the lac or resinous substance, in which they soon become incarcerated. Myriads issue in this way, as may well be conceived when, at a guess, I should think, each insect contained a thousand: but by far the greater number die; for although the branches become quite red with them, it is only here and there that a few, scattered or in groups, live; the rest still remain attached to the bark, but dried up and dead, which may arise, perhaps, from not having been sufficiently developed, or not being strong enough at their delivery to pierce the bark for sustenance.

On leaving the parent, the young *Coccus* (Pl. I. fig. 4) is of a minium-red colour, about 1-40th of an inch long, elliptical, obtuse anteriorly, without any division between the head and body, possessing six legs, two antennæ, two small eyes, marginal and lateral, and two long hairs (*b b*), growing from the penultimate segment of the abdomen; the body segmented regularly; the oral aperture ventral and placed at some distance from the anterior extremity; two tufts of white, powdery, hair-like filaments budding from the sides of the thorax respectively, in the place of wings (*a a*), and a tuft of the same kind (*c*), bifurcated, and curling outwards on each side, projecting from the anal orifice. Anal orifice surrounded by a row of short, strong hairs.

At this period the insect is almost too small for examination organologically; but after it has crept off the incrustation and on to the bark of the branch, it soon becomes stationary, and enlarging, as the resinous secretion exudes from the surface of the body so as to surround all parts except the oral orifice and the three apertures from which the three white tufts issue, at the expiration of a month (that is, by the middle of August) it measures in length almost the 18th part of an inch.

If we now examine it minutely, it will be observed that the legs, antennæ, and the whole of the chitinous parts of the body have become almost undistinguishably incorporated with the resinous secretion, which, when dissolved from the insect by spirit of wine, leaves the body (fig. 11) almost in a larval or caterpillar form, but without eyes or any other appendages, save the three white tufts of hair-like filaments, and the proboscis, which is now fully developed. The proboscis (fig. 12 *a*) consists of a fleshy projection, situated at a little distance from the head, ventrally, presenting a depression in the centre, from which issue four long hairs or setæ, based internally upon as many pyramidal inflations situated almost at right angles to each other, and supported by other horny elements, which also appear to belong to the machinery of the proboscis. These hairs together form the penetrating organ through which the juice of the tree is extracted; but whether they are hollow, and do this individually, or form a single tube by combination for this purpose, I have not been able to determine.

On the other hand, the three apertures from which the white tufts proceed, and which are now seen to open through the incrustation, are observed to be situated in the thorax (fig. 11 *a a*) and at the tail (*b b*) respectively—thus identifying the latter, which still presents the circle of hairs round the anal orifice (fig. 11 *c* and fig. 12 *b*), with the large papilla or anal orifice of the full-grown insect (fig. 2 *b*), and the former or thoracic apertures with the two other papillæ (*c c*), which appear to replace the wings. The white tufts projecting from all these we have already found to consist of the extremities of the tracheæ covered with a white powder.

Thus we see that the increase of size which takes place in the female insect, from its locomotive form to its ultimate development in the fixed state, is chiefly effected by an enlargement and elongation of the body between the mouth, on the one hand, and the parts from which the three white tufts project, on the other; for the oral extremity simply becomes elongated, and the three other openings of the body remain as near together, in the resinous incrustation, at the end as they were at the commencement.

Of what the white powder on the tracheæ consists, I am ignorant, further than that it does not dissolve in spirits of wine like the lac, which, on the other hand, appears to be a secretion from the skin generally, analogous to the chitinous one which would be required under other circumstances.

Male Insect.

On the 8th of September I visited the Custard-apple tree again, to see how the incrusted young were progressing; and, on close examination of the parts where they were most congregated, observed, here and there, little red insects actively crawling over them, which insects appeared so like the original young ones, that I thought they must be a few stragglers of a later evolution; but on inspecting them more particularly, they were observed to possess much larger antennæ; and therefore it was concluded that they were males, which afterwards proved to be the case. Several of them were collected for description, and a small portion of one of the branches, more or less covered by the incrusted young, brought away, to show how the secretion of the lac was progressing.

The male (Pl. I. fig. 5) is a little larger than the young ones at their exit from the parent; it has larger antennæ, which are hairy-plumose (fig. 7) and consist of seven articulations, not including the two basal ones; four eyes, two lateral and two underneath the head (fig. 6); two long hair-like appendages, covered with white powder, proceeding from the penultimate segment above (fig. 5 *b b*); and a beak-like horny extension (*a*) from the last segment, which is curved a little downwards and composed of two members (fig. 9 *a*, *b*), an upper and a lower one, both grooved, and forming together a cylindrical channel, through which the semen is conveyed into the female.

Thus the changes which the larva undergoes during incarceration, to produce the male, consist in an enlargement and alteration in form of the antennæ; in the differentiation of the head, and the addition of two large eyes underneath it, which appear to be for the purpose of enabling the male, as he crawls over the lac covering the females, to find out the apertures in it that lead to the vulvæ; in the addition of the male organ, and in the replacing of the two hairs growing from the penultimate segment on either side of the tail by two delicate, white, twisted cords, composed of the attenuated extremities of the tracheæ. There are further differences between the sexes at this period, in the female having lost all traces of eyes, antennæ, and legs, whilst, no differentiation having taken place between the head and body, the female is reduced to a mere elliptical sac, with but faint traces of the original segmentation. From the thorax, however, project the two tufts of white tracheæ, which are absent in the male, and also a tuft from the anal extremity, the two hairs before alluded to (fig. 4 *b b*) having disappeared altogether; but the row of hairs round the anus, which are now absent in the male, still remain in the female (fig. 11 *b b*), and appear to serve the purpose chiefly of preventing the secretion of lac from covering up the anal aperture.

At this period only, the bodies of both male and female are about the same size (viz. about 1-27th of an inch long); but while the former has become more highly developed and eliminated, for the performance of his special function, the latter has become retrograde and permanently incarcerated for hers. So unsparingly does Nature deal with her forms for the development of the new being!

Impregnation.—After having taken home the small portion of the branch above mentioned, which was covered more or less with the newly incrusted brood, on which there were no free males, I was astonished, on taking it up an hour or two afterwards, to observe that two had made their appearance, and were actively engaged in impregnating the females. This they do by drawing the organ before described downwards and a little forwards just over the hole in the lac which leads to the anal orifice of the female, and then inserting it; after which the male sits on the hole, as it were, for a few moments, and then, withdrawing the penis, goes to another female, and so on till his office is fulfilled.

I now watched the process for some time; and having sufficiently satisfied myself of the fact as just stated, the two males were removed for microscopical examination, and the branch left as before without any. Next morning, to my astonishment, I again found two more males on it, actively engaged in performing their duty like the former ones; and then it struck me that they must come from some of the incrustations; so I examined the latter, and soon saw that there were two distinct kinds of incrustations on the bark,—one (fig. 14) circular, slightly larger than the other, and, when *isolated* from the rest (which for the most part are agglomerated), presenting twelve notches or teeth symmetrically arranged round the base, six on each side, with the three holes above, and the white tufts projecting from them as before described (*a* and *b b*): this, of course, was the female.

The other form of incrustation (fig. 13) was narrower and elliptical, like that of the young insect at evolution, but without serrated base, holes, or white hair-like appendages. Finally, it was observed that the latter were frequently empty, and open at their unfixed and elevated end (*b*), while from others the tail of the male insect itself was projecting.

Thus the origin of the male and the process of impregnation as to time and act were easily determined; while it was also observed that in some parts there were almost, if not quite, as many male as female incrustations present, in others not so many.

On the evolution of the young, therefore, all at first would appear to attach themselves to the bark, and pierce it for nutriment—at least, all that live—preparatory to undergoing further general and generative development (for all are alike, apparently, when first hatched), and that then they respectively become changed for the fulfilment of their ultimate functions,—the males for impregnating the females, and the females for secreting the lac and developing the new brood; but the latter, as before shown, does not appear until the month of July of the following year. Thus we see that the young *Coccus*, as we have termed it, merits rather the term of "larva" (from the metamorphosis which it subsequently undergoes to pass into the matured forms of male and female respectively) than that of "young insect."

Again, all begin to secrete from their bodies the resinous substance even before they have fixed themselves to the bark; for those had it which were hatched from the lac on the branch that was first presented to me, after the latter was dry and dead; so that no doubt can exist of the lac being produced by the insect itself, and that it is not a mere exudation from the tree, which follows the insertion of its proboscis into the bark, as has been stated.

But while those which are to become males are entirely, though but temporarily, shut in by the lac which they subsequently elaborate from the juices of the tree on which they may be located, those which are to become females preserve throughout the three apertures before mentioned, from which project the white tufts of tracheæ.

These tufts, which previous to impregnation (fig. 14 *a*, *b b*) consisted of but a few filaments from each aperture, and thus in no way impeded the functions of the male, had so increased immediately after impregnation (that is, by the 20th of September), that every part of the branch covered with the new lac was rendered white by it; and although there were still a few females which were not enveloped by it (and probably, therefore, were not impregnated), yet for the most part they were thickly covered by this cottony substance; and the few remaining males that were present were so inextricably entangled in it, and so prevented from coming into contact with the females by it, that, together with the presence of dead ones also entangled in the mass, it may be inferred that this rapid evolution of the cotton-like substance at once indicates the death-season of the males, and that impregnation has been fully performed.

One other observation I would add, which is more practical than scientific, viz. that, to obtain as much resin and as much colouring matter as possible, the gathering of lac should take place towards the end of May or the beginning of June, just before the evolution of the young, which, as will have been seen above, carry away with them the greater part of the colouring matter. In Ure's 'Dictionary of Arts and Manufactures,' which contains by far the best, and least incorrect, account of this insect that I have met with, it is stated that the evolution of the young takes place in "November or December," and afterwards, in "October or November," while the lac is gathered twice a year, in "March and October." It is also stated in the same article that the male insect has "four wings," and that there is "one to every 5000 females;" while we are not a little surprised to see, in P. Gervais and Van Beneden's 'Zoologie Médicale' (1859), p. 374, that lac "exudes from certain trees through the punctures which have been made by the females."

It was this and sundry other statements, together with seeing that the insect could be examined successfully only in the country where it lives, which induced me to avail myself of the opportunities presented to me of obtaining as much of its history as I could, for publication.

On the 25th of *June* I received the branch of the Custard-apple tree with the living matured lac-insect on it in its incrustation. About the 5th of *July*, the young or larvæ, about 1-40th of an inch long, began to issue. On the 14th of *August* all were fixed to, and progressively enlarging, in incrustation, on the Custard-apple tree. On the 8th of *September* the males were leaving their incrustations and impregnating the females, each sex being now about 1-27th inch long; and on the 20th of *September* the females were almost all concealed under an exuberant evolution of the white cottony substance (which we now know to be the attenuated extremities of the tracheæ covered with a white powder), with a single male insect here and there alive, and many dead ones, entangled in it.

Bombay, Oct. 11, 1860.

EXPLANATION OF PLATE I. B., Figs. 1—14.

Fig. 1. Transverse section of a branch bearing "lac," with five full-grown individuals of *Coccus lacca* in it, just before the evolution of the young (natural size): *a*, section of branch; *b b*, dotted line showing outline of lac; *c c*, lac-insects; *d*, large or anal papilla; *e e*, the two small or thoracic papillæ; *f f*, tufts of white-powdery tracheæ.

Fig. 2. Diagram of full-grown *Coccus lacca*, to show internal organs, &c.: *a*, oral papilla, which is attached to the branch; *b*, anal papilla surrounded by hairs at its opening, from which projects (*m*) the tuft of cottony substance (tracheæ); *c c*, the two thoracic papillæ, from each of which also projects a tuft of the cottony substance; *d*, œsophagus; *e e*, alimentary canal; *f*, liver; *g*, hepatic duct; *h*, oviduct; *i i i*, branches of the same, bearing ova (this organ is greatly reduced in bulk, for the sake of perspicuity); *k k*, tracheæ; *l l l*, section of sac; *m m*, tufts of white-powdery tracheæ, resembling cotton in appearance.

Fig. 3. Pouch or diverticulum of ovary, magnified to show—*a*, pouch; *b*, ovum filled with cells; *c*, one of these cells magnified, showing *d*, oil(?)-globules, and *e*, globules or cells containing the colouring matter.

Fig. 4. Larva or young *Coccus lacca* as it issues from the parent (1-40th inch long, magnified): *a a*, the two tufts of tracheæ budding from the thorax; *b b*, the two hairs extending from the penultimate segment of the abdomen; *c*, tuft of anal tracheæ; *d*, eyes.

Fig. 5. *Coccus lacca*, male (1-18th inch long, magnified): *a*, penis; *b b*, white filaments composed of tracheæ twisted into a cord.

Fig. 6. The same: ventral view of the head, to show the lower pair of eyes.

Fig. 7. Antenna of the same, more magnified: *a*, free extremity; *b*, the base.

Fig. 8. Antenna of larva, magnified.

Fig. 9. Penis, magnified: *a*, upper, and *b*, lower member.

Fig. 10. Tarsus of mature insect, both male and female, magnified.

Fig. 11. *Coccus lacca*, female (of the same age as the male), after its incrustation has been dissolved off with spirits of wine), 1-18th inch long: *a a*, thoracic tufts of tracheæ; *b b*, anal ditto; *c*, row of hairs around anal orifice, identical with fig. 2 *b*.

Fig. 12. Head and tail of the same, more magnified, to show—*a*, proboscis, and *b*, row of hairs round anal orifice.

Fig. 13. Form of male incrustation: *a*, fixed extremity; *b*, free ditto.

Fig. 14. Form of isolated female incrustation, of the thirteenth week: *a*, anal tuft of tracheæ issuing from anal orifice; *b b*, thoracic tufts of tracheæ.

II.—*On the* Anobiadæ *of the Canary Islands.* By T. Vernon Wollaston, M.A., F.L.S.

Having had occasion lately to look somewhat critically into the various *Anobiadæ* collected by myself during 1858 and 1859 in the Canarian archipelago, I subjoin an enumeration of them, which I believe will be found approximately complete as regards the members of this small but interesting family in the several islands of that Atlantic group.

Fam. Anobiadæ.

Genus Stagetus (nov. gen.).

Corpus parvum, subovato-globosum, convexum, pubescens, durum, *Syncalyptæ* formam simulans: *capite* deflexo, sub margine prothoracis antico parum recondito, *oculis* subrotundatis, minus prominulis: *prothorace* longiusculo, subconico (antice producto attenuato, postice lato truncato vix sinuato): *scutello* minuto, triangulari: *elytris* subconnatis, pygidium tegentibus: *alis* obsoletis: *abdomine* e segmentis 5 composito, 1^{mo} costato-limbato, brevi, præsertim in medio, et ibidem in lobum crasso-elevatum (in metasternum receptum) retrorsum producto. *Antennæ* longiusculæ, basi distantes, infra oculos insertæ, distinctissime 11-articulatæ, art. 1^{mo} maximo robusto crasso subflexuoso, 2^{do} minus incrassato brevi basin versus (præsertim extus) clavato, 3^{tio} ad 8^{vum} gradatim paulo latioribus (3^{tio}, 4^{to} 5^{to}que subelongatis gracilibus, longitudine leviter decrescentibus, latitudine vix crescentibus; 6^{to}, 7^{mo} 8^{vo}que gradatim distincte latioribus et gradatim magis triangularibus intus productis), reliquis clavam magnam laxam longissimam 3-articulatam efficientibus (9^{no} et 10^{mo} oblongis apice truncatis, 11^{mo} elongato-oblongo). *Labrum* parvum, corneum, longiusculum, postice constricto-angustatum, antice rotundatum angulis anticis valde rotundatis, per marginem anticum leviter rotundatum et ibidem ciliatum. *Mandibulæ* validæ, corneæ, triangulares, ad apicem acutæ integræ, mox intra apicem dente maximo acuto instructæ, inde ad basin subrectæ. *Maxillæ* bilobæ, lobis latis membranaceis, intus longe et dense pubescentibus, *interno* breviore. *Palpi maxillares* articulo 1^{mo} flexuoso, 2^{do} vix clavato, 3^{tio} breviore, ultimo magno crasso securiformi-fusiformi apice oblique truncato: *labiales* haud distincte observavi. *Mentum* corneum, triangulare sed apice recte et late truncatum. *Ligula* longiuscula, submembranacea, basi rotundata, apice valde profunde biloba, lobis magnis subdivergentibus pilosis obtusis, in media parte (inter lobos) crassior et ibidem pilis duobus longissimis obsita. *Pedes* graciles, contractiles: *tibiis* rectis, gracilibus, ad apicem internum minute calcaratis: *tarsis* brevibus, art. 1^{mo} (paulo in *anticis*, magis in *intermediis*, et maxime in *posticis*) elongato, 2^{do}, 3^{tio} 4^{to}que brevioribus et ad apicem internum gradatim productis, ultimo brevi ovato *unguiculis* minutissimis simplicibus munito.

Obs. Genus inter *Anobium* et *Dorcatoma* aliquo modo situm, sed ab illis sine dubio distinctum; antennarum labrique structura, necnon elytris subconnatis, prothorace conico antice producto, corpore subgloboso aptero hirtulo a generibus *Anobiadum* plerisque discedit.

A *σταγετὸς*, gutta.

Until critically examining the two insects described below, I had regarded them as members of the genus *Dorcatoma*; but on comparing them therewith, I perceive that they possess abundant distinctive features of their own. Apart from their more conical, anteriorly-produced prothoraces, and subglobose pilose bodies—which, at first sight, much resemble those of *Syncalypta* and other small exponents of the *Byrrhidæ*,—the structure of their antennæ is altogether dissimilar from that of *Dorcatoma*, being not only distinctly 11-articulate (whilst those of the latter have but ten* joints), but almost coincident with those of the *Anobia*, except that the six intermediate articulations (between the 2nd and 9th) are of totally different proportions and shape, —the first three of them being slender and elongate (though gradually decreasing in length), whilst the latter three are thicker and subtriangular, being gradually more and more produced at their inner apical angle. Their 3-articulated club is very long and lax, and almost without any tendency to have its first two joints internally produced. In the construction of the mandibles, maxillæ, and ligula, they agree pretty nearly with both *Dorcatoma* and *Anobium*, whilst their mentum and feet are more suggestive of the latter than of the former; but, apart from the details of their antennæ and outward contour (which have been just alluded to), in their very singular upper lip, obsolete wings, and subconnate elytra, they recede entirely from both.

1. *Stagetus hirtulus*, n. sp.

S. niger, pube flavo-cinerea longiuscula suberecta vestitus; prothorace antice (oculo valde armato) remote punctato (punctis levissimis sed magnis); elytris leviter striatis, striis versus latera obsolete subcrenatis; antennis piceo-testaceis; pedibus rufo-piceis.

Long. corp. lin. $1-1\frac{1}{4}$.

Habitat prope oppidum Valverde in ins. Hierro, mense Februario 1858 parce captus.

The present insect and the following one are very nearly allied; but the *S. hirtulus* is perhaps a trifle the larger and more

* Prof. Lacordaire, in his admirable work on the 'Genera of Coleoptera,' states that these small intermediate joints in the antennæ of *Dorcatoma*, between the second and the club, are, from their minute size, most difficult to count. In an English specimen, however, of the *D. flavicornis*, the parts of which I have lately mounted in balsam for the microscope, there are unquestionably (and most distinctly) *five* of them—the first being about half as long again as any of the others, and rather slenderer *at its base*, whilst the remaining four are very short and closely connected *inter se*,—making the whole antenna to be 10-articulate.

globular of the two; its pubescence is somewhat longer, and its elytra are more lightly striated,—the striæ, except the ones towards either side (and even those very obsoletely so), having no tendency to be crenulated. I captured several specimens of it in Hierro, during my sojourn there with the Rev. R. T. Lowe and Mr. Gray in February 1858, both near the town of Valverde and in the sylvan region of El Golfo, on the west of the island.

2. *Stagetus crenatus*, n. sp.

S. niger, pube flavo-cinerea paulo breviore depressiore vestitus; prothorace antice distinctius remote punctato; elytris distincte crenato-striatis; antennis piceo-testaceis; pedibus rufo-piceis.

Long. corp. lin. 1.

Habitat Teneriffam, ad Souzal et "Ycod de los Vinhos" inter lichenes in truncis arborum crescentes collegi.

The more deeply striated and distinctly crenated elytra of the present species, in conjunction with its rather shorter pile, will (as already stated) distinguish it from the *S. hirtulus*. I have hitherto only observed it in Teneriffe, where I have captured it at Ycod de los Vinhos, and from out of lichens growing on the trunk of an old tree at Souzal.

Genus Xyletinus.

Latreille, Cuv. Règne Anim. (ed. 2) iv. 483 (1829).

Whether the four insects described below should not properly be detached from the *Xyletini*, I will not at present undertake to pronounce for certain; nevertheless it must be admitted that their softer, less ovate (*i. e.* more cylindric) and pilose bodies, posteriorly-rounded and less sinuated prothorax, and unstriated elytra, in conjunction with the more or less perceptibly longer second articulation of their feet, would give them a *primâ facie* claim for separation; nevertheless, since the ultimate joint of their palpi is decidedly securiform, I would not magnify the above discrepancies more than is necessary. From the *Notiomimi* (which have a more evidently elongate second tarsal joint) they may be known by, *inter alia*, the securiform termination of their palpi, and their less strictly *sericeous* (or more properly pilose) surfaces.

§ I. *Palpi maxillares articulo ultimo securiformi, simplici.*

3. *Xyletinus desectus*, n. sp.

X. rufo-brunneus, sat crebre punctulatus et pube breviuscula subdepressa flavo-cinerea dense tectus; elytris obsoletissime subseriatim pubescentibus, ad humeros rotundato-desectis (*i. e.* oblique truncatis); antennis dilute testaceis; pedibus rufo-ferrugineis, tibiis gracilibus.

Long. corp. lin. $1\frac{1}{2}$–$1\frac{2}{3}$.

Habitat in Canaria Grandi, in regione "El Monte" mensibus Martio et Aprili 1858 a meipso detectus.

In their general contour, clothing, and hue, the present species and the following one are very similar, and therefore might easily be confounded unless their characters were clearly pointed out. I am convinced, however, after a careful examination of them, that they are truly distinct,—the *X. desectus* not only being very much more coarsely punctulated (when viewed beneath the microscope), and having its shoulders more obliquely truncated or rounded-off, but likewise having the basal joint of its (rather longer and darker) antennæ considerably less inflated —a structure which is exceedingly apparent when the antennæ of the two species are removed, and gummed alongside each other on a separate card. In minor details, the *X. desectus* has its elytra a trifle more convex (or drawn-in) posteriorly, with their pubescence rather shorter and with a more evident tendency to be disposed in longitudinal rows, and its legs are a shade darker, with their tibiæ just perceptibly more slender. In its habits, also, it would appear to be less exclusive; at any rate the few specimens which I have hitherto detected of it were captured (by brushing) *in aperto*, in the region of El Monte in Grand Canary, whereas the *X. latitans* I have as yet only observed under the dead bark of old *Euphorbia*-stems.

4. *Xyletinus latitans*, n. sp.

X. rufo-brunneus, crebre et minutissime punctulatus (punctulis oculo valde armato solum observandis) et pube longiuscula suberecta flavo-cinerea tectus; elytris posterius paulo minus convexis, obsoletissime seriatim subcostatis, ad humeros minus oblique rotundatis; antennis brevibus, testaceis, articulo basilari maximo inflato; pedibus ferrugineis, tibiis subgracilibus.

Long. corp. lin. $1\frac{2}{3}$–$1\frac{3}{4}$.

Habitat in insulis Teneriffa et Hierro, sub cortice Euphorbiarum arido laxo latitans.

The distinctions between the present species and the last one, which are very closely allied, have been already pointed out,— the slightly larger size, and *most* minutely and less deeply punctulated surface (even beneath the microscope) of the *X. latitans*, in conjunction with its less rounded shoulders, rather longer and more coarsely pubescent elytra, shorter and paler antennæ (which have their basal joint more swollen), and its somewhat less slender tibiæ, being sufficient to characterize it. The few examples which I have as yet taken were captured beneath the loose outer bark of dead *Euphorbia*-stems, under which circumstances

I have taken it at Orotava in Teneriffe, and in the district of El Golfo on the west of Hierro.

§ II. *Palpi maxillares articulo ultimo securiformi, sed ad apicem internum late oblique excavato.*

5. *Xyletinus excavatus*, n. sp.

X. piceus, sat crebre punctulatus et pube longiuscula suberecta cinerea dense tectus; elytris obsoletissime subseriatim pubescentibus; antennis gracilibus, rufo-testaceis; pedibus rufo-ferrugineis, tibiis latiusculis, tarsis subgracilibus.
Long. corp. lin. $1\frac{1}{2}$.
Habitat in Canaria Grandi australi, mense Aprili 1858 captus.

Well distinguished from the other *Xyletini* here described by its darker and more piceous hue, rather more erect and paler pubescence, and somewhat broad tibiæ. Its tarsi also are a little longer and slenderer than is the case in the allied species, and have their basal joint (in proportion to the rest) more perceptibly thickened.

6. *Xyletinus brevis*, n. sp.

X. rufo-brunneus, sat crebre punctulatus et pube longiuscula subdepressa flavo-cinerea tectus; elytris breviter ovatis, ventricosis; antennis pedibusque rufo-testaceis.
Long. corp. lin. $1\frac{1}{3}$.
Habitat in ins. Palma, mense Maio 1858 repertus.

The short-ovate outline of this interesting little *Xyletinus*, the elytra of which are subventricose, and not at all parallel at their sides, will at once distinguish it from the other species here described. In the apically scooped-out terminal joint of its maxillary palpi it agrees with the *X. excavatus*; nevertheless the emargination is somewhat less deep than in that insect, whilst its totally different shape and paler hue will still further separate it therefrom.

Genus Notiomimus (nov. gen.).

Corpus parvum, cylindrico-oblongum, sat durum: *capite* magno, lato, inflexo, ad pectus inter otium applicando, *oculis* rotundatis: *prothorace* brevi, transverso, antice subtruncato, postice subsinuato-rotundato angulis posticis valde rotundatis; *prosterno* brevissimo: *scutello* sat magno, subtriangulari: *elytris* postice plus minus abbreviatis, pygidium vix tegentibus: *alis* amplissimis: *abdomine* e segmentis 5 composito, 1–4 brevibus transversis inter se longitudine subæqualibus, 5^{to} paulo longiore subtriangulari. *Antennæ* basi distantes, sed longe infra oculos insertæ, 11-articulatæ, art. 1^{mo} magno robusto subflexuoso, 2^{do} minore brevi clavato, 3^{tio} longiore paulo graciliore triangulari intus apice oblique truncato, 4^{to} ad 10^{mum} latitudine longitudineque vix paulatim crescentibus fortiter serratis (i. e. triangularibus intus productis), ultimo graciliore elongato-ovato. *Labrum* subcorneum, postice angustatum, antice lato-ampliatum angulis anticis rotundatis sed per marginem anticum rectissime truncatum et ibidem ciliatum. *Mandibulæ* validæ, corneæ, latissimæ, crassæ, extus valde truncato-rotundatæ, ad apicem acutæ integræ, mox intra apicem dente magno lato et infra hunc dente minore obsoletiore instructæ, inde ad basin rectæ haud excavatæ. *Maxillæ* bilobæ, lobis latiusculis membranaceis intus longe et dense pubescentibus, *interno* breviore. *Palpi* subfiliformes, elongati; *maxillares* art. 1mo parvo, 2do longiore crassiore subtriangulari intus oblique truncato, 3^{tio} paulo breviore crassiore, ultimo haud latiore valde elongato fusiformi: *labiales* longissimi, e scapis ligulæ connatis surgentes, art. 1mo sat parvo, 2do multo majore subtriangulari ad apicem internum valde oblique truncato et ibidem longe piloso, ultimo paulo majore crassiore fusiformi. *Mentum* basi subcorneum, apicem versus membranaceum, triangulare apice recte truncatum. *Ligula* longiuscula, membranacea, basi rotundata, apice valde profunde biloba, lobis magnis subdivergentibus pilosis obtusis. *Pedes* graciles, contractiles: *tibiis* rectis, gracilibus, ad apicem internum minute calcaratis: *tarsis* articulis 1mo et 2do elongatis (hoc illo vix breviore), 3^{tio} 4toque brevibus, ad apicem internum (præsertim hoc) leviter productis, ultimo his conjunctis longitudine subæquali, *unguiculis* simplicibus munito.

Obs. Genus *Xyletino* affinitate proximum, sed corpore longiore magis cylindrico vestito, capite paulo latiore, prothorace postice valde rotundato (minus sinuato), palporum omnium articulo ultimo fusiformi (nec securiformi), tarsorum articulo secundo longiore (basalis fere longitudine) necnon victu moribusque certe distinctum videtur.

A *νότιος* australis, et *μῖμος* imitator. (Typus *Notiomimus fimicola.*)

The curious-mannered beetle from which the above structural details have been drawn has much the external contour of a *Xyletinus,* with which indeed, in its antennæ, mandibles, maxillary lobes and ligula, it is almost coincident. Its rather larger and broader head, however (which is much inflexed, and closely applied to the chest when the insect is in a state of repose), in conjunction with the strictly *fusiform* terminal joint of all its palpi, and the elongate second articulation of its feet (which is scarcely shorter than the basal one)—not to mention its extraordinary habits and other minor characteristics,—will undoubtedly separate it from that genus. The terminal joint, too, of its tarsi is less abbreviated than is the case with the true *Xyletini,* being quite as long as the two preceding (short) ones united; its mentum is more decidedly triangular (though broadly truncate at its tip); its labial palpi are longer; its upper lip is contracted at its base, wide anteriorly (with the angles rounded), and *very* straight along its front edge; and its elytra are somewhat shortened behind, leaving more or less of the pygidium uncovered. Its habits, moreover—which, so far as I have hitherto observed, are purely stercoraceous (the insect infesting the dried dung of the larger animals)—are altogether different from those of the *Xyletini*, and indeed from those of *any* of the members of the *Anobiadæ* with which I am acquainted.

§ I. *Elytra crenato-striata, apice pygidium haud tegentia.*

7. *Notiomimus fimicola*, n. sp.

N. cylindrico-oblongus, rufo-brunneus, breviter sericeus; capite obsolete carinato; elytris ad latera rectis, interstitiis subdepressis; antennis pedibusque gracilibus fragilibus, illis brunneo-nigris ad basin rufescentibus, his dilute testaceis.

Long. corp. lin. $1\frac{1}{3}$–2.

Habitat aridos insularum Lanzarota et Fuerteventura, in stercore desiccato bovino, equino, camelino, tempore vernali ubique vulgaris.

The slender and fragile limbs of this insect, in combination with its rufo-brunneous hue, cylindric outline, and minutely sericeous surface, will, apart from many other characters, at once distinguish it. It abounds, during the spring and early summer months, in the most sterile spots of the barren islands of Lanzarote and Fuerteventura, occurring in the dried dung of horses, oxen, and camels,—such being, moreover, the *only* situations in which I have ever observed it.

8. *Notiomimus holosericeus*, n. sp.

N. oblongus, brunneus, dense et grosse sericeo-subvariegatus; capite distincte carinato, oculis magnis prominulis; elytris ad latera subrectis, interstitiis alternis obsolete elevatis; antennis pedibusque elongatis robustis, illis brunneo-nigris ad basin rufescentibus, his fusco-testaceis.

Long. corp. lin. vix $1\frac{2}{3}$.

Habitat in ins. Palma, a Dom. Gray mense Februario 1858 repertus.

A single specimen of this very distinct species was taken by John Gray, Esq., in the island of Palma, during February 1858. It may be known from the preceding one by its less rufescent hue and more densely and coarsely sericeous surface (which is more glossy, or variegated, with the short silken pubescence), by its rather larger and more prominent eyes, its obscurely raised alternate elytral interstices, its more decidedly carinated forehead, and by its longer and robuster limbs.

§ II. *Elytra haud striata, apice pygidium tegentia.*

9. *Notiomimus punctulatissimus*, n. sp.

N. rufo-brunneus, subopacus, creberrime punctulatus et pube brevi depressa flavo-cinerea densissime tectus; elytris obsolete subseriatim pubescentibus; antennis pedibusque brevibus gracilibus, illis brunneo-nigris ad basin rufescentibus, his rufo-testaceis.

Long. corp. lin. 1 .

Habitat in Canaria Grandi australi, Aprili 1858 captus.

Well distinguished from the two preceding species by its smaller size, shorter limbs, most densely (but minutely) punctulated surface, and its unstriated elytra, which entirely cover the pygidium at their apex. It was captured by myself in the south of Grand Canary, during my expedition there, with the Rev. R. T. Lowe, in April 1858.

Genus Anobium.

Fabricius, Syst. Ent. 62 (1775).

10. *Anobium velatum*, Woll.

Anobium velatum, Woll., Ins. Mad. 276. tab. 5. f. 3 (1854).
—— ——, Woll., Cat. Mad. Col. 92 (1857).

A single example of this insect, found (dead) in a house at Haria, in the north of Lanzarote, is all that I have hitherto detected of it in the Canarian group. It is, however, highly satisfactory to find it represented—as tending still further to establish its distinctness from its near ally the *A. villosum* (of southern Europe), which I have taken in the neighbouring island of Teneriffe. It differs from the *A. villosum* (*inter alia*) in being a trifle larger and with more erect pubescence, in the punctures of its elytra being somewhat smaller and the interstices more flattened, and in its larger and broader prothorax, which is much straighter at the sides (being less rounded-off posteriorly), more coarsely and closely granulated, less convex on its disk, and with a more evidently glabrous central line behind.

11. *Anobium villosum*, Brullé.

Anobium villosum, Bonelli, in litt.
—— ——, Dej. Cat. 130 (1837).
—— ——, Brullé, Webb et Berth. Hist. Nat. des Iles Can. 60 (1839).

Having captured this insect several times in the houses of S^ta^ Cruz, in Teneriffe, I am enabled to correct a false impression into which I had fallen in the 'Insecta Maderensia' (*vide* p. 277), in supposing that the *Anobium* recorded by M. Brullé, in Webb and Berthelot's 'Histoire Naturelle des Iles Canaries,' was probably identical with the Madeiran *A. velatum*. From the occurrence, however, of the true *A. villosum* (of southern Europe) at S^ta^ Cruz, it is certainly *more likely, à priori*, that the Canarian specimens examined by Brullé were correctly identified. Its distinctions, which, although sufficiently numerous, consist *principally* in the form of its rather smaller and more posteriorly-rounded prothorax, have been pointed out under the last species. From Brullé having, in his short mention of it (I cannot say his *description*, for the few words in which he alludes to it do not amount to even a diagnosis), accidentally compared it with the common *A. paniceum*, Professor Lacordaire, in his recent admirable volume on the 'Genera of Coleoptera,' *queries* it as a possible variety of that insect. It may be sufficient, however, to state that the two species *have scarcely anything whatever in common* except their generic characters.

12. *Anobium striatum*, Oliv.

Anobium striatum, Oliv., Ent. ii. 16. 9 (1790).
—— ——, Gyll., Ins. Suec. i. 291 (1808).
—— ——, Woll., Ins. Mad. 278 (1854).
—— ——, Woll., Cat. Mad. Col. 92 (1857).

This universal European insect has established itself pretty generally at the Canaries, into which it has doubtless been imported from more northern latitudes. I have not looked very closely over my immense material, but I believe I have taken it in most of the islands; nevertheless the specimens which I have before me at the present moment are merely from Teneriffe and Palma. It undoubtedly is not very abundant anywhere; and certainly not so common as it is in the Madeiran group.

13. *Anobium paniceum*, Linn.

Dermestes paniceus, Linn., Fauna Suec. 431 (1761).
Anobium paniceum, Steph., Ill. Brit. Ent. iii. 340 (1830).
—— ——, Woll., Ins. Mad. 277 (1854).
—— ——, Woll., Cat. Mad. Col. 93 (1857).

Like the last species, clearly an importation from more northern latitudes. I have taken it in houses in Grand Canary, and *in aperto* in the immediate vicinity of Santa Cruz in Teneriffe.

Genus Ptilinus.

Geoffroy, Hist. Abr. des Ins. i. 65 (1764).

14. *Ptilinus cylindripennis*?, Woll.

Ptilinus cylindripennis?, Woll., Ins. Mad. 285 (1854).
—— ——, Woll., Cat. Mad. Col. 94 (1857).

I have *queried* my identification of the present *Ptilinus* simply because I have no example of the Madeiran *cylindripennis* now in my possession for comparison. I believe, however, it is specifically identical with that insect. I captured both sexes of it, in tolerable abundance, in Palma, on the 1st of June, 1858,—out of an old post, at Galga, in the east of the island.

III.—*Description of a new Species of Spider lately discovered in England.* By R. H. Meade, F.R.C.S.

Tribe **Octonoculina.**

Family EPEIRIDÆ. Genus Epeira.

Epeira bella.

E. flavo-castanea, cephalothoracis marginibus et vitta centrali V-figurata rubris; pedibus rubro-annulatis; abdomine rubro et brunneo marmorato, dorso flavescente, et setarum 8 vel 10 nigrarum ordine basi posito.

Long. $\frac{1}{5}$ unciæ ♂ et ♀.

Cephalothorax narrow, compressed and elevated at its anterior part. Colour yellowish chestnut, the lateral margins being surrounded by an irregular band of a brownish-red colour; a V-shaped red mark is also seated on the middle and anterior part, extending backwards from a short distance behind the eyes, where its colour is paler, for about two-thirds of the length of the cephalothorax, where its apex terminates in a dark point. Two rather indistinct brown spots are seated one on each side of the median line, towards the anterior part of the dorsal mark. Eyes black and projecting, being seated upon tubercles and placed near together; the four intermediate ones form a square, and the lateral ones on each side are contiguous. The eyes in the antero-inferior row are nearly in a straight line; those in the posterior row form the segment of a circle, the concavity of which is forwards. Falces yellowish brown, each armed on its inner side with two rows of small teeth, which, as well as the fangs, are of a dark reddish-brown colour. Maxillæ, labium, and sternum dark brown, the last having three elevations upon each side, corresponding to the points of insertion of the first three pairs of legs. Palpi and legs luteous, annulated with rosy-red marks and bands. The legs are short and rather feeble, the first pair the longest, then the second, and the third pair the shortest. Abdomen oval, projecting considerably over the base of the cephalothorax; the colour of the upper surface is a clear brownish yellow, the sides and posterior part being thickly spotted and marbled over with red and brown marks, giving them a prettily mottled dark-red colour. A series of five or six transverse, obtusely angular dark lines extends down the middle of the posterior half of the dorsum, towards the apex; and in front of these are four deeply-impressed brown spots, placed nearly in a square, and situated about one-third from the anterior extremity of the abdomen. In young specimens the central parts of the transverse lines are generally deficient, two longitudinal rows of dark spots only existing, the intervals between which are about as wide again as those between the four spots before mentioned. A number of minute white hairs are spread over the back and sides, causing silvery reflexions in certain lights; the edge of the projecting base of the abdomen is also fringed with a row of stiff black bristles, eight or ten in number. Under-surface of the abdomen dark brown, with two wide longitudinal yellow stripes.

The male only differs from the female in being more slender in form and brighter in colour. The palpal organs of the specimen which I found were not fully developed, as it had not undergone its final change of integument.

I discovered an adult female and an immature male of this very pretty little spider, in August 1860, on the ground among brush-wood at Newton Purcel, near Bicester, Oxon; and I captured several young individuals of the same species on previous occasions in the same locality.

IV.—*Notes on the Pteropodous Genus* Hyalæa, *and Description of a new Species.* By W. H. Benson, Esq.

The localities of the tracts inhabited by the shell-bearing Pteropoda are mostly given by systematic writers and other observers in such general terms, that a few notes on the subject may prove useful to those who collect or study these interesting forms. I commence with the genus *Hyalæa*, including *Diacria*, Gray.

Only eleven recent species of *Hyalæa* are admitted by Souleyet in his edition of Rang's folio work published in 1855. Including *H. flava*, D'Orbigny, which appears to be a distinct species, the number of well-ascertained species will amount to thirteen, the whole of which, with a number of varieties, were procured in the ship 'Malcolm,' in 1834–35, and during a passage from Bengal to the Cape in 1846, in the 'Gloriana.' My observations may assist in determining the value of the specific distinctions between one or two forms regarding which authors have differed, and in proving that a species described by Mörch as new may be referred to one previously known.

Hyalæa tridentata, Lamk.

This large globose species, which may be detected at sunset flitting at the surface of the ocean in its usual jerking mode of progression, was taken at intervals from 10° S. lat. and 31° W. long. in the Southern Atlantic, through $39\frac{1}{2}$° S. lat. and 33° E. long. in the Southern Ocean, 37° S. lat. and 75° E. long., 33° S. lat. and 81° E. long. to 6° S. lat. and 87° E. long. in the Indian Ocean; and a small variety (or more probably a distinct species) then took its place as far as 4° and 5° N. lat. and 90° E. long.

Its capture was recorded on eleven different days; and the largest number of specimens taken on a single occasion occurred on the night of December 1 (in 33° S. lat. and 81° E. long.), when forty-five examples of the larger variety were secured, in three towing nets, in the course of a few minutes after darkness had set in.

The large variety agrees with the figures given by Rang in plate 2 as *H. Forskalii* (asserted by Souleyet to be *H. tridentata*, Lamk.), and with the description given by Souleyet of the latter species, as well as with Krauss's description and figure of his *H. truncata* from False Bay, in the 'Süd-Afr. Moll.,'—the specimens taken up to the 1st of December being of a clear horn-colour, and having the gibbous portion in front and the summit of the labrum tinged with a darker hue in most specimens; while another variety, of the same size and characters (of which I took three specimens in 31° S. lat. and 83° E. long.), presents the colouring assigned by Krauss to his *H. truncata*. The greatest length is 18 mill., with a breadth of 12½ mill.

The smaller variety, taken near the Equator in the Indian Ocean, differs in its narrower and less elevated labrum not emarginate in the centre, and in having only three broad ribs on the flatter face of the shell, instead of five assigned by Souleyet to *H. tridentata*, and by Krauss to *H. truncata*; also in the absence of radiate striæ on the ventral side. It may possibly be the species which Krauss viewed as *H. Forskalii* when he described *H. truncata* as distinct. I shall not risk an increase of the evident confusion already caused by misapprehensions concerning the true characters of the original species. This can only be cleared up by reference to authentic examples; but the following characters may help to solve the difficulty. I can find no allusion to them in any work to which I have access.

In the larger five-ribbed species the edges of the lateral rifts are expanded and very thin, and on the flatter side (called the dorsal by Souleyet and Krauss, and the lower by Mörch) are wrinkled at right angles to the line of the rift, and slightly reflected at the edge; while in the smaller three-ribbed shell the edge of the rift, instead of being expanded, is thickened by a rib on the ventral side, and the dorsal edge is inverted into the rift. This seems to be a very decided distinction, and, in conjunction with the fewer ribs and the structure of the labrum, &c., may justify a specific separation.

The dimensions of three specimens of the smaller shell are—

Length 14, breadth 9 mill. (two specimens).
„ 12, „ 8 „ (one specimen).

The slight characters assigned to *H. tridentata* in Gray's 'Cat. Brit. Mus.' will apply to either form; and those given for *H. affinis*, D'Orb., in the same work, are, as far as they go, applicable partly to both—noticing the narrowness of the protruded labrum as well as the emargination at the end. According to Souleyet, the darker colour and smaller size of *H. affinis* are its chief characteristics. The colour is quite immaterial, as I find all variations of it in the larger type. In the smaller shell the apex of the labrum is occasionally flexuose, but it does not present the decided emargination so conspicuous in the other form.

Hyalæa uncinata, Rang.

Three different varieties in size occurred,—the smallest in the northern tropical Atlantic, the medium-sized in the tropical portion of the Indian Ocean, and the largest (measuring 9 mill. in length and 5½ in breadth) in the Bay of Bengal, about 15½° N. lat., and in the Indian Ocean in S. lat. 6½° and E. long. 83½°.

Hyalæa globulosa, Rang.

I consider this species, with reference to Rang's figure and Souleyet's description, to be the same as the Philippine *H.* (*Cavolina*) *Pisum*, Mörch, Zeitschr. 1850, notwithstanding Souleyet's character "superne quinque-costata," and Mörch's "inferne convexa, medio sulcis 2 divergentibus," which would attribute only three ribs to the part which he regards as the lower, but which is the superior side according to Souleyet's view. This difference is easily reconciled by the probability that an inconspicuous elevation on either side, connected with the prominence which borders the fore part of the lateral rift, was regarded by Souleyet as a rib, and rightly disregarded, on the other hand, by Mörch,—the two deep furrows between the three central ribs being alone conspicuous in Rang's figure No. 18 of plate 2, as contrasted with the five conspicuous ribs in the adjoining figure No. 14 of *H. uncinata*. It is also evident that Rang's figure 17 was taken from a specimen of *H. globulosa* with an imperfect labrum, and deficient in the perpendicular inflexion in front of the aperture noticed by Souleyet.

H. globulosa was taken on seven different occasions, in December 1834 and January 1835, from 2° S. lat. and 88° E. long. to the head of the Bay of Bengal, and in greater abundance on the southern side of the Equator than on the northern. In 1846 it was captured on two nights, near 5° S. lat. and 82½° E. long., where calms and squalls alternated.

Hyalæa gibbosa, Rang.

Souleyet has confounded this form with the larger calceolate species, *H. flava*, D'Orb., and refers to the figure of the latter (plate 10. figs. 3, 4) as representing Rang's shell, of which no drawing appears in the work. It is sufficient to compare specimens of the two shells, to become satisfied that Souleyet's statement that *H. gibbosa* is merely an immature *H. flava* is founded on error. No possible increase of size could convert the perpendicular lip of *H. gibbosa* (nearly parallel with the anterior portion of the ventral side, and running into an angular apex) into the oblong, scarcely narrowed, and protruding labrum of *H. flava,* gradually rising as in the smaller shell referred to *H. tridentata,* nor produce the overhanging form of the anterior ventral portion, so characteristic of D'Orbigny's species.

H. gibbosa was taken only six times, in November and December 1834, and did not exceed two specimens on any occasion. In 1846 eleven specimens were procured by a fellow-passenger, to the south of Madagascar, in one night, and three specimens within sight of the Natal coast. In 1834 the shell occurred between 30° and 31° S. lat. and about 17° W. long., as far as 39° S. lat. and 69° E. long.; and the last examples were procured in 4° S. lat. and 87° E. long.

Hyalæa flava, D'Orb.

This subcalceolate species did not fall into our nets during the outward voyage in 1834–35. A single specimen was taken in 1846, on the same night as three specimens of *H. gibbosa,* a little to the south of the embouchure of the Umzimvobo or St. John's River, and within sight of the land of Natal. Its dimensions are 10 mill. in length by 6 in breadth. Those of my largest *H. gibbosa* are 8 mill. in length by 5½ in breadth.

In addition to the differences above noted, it may be observed that *H. flava* has five very flat ribs on the dorsal side, and is delicately and closely striated radiately on both the dorsal and ventral sides, while *H. gibbosa* is more strongly ribbed on the dorsal face, and the two ribs next to the middle one are each inclined to be divided into two by a longitudinal furrow. The radiate striæ on the upper side are scarcely to be distinguished, and on the gibbous ventral side are distant and elevated.

Hyalæa quadridentata, Lesueur.

Three varieties of this, the most minute form of the genus, were captured. On the 23rd of October, 1834, I got it in the South Atlantic, about 17° S. lat. and 27° W. long. I find no record of its reappearance until we reached 2° S. lat. and 88° E. long., where it was abundant, and accompanied us, at intervals, nearly to the head of the Bay of Bengal.

On the 21st of February, 1846, I took nine specimens of an exceedingly minute variety, pellucid, and with obsolete ribs and sculpture, in company with a single specimen of the ordinary form, in 3° S. lat. and 83° E. long.; and the species again occurred to the south of Madagascar.

The sculpture is variable in respect to the depth of the sulci and of the transverse striæ on the dorsal face. In the Atlantic specimens the ribs are moderately developed, the striæ obsolete, and the white or ferruginous labrum moderately thickened at the edge. In those taken near the Line, in the Indian Ocean, in 1834, the ribs are strongly marked, as well as the transverse striæ, and the labrum much thickened, and generally brown. In the minute hyaline variety taken in 1846, the ribs are nearly obsolete, the striæ not to be detected, and the lip but slightly thickened and colourless. The single larger variety taken with it has more apparent ribs and a ferruginous labrum; and when alive, the mouth had a purple tinge, which appeared to be due to the animal.

Hyalæa longirostris, Lesueur.

When perfectly developed, this species has a bifurcate termination to the labrum, with an emargination between the points, as noted by Souleyet, and the lateral posterior spines run into a long and delicate point. Rang's plate 2 (figs. 7–10) exhibits the shell with these parts in their ordinary truncate form. A small variety, with a blue or violet animal, and a horny-white or hyaline shell, appeared sparingly between 12° and 6° N. lat. and 25° and 22° W. long. in the Atlantic, and a larger variety between the Equator and 2° N. lat. and about 90° E. long. in the Indian Ocean. This variety was white and translucent.

Hyalæa angulata, Soul.

Souleyet states that this species offers no differences in the characters of the shell, and that the point of the beak is truncate. I have, however, specimens of the ordinary form, and with the anterior vaulted part well developed, in which the beak is thickened at the extremity, and bifid as in *H. longirostris*. This shell is pellucid, with a brown spot at the place where the narrow rostrum leaves the broad part of the labrum; and some slight horn-coloured markings are scattered elsewhere. It occurred frequently from 5° N. lat. and 92° E. long., to the head of the Bay of Bengal. Souleyet notes it as rare in the Atlantic, and in the Indian and Chinese Seas.

Another singular shell, which must be regarded as a distinct species, presented itself in the Atlantic with *H. longirostris*. It is altogether horn-coloured; the gibbous portion at the base of the beak, although distinct, is less strongly developed, and not vaulted as in *H. angulata*; the bifid rostrum, instead of being short as in *H. angulata,* is very long and nearly perpendicular to the plane of the shell; the lateral spines are long (running out, in one specimen, to a sharp point); and the interior of the labrum, below the insertion of the bifid rostrum, is furnished on each side with a strong tooth, and exhibits a deep fissure or sinus between the prominences. The animal presented a blue or violet tint, like *H. longirostris,* very different from the hyaline, yellow, and brown colours recorded by Souleyet for that of *H. angulata.* Taking all these characters together, it appears that it cannot be regarded as a variety either of *H. longirostris* or of *H. angulata.* I describe it as

Hyalæa fissilabris, B., n. sp.

H. testa elongato-triangulari, cornea, infra semiglobosa, antice transversim sulcata, superne planiuscula, 5-costata, costa mediana convexiore; spinis lateralibus subangulatis, basin versus latis, planatis, postice elongatis, ad apicem acutis, hyalinis, margine postico medio angulatim prominente; cuspide mediana posteriore lata, brevi, truncata, lateraliter angulata; apertura late angulare, angusta; labro subito valde inflexo, extus superne subgibboso, verticali, intus dentibus 2 lateralibus prominentibus, rima profunda divisis, ad insertionem rostri munito, in rostrum elongatum, subverticale, angustum, modice aversum, intus profunde canaliculatum, ad apicem bifidum, desinente.

Long. $3\frac{1}{2}$, diam. 3, alt. corporis 2, alt. labri 3 mill.

Taken on the night of the 7th October, 1834, in N. lat. 6° and W. long. 22° 25′, in the same tract with the horny variety of *H. longirostris.*

The greater comparative length and vertical position of the labrum, suddenly curved at the base, and slightly averted from the shell at the termination of the beak, together with the peculiar internal structure of the labrum, sufficiently distinguish this shell from the two allied species. In *H. fissirostris* the prominence at the posterior edge of the lateral spines (termed "uncination" by Souleyet) is situated far from the point and at the end of an obtuse rib at the back; in *H. longirostris* it forms the termination of a short narrow rib near the final process; and in *H. angulata* it is between the end of an obtuse rib and the terminal spine.

The lateral spines are altogether more horizontal, and not perpendicularly curved at the outer edge as in *H. longirostris.*

Hyalæa labiata, D'Orb.

This shell first appeared in the Atlantic about 31° S. lat. and 17° W. long.; again between 39° and 40° S. lat. and about 33° E. long.; also in 33° S. lat. and 81° E. long., 8° S. lat. and 86° E. long., as far as 1° S. lat. and 89° E. long., in the Indian

Ocean,—on the last occasion in abundance. It occurred also to the south of Madagascar, in 1846. Souleyet notes it as not common, although found in all seas. I did not notice the variety to which he alludes.

Hyalæa inflexa, Lesueur.

I took this species only once in the South Atlantic, where a single specimen was met with, about 17° S. lat. and 27° W. long., on the 24th of October, 1834. Souleyet states that it has also been found in the Mediterranean and Pacific.

Hyalæa lævigata, D'Orb.

A scarce and singular little shell, included by Gray in *Diacria*, which escaped observation in 1834–35. The sole specimen captured in 1846 entered my towing net, with the minute variety of *H. quadridentata*, in 3° S. lat. and 83° E. long. The dorsal surface has the central elevation noticed by Souleyet and omitted by D'Orbigny in his description.

Hyalæa 3-spinosa, D'Orb.

A *Diacria* of Gray. Of the ordinary variety, two sizes (one being of very inferior magnitude) as well as two forms were taken,—one having the lateral spines projecting at the sides nearly at right angles to the long posterior mucro; in the other they are slightly inclined backwards at various angles. These two varieties are figured in plate 3 of Rang and Souleyet's work. They were found on seven different occasions, in 1834, in the North and South Atlantic; in the Southern Ocean about 39° S. lat. and 33° E. long., where the species occurred in the greatest number; and in the Indian Ocean between 7½° and 8° S. lat. and 86° and 86½° E. long. In 1846 it was captured south of Madagascar.

Besides these shells, a third aberrant form (*H. mucronata*, D'Orb.) appeared more rarely. It is of considerably greater magnitude, and is distinguished from the variety of *H. trispinosa*, in which the spines are most inclined backwards, by the position of the lateral spines and the stronger transverse sculpture on the ventral face. There is no figure answering to it in the plates of Rang and Souleyet's work, but Souleyet pronounces it to be merely a larger and flatter variety. Two specimens were taken in the Southern Indian Ocean between 31° S. lat. and 83° E. long. and 29½° S. lat. and 84° E. long., in a tract where the smaller kind was absent. The spines take their origin further back on the shell, not near the centre of the broad part as in the type of *H. trispinosa*: the angle formed by them with the central mucro will be found to be one of 33°, and in a specimen of the ordinary kind in which the spines have the greatest deviation from a right angle, 55°.

In the relative position of the lateral spines, although not in respect to their length, the ordinary *H. trispinosa* is in some degree represented by *H. inflexa*, while the variety (*mucronata*) has a partial representative in *H. labiata*. There appear to be considerable grounds for regarding it, with D'Orbigny, as a distinct species.

Cheltenham, Nov. 29, 1860.

V.—*Description of a new* Alycæus *from the Andaman Islands; with Notes on other Indian* Cyclostomacea. By W. H. Benson, Esq.

Alycæus Andamaniæ, B., n. sp.

A. testa aperte umbilicata, conoideo-depressa, remote radiato-plicatula, plicis regionis inflatæ confertis costulatis, superne subtusque rugis flexuosis spiralibus remotiusculis sculpta, ferrugineo-rubente, apice rubido, subtus pallidiore, pone aperturam cornea; spira primo planiuscula, apicem versus papillarem obtusum exserta, sutura profundiuscula; anfractibus 4, convexis, ultimo rotundato antice descendente, tubulo suturali retroverso brevi; apertura majuscula circulari integra; peristomate subduplici, margine undique expansiusculo, extus fuscato. Operc. ——?

Diam. major 5, minor 4, alt. 3 mill.

Habitat ad Portum Blair Insulæ Andamanicæ. Collegit Capt. J. C. Haughton.

I am indebted for a single specimen of this very distinct species of the typical section to the present Superintendent of the Penal Settlement. Including *Al. expatriatus*, Bl., from the Nilgherries, described in a late Number of the 'Journal of the Asiatic Society of Calcutta,' and a new species, also belonging to the section *Charax*, from another hill range in Southern India, to be described by Mr. W. T. Blanford, the number of known species of *Alycæus* now amounts to twenty-five.

Alycæus distortus, Haines, was conjecturally assigned, in the 'Annals of Natural History' for March 1859, to the section *Dioryx*. This location appears, on reference to Haines's figures, lately received, to be correct; however, the black blotches caused by the use of an inferior description of white paint in colouring the plate have, as in most of the Continental works on Conchology, made it difficult to ascertain the true characters of the shell.

A curious variety of *Alycæus Amphora* was sent to me from Moulmein by Major Sankey. Besides a stronger angulation at the lower part of the last whorl, the shoulder of that whorl is also distinctly angulate, almost giving the appearance of a new species; but the other characters of the shell prove it to be merely a variety. It was found at the Farm Caves by Capt. Haughton.

In a former paper, the discovery of *Cyclophorus* (*Turbo*) *foliaceus,* Chemn., in the Andamans was announced. I am indebted to Capt. Haughton for larger specimens of the shell, containing the operculum *in situ;* so that no doubt remains of the propriety of referring the species to *Cyclophorus.* The younger specimens are depressed, angulate at the periphery, and wider in the umbilicus. The adult shell is more lengthened, the last whorl is rounded, and the umbilicus narrow. In some specimens, vestiges of a brown scabrous epidermis, which had concealed the white and rose-colour of the surface, are visible. The largest specimen is 22 mill. in length by 19 in breadth.

In the paper on *Opisthostoma* lately published by the Messrs. Blanford, a shell named *Cyclotus malabaricus,* Bl., allied to *C. filocinctus,* Bens., and likewise found in the Nilgherries, is described. Mr. W. T. Blanford informs me that he intended to separate these shells under the generic name of *Cyathopoma,* Bl., with reference to the singular construction of the operculum, which fully bears out his opinion on the subject.

An interesting shell from Assam, partaking of the characters of *Rhiostoma* and *Opisthoporus,* has lately been communicated to me by Mr. W. T. Blanford, who proposes to describe it in a future number of the Calcutta Journal.

Cheltenham, Nov. 30, 1860.

VI.—*On a Bisexual Nematoid Worm which infests the common House-Fly* (Musca domestica) *in Bombay.* By H. J. Carter, Esq., F.R.S.

[Plate I. A. figs. 1–4.]

In November last (1859), while examining the head of the common House-fly (*Musca domestica*), I noticed that two Nematoid worms came out of it; but not having time to look after them then, I deferred the subject for a future opportunity, thinking that the occurrence would be found to be frequent, and if so, that the form and origin of these worms would be worth investigating for the light it might throw on the origin of the Guinea-worm (*Filaria Medinensis*) in the human subject. Accordingly during the past month (July 1860) I have returned to the inquiry, and have observed that, on an average, about every third Fly contains from two to twenty or more of these worms, which are chiefly congregated in, and confined to, the proboscis, though occasionally found among the soft tissues of the head and posterior part of the abdomen. They are bisexual, have arrived at maturity, and are all nearly of the same size; and as they are perhaps more nearly allied to the Filaridæ than to any other family of the Nematoid worms, it seems best to place this worm, at all events for the present, in the genus *Filaria*, where, with the specific designation of "*Muscæ*," its description may stand as follows:—

Filaria Muscæ, n. sp. Pl. I. A. figs. 1 and 2.

Linear, cylindrical, faintly striated transversely, gradually diminishing towards the head, which is obtuse and furnished with four papillæ at a little distance from the mouth, two above and two below; diminishing also towards the tail, which is short, and terminated by a dilated round extremity covered with short spines. Mouth in the centre of the anterior extremity. Anal orifice at the root of the tail.

Œsophagus commencing from a slightly dilated oral orifice, narrow at first, then becoming suddenly increased in calibre, and, after extending some distance backwards, joining the intestine, apparently without any line of demarcation, opposite the anterior termination of the hepatic organ. Intestine continued straight through the body, and nearly of the same size, on to the rectum, which is short and obliquely directed towards the anus. Œsophageal sheath (fig. 3 *d*) commencing at the termination of the narrow portion of the œsophagus posteriorly, where the latter is embraced by the dorsal vessel, gradually increasing backwards to join, without a line of demarcation, the sheath of the intestine, which, on its part, soon attaining its maximum calibre, is continued backwards, of the same size, to the termination of the hepatic organ, where it becomes slightly but suddenly reduced in diameter and afterwards maintains nearly the same size, on to the rectum.

Hepatic organ (Pl. I. fig. 2 *d*) marked by a dense white layer of oil-globules and granular matter within the intestinal sheath, surrounding the anterior third of the intestine, commencing opposite the union of the latter with the œsophagus, and terminating at the sudden diminution in diameter of the intestinal sheath, where it is defined by a circular line (*m*). Rectum (*o*) more or less obscured by muscular and other structure, in the midst of which two glandular bodies are observed opposite its junction with the intestine. Dorsal vessel (*e e e*) extending from the point of union between the smaller and larger portions of the œsophagus (*e*), which it embraces by bifurcation, to the posterior end of the hepatic organ (*m*), where it again appears to bifurcate, and to embrace the intestinal sheath.

Generative organs situated in the anterior part of the body, under the œsophagus and anterior part of the intestine, consisting of an ovary (fig. 3 *f*) and testicle (*h*), opening on the right side, a little in front of the liver, by separate ducts about one-hundredth of an inch apart,—the former, which is anterior, by a simple papillary aperture (*g*), and the latter by the same, but with a short funnel-shaped exsertile organ (*i*). Ovary unseen in detail, but charged with nucleated cells, and presenting a distinct line of demarcation between itself and the testicle, which on its part appears to be saccular, and also contains nucleated cells that are sometimes spermatophorous (fig. 4). Spermatozoa indistinctly seen; single, in cells about 1-700th of an inch in diameter; consisting, when half-developed, of a striated, pyramidal or triangular body growing out of a small mass of granular mucus on one side of the cell (*a*, *b*); when fully developed, apparently club-shaped (*c*).

Size. About 1-11th of an inch long and 1-313th of an inch in its broadest diameter, that is, in the middle.

Hab. Proboscis, head, and posterior part of the abdomen of the common House-fly (*Musca domestica*).

Loc. Island of Bombay.

Observations.—The papilliferous head, transversely striated body, and general form of this worm ally it more to *Filaria medinensis* and the microscopic free Filaridæ which I have described under the generic term of "*Urolabes* *," than to any other of the Nematoid families; but, of course, the characteristic penis of the Filaridæ, both in form and position, is here absent, from the approximation of the male and female outlets of the organs of generation, which seems to be entailed by the bisexuality (although it is not by any means apparent why it is the male organ which should be transposed), while the latter still maintains its posterior position with respect to the former. The advancement of the vulva towards the head is not remarkable, for in *Filaria Equi* it is close to the anterior extremity †. The spermatozoon, however, more nearly resembles that of *Ascaris mystax*, both in form and development ‡. The inflated spiniferous extremity of the tail of *F. Muscæ*, besides being more characteristic of the male than the female, whose tail in the Filaridæ generally is whip-like, has its resemblance in one of the free microscopic species which inhabit the salt-water drain of the town of Bombay, with this difference only, that the spines of

* Ann. Nat. Hist. ser. 3. vol. iv. p. 28, July 1859.

† Blanchard, Ann. des Sc. Nat. 3 sér. t. xi. pl. 6. fig. 3 *a*.

‡ Phil. Trans. 1852, pl. 26.

the latter are longer, and the whole resembles more the rowel of a spur. Again, the liver is shorter, and the divisions of the alimentary canal less defined than in the free Filaridæ.

The presence of spermatozoa in these worms, together with their being all of the same size, indicates that they have arrived at maturity, and are not developed in the Fly.

As above stated, I have not seen the ova in their fully developed state, and I am ignorant of the future of this worm; but knowing that many Entozoa are nursed in one animal and lay their eggs in another, it is not improbable that this part of the cycle of their development may be performed in the alimentary canal of the white "Paddy-bird" or Crane (*Ardea modesta*), which appears to live chiefly on the common House-fly, being a constant attendant for this purpose on cattle, and at the slits made in the palm-trees for the extraction of their saccharine juice.

To ascertain if *F. Muscæ* would live in sugar-and-water, in water alone, and in the former, to which in one instance *gum acaciæ* had been added, and in another a portion of gelatinized *Nostoc*, both to serve as a nidus to nestle in and for nourishment, several of these worms were transferred to these media respectively, in watch-glasses sheltered in a glass-case; but none survived more than a few hours, whether from change of habitat or change of nourishment (which latter could not be very different from that taken in by the Fly, unless a secretion from the Fly itself), I am ignorant.

At first I thought that I had discovered both the spermatic cells and the ova, in certain masses of cells which exist both in the lobes of the proboscis and in the head respectively of the Fly, as well as about the rectum in the abdomen. But subsequent observation proved to me that these were extensions of a nucleated blastema accompanying the tracheæ, and that each cell was provided with a terminal branch of the latter. What are these cells, and what is their function? Are they at once appendages both to the tracheal and vascular systems? They differ somewhat in the lobes of the proboscis, where there are two or more groups, from those in the head, and may be easily seen in both when torn to pieces and placed under a magnifying power of 350 diameters. It seems strange that such remarkable organs should not have been figured in connexion with the elements of the proboscis of the Fly generally, which is one of the commonest objects of microscopical observation.

F. Muscæ will, I think, be the first bisexual *Filaria* of the kind on record. Schneider, however, appears to have found a true hermaphrodite one in Snails, in which *Filaria* "spermatozoids are first seen to make their appearance in the generative tube, and then eggs; fecundation takes place, and a new generation is brought forth." Here there appears to be a single tube which performs both functions, and of course there is no male outlet. If there be no mistake here, and the worm itself should resemble in form *Filaria Medinensis*, it will afford strong grounds for assuming that the same kind of generative process takes place in the latter. But, without desire to impugn in the least M. Schneider's assertion, I would observe that this takes place in all the free microscopic Filaridæ which I have described (the type of which in *Urolabes palustris* is figured *), with this exception, that the store of undeveloped spermatozoa which is always present at the upper end of the oviduct, close to the opening of the ovisac, has been introduced by the male; hence it is possible that a female *Filaria* in this state might be mistaken for a hermaphrodite of the description mentioned by M. Schneider †.

Bombay, August 1860.

EXPLANATION OF PLATE I. A. figs. 1–4.

Fig. 1. *Filaria Muscæ*, n. sp.; natural size.

Fig. 2. The same, magnified: *a*, œsophagus; *b*, intestine; *c*, intestinal sheath; *d*, liver; *e*, rectum and anus.

Fig. 3. The same, more magnified, in three portions: *a*, two upper papillæ; *b*, small part of œsophagus; *c*, large ditto; *d*, œsophageal sheath; *e e e*, dorsal vessel; *f*, ovary charged with nucleated cells; *g*, vulva; *h*, testicle charged with nucleated cells; *i*, penis; *k*, anterior extremity of liver; *l*, anterior extremity of intestine; *m*, posterior end of liver; *n*, intestine and intestinal sheath; *o*, rectum and anus; *p*, spinous extremity of tail.

Fig. 4. Spermatic cells, containing each a single spermatozoon: *a*, front view, showing striated triangular form of spermatozoon based upon granular mucus; *b*, the same, lateral view; *c*, fully developed (?) spermatozoon.

VII.—*Remarks upon some points in the Economy of the Nudibranchiate Mollusca.* By Cuthbert Collingwood, M.B., F.L.S. &c.‡

[Plate IV.]

The following observations were suggested by a small Nudibranch which was kindly sent me by a correspondent residing in Glasgow, Mr. Robertson, on the 25th of October last. This minute but beautiful little animal was dredged on a frond of *Laminaria saccharina* in 8 or 10 fathoms water, from a sheltered

* Annals, *loc. cit.* pl. 2. fig. 13.

† Annals, vol. v. p. 506, June 1860.

‡ Communicated by the author, having been read before a Meeting of the Liverpool Ray Club.

bay in the island of Cumbrae, Firth of Clyde. I received it alive, and had it under observation, in a tolerably active state, for two days. Supposing the animal to be a normal form, I could not refer it to any British genus: nor did a comparison with the characters of all the known genera of Nudibranchiate Mollusca appear to throw much light upon the subject; it seemed to agree with no known species. I contented myself, however, for the present, with preparing a full description and careful drawings of it while it was yet living, and taking every opportunity of watching its movements. It was tolerably lively —changing its place but little, however, though its body was in constant motion, rendering it a difficult task to delineate it with accuracy. The dorsal tentacles were singularly large, and were covered with active cilia; the papillæ, or what appeared to answer to them, and which in the Eolididæ are usually very active, were in this specimen motionless; and before death they became detached and fell off, giving the little creature the appearance of being in shreds. It floated freely, foot uppermost, on the surface of the water, as is the habit of Nudibranchs, and did not produce any spawn.

After death, I pursued the examination with the microscope, and now discovered that the skin was loaded with spicula—a fact which proved that it did not belong to the Eolididæ at all, that family possessing no spicula, and also that it was a member of the family Dorididæ, all of which, however, have more or less conspicuous branchial plumes. These spicula were symmetrically arranged, and very dense along the margin of the cloak; in shape they were generally cruciform, although a few were triradiate, and some simple. The tongue was broad, and formed of numerous small denticulated spines (eight or nine in a row), with two longer spines at either side (Pl. IV.).

The fact of the presence of spicula, which could only be determined after death, was an unexpected one, but came too late to be of service in a further comparison of the animal with the members of the family Dorididæ, to which it evidently belonged; and the absence of branchial plumes became now only more remarkable, without assisting in the identification. I therefore forwarded the drawings and description to my friend Mr. Alder, knowing that his close acquaintance with the family, and great experience in the critical examination of them, would be most likely to elucidate the affinities of this little animal. Nor was I disappointed: his answer, written with his usual kindness and promptitude, was, "Upon carefully examining your drawings, I cannot resist the conclusion that the animal is a young and undeveloped specimen of *Triopa claviger*." Upon turning to the figure of this species in the Ray Society's beautiful Monograph, I could not help feeling convinced that my specimen differed from it in very important particulars. In *Triopa*, for instance, there are distinct sheaths to the tentacles, which, after the most careful observation, I failed to detect in my specimen. The absence of branchial plumes, also, which it will be observed are visible enough in the drawing of *Triopa*, had to be explained; while the colour of the processes, which in my drawing is bright vermilion, in *Triopa* is orange-yellow. Still there were points of resemblance yet remaining which only one so well acquainted with the family as Mr. Alder would have recognized. The number of the *processes* in *Triopa* agreed with that of the *papillæ* of my specimen; there were papular elevations on the back, occupying the same position in both; and the peculiar dash of colour in the extremity of the foot was also common to both.

"The tentacular sheath in the young state," writes Mr. Alder, "is very small and difficult to detect." I examined the tentacles long and carefully without discovering this sheath; and I also felt convinced that if branchial plumes had been present, I could not have missed seeing them. But, in order to make this matter certain, I wrote to my correspondent who had kindly sent me the specimen, requesting to know if he had observed these plumes. In reply, he said that, although he had carefully looked for them immediately after having dredged it, he had failed to perceive them.

Mr. Alder's recognition of the species as *Triopa claviger*, therefore, does not divest the specimen of all further interest, inasmuch as it opens up questions of considerable importance with regard to the history of the Nudibranchiata, such as the following:—

1st. How far the so-called branchiæ of the Nudibranchiata may be considered as breathing organs.

2nd. To what extent colour is valuable as a specific distinction.

3rd. The great importance of a knowledge of immature forms.

If the term *Nudibranchiate* mean anything, it means that the gills or breathing organs of this order are naked, or uncovered, and external. This was the character assigned to them by Cuvier, in which he has been followed by the majority of zoologists; and although they were called Opisthobranchiata by Milne-Edwards, the meaning of the term is virtually the same. This eminent naturalist, in 1842, was the first to remark that the family Eolididæ, in which the so-called branchiæ are papillose, were possessed of a remarkable arrangement of the digestive organs. He found that (as he interpreted it) the stomach communicated with certain vessels, while these vessels sent off branches into each of the papillæ; and this gastro-vascular apparatus being recognized by Quatrefages, he applied to those

Mollusks collectively which appeared to possess it, the term "Phlebenterata." M. Milne-Edwards, however, subsequently abandoned this theory, owing to the discoveries and arguments of M. Souleyet in France, and Messrs. Hancock and Embleton in England, all of whom maintained that the so-called gastro-vascular apparatus was no other than a highly developed system of biliary ducts in connexion with a divided liver. And the result of the controversy between these eminent anatomists was, that instead of it being proved that the Nudibranchiata exhibited in their structure a degradation of type, as had been maintained by Quatrefages, it was demonstrated by Messrs. Hancock and Embleton that in *Doris*, at least, a portal heart existed, and that all the Nudibranchiata possessed a sympathetic system of nerves, being the first instance in which they had been fully proved to exist in the Invertebrata, and a remarkable example of the value of controversy, such as is often aroused by erroneous statements.

The learned authors of the Ray Society's Monograph, however, distinctly affirm that, "from the state of the circulatory apparatus, the respiration is performed *only in part* by the branchiæ," and further that "in all the families, the skin, which is covered with vibratile cilia, acts as an imperfect accessory breathing organ." And considering these statements, we can scarcely regard the term Nudibranchiata as anything but a misnomer, or, at all events, only to a limited extent correct. In the instance before us, the branchiæ were absent, and yet the animal was lively. Mr. Alder suggested that the branchiæ might have been decomposed; but special inquiry of my correspondent who dredged it, elicited the fact that he looked for branchiæ, but saw none. How long this little animal may have existed without these appendages we cannot say, but it cannot have been less than three days; and yet it belonged to a family in which the branchiæ are considered to attain a high degree of development, and may therefore be supposed to have more of the work of aëration to perform.

So also in the genus *Eolis*, the papillæ or branchiæ (so called) generally begin to fall off before the animal dies; and I have seen specimens of *E. Drummondi* crawling about with their backs entirely bare. Whether this may prove anything against their value as breathing organs may be considered doubtful; for even supposing them to be gastro-hepatic organs, the loss of any, or at all events of most of them, should, *à priori*, be fatal.

Mr. Lewes says he has seen *food* oscillating in the papillæ of *Eolis*, simultaneously with the ordinary locomotive movements of the body; and when we consider the universal morphologies of true branchiæ, we cannot help perceiving that these papillæ do not come under the same category with them; for a branchia or gill is an organ of an arborescent form, offering by its duplications and reduplications, and laminated structure, as much *surface* as possible to the surrounding medium, and supplied with an afferent and efferent system of vessels. But the papillæ of the Eolididæ do not follow this morphological law; for although they are very *numerous* in certain species, great multiplication of them is not an essential element of the arrangement. Thus in *Eolis exigua* the normal number is about ten, and in *E. despecta* only six or eight; and from this they increase to an indefinite number in *E. papillosa,* which stands at the other end of the scale. Neither have these papillæ any afferent branchial veins in connexion with them; so that neither morphologically nor anatomically can they be regarded as *branchiæ.*

Taking as illustrations the three British families of Nudibranchiata, viz. the Dorididæ, Tritoniadæ, and Eolididæ, the following appears to me to be a fair statement of the value and degree of specialization of their breathing apparatus:—The first family (Dorididæ) consists of two subfamilies, of which the Doridinæ possess true and perfect branchiæ, external and naked, situated upon the median line of the body, large and elaborate in their construction, and easily performing the aëration of the blood, although they may receive slight and unimportant assistance from the general surface of the body, which is destitute of appendages. The other subfamily (Polyecerinæ) possesses branchiæ of a smaller relative size, consisting usually of three or four laminæ only, which are inadequate of themselves to carry on the respiratory process. But in these the body is not simple as in the Doridinæ, but diverges more or less into *appendages,* which supplement the branchiæ by increasing the aërating surface of the body, and generally perhaps bear an inverse ratio in size and number to the development of the branchiæ.

In the second family (Tritoniadæ) the breathing organs, although not equalling the branchiæ of the Doridinæ in the perfection of their anatomical connexion, surpass them, and more particularly those of the Polyecerinæ, in extent of laminated surface; they are numerous and effective, but placed along the sides of the back, instead of being collected to one point of the median line. Hence we find this family devoid of any secondary processes which may serve as auxiliary aërating organs, such as are found in the Polyecerinæ. Still the communication which exists between the efferent branchial veins and the sinuses of the skin which contain venous blood, affords a character which places the Tritoniadæ considerably below the Dorididæ in the scale of organization.

But the papillæ of the Eolididæ are not branchiæ either by morphological structure or anatomical relation. In this family the respiratory function is distributed with nearly perfect equality over the whole body, no one part being specialized for that purpose. Here there is no duplication or lamination—no provision for multiplying the extent of surface—no distinct afferent branchial vessel—no means to secure the imperfectly aërated blood from contact with the venous stream contained in the dermal sinuses—in fact, no one character which is essential to a true gill. True, the blood is aërated sufficiently for the requirements of the animal; but it is not effected by means of branchiæ, but by the general surface of the body; and if the papillæ assist more than other parts, it is not because they are *gills,* but simply because the skin is there more delicate, and allows of a more perfect interchange between the blood there exposed and the oxygenating influences of the surrounding medium.

If to these important differences in the respiratory apparatus it be added that the Eolididæ in general have a much-divided liver, possess no buccal glands, no cloak with its attendant spicula, an uncomplicated systemic circulation, and an urticating apparatus similar to that of the Actiniæ (in all which respects they contrast with the Dorididæ and Tritoniadæ), there appears strong reason for believing not merely in the distinctness of the family, but that they are more widely separated from the true Nudibranchiata than has been generally admitted. At all events they have no title to the term Nudibranchiata, with which order they have apparently been associated chiefly on account of an accidental similarity of form.

With regard to the specific value of colour in the Nudibranchiata, I may remark that, in the individual specimen which has been the cause of these observations, the processes were of a bright vermilion, while in the mature *Triopa claviger* they are described as tipped with yellow or orange. Mr. Alder, however, does not lay much stress upon this fact, but only remarks that "the *Triopæ* we find in the north are more brightly coloured in the processes than those from the south." Now the most brilliantly coloured parts of the Nudibranchiata are usually the processes and papillæ, particularly the latter, in which there is a central ramification of the hepatic cells; and these it is which give the character to the animal. This brilliant colour is associated with fat, "always bearing a certain relation to the oily constituents both of plants and animals" (Bennett). Various influences of nutrition, seasonal conditions, and light, &c., may modify the production of pigment, although this last agent is no doubt less certain in its effects upon animals and plants living beneath the water, and perhaps in comparative darkness, than upon those inhabiting the surface of the earth. Indeed, the fact that many richly-coloured animals habitually lurk under stones and in obscurity would lead us to the conclusion that light has no influence in evolving these gorgeous tints. Be that as it may, however, colour, in the creatures which we are considering, is extremely capricious; and experience has shown that it is impossible to be sure, *à priori*, whether a certain colour is a permanent specific mark or otherwise. *Eolis Landsburgii* always possesses its characteristic amethystine tint, *E. rufibranchialis* its brilliant scarlet, and I have never met with an *E. coronata* which did not possess a delicate dash of ultramarine in the papillæ. But other species are far more variable, such as *Doris tuberculata*, which boasts of all the colours of the rainbow, *D. pilosa*, *Polycera quadrilineata*, &c., which vary considerably in the intensity of their markings; while of a great many other species some individuals are dark, or highly coloured, and others of the palest: such are *Polycera ocellata*, *Eolis papillosa*, *Embletonia pulchra*, *Hermæa dendritica*, &c. The danger, however, of naming these animals from the colour, especially when they are imperfectly known, is best illustrated by such examples as *Doris pilosa*, which has burdened science with not a few synonyms, having been called by Lovén, *Doris fusca*—by Leach, *Doris ochracea*—by Fleming, *D. nigricans*; whereas the species was in each case identical, and simply varied in colour. *Doris bilamellata* also received the name of *D. fusca* from Müller, but I have repeatedly met with it of the palest tint. *Tritonia Hombergii* is found sometimes purple, sometimes yellow, and Macgillivray described a specimen as a new species, under the name of *T. atrofusca*: it was, however, only a dark variety of *T. Hombergii*; and I have lately met with it of a pure white. Even the careful authors of the beautiful Ray Monograph have not steered quite clear of this error, for I have found specimens of *Eolis aurantiaca* in which no trace of orange colour was evident; and in the 'Ann. Nat. Hist.' for 1842 a species was described under the name of *E. pallida*, from its want of colour, which it behoved its discoverers to re-name, at a subsequent period, as *E. picta*, owing to the rich and variegated tints with which most examples were adorned. Both pale and dark varieties occur on the shores of the Mersey. It would appear, therefore, that no degree of certainty attaches to the fixity of colour as a specific character, and it is only when the species has been well observed that any reliance can be placed upon the uniformity of its tints, and this at too late a period for it to be of any real service in nomenclature. Not, however, that this danger is peculiar to the naming of the Nudibranchiata; it is a generally besetting one; and numberless examples might be adduced, both from the animal and vegetable kingdoms, of the fallacious and variable character of colour, and its untenability as a specific distinction.

The development of the Nudibranchiate Mollusca has not been clearly traced through all its stages; but the hatching of the ova may be readily observed; and from these ova there are produced little shelled Mollusks, or Nautilines, which are freely moveable by the aid of large ciliated lobes; but whether they undergo further metamorphosis has not been satisfactorily ascertained. There can be no doubt, however, that in order to comprehend with correctness the affinities of new species, some knowledge of the immature forms of ascertained species is necessary. The relative degree of development of certain organs can hardly be arrived at by *à-priori* reasoning; and an examination of the animals themselves in various stages of growth is requisite for the formation of correct conclusions. Thus, in the individual which has been the cause of these remarks, although the general conformation of the body presented evident signs of its not having arrived at maturity, the dorsal tentacles were well developed, and of a much larger relative size than in the mature *Triopa*. The tongue also, which is an organ of the utmost importance in determining species, appears to have been in this specimen well developed; and a careful examination of it with high powers of the microscope revealed the curved lateral denticles which are described as belonging to *Triopa claviger*. Whenever a doubt arises as to whether an animal is a new species or the young of a known species, the tongue is a useful criterion which may be safely depended on, and the more valuable because it is one of the hardest and most imperishable structures of the Nudibranch, and may serve to determine after death, a species which we have failed to recognize during life. The spicula also are important hard structures, though more variable than the tongue. It is remarkable that in my specimen—immature, be it remarked—the spicula were more highly developed than usual, being for the most part *cruciform*, while those of *Triopa* are usually *triradiate*. Mr. Alder remarks upon this, "I have drawings of the spicula of *Triopa claviger* very similar to yours, cruciform or dagger-shaped; but the triradiate are the more common kinds."

The distribution of these spicula in the Nudibranchiate order is worthy of attention. They are usually calcareous and situated in the cutis. The Dorididæ invariably possess them in large quantities, especially the Doridinæ or true Dorids, in which they are more abundant and are arranged more symmetrically than in the Polycerinæ. The Tritoniadæ do not possess them, and the Eolididæ also are entirely devoid of them, the skin in these last being soft and pliable, and the cloak absent. I once believed I could perceive a reason for this difference, in the fact that the Dorids and Polycerinæ having special and effective branchiæ, the presence of spicula thickly distributed through the dermal covering would not so much interfere with their respiration as they would with that of the Eolididæ were their skin largely occupied by them; for these latter, having no special branchiæ, require an unimpeded surface for the vascular system to be brought as much as possible in contact with the surrounding element. But the fact that spicula are found even in the branchial plumes of the Dorids and Polycerinæ militates against this theory. On the other hand, if what I have previously said is true, as to the incorrect position hitherto assigned to the Eolididæ, we should not be bound to expect that their external similarity of form to the true Nudibranchiata should necessarily be accompanied by an identity of internal economy.

But, to return to the necessity which exists for an acquaintance with immature forms, particularly among those who give names to apparently new species, the history of the Nudibranchiata is not without instances of the unnecessary multiplication of synonyms arising from this fertile source. Messrs. Alder and Hancock tell us that *Goniodoris nodosa* has received several distinct names from those who have observed it in different stages of growth. When young, and before the tubercles have begun to appear, they are the *Goniodoris emarginata* of Forbes; after a time they assume the appearance of the *Doris nodosa* of Montagu; and even when full-grown, the distention of the body with spawn, by rendering the tubercles obsolete, has given rise to the spurious *Doris Barvicensis* of Johnston. Other instances of this kind might be cited; but it must not be forgotten that there is also a danger of falling into the opposite error—that, namely, of mistaking a really distinct animal for the immature form of another species. Thus, *Tritonia alba* was long regarded as the young of *T. Hombergii*, until distinguished by Alder and Hancock; and *Tritonia plebeia* was also for some time imagined to be the young of the same animal, until recognized as a distinct species by Dr. Johnston. In all similar cases, the persistence of characters in the smaller animals, added to a careful examination of the *tongue*, will seldom fail to lead to a correct conclusion in the end.

VIII.—*On some additional new Species of* Pyramidellidæ *from the Islands of Japan.* By Arthur Adams, F.L.S. &c.

Still pursuing my investigations among the members of this little-known family of Mollusca, I have become acquainted with several species not mentioned in my former communications, which I now beg to bring before the notice of malacologists.

Genus Parthenia, Lowe.

1. *Parthenia mundula,* A. Adams.

P. testa ovato-conoidea, rimata, solida, alba; anfractibus normalibus 4, planiusculis, longitudinaliter plicatis, plicis angustis subobliquis, interstitiis transversim elevatim striatis; anfractu ultimo magno, rotundato; apertura ovata, antice producta, postice acuminata; plica parietali superiore, valida, conspicua.

Hab. Sado Island; 30 fathoms (Nullipore bottom).

2. *Parthenia costellata,* A. Adams.

P. testa elevato-conica, imperforata, solida, sordide alba; anfractibus normalibus 4, planis, longitudinaliter costellatis, costellis validis; anfractu ultimo ad peripheriam evanidis, basi læviusculo; apertura ovata; plica parietali valida, transversa, mediana; labro subincrassato.

Hab. Tsu-Sima; 26 fathoms (sand and shells).

3. *Parthenia littoralis,* A. Adams.

P. testa ovato-conica, cornea, semipellucida, tenui; anfractibus normalibus 5, planiusculis, longitudinaliter costatis, costis crassis rectis subdistantibus, ad suturas abrupte evanidis; anfractu ultimo costis ad peripheriam in zonulam moniliformem desinentibus, basi lævi; apertura oblonga, antice producta; labio recto; plica parietali vix celata, superiore, obliqua; regione umbilicali impressa.

Hab. Tsu-Sima; on oysters, at low water (rocks).

Genus Odostomia, Fleming.

Odostomia hyalina, A. Adams.

O. testa ovato-conica, rimata, tenui, alba, semipellucida; anfractibus normalibus 3, lævibus, convexiusculis; anfractu ultimo ventricoso; apertura oblonga; labio rectiusculo, superne tortuoso; plica parietali inconspicua, vix celata, perobliqua, superiore.

Hab. Mino-Sima, Korea Strait; 63 fathoms.

Genus Auriculina, Gray.

1. *Auriculina ovalis,* A. Adams.

A. testa ovata, imperforata, solidiuscula, alba, semiopaca; anfractibus normalibus 3, convexiusculis, transversim tenuissime striatis; anfractu ultimo amplo, elongato; apertura oblongo-ovata, antice dilatata, postice acuminata; labio simplici, arcuato, subincrassato.

Hab. Mino-Sima; 63 fathoms.

2. *Auriculina Grayi*, A. Adams.

A. testa ovato-acuta, subrimata, semiopaca, alba; anfractibus normalibus 4, convexiusculis, transversim tenuissime striatis; anfractu ultimo amplo; apertura oblonga, antice producta ac angulata, postice acuminata; labio subincrassato, antice vix reflexo.

Hab. Mino-Sima; 63 fathoms.

I have already noticed this species in a former paper, but now add a rather fuller description of the specific characters. It is the largest species in the genus.

Genus Aclis, Lovén.

1. *Aclis Loveniana*, A. Adams.

A. testa turrita, subulata, imperforata, alba; anfractibus 11, convexis, transversim sulcatis; anfractu ultimo antice subproducto; apertura oblonga, longiore quam latiore; labio arcuato, vix incrassato; labro intus sulcato.

Hab. Port Hamilton; 7 fathoms.

This is a large shell for the genus, and resembles an elegant little *Turritella*. I think, however, the texture and appearance must refer it to this genus. A minute examination of the nucleus, which I am at present unable to make, would determine the point.

2. *Aclis crystallina*, A. Adams.

A. testa imperforata, subulato-turrita, hyalina, tenui, vitrea; anfractibus normalibus 9, ad suturas angustatis, simplicibus; anfractu ultimo elongato, antice producto; apertura ovata; labio tenui, arcuato; labro antice effuso.

Hab. Tsu-Sima; 16 fathoms.

3. *Aclis fulgida*, A. Adams.

A. testa umbilicata, turrita, alba, polita, nitidissima, opaca; anfractibus convexis, lævibus; apertura circulari, antice vix producta; labio arcuato; labro margine postice subangulato.

Hab. Tsu-Sima; 16 fathoms.

This shell is very elegantly formed, but has lost some of the upper whorls. When perfect, this species would be the most beautiful in a genus where all the species are beautiful.

Genus Ebala, Gray.

1. *Ebala diaphana*, A. Adams.

E. testa subulata, turrita, imperforata, nitida, pellucida, vitrea, apice obtuso; anfractibus 7, convexiusculis, suturis marginatis, anfractu ultimo rotundato; apertura orbiculato-quadrata, antice subproducta et angulata; labio rectiusculo, superne vix flexuoso.

Hab. Port Hamilton; 7 fathoms.

2. *Ebala scintillans*, A. Adams.

E. testa subulata, turrita, alba, opaca, nitida, imperforata; anfractibus normalibus 7, planiusculis, simplicibus; anfractu ultimo rotundato; apertura subquadrata; labio recto, antice producto.

Hab. Sado; 30 fathoms.

Genus Chrysallida, P. P. Carpenter.

1. *Chrysallida pygmæa*, A. Adams.

C. testa parva, turrita, in medio tumida, apice obtuso, alba; anfractibus $4\frac{1}{2}$, planis, longitudinaliter plicatis, plicis rectis, interstitiis punctatis; anfractu ultimo ad basin rotundato; apertura oblonga; plica parietali inconspicua, obliqua.

Hab. Port Hamilton; 7 fathoms.

2. *Chrysallida pupula*, A. Adams.

C. testa subrimata, oblongo-ovata, in medio tumida, tenuicula, albida; anfractibus $5\frac{1}{2}$, planulatis, longitudinaliter plicatis, plicis rectis validis, ad suturas rotundatis ac prominentibus, interstitiis transversim striatis; anfractu ultimo ad basin rotundato et contracto; apertura oblonga; plica parietali obliqua.

Hab. Tsu-Sima; 16–26 fathoms.

3. *Chrysallida consimilis*, A. Adams.

C. testa oblongo-ovata, subrimata, alba, solida, longitudinaliter plicata; anfractibus $5\frac{1}{2}$, planis, plicis rectis validis, interstitiis simplicibus; anfractu ultimo ad peripheriam rotundato; apertura oblonga; plica parietali transversa, valida.

Hab. Port Hamilton; 7 fathoms.

Like *C. pupula*, but elongated and less tumid in the middle; inner lip thickened, and the parietal plica strong and transverse; the interstices between the ribs simple.

4. *Chrysallida consobrina*, A. Adams.

C. testa oblongo-ovali, subrimata, alba, solida, subpyramidali; anfractibus $5\frac{1}{2}$, planiusculis, longitudinaliter plicatis, plicis rectis validis, interstitiis valde striatis; apertura ovata; plica parietali valida; labro intus sulcato.

Hab. Awa-Sima; in shell-sand.

Like *C. pupula*, but stouter and more pyramidal, and with the interstices coarsely striated; outer lip internally sulcate.

5. *Chrysallida alveata*, A. Adams.

C. testa ovato-oblonga, rimata, alba, nitida, semiopaca; anfractibus $5\frac{1}{2}$, planiusculis, longitudinaliter plicatis, interstitiis crebre striatis; anfractu ultimo elongato, ad basin rotundato; apertura ovata; plica parietali obliqua.

Hab. Tsu-Sima; 16–26 fathoms.

Like *C. pupula*, but semi-opake, thinner, and more slender; the ribs smaller, and not prominent at the sutures; interstices more coarsely striated.

6. *Chrysallida munda*, A. Adams.

C. testa ovato-oblonga, in medio tumida, albida; anfractibus $4\frac{1}{2}$, convexiusculis, longitudinaliter plicatis, plicis ad suturas simplicibus, interstitiis tenuiter striatis; anfractu ultimo ad basin rotundato; apertura oblonga; plica parietali obliqua.

Hab. Korea Strait; 46 fathoms.

Like *C. pupula*, but shorter and more conical; whorls more convex; plicæ simple at the sutures, and the intervals between the plicæ very finely striated.

7. *Chrysallida mumia*, A. Adams.

C. testa elongato-ovali, albida; anfractibus $6\frac{1}{2}$, planiusculis, plicis longitudinalibus obliquis instructis, interstitiis transversim tenuissime striatis; apertura ovata; plica parietali obliqua.

Hab. Port Hamilton; 7 fathoms.

Like *C. munda*, but more elongate; whorls more numerous and less convex; interstices very finely striated.

8. *Chrysallida nana*, A. Adams.

C. testa perparva, gracili, tereti, alba; anfractibus $4\frac{1}{2}$, convexiusculis, longitudinaliter plicatis, plicis distantibus; anfractu ultimo ad peripheriam rotundato, plicis ad basin evanidis; apertura ovata; plica parietali inconspicua, obliqua.

Hab. Tsu-Sima; 16–26 fathoms.

9. *Chrysallida terebra*, A. Adams.

C. testa gracili, tereti, subulata, nitida, albida; anfractibus $7\frac{1}{2}$, planis, longitudinaliter plicatis, plicis vix undulatis, validis, subdistantibus, interstitiis creberrime transversim striatis; suturis profundis; anfractu ultimo ad basin subangulato; apertura subquadrata; plica parietali valida.

Hab. Tsu-Sima; 16–26 fathoms.

10. *Chrysallida pusio*, A. Adams.

C. testa parva, turrito-conica, nitida; anfractibus $5\frac{1}{2}$, planis, oblique plicatis, plicis validis, interstitiis transversim striatis; anfractu ultimo ad basin subangulato; apertura vix quadrangulari; plica parietali inferiore, valida, transversa.

Hab. Tsu-Sima; 16–26 fathoms.

11. *Chrysallida pura,* A. Adams.

C. testa subulato-turrita, tenuicula, nivea, opaca; anfractibus normalibus 8, convexiusculis, costatis, costis rectiusculis validis; interstitiis liris spiralibus decussatis; costis in anfractu ultimo ad basin extendentibus; peripheria rotundata; apertura ovata; labio rectiusculo; plica parietali superore.

Hab. Awa-Sima (in shell-sand).

Genus Dunkeria, P. P. Carpenter.

Dunkeria craticulata, A. Adams.

D. testa elongato-turrita, pallide fusca; anfractibus rotundatis, costellis longitudinalibus permultis et lirulis spiralibus elevatis validis eleganter cancellatis, interstitiis profundis, quadratis; costellis in anfractu ultimo ad peripheriam abrupte desinentibus; basi lirulis concentricis instructa; apertura ovata; labio arcuato.

Hab. Mino-Sima; 63 fathoms.

Genus Eulimella, Forbes.

From the figure in the 'British Mollusca' of *Eulimella Scillæ* (pl. F. F. fig. 7), the animal has very obtuse folded tentacles and other characters which would refer the genus to Pyramidellidæ; the shell, however, is very similar to that of *Eulima.* The specimens serving for the descriptions of the following species were dredged from deep water, and although in a good state of preservation, were possessed of neither animals nor opercula.

1. *Eulimella pellucens,* A. Adams.

E. testa subulato-pyramidali, gracili, pellucida, alba, anfractibus supremis rufo tinctis; anfractibus 10, planatis, ultimo ad peripheriam subangulato; apertura oblongo-ovata; labio rectiusculo, producto, in medio subangulato.

Hab. Mino-Sima; 63 fathoms.

2. *Eulimella opalina,* A. Adams.

E. testa subulato-pyramidali, robusta, valida, alba, semipellucida, opalina; anfractibus 10, planatis; suturis distinctis; anfractu ultimo lato, ad peripheriam obtuse angulato; apertura oblonga, lata, antice producta; labio rectiusculo; labro in medio producto et angulato.

Hab. Tsu-Sima; 26 fathoms.

3. *Eulimella opaca*, A. Adams.

E. testa subulato-pyramidali, alba, opaca, solidiuscula; anfractibus 10, planatis, ultimo ad peripheriam obtusim angulato; apertura subquadrato-ovata; labio brevi, recto, subincrassato; labro in medio subangulato.

Hab. Mino-Sima; 63 fathoms.

4. *Eulimella vitrea*, A. Adams.

E. testa parvula, subulato-pyramidali, alba, tenui, vitrea; anfractibus 6, planatis; suturis impressis; anfractu ultimo magno, ad peripheriam obtuse angulato; apertúra subquadrata; labio brevi, rectiusculo; labro in medio obtusim angulato.

Hab. Tsu-Sima; 26 fathoms.

5. *Eulimella hyalina*, A. Adams.

E. testa subulato-pyramidali, brevi, alba, tenui, pellucida; anfractibus 5, planatis; suturis impressis; anfractu ultimo ad peripheriam rotundatim angulato; apertura subquadrata; labio rectiusculo; labro in medio obtusim angulato.

Hab. Sado; 30 fathoms.

Ta-Lien-Whan, China,
July 2, 1860.

IX.—*Supplementary Memoir on the Genera* Liriope *and* Peltogaster, *Rathke.* By W. Lilljeborg.

[Plates II. and III.]

Amongst his collections made on the coast of Norway in 1858, the author found a specimen of the female of *Liriope,* less developed than that previously described by him, fixed upon *Peltogaster Paguri.* At Bohuslaen in Sweden, in 1859, he had the opportunity of examining a living specimen of *Sacculina* and several specimens of *Peltogaster Paguri* and *P. sulcatus.* He also obtained examples of two new genera, one allied to *Sacculina* and the other to *Peltogaster.* The examination of these new materials gave rise to the paper of which the following is an abstract.

Liriope, Rathke.

The specimen measured $2\frac{1}{2}$ millim. across. The whole anterior part of the *Liriope* (see vol. vi. Pl. 4. figs. 2 & 3 *a*) had penetrated through the skin of the *Peltogaster,* so that it could not be seen from the outside. The part of the *Peltogaster* to which the *Liriope* was attached was swelled. The *Peltogaster* contained no eggs. The body of the *Liriope* was more distended than that before described, and exhibited no folds or wrinkles. Its form was transversely oval; at the posterior part the anal aperture was seen in a small depression, and surrounded with dark points and a slightly projecting border. The body was less convex below than above, and had no longitudinal fissure. The colour was yellowish white.

Sacculina Carcini, J. V. Thompson.

Ent. Mag. vol. iii. p. 452 (1836).

Pachybdella Carcini, Diesing.

The author observes that the form of this animal changes remarkably according as it contracts the pallium more or less, or absorbs a larger or smaller quantity of water. When immersed in spirits, still fixed to the Crab, the latter, by strongly drawing up the abdomen, causes the *Sacculina* to acquire a flattened form. By absorbing water it becomes more inflated and rounded. After emptying and abandoning the oviferous tubes, the animal acquires a more contracted form.

The author cites Thompson's descriptions of the larva of *Sacculina,* and copies his figures, which he considers to confirm the opinion, put forward in the preceding memoir, that *Sacculina* is a Cirripede; he also points out the error made in the report of Thompson's paper in Wiegmann's 'Archiv' for 1837, and already indicated by us in a note on Leuckart's Memoir on *Sacculina**, according to which Thompson regarded this parasite as "belonging to Lernæadæ," whilst in reality his remarks evidently tend to show that he considered its nearest affinities to be with the Cirripedia.

The living *Sacculina* (Pl. II. fig. 1, nat. size) shows scarcely any movement, except that it from time to time contracts the aperture at *b,* so that the wrinkles of the pallium round this aperture become more numerous, and form a depression as shown in the figure. The pallium is slightly transparent, so that the oviferous tubes may be indistinctly seen. The pallium consists of three distinct membranes. Externally there is a tolerably thick and opake yellowish-white chitinous membrane, having on its inner face a pretty thick cellular layer. In this cellular layer branching and anastomosing tubes containing a darker matter are observed: these the author thinks may be muscular tubes. A thick and opake membrane, slightly attached by connective tissue, lies beneath this layer, and appears to present a more complicated structure. Externally there is a thin chitinous lamella, on which there are a great number of bands of a more solid structure, rising a little above the lamella, and becoming confounded with it at the extremities and sometimes

* See Annals, ser. 3. vol. iv. p. 424.

also in the middle. Beneath this chitinous lamella is a thick layer of an intercellular substance and indistinct cells, among which are more or less evident muscular fibres, feebly joined together, and destitute of transverse striæ. This membrane is easily detached from the others; it is described by Leuckart (*l. c.* p. 427) as "a sort of fatty body, or a cutaneous muscular sac permeated by fat." Within this muscular membrane there is another, delicate and transparent, containing small irregular cells. At the upper part of the tube leading to the opening of the mouth the two inner membranes unite with each other and with the membranes enveloping the internal body, forming the tube which clothes the inner face of the neck of the adhesive organ. At the orifice opposite the mouth and on one side of the body, these two membranes are also joined to those of the fleshy body. The tube descending to the organ of adhesion is not spiral (fig. 2 *a*).

The internal body (*corpus carnosum*) differs little in the living animal from that already figured by the author. It is more inflated and rounded. A longitudinal section through the organ of adhesion and the opposite opening is elliptical. The body is surrounded by a delicate and transparent chitinous membrane, on which there are small raised and irregular cells, probably the nuclei of cells remaining after the membrane became chitinous. This membrane exactly resembles the third or innermost membrane of the pallium. It is united to that membrane at the lower part of the body, at the orifice of the pallium and on the right side of the body, and may be regarded as a continuation of it. Between these two membranes are the oviferous tubes, slightly attached to both of them, and not surrounded by any other membranous sac, so that the young, when hatched, may escape directly through the orifice of the pallium. In a specimen with empty oviferous tubes, the residue of their membranes was at the right side of the orifice of the pallium, and some of their branches extended into that orifice. In the same specimen, near this spot, and in the vicinity of the ramose gland, there were in the body some brownish corneous tubercles, of irregular and variable form: these were probably products of the ramose gland. Close to the right side of the orifice of the pallium (fig. 2 *c*) is the orifice through which the internal ovaries communicate with the oviferous tubes. The lower part of the body, in the vicinity of the tube descending to the organ of adhesion, is whitish, and the internal ovaries do not penetrate to it. The muscular membrane forming its wall is more compact than elsewhere, except the part surrounding the pallial orifice. In two small fragments of this membrane, the author observed some filaments swelled here and there, and without transverse striæ. At the place where they were torn they presented a fibrous structure. The author has found similar filaments in *Peltogaster*, and seems to think that they may be nervous. Otherwise he has found no trace of a nervous system.

In the inferior part of the body there are two organs in the form of elongated sacs placed close together (Pl. II. fig. 9). At the closed end (*a*) the walls are thick, compact, and whitish; at the other end (*b*) they are thin and cellular. The contents of these are small globules of variable size, without nuclei. One of these organs was observed by Thompson, who says that it is transparent, and supposed that it might be a stomach. They appear to correspond exactly with those described by the author in his former memoir, and which he regarded as primitive ovaries in *P. Paguri* and as male organs in *P. sulcatus*. From observations on the contents of the corresponding organs in a form allied to *Peltogaster*, he is led to believe that they are testes. In *P. sulcatus* he has always found them largest in the smaller specimens, which had the ovaries and ova least developed. Amongst the cells with a distinct nucleus he has also seen globules of larger or smaller size, some of which were of a brownish colour.

No digestive organs were detected by the author; but he thinks that if the animal has a stomach, it will be situated in the lower part of the body.

The remaining and greater part of the internal body is of a complicated structure, and consists principally of muscular tissue and of the ovaries, together with a pretty large gland, regarded by Leuckart as a cement-gland. The muscular membrane forming the walls of the body resembles the second membrane of the pallium; but the muscular fibres are transversely striated. It is covered externally by a very delicate membrane, probably of chitinous nature, presenting bands similar to those of the second membrane of the pallium. The internal muscular tissue is most dense about the orifice of the pallium, round which it forms a sort of sphincter (fig. 2 *b*). The interior of the body is divided into several compartments containing the ramified ovaries.

The muscular membrane of the body close to the orifice of the pallium resembles that covering the lower part of the body. It rises a little above the muscular membrane of the vicinity, and extends to the orifice of the pallium. Beneath this membrane there is a large gland formed of ramified tubes (fig. 4). Its efferent canal was not observed, but its component tubes are directed towards the upper part, and therefore probably towards the orifice by which the internal ovaries communicate with the oviferous tubes. The component tubes are 0·04 millim. in diameter; their walls are formed of irregular cells. The gland was empty in one specimen, its contents having probably been discharged when the ova quitted the internal ovaries; in another the gland was filled with a cellular matter, and the walls were composed, as described by Leuckart, of cylindrical cells. Leuckart regards this as a cement-gland; and the corneous tubercles found in its vicinity render this view not improbable. Otherwise, if the two sacciform organs are not testes, this gland may be supposed to be a testis, as it presents some resemblance to the testes of the Cirripedia.

Clistosaccus * *Paguri*, nov. gen. et spec.

This parasite was found, in July 1859, upon two small specimens of *Pagurus Bernhardus*, taken at Christinebourg, in Bohuslaen. There was a single specimen on each *Pagurus*, attached to the abdomen in the place usually occupied by *Peltogaster*, namely, on the left side, near the base of the abdomen.

The animal (Pl. II. fig. 5) has the form of a completely closed and more or less rounded sac, fixed by one side to the abdomen of the *Pagurus*. The largest specimen was 5 millim. in length, and was of an oval form; the smaller one was rounded. The surface of the pallium was smooth, and, in the larger specimen, exhibited a slight sinuosity at the lower part where it was attached. The pallium was tolerably thick, though more transparent than in *Sacculina*. In the larger individual there was an empty space on one side of the larger extremity. In structure the pallium resembled that of *Sacculina*. The portion of the parasite which was fixed to the abdomen of the *Pagurus* (fig. 6 *a*) was very convex, and had traversed the skin of the Crab. The compact external membrane of the pallium is not continued over the part of the animal which penetrates the skin of the host, but terminates close to this, in a raised, horny, brownish margin, which becomes confounded with the skin of the *Pagurus*, just as the corneous margins of the organs of adhesion in *Sacculina* and *Peltogaster* unite with the skin of the Crustacea to which they are attached. This corneous border may therefore be regarded as the organ of adhesion of this animal. It is presumable that the skin which envelopes the organ of adhesion in the younger individuals of *Peltogaster* adheres in exactly the same manner to the abdomen of *Pagurus*. Probably the young *Sacculinæ* are also fixed in the same way. Young Peltogasters sometimes have the anterior orifice closed, but they always possess a buccal orifice. There is consequently a great analogy between *Clistosaccus* and the young of *Peltogaster*, and perhaps of *Sacculina*;

* κλειστὸς, closed: σάκκος, sac.

but *Clistosaccus* differs from both in the absence of a buccal orifice. It appears therefore to have remained at a lower stage of development, although, as compared with *Peltogaster*, in its internal structure it represents a higher degree, and approaches more to *Sacculina*.

The portion of the *Clistosaccus* which had traversed the skin of the *Pagurus* (fig. 6 *a*) was enveloped by a thick, but not compact, muscular and cellular membrane, which appeared to be a continuation of the second membrane of the pallium. Immediately under the skin of the *Pagurus* the penetrant portion of the parasite bore a circle of soft ramose appendages (figs. 6 *b* & 7), consisting of a delicate and transparent external membrane, and, within this, of granules and small round vesicles without distinct nuclei. Beneath these the integument became thicker; so that the thickest part was near the base, where it presented a very uneven surface.

In the structure of this part we find a striking analogy with *Anelasma squalicola*. The peduncle of the latter, which penetrates the skin of the Shark, has a great resemblance to the portion of the *Clistosaccus* which traverses the skin of the *Pagurus*. It is also furnished with similar ramose appendages. As *Clistosaccus* has no buccal orifice, it must be supposed to obtain its nourishment by absorption; and the ramose appendages are probably absorbent organs, comparable to the villosities of the intestines in the higher animals. These appendages in *Anelasma* may perhaps have a similar function.

When the pallium is opened (fig. 6), the animal presents a structure almost exactly in accordance with that of *Sacculina*. There is a muscular, oval, whitish internal body (*c*), surrounded on all sides by oviferous tubes. This body has a small neck, by which it is fixed to the basal part of the animal. The body is comparatively smaller than in *Sacculina*, and the author could not ascertain whether it is attached to the pallium. Within the body there were more or less developed ovules, but not enclosed in ramified tubes. As the pallium is completely closed, a fissure must be produced in it somewhere for the escape of the young. The author gives the following characters of his new genus and species:—

CLISTOSACCUS, nov. gen.

Animal e Crustaceorum classe et Cirripediorum subclasse, generibus *Sacculinæ* et *Peltogasteris* affine, ectoparasiticum, in abdomine *Paguri* degens.

Animal sacciforme, saccum rotundum vel ovalem, clausum et lævem præbens, latere uno (inferiore) in abdomine *Paguri* immerso, molli et appendicibus ramosis (absorbentibus?) prædito, ibique pallii tunica extima chitinosa cum cute *Paguri* coalita. Pallio aperto corpus parvulum carnosum, ovaria interna continens, et tubulis oviferis cæciformibus obtectum, videmus.

Clistosaccus Paguri, n. sp.

Specimina duo, quorum majus (fig. 5) 5 millim. longum in abdomine *Paguri Bernhardi*, mense Julii ad litus Bahusiæ accepta.

Peltogaster Paguri, Rathke.

The outer membrane of the pallium is composed of two chitinous lamellæ, of which the exterior is the thickest, and has more or less distinct longitudinal lines or bands, somewhat resembling those occurring in the membrane enveloping the ovarian sac. The development of these bands varies upon different parts of the pallium, and the lamella itself is from time to time of different degrees of thickness and opacity. On the inner face of the interior and more delicate membrane there is a more or less distinct epithelium with irregular cells; and this lamella itself is sometimes composed of hexagonal cells. The epithelium is more distinct between the bands. Within this lamella, and slightly attached to, or sometimes separate from it, there is a membrane or thick and more or less opake sac, of cellular and fibrous structure. It consists of a thick cellular layer, upon the inner face of which there are bundles of muscular fibres feebly bound together and directed transversely. These fibres are naturally formed from the cellular layer, and in *P. sulcatus* the author has seen these cells taking the form of fibres, which are striated, whilst in *P. Paguri* they are smooth. In the cellular layer there is a system of lacunar canals, but less developed than in *Apeltes*.

This membrane answers exactly to the second membrane of the pallium in *Sacculina*, and the author therefore regards it as belonging to the pallium, although, when the *Peltogaster* contains no ova, it is sometimes contracted, and forms a sac considerably removed from the outer membrane (Pl. III. fig. 2 *d*). It extends into the anterior orifice of the pallium, where it is very thick and abundantly furnished with muscular fibres which act as sphincters. It is probably this sac that was regarded by Rathke as an organ of digestion or stomach, and at the same time as a matrix. The author described its membrane as the "dermis" in his previous memoir.

When these membranes are removed from the animal containing ova, its lower surface presents the appearance shown in Pl. II. fig. 8*. Along the median portion there is a whitish or yellowish body (the *ovarian sac*), which is bordered above and along

* The specimen figured was preserved in spirit.

the sides by a large oviferous sac. On the lower part of the ovarian sac there are two elongated cylindrical bodies surrounded by connective tissue, by which they are attached to the sac (*c c*, and fig. 9). The author regards these as testes, principally from his observations on the allied new form *Apeltes*. From the more obtuse and whitish extremity, which is surrounded by a rather thick cellular membrane, issues a narrow and compact serpentine canal (*b*), which is attached to the membrane of the oviferous sac.

The ovarian sac is attached by connective tissue to the oviferous sac which surrounds it, and anteriorly (*a*) and posteriorly to the inner membrane of the pallium; it sends a small tube into the neck of the adhesive organ. The external chitinous membrane of this sac is furnished with raised and regular longitudinal bands, which appear to have a canal in their interior. Under this outer membrane there is another, which is cellular and fibrous, and resembles the muscular coat of the pallium, except that the muscular tissue is rather denser. The ovarian sac thus presents a great conformity of structure with the pallium. In one individual its anterior extremity was produced into the pallial orifice, so as to be visible before the removal of the pallium. The author detected no aperture at the anterior extremity; the membranes there were only a little thinner; nor did he succeed in finding the aperture through which the ova must escape from the ovarian sac.

The ovaries contained in the ovarian sac form two sacs parallel to the axis of the body. In their lateral portions these sacs bear lobules or branches of different lengths, and they become confounded at their posterior part. They vary both in form and volume as the eggs are developed. In the specimen represented in fig. 8, the ovaries contained ova, cells, and intercellular substance. Some of the ova were tolerably large, and filled with a great number of vesicles. The ovarian sac was whitish, tinged posteriorly with yellowish red.

The ovarian sac in *Peltogaster* corresponds exactly with the part called "*corpus carnosum*" in *Sacculina* by the author. Its principal contents are ovaries; and it is clear that the ovarian sac, as well as the "transformed body" in *Sacculina*, must absorb the food.

The testes (Pl. II. figs. 8 *c* & 9) are always of the same form. Their colour is greenish yellow, with darker transverse lines. Their walls are compact, thick and opake, and formed of several layers of cells. They are surrounded by a sac of connective tissue, which is very thick and cellular at the part whence the canal issues and which surrounds the canal itself. They are empty in specimens with a greatly developed oviferous sac; in those in which this is wanting they have cellular and viscid contents. No spermatozoids were detected in them. The canal issuing from them is compact and strong, but narrow and tortuous; at the part attached to the testis it has a flask-shaped dilatation of a less solid consistence. In the specimen figured (fig. 8), one of the canals had in the middle a short cæcal branch, and also an apophysis at the extremity attached to the oviferous sac; these were wanting in the other canal. At the point where the canal terminated, the membrane surrounding the oviferous sac was thicker, uneven, rugose and brownish, apparently indicating that a deposition of cement had taken place. The canal being attached to the oviferous sac seems to prove that the ova are not fecundated until after leaving the ovary.

The oviferous sac (fig. 8 *d*) is voluminous, surrounds the ovarian sac above and along the sides, and forms the greater part of the contents of the *Peltogaster*. It is everywhere enveloped in a delicate pellucid membrane, having small and more or less distinct irregular cells; it is slightly attached by connective tissue both to the muscular membrane of the pallium and to the ovarian sac. The membrane surrounding the oviferous sac appears to be exactly analogous to those which in *Sacculina* are placed closest to the oviferous tubes. Within are the ova, held together by cement, just as in the ovisacs of *Cyclops*. The oviferous sac corresponds with the oviferous tubes of *Sacculina*. Its colour was yellowish red, but varies according to the development of the ova.

From these observations, the author's previous statements regarding the ovaries (Annals, vol. vi. pp. 166, 167) must be suppressed. The portions described and figured by him as "primitive ovaries" are the testes, enveloped by their sacs. The supposition that the animals perish after having once produced their ova (p. 167) is also erroneous. The author has found in the same individual of *P. sulcatus*, hatched young in the oviferous sacs, and large eggs, filled with yellowish vesicles, in the ovaries. After the escape of the young, the oviferous sac is probably destroyed, as is the case in *Cyclops* and *Sacculina*; the new ova are then probably enclosed in a new oviferous sac.

The author on one occasion met with a small specimen of this species in which he could discover no trace of the anterior orifice of the pallium. He at first took it for a distinct species, but the form of its organ of adhesion and of its testes showed it to belong to *P. Paguri*. It was three millim. in length, and the colour of its oviferous sac was a deep brownish red. It was attached to *P. chiracanthus*, Lillj. This closed structure of the pallium seems to belong to a particular grade of development both in *P. Paguri* and *P. sulcatus.*

Peltogaster sulcatus, Lilljeborg.

In the arrangement of the parts of the body, this species agrees with the preceding. The outer chitinous membrane of the pallium is destitute of longitudinal bands or raised lines; and the muscular membrane has the cellular layer thinner and the fibrous layer more developed, forming a compact stratum of distinctly striated fibres. The outer membrane of the ovarian sac is also destitute of longitudinal bands, and its muscular membrane is much thinner than in *P. Paguri.* The testes are of a different form (see Annals, vol. vi. pl. 4. fig. 11). They are small in specimens with a large sac of ova, and largest in small specimens without an oviferous sac. Sometimes they are found empty, sometimes filled with granules and cells with distinct nuclei, and enveloping a smaller sac or having double walls (Pl. II. fig. 10). On issuing from the testis, the canal, in the specimen figured, was a little thickened and opake. The extremity which was attached to the membrane (*c*, of the future oviferous sac?) was slightly enlarged, having its margins uneven and rather thick. At this point the canal appeared to have traversed the membrane, on the other side of which there was a vesicle containing a smaller one (*b*) fixed to the orifice of the canal. The spermogenous cells in these testes were less developed than in that of *Apeltes,* in which their nature was clearly seen.

The ovaries are nearly of the same form as in *P. Paguri.* In neither species could the author find in the ovarian sac any organ corresponding with the supposed cement-gland of *Sacculina,* which seems to support the opinion that this may be the testis. No orifice for the escape of the ova could be detected.

The form of the adult animal differs a little from that represented in the author's previous memoir; it is shown from a living specimen in Pl. III. fig. 1. Fig. 2 represents a specimen, preserved in spirit, from which the young had escaped, and in which the ovaries contained no eggs. A great part of it is empty; the small ovarian sac (*e*) extends along the lower part of the body from end to end. It is pretty closely surrounded by the muscular membrane (*d*) of the pallium, which is contracted and widely separated from the outer chitinous membrane. At the anterior extremity (*a*), the anterior part of the ovarian sac is forced through the pallial orifice; it has burst, and let out a portion of its contents. Sometimes similar empty specimens are met with alive, but they are probably near the end of their existence.

Small specimens exhibit a good deal of vivacity, which decreases with their growth. When very small, the animals curve their bodies in different directions, and exhibit vermicular movements, constantly contracting the body from behind forwards. The short tube surrounding the pallial orifice extends and becomes slightly dilated, and from time to time one of the internal membranes is pushed out, in the form of a sac, through this orifice. Sometimes they retract the little tube, and then the orifice appears as a depression.

These small individuals differ greatly in form from those which have completed their development. Of the smallest (figs. 3, 4) the author once found eight individuals on the abdomen of a small specimen of *Pagurus cuanensis*. The one figured (fig. 4), which is distorted by its removal from the *Pagurus*, has at its anterior extremity (*b*) the carapace of a Cirripede-larva in the last stage of development (*c*), fixed in the depression of the retracted tube of the pallium. It is a cast skin (fig. 5), and its form is precisely that of the ordinary larvæ of the Cirripedes in what Darwin calls the "pupal stage." This larva has six pairs of feet and a caudal appendage. The prehensile antennæ are large, and are fixed in the pallial orifice of the *Peltogaster*. As a similar carapace was attached to three of the eight specimens above referred to, and it has never been met with except on the smallest and least developed *Peltogasters*, it appears certain that it belongs to the last stage of development of the larva of *Peltogaster*, and that it has remained fixed for some time after the *Peltogaster* has issued from it.

The small *Peltogasters* differ from the fully-developed individuals, especially in the structure of the organ of adhesion and of the part of the body in the vicinity of that organ,—the differences indicating that, as might be expected, these parts constitute more powerful organs of suction than in the adult individuals. On comparing the figures (Pl. III. figs. 3 & 4 with 1 & 2), the tube (*a*) by which the animal is attached to the *Pagurus* differs greatly both in size and structure. This tube, in the young animal, is much larger and of a more tender consistence, except at the lower margin, which was attached to the *Pagurus*. Within this tube there is another with thick cellular walls, formed by the muscular membrane of the pallium, and apparently also by the tube which issues from the ovarian sac and unites with the preceding one. The margins of both, but especially of the former, are bent outwards. Under the microscope the end of the interior tube is seen to be principally composed of cells and an intercellular substance. It presents two concentric layers,—the outer belonging probably to the membrane of the pallium, the inner to the ovarian sac. The cells of the outer layer are larger, more transparent, and less strongly united than those of the inner, and at its outer margin there are one or two rows of cylindrical cells of larger size than the rest. The inner layer is of a yellowish or brownish colour; its cellular structure is less distinct, and is not perceptible at its outer margin, which is somewhat fibrous and distinctly limited. This margin has already some resemblance to the organ of adhesion in *Sacculina*. The inner layer is also compact and coherent even under strong pressure; so that everything seems to prove that it is this layer which, in the fully-developed animal, becomes converted into the horny disk attached to the skin of the *Pagurus*. At the point where the inner tube is fixed, there is a hole through the two chitinous lamellæ of which the skin of the *Pagurus* consists; and after the removal of the young *Peltogaster*, a portion of the internal tissues of the *Pagurus* may be seen hanging out of this aperture. Hence it is clear that it is by the inner tube that the *Peltogaster* sucks its nourishment from the abdomen of the *Pagurus*.

The testes are very large, and placed at the upper part of the tube just described. This great development of the testes in so young an animal leads one to suppose that they may at this time have some other function than that of testes. As they contain brown pigment-granules and their contents are very coherent, the author is inclined to think that they secrete the cement, as do the ovaries, according to Darwin, in the ordinary Cirripedes. The pallium in this *Peltogaster* bristled with short spines.

In a specimen nearly twice the length of that figured (fig. 4) the body was rather more elongated, and the ovarian sac with its contents was more evident. The tube of the organ of adhesion was smaller, and had become narrower at its lower extremity. The testes were also smaller. It exhibited no vermicular contractions, but curved its body in various directions with vivacity. There was an orifice at the anterior extremity of the body. The author describes the mode of attachment of this *Peltogaster* to the abdomen of the *Pagurus*. When viewed from the lower surface of the skin of the latter, there is an orifice surrounded by the inner chitinous lamella of the skin, which is still very delicate and transparent, having been very little impregnated with cement, but immediately round the orifice presents some concentric striæ. Beyond and round this lamella there is a circular border, thick and brownish, belonging to the outer lamella of the skin of the *Pagurus*. This border marks the limit of the aperture in the outer lamella; it is already strongly impregnated with cement, and from it there run inwards some radiating lines formed of brown cement.

In the attachment of the old *Peltogaster sulcatus*, the inner lamella of the skin of the *Pagurus* is strongly impregnated with cement. The central aperture is closed by a layer of opake and deep-brown cement, and the concentric striæ surrounding this aperture are far more distinct. The raised border of the outer lamella is larger and more elevated, its colour is darker, and its structure fibrous.

The organ of adhesion in a fully-developed egg-bearing *Peltogaster sulcatus* is bounded by a sinuous ring, which, with all the parts placed within it, is of a brownish colour and much impregnated with cement. An inner sinuous ring indicates the circumference of the part which is fixed upon the skin of the *Pagurus*; it is situated upon a small neck, and forms the organ of adhesion, strictly so called. The outer ring, which is a little raised and resembles a cement-canal, sends inwards branches conveying cement, and forms the outer boundary of a buckler which exists in the skin and surrounds the neck of the organ of adhesion. The margin of the part of the organ of adhesion at the lower extremity of the neck is darker than the rest of the organ, and from it numerous radiating lines of cement run towards the centre. The central orifice is closed by cement.

This mode of attachment proves that the *Peltogaster*, at this stage of its development, no longer sucks its nourishment from the *Pagurus*, the orifice through which the food must pass being filled up with cement. Thus the functions of nutrition in these animals must cease when they are completely developed.

In a specimen 5 millim. in length the form was less elongated, and the tube of adhesion shorter than in the two young individuals already described. The anterior extremity of the pallium was closed. The ovaries were more developed, and distinctly presented the form of two elongated ramose sacs. The testes were scarcely perceptible. In another, 5½ millim. long, and further advanced, the tube of adhesion was narrower, and its margin, folded outwards, had begun to unite with the internal tube, acquiring the ordinary form of the fully-developed adhesive organ. The ovarian sac was very large, and contained distinct ova; the ovarian branches had become short, prominent lobules. The anterior extremity of the body had a small orifice.

Apeltes Paguri, nov. gen. et sp.

This parasite (Pl. III. fig. 6) nearly resembles *Peltogaster Paguri* in form. It is 11 millim. in length and 3½ millim. in thickness. It differs from all the preceding forms in the structure of the part by which it is fixed upon the *Pagurus*. Behind the middle of the lower part of the body (fig. 7) there is a large rounded aperture in the pallium; the margin of the chitinous membrane of the pallium round this orifice is a little elevated, and by this the animal is fixed to the skin of the *Pagurus*. At the posterior extremity of the body there is a small tubercle or tube (*b*), the outer membrane of the pallium forming there a projecting border around an aperture which is closed by the internal membranes. A short and corneous tube from the ovarian sac also leads to this point. At the anterior extremity (*a*) there is a large gaping orifice, of which the lower margin forms an obtuse point. If the posterior tube is ever opened, we have thus an anterior and a posterior orifice, which seem to offer some analogy with a mouth and an anus, even if they have not the same functions. The pallium consists of the ordinary membranes. In the muscular membrane, especially on the lower surface, there is a system of lacunar vessels (figs. 7 & 8), presenting trunks of considerable size, from which numerous branches ramify throughout the pallium.

The ovarian sac (fig. 9) resembles that of *Peltogaster Paguri*. The outer membrane has longitudinal bands, and beneath it there is a muscular membrane with fine fibres slightly bound together. At the anterior extremity this membrane forms a thick layer of lax cellular tissue (fig. 10 *b*). The two sacciform ovaries (*c c*) are surrounded by a very delicate structureless membrane. They had apparently been recently emptied, and contained very few ova, which resembled those in the ovisac. At the posterior extremity (*b*) there is a short tube, before which the two ovaries are united. Between the ovaries (which are spread out in the figure) there is a single testis (*a*), of large size, oval, opake and yellowish, attached by connective tissue near to the anterior extremity. Its walls are formed of a delicate structureless membrane, clothed internally with a thick layer of formative matter. From the anterior extremity issue two efferent canals. The walls of these canals, close to the testis, are of a lax tissue, containing a great quantity of fine fibres mixed with cellular matters. The testis was filled with spermogenous cells, all nearly equally developed, more or less rounded, and containing several fatty globules or drops of various sizes. Hence it is probable that the ova, which were in the ovisac, were not yet fecundated.

Of this new form the author only obtained a single specimen, which was found on a small individual of *Pagurus Bernhardus*, on the coast of Bohuslaen. All the figures are from the animal preserved in spirit.

The author gives the following tabular view of the genera forming his proposed order of *Cirripedia Suctoria*, which he considers to constitute two families :—

				Genera.
Cirripedia, Ordo Suctoria. Ova portantur	in tubulis ramosis cæciformibus . .	1 Familia. *Sacculinidæ.* Corpus subtus	apertura suctoria, sive ore præditum	*Sacculina.*
			sine apertura suctoria . . .	*Clistosaccus.*
	in sacco simplici magno . .	2 Familia. *Peltogastridæ.* Corpus	tubulo postico nullo ; testes duo	*Peltogaster.*
			tubulo postico brevissimo ; testis unus. . . .	*Apeltes.*

He also gives the following modified characters of the genera *Sacculina* (*Pachybdella*) and *Peltogaster* :—

Genus Sacculina, Thompson.

(*Pachybdella*, Diesing.)

Animal e Crustaceorum classe et Cirripediorum subclasse, ectoparasiticum, sub abdomine Crustaceorum Decapodorum Brachyurorum degens.

Animal adultum crassum, sacciforme, transverse ellipticum, cute (pallio) lævi, molli, sed firma, corpus internum crassum, carnosum, genitalia continens et sine cavitate digestionis distincta, instar pallii circumdante, vestitum. Os in organo adfigendi subinfundibuliformi et corneo perforatum, et in œsophagum vel tubulum suctorium transiens. Genitalia bisexualia. Testes duo, sacculiformes, elongati? vel fortasse tubuliformes et ramosi?, in corpore interno positi. Ovaria ramosa, tubuliformia, in corpore interno sita. Tubuli oviferi numerosi, ramosi, cæciformes, circa corpus internum ad duas membranas tenues adfixi. Cavitas inter corpus internum et pallium per foramen sat magnum, ori oppositum et plicis pallii circumdatum, aperta.

Pullus entomostraciformis, pullo Cirripediorum processibus ad latera partis anterioris corporis similis, et tantum processibus pluribus posterioribus diversus.

Genus Peltogaster, H. Rathke.

Animal e Crustaceorum classe et Cirripediorum subclasse, ectoparasiticum, in abdomine Crustaceorum generis *Paguri* degens.

Animal adultum: Corpus sacciforme, elongatum, teretiusculum, vel depressiusculum, cute (pallio) plus vel minus pellucida sed firma vestitum, minime segmentatum, et partibus appendicularibus articulatis destitutum. Os vel apertura suctoria in organo adfigendi subinfundibuliformi, vel acetabuliformi, vel etiam tubiformi, plus vel minus corneo, in latere inferiore corporis situm, appendicibus buccalibus nullis. Ad extremitatem unam (anteriorem) corporis plerumque apertura, interdum magna, interdum parva, cavitatem intrapallialem aperiens adest. Nullum corpus internum crassum et carnosum, ut apud Sacculinam, nullusque ventriculus adest, saccum vero internum musculosum, ovaria amplectens, invenimus. Genitalia bisexualia. Testes duo simplices tubiformes vel sacculiformes, infra saccum ovariorum positi, uterque canaliculo ad saccum oviferum adfixus. Ovaria duo sacciformia, plus vel minus ramosa vel lobata, et sacco communi inclusa. Ova, quum ex ovariis exierunt, in sacco magno, ovariorum saccum communem supra et ad latera obtegente, adservantur.

Pulli pullis antecedentis similes, entomostraciformes, cum Cirripediorum pullis processibus lateralibus a parte anteriore et inferiore corporis exeuntibus congruentes.

EXPLANATION OF PLATES II. & III†.

Plate II.

Figs. 1 to 4, *Sacculina Carcini*.

Fig. 1. The animal, of the natural size: *a*, the organ of adhesion; *b*, the orifice of the pallium*.

Fig. 2. The internal or ovarian body, of the natural size: *a*, the orifice of the mouth or sucker; *b*, the thick muscular membrane around the orifice of the pallium; *c*, the aperture through which the internal ovarics issue and communicate with the oviferous tubes; *d*, a portion of the second and third membranes of the pallium; *e*, a portion of the outer chitinous membrane of the pallium*.

Fig. 3. A testis (?): *a*, the apical portion, which is compact and whitish; *b*, the basal portion, which is more lax and cellular*.

Fig. 4. A portion of the cement-gland (?), magnified 200 diameters*.

Figs. 5 to 7, *Clistosaccus Paguri*.

Fig. 5. A large specimen attached to the abdomen of *Pagurus Bernhardus*: *a*, the *Clistosaccus*; *b*, the abdomen of the *Pagurus*.

Fig. 6. The animal, opened: *a*, the portion situated beneath the skin of the *Pagurus*; *b b*, the ramose appendages; *c*, the ovarian body; *d d*, lobes of the pallium; *e e*, the skin of the *Pagurus* *.

Fig. 7. One of the ramose appendages, more highly magnified.

Figs. 8 & 9, *Peltogaster Paguri*.

Fig. 8. An oviferous individual, of which the pallium has been detached: *a*, the anterior extremity of the sac or ovarian body; *b*, the posterior extremity of the same; *c c*, the testes; *d d*, the oviferous sac (magnified 25 diameters).

Fig. 9. A testis: *a*, the testis; *b*, the efferent canal*.

Fig. 10. *Peltogaster sulcatus*; the testis of a very young individual (the same as represented in Pl. III. fig. 4): *a*, the testis; *b*, a vesicle

† The figures to which an * is affixed have been drawn from living specimens.

attached to the orifice of the efferent canal; *c c*, a fragment of the membrane to which the canal is attached (magnified 200 diameters).

PLATE III.

Figs. 1 to 5, *Peltogaster sulcatus.*

Fig. 1. An adult individual seen from the side: *a*, the organ of adhesion*.

Fig. 2. An adult individual deprived of its eggs and young: *a*, the anterior extremity, at which the end of the ovarian sac has been pushed out; *b*, the posterior extremity of the body, a little contracted; *c*, the organ of adhesion; *d*, the muscular membrane of the pallium; *e*, the ovarian sac.

Fig. 3. A very young individual, slightly magnified: *a*, the tube of the organ of adhesion*.

Fig. 4. The same individual more highly magnified, and having wrinkles and folds caused by the contraction of the animal: *a*, the tube of the organ of adhesion; *b*, the anterior extremity, at which a cast skin (*c*) of its larva in the last stage of development is attached by its prehensile antennæ in the orifice of the pallium; *d*, the internal and cellular tube of the organ of adhesion; *e*, the posterior extremity, which has been curved*.

Fig. 5. The cast skin of the larva, magnified 200 diameters: *a*, the prehensile antennæ; *b*, the anterior extremity of the *Peltogaster*.

Figs. 6 to 10, *Apeltes Paguri.*

Fig. 6. The animal seen from above: *a*, the anterior extremity; *b*, the posterior extremity, with a small tube.

Fig. 7. The same individual seen from beneath: *a*, the anterior orifice of the pallium; *b*, the posterior extremity; *c*, a fragment of the skin of the *Pagurus* attached to the organ of adhesion or to the margin of the pallium, which surrounds the large round aperture occurring at this point.

Fig. 8. The anterior extremity of the same, showing the ramose lacunæ in the muscular membrane of the pallium, seen from above.

Fig. 9. The ovarian sac of the same, seen from above: *a*, a fragment of the pallium attached to the anterior extremity; *b*, the posterior tube.

Fig. 10. The two sacciform ovaries, slightly separated, and the testis, seen from the lower surface: *a*, the testis, with two efferent canals; *b b*, the thick cellular layer at the anterior extremity of the ovaries; *c c*, the two ovaries; *d*, their posterior extremity.

BIBLIOGRAPHICAL NOTICES.

The Sea and its Living Wonders; translated from the German edition, and partly re-written by the Author, Dr. G. HARTWIG. With numerous woodcuts and twelve Chromoxylographic Plates by HENRY NOEL HUMPHREYS. 8vo. Longmans, London, 1860.

CONSIDERING the vastness of the ocean, and the innumerable creatures which dwell in it, we can hardly wonder that it furnishes an inexhaustible theme for writers of all kinds, and the appearance of many new books on the Sea and its inhabitants can excite no surprise in our minds. The author of the present work tells us that "for years his daily walks have been upon the beach, and that he has learnt to love the ocean as the Swiss mountaineer loves his native Alps, or the Highlander the heath-covered hills of Caledonia." Under these circumstances he would seem to be the right man to undertake the task of describing the sea and its living wonders,—always provided that his scientific knowledge and literary powers be equal to his fondness for his subject. In these respects we have little to complain of. As Dr. Hartwig's plan was to furnish his readers with an account of the physical geography of the sea, and of its principal inhabitants, together with what seems to us a somewhat unnecessary history of maritime discovery, within the compass of an octavo volume of some four hundred pages, it will be easily understood that he can at best pass but superficially over so vast a range of subjects: we look for nothing original in such a work; and if the author be careful in the collection of his facts, and show sound judgment in their selection, we have every reason to be satisfied. In these respects the reader of Dr. Hartwig's book will have no cause for complaint. Our author has evidently got together his materials with a vast amount of labour and study; and, with the exception of a few minor errors, to which we may have occasion to advert, the compilation of the book has been most creditably executed.

With regard to the literary performance of the work, we must also speak in terms of high commendation. Looking at it as a translation by a German author from a German original, the language employed is wonderfully good. It is only here and there that we meet with slight traces of German modes of expression, or literal translations of German terms which may perhaps be puzzling to the young naturalist. An example of this, which leads the author into a confusion of terms, is to be found at pp. 203 and 204, where he translates the German word "Fühler" by its English equivalent, "feelers," applying it in the first place to the *antennæ* of Insects and Crustacea, and in the second to the claw-like *palpi* of the Scorpion. At p. 235 we also meet with a term which will seem curious to English readers —"Snail-house," a translation of "Schneckenhaus," applied to the spiral shells of the Gasteropoda. And there are numerous examples of the same sort of thing, which might easily have been got rid of by the employment of an English editor to look through the proof-sheets. These, however, are minor defects, and detract but little from the exceedingly pleasing style in which the author has communicated his information—a style which will render his book a most agreeable companion to the general reader, and especially a source of great pleasure and improvement to the young.

Dr. Hartwig divides his book into three parts, of which the first treats of the physical geography of the sea, the second of its inhabitants, and the third of the progress of maritime discovery.

In the first chapter our author dwells upon the magnitude of the sea; but notwithstanding the warm and somewhat poetical feelings which he attributes to himself in his preface, as above quoted, this portion does not strike us as particularly happy. In succeeding chapters he explains the mode of formation and propagation of waves, the origin and course of the tides and currents of the ocean, the influence of winds, and the meteorological points connected with the ocean. Although of course these chapters contain nothing new, and only give a slight sketch of the multifarious and important phenomena of the physical geography of the sea, they are agreeably and clearly written, and will give the unlearned reader an excellent notion of the subjects treated of.

The chapters on the inhabitants of the sea commence with the gigantic and highly organized Cetaceans, of which and of their mode of capture we find a good account. In the second chapter of this part the author seems to have fallen into a singular error in stating that the Dugongs "form the connecting link between the real Whales and the Seals and Walruses." If not true Cetacea, these curious animals are intermediate between the Cetacea and Pachydermata; but they certainly have nothing whatever to do with the Seals. From these mammals the work follows a descending scale through the different groups of the animal kingdom, treating briefly of a few of the most remarkable members of each class, but devoting far more space to the higher than to the lower forms. Indeed, although we are far from looking for much philosophical zoology in a work of this class, the author does not appear to us to have judged rightly in omitting or passing very lightly over many things which in the hands of some English writers have made up the romance of marine zoology. The metamorphoses of the higher Crustacea are, indeed, briefly described; but the parasitic Crustaceans are scarcely mentioned, and their transformations, with the still more wonderful history of the Cirripedes, are passed in silence. The remarkable development of the Echinoderms is not so much as alluded to, except as regards *Comatula*; and the mode of reproduction of the *Medusæ*, the discovery of which led directly to the establishment of the law of the Alternation of Generations by Steenstrup, is referred to (at p. 278) in a style which makes one feel that it had been better let alone altogether. Our author, indeed, does not appear to have any comprehension of the importance in modern zoology of the phenomena to which the name of "alternation of generations" has been given; nor, if we may judge from his only references to them (at pp. 256, 278), can he understand their nature very clearly: and it will easily be understood that those chapters of his book which have reference to the lower Invertebrata would have been all the better had his knowledge been a little further extended in this direction. Our author places the Diatomaceæ amongst microscopic animals, and describes the Sponges as members of the vegetable kingdom in his chapter on sea-weeds: but in respect of this chapter we have a heavier charge to make against him; for he has revived the long-exploded notion that the edible birds'-nests of Java are composed of sea-weeds collected on the shore and macerated in the stomach of the Swift, and actually devotes about three pages of his book to the full development of this subject, which has no business in his pages at all.

The concluding chapters of the second part are devoted to the geographical distribution of marine life, the phosphorescence of the sea, and the primitive ocean, which call for little notice. The first-mentioned is principally derived from the posthumous work of Professor Edward Forbes, the second contains a description of the luminosity of the ocean and of some of the animals which produce it, and the last gives a brief outline of the geological history of the earth.

The third part, as already stated, contains a summary of the history of maritime discovery; and although it seems to us a little out of place here, we must admit that it forms an attractive portion of the book, and will be read by many with much interest. In fact, notwithstanding the defects which we have already adverted to, Dr. Hartwig's volume must take a far higher place in our popular scientific literature than can be accorded to many of the works on kindred subjects which are constantly issuing from the press; it furnishes a good and comprehensive general view of the vast subject of which it treats, and may be read with both pleasure and profit.

We have still a few words to say with regard to the illustrations; and here we hardly know whether those faults that we have to indicate are to be ascribed to the author, the editor (if there be one), or the publishers. The woodcuts, most of which are well executed, are certainly, as stated on the title-page, numerous; for the publishers seem to have brought together all their available stock of this nature, and inserted figures wherever they had the shadow of a reason for so doing. But of woodcuts specially executed for the work there appears to be an utter absence; and the illustrations inserted in the first section are, for the most part, without the smallest relation to the subject. Thus, we have a representation of "H.M.S. Resolute lying-to in the North Atlantic," which might be a representation of any other ship in the same uncomfortable situation, and certainly has nothing to do with the chapter in which it occupies a place; we find two or three vignettes designated Japanese junks, and finally, three views on the Great Bear Lake River. It is, however, amongst the illustrations of the second part that we find the most cause of complaint: here we have two perfectly distinct Herrings, two Hammer-headed Sharks of the most incongruous description, three different figures with the simple designation "Seal," and, we presume, intended to represent the common Seal, and four Flying-Fishes, all exhibiting differences in important characters. These things would be sufficiently confusing to a young reader; but the figures of the Cephalopodous Mollusca are still more open to criticism: here we have no less than six woodcuts with the word "Cuttle-fish" beneath them, one of which is a Poulpe, and is given a second time with that designation, whilst another figure of the Poulpe is denominated the "Sea-Arrow." There are also two Sea-horses, the second of which, placed as a tail-piece at the end of the chapter on Echinoderms, seems to have been designed by the artist whilst under some erroneous impression of the meaning of the second commandment: it is certainly unlike anything on the earth or in the waters; and we don't expect to find the original in heaven. The Barnacle figured on p. 77 as an illustration of the statement that the Whale is often covered with such creatures, is the common Barnacle, and has nothing to do with the species parasitic on the Whale; and the representation of the Barnacle in its legitimate place is actually a copy of Darwin's diagram to show the homologies of the pedunculated Cirripedes with the other Crustacea!

But what shall we say of the twelve chromoxylographic plates by Mr. H. N. Humphreys? From the imposing nature of the name applied to them, we were led to expect some grand effort of art, and were rather disappointed when we found that, after all the trouble we had undergone in spelling out the above sesquipedalian word, the articles themselves were simply large woodcuts, with a blue tint across the top and a buff one across the bottom. And this first feeling of disappointment was by no means lessened when we came to inspect the woodcuts more closely. The three plates representing the Australian Sea-bears, Penguins, and Gannets are the only ones which we can contemplate with satisfaction; but even in these we find defects: the principal figure in the group of Gannets, especially, is rendered worthless as a zoological illustration by the fact that it has four front toes on one foot and three on the other, and that the membrane running to the hinder toe is on the outside of the foot in the former case, and on the inside in the latter. Passing over those plates which are intended to have a dramatic interest from the introduction of human action, and which are remarkable neither for goodness nor badness, we may refer to the representation of a "Lighthouse and Waterspouts" as a miserable failure, and to the plate of "Ocean Fish" as a collection of caricatures. The plate of Crustacea is also indifferent; but we think that all the preceding are thrown completely into the shade by the unutterable badness of the "Ocean Shells." This is a confused mass of things, so badly arranged, so badly drawn, and so badly managed in every way, that it is only with considerable difficulty that one is able to make out what portions of the group are intended for distinct objects; indeed, some parts of this plate are still a mystery to us. We may add that most of the spiral shells are reversed. In the plate of Star-fish, Zoophytes, and Annelides, Mr. Humphreys has again indulged in that tendency to augmentation which prompted him to give the Gannet five toes: it is here exerted upon his Star-fishes, nearly all of which are either furnished with six distinct rays, or with five so placed that the sixth is inevitable.

It is with regret that we have felt it our duty to find so much fault with one part of the execution of a book which in many respects has been most satisfactorily got up. We have, however, been so long accustomed to see the illustrations even of our popular books on natural history correctly drawn, that any exception to the rule becomes strikingly offensive; and we can only hope that our remarks may induce Mr. Humphreys to endeavour to obtain some knowledge of zoology before he again attempts to illustrate a book like the present.

The Ibis; a Magazine of General Ornithology. Edited by Philip Lutley Sclater, M.A. Vol. ii. Trübner & Co. 1860.

The second yearly volume of the 'Ibis' is now before us. Enough has been said, on a former occasion, of the scope and character of this Magazine. It only remains to say that the 'Ibis' for 1860 keeps up the promise of that of 1859, and fully sustains the reputation of its editor.

The second volume of the 'Ibis' contains articles upon the birds of Turkey and Greece, Northern Africa, North-east Africa, Eastern Africa, Natal, Celebes, New Guinea, China (Amoy), Arctic America, Hudson's Bay, Honduras, Guatemala, the Falkland Isles, as well as several separate notices of individual species.

The papers of Messrs. Tristram, Simpson, and Powys, and Mr. Moore's history of the occurrence of Pallas's Sand-Grouse (*Syrrhaptes paradoxus*) near Tremadoc, will be found interesting alike to British and general ornithologists. So also is the account of the edible Swallows' nests, given by Mr. Blyth, who tells us that these nests are formed from a certain secretion proceeding from the salivary glands of the bird. Still it would be desirable to know what substances are taken for food by these birds during the exceptional period of nesting; for it is hard to believe that the viscous saliva of a Swift could be developed in so extraordinary a degree unless it were supplied by a corresponding diet.

Mr. O. Salvin has returned from Guatemala with rich stores of new and important information.

A memoir of the late John Wolley is a well-deserved tribute to the memory of one of the most diligent and successful of ornithological explorers, himself an early and zealous promoter of the 'Ibis.'

There is in the present volume a careful review of M. O. des Murs's 'Oologie Ornithologique;' and we cordially agree with the remark of the writer (p. 335) that any "scheme composed solely with reference to this one branch would never lead us to the true comprehension of the system of nature." To make Oology the foundation of a system of classification would be as great a mistake as to consider egg-taking the chief and sole object of a travelling naturalist; though, if ornithologists could be persuaded to reckon separately, as indigenous to a country, only the birds which nest in it, we believe great advantage would accrue to the science, both on account of the sound basis thus to be secured for views of geographical distribution, and, especially, as this would afford a starting-point from which to obtain some insight into the laws of migration. Mr. Newton's remarks on the migratory habits of the Song-Thrush lend great support to the idea that, to a certain extent, all birds are migratory.

The anatomical part of the subject is ably sustained by Mr. R. F. Tomes, who contributes a paper on the internal structure of the Bearded Titmouse (*Calamophilus biarmicus*).

Recent works relating to ornithology continue to be carefully noticed, as well as the proceedings of travellers in foreign countries.

We could still wish to see an increase in the number of contributions relating to British birds as observed in our own country, and we trust that among our numerous field naturalists there will be found some who will be ready and able to supply this deficiency.

MISCELLANEOUS.

Notes of Algæ, *&c., found in the Isle of Man and on the Coasts of Northumberland and Durham.* By George S. Brady.

The Phycology of the Isle of Man seems to have been very little investigated; at least I have found no information on the subject in any of the standard algological works: yet there can scarcely be a richer field for the collector of sea-weeds; for, owing to the influence of the Gulf stream, which sets directly upon the island, the marine vegetation of its shores is unusually varied and luxuriant. During a stay of three days at Douglas during the past summer, I gathered several very interesting species, though scarcely sufficient of themselves to warrant publication. My friend Mrs. Gatty of Ecclesfield has, however, furnished me with a copious list of her own gatherings in the same locality. These are included in the following list. The gatherings were made altogether in Douglas Bay, except in a few exceptional cases, where the localities are specially mentioned. It should be understood that the list embraces merely a selection of the more interesting plants.

Sporochnus pedunculatus, *Mrs. Gatty.*
Laminaria bulbosa, *Mrs. Gatty.*
—— Fascia.
Dictyota dichotoma.
Punctaria tenuissima, *G. S. B.*
Mesogloia vermicularis.
—— virescens.
Myrionema Leclancherii, *G. S. B.*
—— strangulans.
Sphacelaria fusca, *Mrs. Gatty.*
Myriotrichia filiformis, *G. S. B.*
Rytiphlœa thujoides.
—— fruticulosa, *Miss Thompson.*
Polysiphonia fibrata.
—— elongella (?), *Mrs. Gatty.*
—— violacea (?), *Mrs. Gatty.*
—— Brodiæi, *Mrs. Gatty.*
—— parasitica.
—— byssoides, *Mrs. Gatty.*
—— fibrillosa, *Mrs. Gatty.*
Dasya coccinea.
Bonnemaisonia asparagoides.
Chylocladia kaliformis.
Lomentaria ovalis.
Delesseriæ, all the British species.

Rhodophyllis bifida, *Mrs. Gatty.*
Calliblepharis jubata, *G. S. B.*
Sphærococcus coronopifolius, *Mrs. Gatty.*
Phyllophora rubens, Kirk Ouchan Harbour, *G. S. B.*
Gymnogongrus Griffithsiæ, Laxey, *Mrs. Gatty.*
Catenella Opuntia.
Naccaria Wiggii, *Mrs. Gatty.*
Ptilota plumosa, *Mrs. Gatty.*
Ceramium decurrens, *Mrs. Gatty.*
—— diaphanum.
—— echionotum, *Mrs. Gatty.*
—— acanthonotum.
—— ciliatum.
Griffithsia setacea.
—— corallina, *Miss Thompson.*
Wrangelia multifida, Kirk Ouchan Harbour, *G. S. B.*
Seirospora Griffithsiana, *Miss Thompson.*
Callithamnion Plumula, *Mrs. Gatty.*
—— Turneri, *G. S. B.*
—— tetragonum.
—— Hookeri, *G. S. B.*
—— byssoideum, Kirk Ouchan Harbour, *G. S. B.*
—— polyspermum, *Mrs. Gatty.*
—— Borreri, *Mrs. Gatty.*
—— granulatum.
—— floridulum, *Mrs. Gatty.*
—— Daviesii, *Mrs. Gatty.*
—— virgatulum, *G. S. B.*
Bryopsis plumosa.
Cladophora pellucida, *G. S. B.*
—— refracta, *G. S. B.*
—— albida, *Mrs. Gatty.*
—— glaucescens, *G. S. B.*
Conferva Melagonium, near Clay Head, *G. S. B.*
—— tortuosa, *Mrs. Gatty.*
Rivularia (? nitida), *Mrs. Gatty.*
Calothrix confervicola, *Mrs. Gatty.*

The following zoophytes were also gathered in the Isle of Man by Mrs. Gatty :—

Lepralia coccinea.
—— ansata.
—— nitida.
—— punctata.
Pallasiana hyalina.
Membranipora dentata.
—— pilosa.
Serialaria lendigera.
Plumularia falcata.
—— setacea.
Plumularia cristata.
Sertularia abietina.
Flustra foliacea.
Laomedea geniculata.
Crisia eburnea.
—— denticulata.
Crisidia cornuta.
Canda reptans (*Busk*).
Ætea anguina (*Busk*).
Scruparia chelata (*Busk*).

During the past two years I have pretty thoroughly investigated the Algology of the coasts of Durham and Northumberland, with the result of adding several very interesting species to the local flora. This coast is in many respects unfavourable to the growth of Algæ, being remarkably destitute of those quiet inlets in which the more delicate species luxuriate, and, in common with the whole of our north-eastern shore, being washed by cold northern currents. There are, however, in many places, large tracts of rock left bare at ebb tide, which form good searching grounds for those plants which can bear exposed situation and cold climate; but where strictly southern species occur, they are invariably ill-grown and stunted. Several such will be found in the annexed list. It includes those species only which have been hitherto unknown, or imperfectly known, as natives of the north-east coast, and which thus possess some interest as regards their distribution.

Myrionema punctiforme, on *Polysiphonia areolata*, at Seaham Harbour, Durham, April 1859.

Sphacelaria filicina, near Seaham Harbour, Durham, 1859 and 1860. In a very small pool. Probably now extinct, owing to the close proximity of rubbish from some new blast furnaces,

Sphacelaria fusca, near Seaham Harbour, Durham, 1860.

Ectocarpus fenestratus, Whitley Rocks, Northumberland, 1860.

—— *sphærophorus*, not uncommon.

Rytiphlœa thujoides, St. Mary's Island, Northumberland, 1860.

Polysiphonia parasitica and *P. byssoides*, very fine near Whitley, Northumberland, and on other parts of the coast.

Dasya Arbuscula, Cullercoats, Northumberland, *Mr. R. Foster*.

Gymnogongrus norvegicus, near Sunderland, Durham.

Phyllophora Brodiæi, not rare.

Cruoria adhærens, Tynemouth, &c., Northumberland.

Ceramium botryocarpum, near Seaham Harbour, Durham.

—— *flabelligerum*, St. Mary's Island, Northumberland.

Callithamnion Arbuscula, frequent on the Northumberland coast.

—— *floridulum* and *C. sparsum*, Roker, Durham.

Cladophora gracilis, Hartley, Northumberland.

On a new Species of Kangaroo, of the Genus Halmaturus. By John Gould, F.R.S., &c.

Halmaturus stigmaticus.

Face, sides of the body, outer side of the fore limbs, and the flanks rufous, more or less interspersed with whitish-tipped hairs; outer side of the hinder limbs rich rusty-red; occiput dark brown, interspersed with silvery-tipped hairs; ears externally clothed with long black hairs, and narrowly fringed on the front edge with white; upper surface of the body blackish-brown, interspersed with numerous whitish-tipped hairs, and gradually blending with the rufous hue of the flanks; down the back of the neck an indistinct line of a darker or blackish hue; across each haunch a broad and conspicuous mark of buff; upper lip, chin, and all the under surface of the body and the inner side of the limbs dirty white; hands and feet dark brown; upper surface of the tail dark brown; on its sides the hairs are less numerous, and the scaly character of the skin becomes conspicuous.

	ft.	in.
Length from the tip of the nose to the extremity of the tail	3	4
—— of the tail	1	4
—— of the tarsus and toes, including the nail	0	$5\frac{3}{4}$
—— of the arm and hand, including the nails	0	$6\frac{1}{4}$
—— of the face from the tip of the nose to the base of the ears	0	$4\frac{3}{4}$
—— of the ear	0	$1\frac{7}{8}$

Hab. Point Cooper, on the north-east coast of Australia.

Remark.—Nearly allied to *H. Thetidis*, but differing from that species in being of a somewhat larger size, in the more rufous colouring of the fur, particularly of that clothing the hind limbs, and in having a broad brand-like mark of buff on each haunch.

For the discovery of this new species we are indebted to the researches of Mr. John Macgillivray. The typical specimen is now in the British Museum.—*Proc. Zool. Soc.* Nov. 13, 1860.

Note on the Female of Cuscus ornatus. By Dr. J. E. Gray, F.R.S., V.P.Z.S., &c.

On the 11th of January of this year* I described a new species of *Cuscus*, under the name of *Cuscus ornatus*, from a male specimen sent by Mr. Wallace from the Island of Batchian.

Mr. Wallace has now sent three female *Cusci* (two adults and one younger specimen) from Ternate, which appear to be the females of the species above-described.

The older female only differs from the male from Batchian in being darker. One specimen has many more spots on it than the other; the spots are small, irregular in size, and not disposed symmetrically. The younger specimen is yellower than the others, but, still, darker and browner than the male, and only indistinctly spotted. The dorsal streak is distinct and well marked in the whole of the three, and disposed exactly as in the male.—*Proc. Zool. Soc.* Nov. 13, 1860.

The National Museum of Victoria.

This Museum has recently received a very large Herbarium, consisting of upwards of 17,000 species of dried plants, all named and compared with the European collections, and including specimens from most of the collections which have been recently made by English and Continental collectors.

* See 'Annals' for July 1860, p. 65.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 38. FEBRUARY 1861

X.—*On* Clavatella, *a new Genus of Corynoid Polypes, and its Reproduction.* By the Rev. Thomas Hincks, B.A.

[Plates VII. & VIII.]

During the past summer I have obtained, in the neighbourhood of Torquay, a Corynoid polype which presents some very interesting peculiarities, and will constitute the type of a new genus. It occurred in the small basins scooped out in the masses of limestone with which the shores of Torbay are, in many parts, so thickly strewn—snug retreats which afford a home to large Invertebrate populations and are crowded with forms of beauty. Amongst forests of *Laomedea flexuosa* and companies of the Daisy Anemone, in possession of every chink and cranny, and scattered colonies of the exquisite little *Zoanthus sulcatus*, a quick eye may detect here and there groups of minute, milk-white, thread-like bodies, which on closer examination show themselves to be graceful clavate polypes of the Corynoid order, but of a new generic type. To furnish an account of their structure and life-history is the object of the present paper.

I shall first define the genus which it is necessary to constitute for their reception.

Subkingdom *CŒLENTERATA.*

Class HYDROZOA.

Order **CORYNIDÆ.** Fam. **Coryniadæ.**

Clavatella, nov. gen., Hincks.

Polypes naked, clavate, extensile, rising at intervals from a creeping filiform base; tentacula capitate, arranged in a single verticil round the head. Reproduction by means of free polypoid buds, which pullulate from two opposite points on the lower portion of the body.

In the remarkable extensibility of the body, and the position of the reproductive buds on the lower portion of it, *Clavatella* resembles *Myriothela*. The character of its sexual organs is so far unique. I have failed to detect any horny investment, either on the creeping thread which unites the polypes, or round the base of the body itself. The examination of these portions of the structure was attended with extreme difficulty, as the zoophyte almost always occurred amongst a forest of minute Algæ. But in the only case in which I succeeded in detaching an individual with a portion of the thread, I was unable to find any hard covering. The thread seemed to be cased in a delicate membranous skin.

The species may be characterized as follows:—

C. prolifera, Hincks, n. sp. (Pl. VII. figs. 1, 2.)

Polypes slender; head and centre of the body opake white; tentacles (in the mature zoophyte) six or seven, surmounted by large globular tips,—a patch of opake white just below the tip, and another towards the base of each; reproductive zooids hemispherical, yellowish white, with six bifurcate tentacles round the body,—the longer branch capitate, and resembling the arm of the alimentary polype, the other supporting a suctorial disk, and forming a locomotive and prehensile organ; six red specks at the base of the tentacles, on the proximal* aspect of the body.

The polypes of *Clavatella prolifera* possess a remarkable power of altering the dimensions of the body. At times it is greatly elongated and attenuated, and they then present the appearance of very delicate threads. If disturbed, they suddenly contract, and in this state often assume a somewhat flask-like form (Pl. VII. fig. 2 *a*).

The somatic cavity, pervading the centre of the body, is enclosed by an opake-white endoderm. The external portion (ectoderm) which surrounds it is transparent.

On one occasion I found an Annelid of very considerable size in the stomach of a polype, which had evidently gorged itself, and was much distended and altered in shape.

The tentacles, as well as the body, are extensile; the number is variable, and probably dependent on the age of the polype.

* Throughout this paper I shall employ the terms "proximal" and "distal," as defined by Prof. Huxley ('Oceanic Hydrozoa,' pp. 4, 5); the latter to designate the "growing," and the former the "comparatively fixed" extremity of the hydrosoma.

I have never met with more than seven. The capitate extremities are large and thickly set with thread-cells.

The polypes occurred in groups scattered here and there over the bottom and sides of the smaller rock-pools.

Reproduction.—The Eleutheria *of De Quatrefages.*

Reproductive buds are almost always present. They are constant in position, forming two clusters at opposite points on the lower portion of the body. Each cluster generally consists of three or four buds in various stages of development, from a simple excrescence on the surface of the body to the fully-formed zooid.

In its earliest state, the bud appears as a papillary process both of the external transparent investment and of the opake-white centre, consisting of the endoderm and the somatic cavity (Pl. VIII. fig. 4 *a*). As it increases in size it assumes a clavate form, and becomes attenuated below. As the development proceeds, the upper portion expands and gains in width, and is gradually moulded into hemispherical proportions, while the lower part becomes a slender pedicle or stalk. When this stage is reached, the margin of the distal surface of the zooid begins to exhibit a number of slight crenations, the rudiments of the future tentacles. Soon these crenations are themselves crenated or faintly lobed, and we have an intimation of the bifurcate structure of the arms. There are also very early indications of a difference in character and function between the two branches of the tentacle. One of the lobes into which each of the rudimentary arms has divided becomes somewhat truncate, while the other assumes a globular form at the extremity; and in this part one or two minute thread-cells are soon elaborated (Pl. VIII. fig. *d*). The latter is ultimately to constitute the true tentacle, while the truncate branch is to take another line of development, and to become an admirable organ of locomotion. As the growth of the arms advances (but at what precise point I am unable to say), a small pigment-spot makes its appearance at the base of each, on the proximal aspect of the body. To this portion of the structure I shall refer again hereafter.

The subsequent changes may be summed up as consisting of the gradual enlargement of the hemispherical body, which ultimately assumes a yellowish-white colour, the further growth of the arms, and the formation of a round central opening (the mouth) at the distal end of the body and in the midst of the circle of tentacles.

The forking of the fully developed arm takes place a little above the middle, and the disk-bearing branch is somewhat shorter than that which is surmounted by the globular tip.

The number of the tentacles is constant in the sexual zooid, always amounting to six. The internal structure is curious, and closely resembles in part that which has been described by Dr. Strethill Wright as occurring in *Coryne* and *Stauridia* (Edinb. New Phil. Journ. for April 1858). The tentacles in these genera, he says, "are not hollow, but contain a core or chain of endodermic cells, placed in single series. The contents of each of these cells consist of highly vacuolated sarcode, which includes a nucleus, accompanied by a few coloured granules, the function of which has not been determined." The central chain of cells is very apparent in the arm of the *Clavatella*-zooid, and down the middle of it there runs a line of coloured granules (brownish) (Pl. VIII. fig. *g*).

Another portion of the structure of the arms I find it difficult to explain. From certain points on the median line of granules, threads pass off on each side to the cell-walls, or rather, perhaps, to longitudinal muscular bands traversing the length of the tentacle (Pl. VIII. fig. *g*). M. de Quatrefages has described a similar structure as occurring in his *Eleutheria*, in a 'Mémoire' to which I shall have occasion to refer more particularly hereafter, and he connects it with the muscular system *. The muscular energy of the arm is very great, as evidenced by its percussive action, its contractility, and its vigorous locomotive power.

The ectoderm appears to consist of a series of cells, somewhat semicircular in form, in which I have often observed a small nucleus, which may possibly be connected with a "palpocil" (*vide* Dr. Wright's paper *ut ant.*), though I have not succeeded in detecting any such organ.

The shorter branches of the arm terminate in a somewhat funnel-shaped opening, which is closed below by the core of endodermal cells. They have very considerable adhesive power, and constitute efficient organs of locomotion.

When the zooid approaches its full development, its movements become frequent and vigorous, and at length the pedicle by which it is attached gives way, and it enters upon a period of free existence, during which the generative products are matured and discharged (Pl. VIII. fig. 3). It now moves about, with the proximal portion of the body uppermost, using its

* The following is the passage referred to:—"Dans l'intérieur du tentacule, on trouve un appareil fort singulier, dont il n'est pas facile de donner une idée exacte; c'est une espèce de charpente, composée d'un axe irrégulièrement coudé en zigzag, dont chaque angle porte une branche, qui va se fixer à l'une des bandes musculaires longitudinales des parois. Ces branches et l'axe lui-même sont éminemment contractiles......N'hésitons nous pas à les regarder comme étant de nature musculaire, et comme destinées à mouvoir les bras dans toutes les directions."

suctorial disks as feet, and in this stage of its existence often bears a considerable resemblance to a Lilliputian star-fish.

In the course of my investigations into the history of the *Clavatella*, my attention happened to be directed to the brief description of the genus *Eleutheria* of De Quatrefages in Van der Hoeven's 'Handbook of Zoology,' which that author ranks next to *Clava*, in the family *Hydrina*, and upon which he has the following remark: "This form is probably a free bud for the propagation of some species of *Coryne*, *Sertularia*, or *Tubularia* *." Its close relationship to the free zooid of my new Corynoid polype was at once apparent. On referring to the Mémoire in the 'Annales des Sciences Naturelles' (2 sér. Zoologie, tom. xviii. 1842), in which the distinguished French naturalist has given an elaborate and most interesting account of the *Eleutheria* †, it was evident that the key to its real affinities had fallen into my hands, and that the observations on *Clavatella* would enable me to supply the missing chapters of its history. In general structure and appearance there is a close resemblance between the free reproductive zooid of the last-named zoophyte and the *Eleutheria dichotoma*, but there are also differences which prove them to be at least specifically distinct. The chief point of dissimilarity is to be found in the arms, which exhibit in *Eleutheria* two branches, identical in structure, and both surmounted by the globular heads, armed with thread-cells. The special locomotive organ, which is so characteristic of the *Clavatella*-zooid, is wanting; and accordingly we read in M. de Quatrefages's Mémoire,—"Placé sur un plan de verre avec l'eau de mer, notre Radiaire chemine lentement, tenant toujours sa bouche en haut, et se servant de ses bras pour se traîner péniblement sur cette surface glissante; mais, s'il rencontre quelques brins de coralline, il les saisit avec ses tentacules bifurqués, s'y suspend et passe ainsi de l'un à l'autre avec une certaine agilité bien différente de l'extrême lenteur que les Hydres mettent toujours dans leurs mouvements."

* Van Beneden had previously expressed an opinion that the *Eleutheria* would prove to belong to the family of the *Tubulariadæ* (Rech. sur l'Embryogénie des Tubulaires, p. 54); but, in conformity with the views which he then entertained of Tubularian reproduction, he finds an analogy between it and the Actiniform *embryo* of his *Syncoryne pusilla*.

† The title of De Quatrefages's paper is, "Mémoire sur l'Eleuthérie dichotome (*Eleutheria dichotoma*, nob.), nouveau genre de Rayonnés voisin des Hydres." The characters are given as follows:—

"Genre *Eleuthérie*. Des points oculaires à la base des bras. Point de pieds.

"*E. dichotome*. Corps hémisphérique, d'une couleur jaunâtre, parsemé de points d'un rouge carmin à la partie inférieure ou postérieure; six tentacules bifurqués, terminés par des pelotes arrondies. Diamètre un demi-millimètre." (Pl. VIII. fig. 4.)

The *Clavatella*-zooid, on the contrary, moves with ease up the perpendicular sides of a glass vessel, the mouth being on the *lower* side as it walks, while it is quite equal to the *Eleutheria* as a climber.

There are a few other minor differences between the two; but the general resemblance is so great, that we may refer them both (provisionally) to the same genus.

The *Eleutheria* of De Quatrefages, therefore, is the reproductive zooid of a Corynoid polype, and probably of a second species of *Clavatella*.

It was obtained at the Chausey Islands, off the coast of Normandy, and in rock-pools, so that its habitat is similar to that of its Devon congener. The points on the French and English coasts at which the two species have been found are nearly opposite to one another. I am not without hope that the polype which produces the *Eleutheria* may yet be discovered on our own teeming western sea-board.

The reproductive zooids of *Clavatella* differ from those of any other Hydrozoon with which we are acquainted, inasmuch as they do not exhibit the Medusan structure which characterizes universally the motive buds produced by the other known members of the class. The sexual bodies closely resemble the alimentary polypes, presenting the same essential structure, which, however, is somewhat modified to meet the conditions of a free existence. An efficient locomotive apparatus is superadded, and the long pedunculate body which supports the head and tentacles of the alimentary zooid, and secures to it the necessary facilities for the capture of food, is suppressed. The homologue of the latter, however, exists in the stem by which the bud is attached to the polype, a short piece of which it carries with it after detachment, but which gradually disappears. The reproductive zooid of *Clavatella* is, in fact, a free *polype-head*, the tentacles of which are furnished with a retractile branch, terminating in a suctorial disk, and forming an organ of locomotion. The arms, divested of this appendage, bear an *exact* resemblance to those of the alimentary polype, even exhibiting the same number of opake-white patches, and in precisely the same positions. The only additional elements besides are the six red spots, situated at the base of the six tentacles, which M. de Quatrefages has described as *eyes*. If this view of their function be correct, they would seem to be a very natural adjunct to the provision for a free existence. I confess, however, that in the case of the *Clavatella prolifera* I have failed to distinguish the structure which M. de Quatrefages describes, and had regarded the supposed eyes as mere pigment-spots *.

* The following is the passage from the Mémoire, relating to the eyes:

In its movements and mode of life, the sexual zooid of *Clavatella* presents a marked contrast to the Medusoid of other Hydrozoa. The latter is active and mercurial, dancing gaily through the water by means of the vigorous strokes of its crystalline calyx. The former strides leisurely along on its stilt-like legs, or, using the adhesive disks as hands, climbs amongst the branches of the weed. It is also much hardier, and can be kept alive much longer in captivity than the Medusoids. I succeeded in preserving one specimen for about three weeks. During a considerable portion of this time, it led an active life, crawling about on the sides of the vessel in which it was confined, or climbing over the long green filaments of a tuft of sea-weed. After a while, however, it became stationary, fixing itself to some of the stems by means of its six sucking-disks; and thus it remained, the proximal portion of the body, with the six red specks, being uppermost, and the capitate arms standing out rigidly, like the rays of a star-fish. In this state, I imagine, it continues until the embryos are matured and ready to escape. All that I succeeded in keeping for any time passed into this quiescent and rigid condition after a while, exhibiting little subsequent change.

Owing to the semi-opacity of the outer integument, it is extremely difficult to study the internal structure of the zooid, or to detect the generative products. In one or two instances, however, I was able to distinguish globular bodies (ova) in the hinder portion of it; and on one occasion I witnessed the movements of an embryo within, which, in its struggles to escape, caused a frequent distention of the oral surface, retreating apparently after each attempt into the cavity of the body. My observations in this case were brought to an untimely end at the most interesting point by the drying up of the water which contained the zooid, and I was not fortunate enough to meet with a similar opportunity again.

"On y distingue très-clairement une espèce de lentille hémisphérique, parfaitement transparente, dont la base est enveloppée d'une couche de pigment à granulations très-fines et d'un beau rouge carmin. En passant par-dessus cette espèce de cristallin, les tégumens acquièrent une épaisseur considérable et forment une saillie bien marquée à la surface du corps; mais la courbure de ces deux parties de l'appareil réfringent n'est pas la même: l'extérieure doit nécessairement agir comme lentille divergente, l'intérieure comme lentille convergente; et comme elles sont enchaînées immédiatement l'une dans l'autre, il s'ensuit qu'elles sont disposées absolument comme les deux élémens d'une lentille achromatique. La petitesse des objets et le peu de transparence des parties m'ont empêché de reconnaître d'autres détails; mais ce que nous en avons distingué suffit, ce nous semble, pour qu'il soit impossible de se refuser à voir dans l'organe que nous décrivons un appareil de vision—un véritable œil."

M. de Quatrefages records the occurrence of ova in *Eleutheria*, in the same portion of the body which they occupied in the zooid of *Clavatella*. He says they are developed "*entre les tégumens et la partie inférieure du corps,...... au milieu de la gangue transparente.*" They would seem to be a product of the ectoderm. He observed them in the state of segmentation ("*composés d'une petite agglomération irrégulière de granules*"), and describes them as assuming at a later stage a spherical form, and being surrounded by a very distinct transparent membrane. As the eggs increased, they pushed out the integument, which at length formed a *pouch*, the size of which equalled that of the animal itself. It contained a "transparent granular substance" (Pl. VIII. fig. 4 *a*). In the case of the *Clavatella*, the proximal portion of the zooid became much distended as the development of the ova proceeded, and presented at last a very gibbous appearance.

The young of the *Clavatella* is no doubt a ciliated embryo, similar to that of other Hydrozoa; but I have never seen it actually liberated. In an early stage of development the polype consists of a short clavate body, with only two tentacles, placed at opposite sides of the head (Pl. VIII. fig. *i*). The number of arms increases with the age of the polype. I have met with four, five, six, and seven, but never more. Occasionally one occurs of smaller size than the rest, and evidently of later growth.

I have not succeeded in clearly distinguishing the male zooid; but on one occasion an individual, which had passed into the quiescent state, was seen surrounded by a multitude of minute, actively-moving bodies, which I fancied might be spermatozoa.

The genus *Clavatella* presents us with a striking group of distinctive characters. Of these the most remarkable undoubtedly is to be found in the structure of the sexual organs. The history of its reproduction, indeed, supplies us with a new class of facts.

The production of free sexual zooids for the propagation and diffusion of the species is of common occurrence among the Hydrozoa; but, so far as hitherto observed, these motive buds always assume a Medusan organization—consisting, that is, of a polypoid body, more or less developed, invested by a contractile calyx, which serves as an organ of propulsion. The generative elements are elaborated either in the walls of the central sac or of the canals which traverse the swimming-bell. But in the case of *Clavatella*, there is no trace of Medusan structure in the reproductive bud. The free zooid is no longer a swimmer, but a crawler and climber. A new locomotive apparatus is introduced, which is Echinodermal rather than Hydrozoan. The simple polype structure is very slightly modified in the reproductive body, and the variations are not such as to mask it. We should rather bring the sexual buds of *Clavatella* into comparison with the *Hydra* than with the complex Medusiform zooids of other Hydrozoa.

One other peculiarity remains to be noted—the position in which the generative elements are produced. They occupy, as I have mentioned, the extreme proximal portion of the body, and apparently are most intimately connected with the ectoderm. But further information is needed respecting the details of their early development, and the precise nature of the cavity in which they are included, which it will be my endeavour and hope to supply hereafter.

EXPLANATION OF THE PLATES.

Plate VII.

Figs. 1 & 2. *Clavatella prolifera*, natural size and magnified.
Fig. 2 *a*. A polype in a state of contraction.

Plate VIII.

Fig. 3. The free zooid of *Clavatella prolifera*.
Fig. 4. *Eleutheria dichotoma* } [from a tracing of De Quatrefages's figure.]
4 *a*. The ovary }
Fig. a. The sexual bud of *Clavatella* as it appears at first.
Figs. b & *c*. The same, in more advanced states.
Figs. d & *e*. The bifurcate arm of the zooid in the early stages of development.
Fig. f. The same, full grown.
Fig. g. A portion of one of the arms.
Fig. h. A thread-cell.
Fig. i. A young polype.

XI.—*Characters of a gigantic* Helix *from Southern India, and of other Species from Northern India, the Malayan Coast, and the Andaman Islands*. By W. H. Benson, Esq.

Helix Basileus, Bens., n. sp.

H. testa subanguste umbilicata, orbiculato-subconvexa, irregulariter striatula, prope suturam plicatula, sulcis nonnullis spiralibus obsoletis, subtus confertioribus, rugisque obliquis sculpta, sub epidermide decidua albida, apicem versus rubente, infra peripheriam fascia lata cærulescenti-nigro-castanea margine peripherico saturate castaneo ornata; epidermide superne fusco-cornea, subtus viridescente, umbilicum versus luteo-fulva; spira convexiuscula parum elevata, apice planulato, valde obtuso, sutura lineari, antice parum impressa; anfractibus 5, sensim accrescentibus, subplanulatis, ultimo antice dilatato, depresso, non descendente, ad peripheriam subcarinato, carina demum evanescente, subtus convexo, antice subinflato, periomphalo prope marginem columellarem compresso, subito excavato; apertura obliqua, subovato-lunata, intus superne pallide castanea, fascia angusta mediana basalique lata albidis, fascia latissima purpurascente interposita, margine albida; peristomate tenui, acuto; margine columellari expansiusculo, superne triangulatim reflexo, umbilicum partim tegente.

Diam. major 72, minor 62, axis 36 mill.; apert. 38 mill. lata, 31 alta.

Habitat in collibus prope Trichoor Indiæ meridionalis.

This magnificent species (received through Lieut. Charles Annesley Benson), measuring nearly 3 inches in diameter, was discovered by Lieut. G. W. Cox, of the 45th Madras Regiment of Infantry, to whom I am also indebted for *Helix Shiplayi*, Pfr. (remarkable for its file-like sculpture), as well as for a light variety of *Cyclophorus Nilagiricus*, and a small shell which may be a variety of *C. cœloconus*, B. A specimen of *H. Shiplayi* exceeds in size the type of Pfeiffer's species, being 25 mill. in the greater, $22\frac{1}{2}$ mill. in the lesser diameter, and having an axis of 15 mill.

H. Basileus is related to the Cingalese group containing *H. Chenui* and *H. Ganoma*, Pfr., approaching the latter in the more depressed spire and the want of solidity, and differing from both shells in its planate whorls and simple suture. In the mode of colouring and the formation of the umbilicus and columellar lip, it has more resemblance to the less richly tinted *H. Chenui*, which exhibits, however, a depressed suture and more convex whorls. Viewed on the under side, the new species reminds the observer of the Malayan *H. Humphreysiana*, Lea; but it does not possess the conoid spire, the closely wound whorls, or the impressed suture of that more narrowly banded species.

During several years I have urged the collection of the shells of the hill region of Travancore, feeling assured, with reference to its position at the narrow extremity of the Indian Peninsula, and to its climate, that it was likely to produce novel forms. The present satisfactory instalment, from the northern portion of the group, proves the conviction to have had a fair foundation; and when explored by experienced collectors, a further supply of interesting objects may be confidently expected from the more southern mountain-ranges. It is difficult to conceive how such a giant among the Testacea of Hindostan as *H. Basileus* should have been so long overlooked by even the most careless observers. Although associated with Nilgherry forms, it probably does not extend its range to any portion of that group which has been hitherto explored by conchologists.

Helix Trochalia, Bens., n. sp.

H. testa anguste umbilicata, solidiuscula, orbiculato-conoidea, subtrochiformi, irregulariter arcuato-striatula, striis nonnullis prominentioribus, castanea, apicem versus albida; spira conoidea, apice valde obtuso, sutura leviter impressa; anfractibus 5, primis convexiusculis, cæteris planiusculis, ultimo acute compresso-carinato, antice breviter descendente, subtus convexo; apertura obliqua, elliptico-lunata; peristomate tenui, undique expanso concolori, marginibus subconniventibus, columellari dilatata, umbilicum profundum semi-tegente.

Diam. major 22, minor 19, axis 13 mill.

Habitat ad Portum Blair Insulæ Andamanicæ. Detexit Capt. J. C. Haughton.

This is the largest and most characteristic *Helix* yet discovered in the Andaman Islands. Its nearest continental ally will be found in *H. Merguiensis*, Ph., from which it differs in its more elevated conoid spire, narrow umbilicus, more widely separated margins of the non-reflected peristome, &c. On the other hand, it has relations to the higher-spired *H. Capitium*, B., of Hindostan.

Helix Hyba, Bens., n. sp.

H. testa subaperte et profunde umbilicata, conoideo-convexa, subtrochiformi, superne confertim oblique scabreque plicata, striisque exilissimis spiralibus decussata, subtus minutissime granulata, læviore, nitidula, epidermide fusco-cornea; spira elevata, gibboso-convexa, lateribus convexiusculis, apice obtuso, sutura leviter impressa, marginata; anfractibus 6, lente accrescentibus, vix convexiusculis, ultimo non descendente, carina peripherica basali acuta utrinque marginata circumdato, subtus horizontali, convexiusculo; apertura obliqua, parva, subquadrato-lunata; peristomate recto, acuto, margine columellari superne vix expansiusculo.

Diam. major 14, minor 13, axis 7 mill.

Habitat in montibus Sub-himalayanis, ad Dahinkhoond, non procul a fluvio Sutlej. Detexit J. D. Smithe.

This interesting form, discovered in the mountains near the Bari Do-âb by J. Doyle Smithe, Esq., F.G.S., of Madhopore, and kindly communicated to me by his brother, the Rev. Fred. Smithe, of Churchdown, approaches more nearly to the Nilgherry *H. Guerini*, Pfr., than to any Himalayan species. It is notable for its shorter vaulted spire, sharp keel, rather open umbilicus, and sculpture.

In one imperfect specimen, with a higher and more rounded hive-shaped spire, the keel of the penultimate whorl overhangs the anterior part of the last whorl. This variety measures—

Diam. major 12, minor 12, axis 7 mill.

Helix Choinix, Bens., n. sp.

H. testa perforata, vix conoidea-depressa, tenui, oblique striatula, striis exilissimis spiralibus confertissime decussata, superne fusco-cornea, subtus pallidiore, translucente; spira subconoideo-planulata, apice vix elevato, obtuso, sutura leviter impressa, submarginata; anfractibus 6, vix convexiusculis, superioribus arctius convolutis, ultimo majore, ad peripheriam superne subangulato-rotundato, subtus convexiusculo; apertura obliqua, magna, late lunata; peristomate tenui, acuto, margine dextro superne arcuatim prominente, columellari prope umbilicum breviter dilatato.

Diam. major 17, minor $14\frac{1}{2}$, axis 8 mill.; apert. $9\frac{1}{2}$ mill. lata, 8 mill. longa.

Habitat in Insulis Andamanicis.

A naninoid shell, with the last whorl large in proportion to those of the spire. It has not yet been found in a living state. For the specimens which are most perfect in form I believe myself to be indebted to the late Superintendent, Dr. Walker. A broken specimen, with the surface in good condition, was transmitted by Capt. Haughton.

Helix Stephus, Bens., n. sp.

H. testa angustissime perforata, depressa, vix striatula, lævigata, polita, translucente, fulva; spira depresso-conoidea, elevatiuscula, latere concaviusculo, apice obtuso, sutura vix impressa, submarginata; anfractibus 6, vix convexiusculis, lente accrescentibus, ultimo supra peripheriam obtusissime angulato, subtus convexo; apertura obliqua, anguste lunata; peristomate tenui, recto, subsinuato, marginibus superiore et basali leviter antrorsum arcuatis, columellari oblique descendente, leviter expanso.

Diam. major 10, minor 9, axis $4\frac{1}{2}$ mill.

Habitat ad Portum Blair Andamanicum.

Specimens in different stages of growth and condition have been received from the same sources as the last-mentioned species.

A small shell, with a more depressed spire, five more convex whorls, and a wider aperture than *H. Stephus*, has been received from Capt. Haughton. It bears some resemblance to continental Indian types, and has not yet been satisfactorily determined.

Helix Sanis, Bens., n. sp.

H. testa mediocriter umbilicata, conoideo-orbiculata, depressissima, lenticulari, oblique subarcuatim striatula, subgranulata, cornea; spira parum elevata, conoideo-depressa, apice obtuso, sutura impressiuscula, marginata; anfractibus $5\frac{1}{2}$, subplanulatis, ultimo carina mediana acuta utrinque compressa munito, subtus convexiusculo; apertura obliqua, securiformi; peristomate recto, acuto; umbilico infundibuliformi.

Diam. major 11, minor 10, axis $3\frac{1}{2}$ mill.

Habitat ad Portum Blair Andamanicum.

Two specimens of this shell have been received from the same sources as *H. Choinix*. It has close affinity with *H. Planorbis*, Lesson, and *H. Zollingeri*, Pfr., presenting a more depressed form, a different colouring and sculpture, and a marginate suture.

The following closely allied species has long stood in my collection as *H. Planorbis,* Lesson; on mature consideration, it appears deserving of separation.

Helix Cantoriana, Bens., n. sp.

H. testa mediocriter umbilicata, tenui, depressa, orbiculato-conoidea, lenticulari, oblique subarcuato-striata, subtus læviore, utrinque lineis distincte incisis remotiusculis spiralibus decussata, fusco-cornea, translucente, nitidula; spira parum elevata, depresso-conoidea, apice nucleato, obtuso, rubello, sutura impressa, submarginata; anfractibus $5\frac{1}{2}$, convexiusculis, ultimo carina mediana obtusiuscula utrinque compressa munito, subtus convexo; apertura obliqua, subquadrato-lunari; peristomate tenui, acuto; umbilico infundibuliformi.

Diam. major 10, minor 9, axis $3\frac{1}{2}$ mill.

Habitat in insula Pulo Sung-Sung, prope Pulo Piuang. Detexit Dr. J. E. Cantor.

A single specimen was found on the little island in question by the late zealous zoologist Dr. Cantor. It is certainly distinct from *H. Sanis*; and the peculiar sculpture, independently of other characters, affords good ground for distinguishing it from the recorded species of the same group.

Including two *Spiraxes,* one of which is not in a sufficiently perfect state for description; a *Bulimus,* which appears to be the young of the widely spread *B. gracilis,* Hutton; a *Helix* as yet undetermined; an *Auricula*; a *Melampus,* and a *Pythia,* we have now sixteen species of land-shells from the Andaman Islands.

Cheltenham, Dec. 21, 1860.

XII.—*On three new Trachinoid Fishes.*

By Dr. Albert Günther.

[Plate X. A.]

The family of the *Trachinidæ,* Gthr., has been established for those Acanthopterous Fishes which have the spinous portion of their dorsal fin much less developed and shorter than the soft, the anal fin similarly developed to the soft dorsal, and the ventrals composed of one spine and five rays. Their gill-openings are wide, and the caudal portion of their vertebral column is formed by many more vertebræ than the abdominal *.

Such are the positive characters by which they may be easily distinguished from the *Sciænidæ, Carangidæ, Blenniidæ, Gobiidæ, Trichonotidæ,* &c.; whilst the negative character, that of the absence of an infraorbital bone joined to the præoperculum,

* Günth. Acanthopt. Fishes, ii. p. 225.

distinguishes them from the *Cottina*. Other negative characters, as for instance the absence of finlets behind the dorsal and anal, the entire absence or the small number of pyloric appendages, separate them from some of the Scomberoid genera, which otherwise would appear to have a great affinity to them.

I formerly divided this family into four groups: *Uranoscopina*, *Trachinina*, *Pinguipedina*, and *Pseudochromides**.

The fourth of these groups (*Pseudochromides*) is not identical with that so called by Müller, all those genera having been excluded which have the ventral fins not fully developed. But even then the characters of the group appear to me to be too wide to form a natural union of fishes, since I have found that *Chænichthys*, Richards., has the lateral line interrupted, like *Pseudochromis*, *Notothenia*, &c., and therefore should be placed in the same group with them. If, on the other hand, we separate again those *Pseudochromides* which have only one dorsal fin (*Opisthognathus*, *Pseudochromis*, *Cichlops*, *Pseudoplesiops*) from those which have two (*Notothenia*, *Harpagifer*, *Chænichthys*), two groups will be established, well defined even by their geographical distribution.

We divide, therefore, the family of the *Trachinidæ* into the following groups:—

Eyes on the upper surface of the head; lateral line continuous	*a. Uranoscopina.*
Eyes more or less lateral; lateral line continuous; no larger tooth on the posterior portion of the intermaxillary	*b. Trachinina.*
Eyes lateral; a larger tooth on the posterior portion of the intermaxillary	*c. Pinguipedina.*
Lateral line interrupted, or not continued to the caudal fin; one dorsal. (Seas between the Tropics.)	*d. Pseudochromides.*
Lateral line interrupted; two dorsal fins. (Antarctic Seas.)	*e. Nototheniina.*

I add to the known species of this family, *first*, a new genus of *Uranoscopina*, from New Zealand.

Crapatalus.

Form of the head as in *Leptoscopus*, entirely covered with soft skin; cleft of the mouth approaching the vertical line; eye on the upper side of the head; lips fringed. Scales cycloid, of moderate size. One continuous dorsal; ventrals jugular; pectoral rays branched. Minute villiform teeth in the jaws and on the pharyngeal bones, none on the palate; no interior or exterior filament; opercles without external spines; gill-opening

* The genus *Heterostichus*, which has been placed by its describer in a family of *Trachinidæ* widely different from that so called by myself, proves to be a truly Blennioid fish, closely allied to *Myxodes* and *Clinus*.

very wide, partially open above. Six branchiostegals, four gills, pseudobranchiæ.

New Zealand; probably in the sea.

Crapatalus Novæ Zelandiæ. (Pl. X. fig. A.)

D. 35. A. 39. C. 13. P. 21. V. 1/5. L. lat. 60. L. transv. 7/7.

Scales on the neck before the dorsal fin considerably smaller than those on the sides of the body.

Description.—The head is broad, depressed, flat above, and rounded on the sides; its greatest width is four-fifths of its length, and its depth five-eighths of the same. The snout is very short, about as long as the diameter of the eye, which is one-sixth of the length of the head. Cleft of the mouth subvertical; the lips are serrated and fringed, having the appearance of a series of teeth. Nostrils two, the anterior produced into a short tube. The width of the interorbital space equals the diameter of the eye. The gills are widely cleft, and their membrane is only slightly contiguous on the throat; the upper margin of the operculum is fringed; there is an oblong membranaceous flap on each side of the isthmus, which serves for closing a part of the gill-opening.

The length of the head is contained four times and one-third in the total length, the height of the body nearly seven times. The trunk is subcylindrical; the tail, which is considerably elongate, compressed and tapering posteriorly. The vent is much advanced forwards, so that its distance from the snout is contained three times and a half in the total length. The anterior part of the trunk is covered with small scales, and the space behind the pectorals and that before and between the ventrals is naked. The rays of the dorsal and anal fins appear to be simple, not branched; this, however, cannot be satisfactorily ascertained, owing to their indifferent state of preservation. The *dorsal* fin commences behind the vertical from the origin of the anal, at a distance from the occiput which equals that of the latter from the snout, and terminates immediately before the root of the caudal; it appears to be of nearly uniform height, but much lower than the body. The *anal* fin commences immediately behind the vent, extending backwards as far as the dorsal; it gradually becomes lower posteriorly. The *caudal* fin is subtruncated, one-ninth of the total length, and has the middle rays divided. The *pectoral* fin extends to the vertical from the eleventh dorsal ray; its rays are branched, and the lower ones become gradually longer to the sixth upper one, which is the longest. The *ventral* fins are composed of one very distinct spine and five branched rays; they are rounded, somewhat distant from each other, and extend to the fourth anal ray.

The specimen, which is discoloured, was brought from New Zealand, and deposited in the British Museum.

	lines.
Total length	41
Length of the head	$9\frac{1}{2}$
Greatest width of the head	$7\frac{1}{2}$
Greatest depth of the head	6
Greatest depth of the body	6
Diameter of the eye	$1\frac{1}{2}$
Distance of the vent from the snout	12
Length of the pectoral fin	9
Length of the ventral fin	6
Length of the caudal fin	$4\frac{1}{2}$

The *second* new species belongs to the *Trachinina.*

Aphritis gobio.

B. 6. D. 7/22. A. 22. C. 18. P. 16. V. 1/5. L. lat. 65–70.

The maxillary bone extends beyond the vertical from the centre of the eye.

Port Famine.

This species is allied to *Aphritis Durvillii,* described by Cuvier from an apparently small specimen from the fresh waters of Van Diemen's Land. This, however, is said to have the cleft of the mouth rather narrow, whilst in our species it is wide; both differ, besides, in the number of the fin-rays.

The general aspect of the fish is cottoid; the head, however, is considerably more elevated, its depth below the interorbital portion being one-half of its length, which is contained three times and a half in the total. The snout is of moderate extent, twice as long as the eye, with the cleft of the mouth oblique, and with the lower jaw somewhat prominent. Jaws, vomer, and palatine bones armed with broad bands of villiform teeth. The interorbital space is very concave, its width being much less than that of the orbit, which is one-eighth of the length of the head, and nearly one-third of the depth of the head below the orbit. The operculum terminates in an obtuse, stiff spine. The distance of the anterior dorsal from the occiput is the same as that of the posterior from the caudal fin; both are of moderate and nearly equal height. Caudal rounded. The anal commences and terminates behind the opposite fin. Pectoral rounded, extending to the vertical from the third dorsal ray. Ventrals jugular, nearly as long as the pectoral.

The head is entirely scaly, except on the mandibula; there are even some scales on the maxillary. The scales are rather irregularly arranged, cycloid, and those above the lateral line have smaller scales on their base.

The colour now is uniform brown.

There are two specimens in the British Museum: one is a skin, from the old museum of the Zoological Society; the other is a stuffed specimen, 17½ inches long, from the same collection from Port Famine which contained *Chænichthys esox.*

Of the genus *Chænichthys* (*Nototheniina*) only one species was known. We add a second:—

Chænichthys esox.

B. 7. D. 10/33–34. A. 34. C. 30. P. 21. V. 1/5.

Snout without a spine anteriorly. Lateral line smooth, without granulated plates.

Port Famine.

This species is similar to *Ch. rhinoceratus*, Richards., from which it may be readily distinguished by the characters mentioned. The general form of the head is the same as in the other species, and its length is contained three times and a third in the total length. The maxillary extends nearly to below the middle of the eye; both the jaws are armed with cardiform teeth, the palate being entirely smooth. The bony striæ of the operculum are differently arranged from those in *Ch. rhinoceratus*, and do not terminate in very prominent spines; the centre from which they radiate is near the upper anterior angle of the operculum; two run downwards towards the suboperculum, three towards the extremity of the operculum (the upper one being bifurcate), and the last ascends upwards towards the suprascapula. The anterior dorsal fin commences at a small distance from the occiput, and is longer than high, none of the flexible spines being produced; this, however, cannot constitute a specific difference from *Ch. rhinoceratus*, as long as we are ignorant whether the sexes of the fishes of this genus show any external differences. The soft dorsal commences immediately behind the spinous, is about as high, and terminates at some distance from the caudal; the latter fin appears to be subtruncated. The anal commences a little behind the soft dorsal, and terminates in the same vertical. The pectoral is broad, extending to the vertical from the third dorsal ray; the upper portion of its posterior margin is subtruncated, the lower rounded. The ventrals are jugular, and rather longer than the pectoral.

The skin is entirely smooth, the lateral line being formed by small tubules, which, in dried specimens, are very distinct. It ascends in a gentle curve towards the back, running close to the base of the soft dorsal and terminating opposite to the extremity of that fin. The second or lower portion of the lateral line commences below the last fourth of the dorsal fin, running along the middle of the tail towards the caudal.

The colour is now a dirty yellowish, with brown blotches.

The single stuffed specimen, brought by Capt. King from Port Famine, is 12½ inches long.

I subjoin, for comparison, the diagnosis of

Chænichthys rhinoceratus.

Richards. Voy. Ereb. & Terr. Fishes, p. 13, pl. 6. figs. 1–3 (ventrals too short).

B. 7. D. 7/34–35. A. 33.

A hook-like spine anteriorly on the upper surface of the head. Lateral line with a series of granulated scales.

XIII.—*On certain Coleoptera from the Island of St. Vincent.* By T. Vernon Wollaston, M.A., F.L.S.

In the Supplement to vol. xx. ser. 2. of the 'Annals of Natural History', I gave a brief notice of fifteen exponents of the Coleoptera which were captured by John Gray, Esq., and the Rev. Hamlet Clark, during a day's sojourn at St. Vincent (of the Cape de Verdes) in December 1856,—only eleven of which, however, I then attempted to determine precisely. But having lately received, through the kindness of Alexander Fry, Esq., the loan of various specimens which he has collected whilst touching at the same island on two subsequent occasions (amounting to twenty-three species, fourteen of which were not found by Messrs. Gray and Clark), and having likewise had the advantage of a few more (two of which were not included in either of the above-mentioned batches) picked up by my nephew F. W. Hutton, Esq., on the 11th of June, 1857, whilst on his voyage to Calcutta,—I have got together, in all, an assortment of thirty-two species, which I have just been examining somewhat carefully, with the intention of supplying a few critical remarks on them in the present paper.

So little being known of the insect-population of the Cape de Verdes, any contribution which may tend to elucidate even a modicum of the forms that prevail there cannot but be interesting; and when we consider the excessive barrenness of the group (to which all travellers bear most abundant testimony), I cannot but believe that the thirty-two species recorded below, from one of the smaller islands, may give some faint idea of the general character of the Coleoptera of that particular spot. As we might naturally anticipate, in such a dry and cindery region, the Heteromerous type reigns predominant; for whilst as many as thirteen (out of the thirty-two here alluded to) are members of the *Heteromera*, only nine belong to the *Geodephaga*, three to the *Rhynchophora*, two to the *Priocerata*, and one to each of the great sections *Hydradephaga*, *Necrophaga*, *Cordylocerata*, *Pseudotrimera*, and *Brachelytra*. So that, if we may take St. Vincent as a fair index of the whole, it is not difficult to foretell the immense preponderance which the *Heteromera* will be found to possess throughout the entire archipelago of the Cape de Verdes.

There are but few accounts of these remote and desolate islands containing anything of interest to a naturalist. Mr. Darwin, in his admirable 'Journal of Researches,' gives us perhaps the best that has yet been published; but his observations refer only to St. Jago. Perhaps the following extract, therefore, from a letter received from my nephew, F. W. Hutton, Esq., bearing on the general features of St. Vincent, may not be out of place:—

"I landed," says he, "on the 11th of June, 1857. The town (if it deserves the name, for it has only about 200 inhabitants in it) is built on the north-west side of the island, and is situated in the centre of a huge extinct volcanic crater, about four miles in diameter, the western side of which the sea has broken down, and has filled up half the basin, forming the harbour of Porto Grande. It is the only inhabited part of the island, with the exception of a small house belonging to the English consul, which is built on the rim of the crater. The houses look clean outside, but, like the whited sepulchre, are all filth and abomination within. The interior of the country is not much better: either rough red volcanic hills, covered with scoriæ and ashes, constitute the foreground, whilst high broken cliffs of lava shut in the view; or else you stand on the naked lava and see below you these 'rough red hills.' The island is almost entirely devoid of vegetation. A few unhealthy-looking shrubs and plants grow in the sandy valleys; whilst on the mountains, between the blocks of lava which lie thrown about, a scanty crop of long but withered grass is perceptible, and affords sustenance for the few goats and donkeys that live there. I took six species of Coleoptera in the island, chiefly from under the plants in the valleys—the big one [*Trichosternum striatum*] and the black one [*Oxycara pedinoides*] being by far the most common. Of the red one [*Eremonomus Huttoni*], out of about 200 specimens, I only found one alive. I saw no moths or butterflies; but one smooth light-green caterpillar (about an inch and a half long), with a black shining head. I saw part of the skin of a snake*,

* As snakes are altogether unknown in the Canaries and Madeira (and I believe also at the Azores), I felt that there was possibly some error in

which had lost its colour, and two lizards*. There were several spiders and bugs; locusts also frequented by hundreds the most sterile and dusty places, and skipped about as if their land was the best and happiest in the world. Of birds, I saw the Egyptian Vulture, and a brown Eagle with a wedge-shaped tail; also a few Guinea-fowl, and (as I was told) some Quail. I saw a flock of about eight Crows, like the common *Corvus corone*; likewise two Swallows (*Hirundo rustica*), which seemed rather larger than their brethren in England; and a brown-looking Warbler, about the size and shape of a robin. I could find no land Mollusca. The colours of the animals are, on the whole, sober, and harmonize much more with the desolate appearance of the island than with the gaudy colouring which usually obtains in the tropics."

Fam. **Cicindelidæ.**

Genus Cicindela.

Linnæus, Syst. Nat. ii. 657 (1767).

1. *Cicindela Hesperidum*, n. sp.

C. angustula, capite prothoraceque læte viridescenti- cuprescenti- et ænescenti-variegatis; labro mandibularumque basi dilute testaceis, illo brevi antice truncato et dente medio minutissimo armato; oculis intus subangulatim emarginatis; elytris obscurioribus, rugose granulatis, lunula humerali apicalique necnon punctis quatuor (duobus anterioribus confluentibus) testaceis ornatis, ad apicem distincte serratis et singulatim leviter rotundatis, sutura (et etiam circa scutellum) elevata.

Long. corp. lin. 4–5½.

Obs. Species *C. littorali* affinis, sed certe distincta; minor,

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this statement, and that perhaps a lizard's skin, of large dimensions, might have been mistaken for that of a snake. I therefore wrote lately to Mr. Hutton about it again, and have received from him a note, in which he says: "I think there can be no doubt that I found part of the cast skin of a snake, for I know them well; it was about a foot long, split up as you always see them, and colourless, or nearly so."

* Lizards abound in most of these Atlantic islands; in Madeira they absolutely teem, tenanting even the small adjacent rocks. In the Canarian group they are less common, though quite universal. Mr. Darwin, in his 'Journal of Researches,' calls special attention to the abundance of lizards on nearly all oceanic islands. In the central portion of the Galapagos Archipelago, the large *Amblyrhynchus Demarlii* would seem to be a complete nuisance,—so much so, that it was difficult to find a place free from its burrows to pitch a tent in. Mr. Darwin gives a graphic account of these sluggish stupid creatures, and describes their *modus operandi* in forming their holes. "I watched one," says he, "for a long time, until half its body was buried; I then walked up and pulled it by the tail: at this it was greatly astonished, and soon shuffled up to see what was the matter; and then stared me in the face, as much as to say, 'What made you pull my tail?'"

angustior, maculis vix similibus pallidioribus, elytris rugosius tuberculatis ad apicem magis fortiter serratis singulatim rotundatis et spinula suturali media majore terminatis, sutura antice magis elevata (costa etiam circa scutellum continuata), capite prothorace pedibusque lætius cuprescentibus, oculis intus paulo magis angulatim emarginatis, labro breviore antice magis truncato, in medio haud sinuato et denticulo multo minore instructo, mandibulis vix minoribus ad basin externam brevius albidis, antennis paulo gracilioribus articulo basilari minore, femoribus gracilioribus, corpore subtus fere impunctato, et cæt.

A single example of this *Cicindela,* which I forwarded to Berlin three years ago, was regarded by my friend Dr. Schaum as a variety of the widely distributed *C. littoralis;* and, indeed, did its only differences from that insect consist in size, colour, and the slightly altered proportions of its paler patches, I should certainly have been of the same opinion myself. But the subsequent comparison of a larger number of examples with types of the *C. littoralis* from Northern Africa has brought to light so many constant, and even structural distinctions (however small) that I cannot but receive them, in conjunction with those less important ones of external contour, as of true specific signification. Thus it is not merely smaller than the *C. littoralis,* more brightly metallic in parts, and with the spots paler and rather differently proportioned, but its elytra are more coarsely granuled, much more evidently serrated at their apex, and separately rounded-off, causing the spiniform termination of the suture to be larger. The suture also is more raised, particularly in front, where the elevation *is continued round the hinder portion of the scutellum;* its eyes are rather more *angularly* emarginated internally; its antennæ and femora are somewhat slenderer (the former having their basal joint, especially, less robust); its mandibles are not quite so elongate, and with the white stripe at their outer base shorter (extending only to the commencement of the first tooth, instead of to the third); its body beneath is almost impunctate; and its upper lip is very differently constructed, being not only much shorter, but more truncated in front, *unsinuated* in the middle, and with a much smaller central tooth.

I possess two specimens of this insect, which were captured in St. Vincent by John Gray, Esq., and the Rev. Hamlet Clark, during December 1856, and have examined others in the collection of Mr. Fry. I am informed by Mr. Clark that the species was very abundant in a salt locality, or marsh, close to Porto Grande.

2. *Cicindela vicina,* Dej.

Cicindela vicina, Dej., Spec. Gén. des Col. v. 244 (1831).

The present *Cicindela* seems to agree sufficiently well with the

C. vicina of Dejean, from Senegal,—a species closely allied to the *Ægyptiaca,* but (not to mention smaller differences) a little more expanded posteriorly, of a rather more lively greenish-metallic hue, and with its elytral patches a trifle more developed. I do not perceive, however, in the Cape de Verde specimens any indication of the rufo-testaceous tint which Dejean describes as colouring the femora (and base of the tibiæ) beneath: the *trochanters* are all of them brightly rufescent, but the thighs are of an undiluted brassy-green throughout. Nevertheless so small a distinction as this may perhaps be merely indicative of a local variety peculiar to these islands. I have four examples of it now before me, from the collection of Mr. Fry, by whom they were taken at St. Vincent "in a dry water-course, on sand."

Fam. **Carabidæ.**

Genus Dromius.

Bonelli, Observat. Ent. i. tab. synopt. (1813).

The insect described below has all the *prima-facie* aspect, in its general contour and pale subhumeral patch, of a true *Metabletus,* appearing to associate itself with such species as the *obscuroguttatus* and *patruelis;* but its prothorax is broader and more truncated behind, and the terminal joint of its palpi is slenderer; whilst, on carefully dissecting it, I find that its mentum is perfectly toothless. Its paraglossæ may *possibly* be a little more on the *Metabletus*-type than on that of the true *Dromii,* seeming, in my specimen, a trifle to surpass the (apically subtruncate) ligula in length, as also to be more rounded and not *quite* in a continuous curve with the latter; nevertheless, be this as it may, its edentate mentum will completely remove it from the *Metableti;* whilst from *Blechrus* its tongue is, at any rate, very distinct,—the ligula of the *Blechri* being smaller and more robust, cordate (or triangularly emarginate) anteriorly, and with the paraglossæ large and *confluent in front of it.* Its penultimate tarsal joint is entire, and its claws are rather strongly pectinated.

3. *Dromius submaculatus,* n. sp.

D. æenescenti-niger, subnitidus, subtilissime transversim reticulatus; prothorace transverso, basi subtruncato, angulis posticis paulo recurvis; elytris obsolete substriatis, striis postice versus suturam distinctioribus, macula obscura suffusa subhumerali rufescente ornatis; antennis pedibusque breviusculis, gracilibus, dilute testaceis.

Long. corp. lin. vix $1\frac{1}{2}$.

The very delicately *transversely*-reticulate surface of this little *Dromius* (in which it differs from the *Metableti* of the *obscuro-*

guttatus and *patruelis* type, which are regularly shagreened), in conjunction with its brassy-black hue, dull and suffused subhumeral patch, most obscurely striated elytra, and its rather short, slender, and very pallid limbs, will readily characterize it. I have seen six specimens of it in the collection of Mr. Fry, which were taken by himself at St. Vincent, during the month of October, "under grass."

Genus Platytarus.

Léon Fairmaire, Ann. de la Soc. Ent. de France (2 série), viii. Bull. xvii. (1850).

4. *Platytarus Faminii*, Dej.

Cymindis Faminii, Dej., Spec. Gén. des Col. ii. 447 (1826).
—— ——, Léon Fairm., Faun. Ent. Franç. 33 (1854).

After examining carefully five specimens of this insect, which were captured by Mr. Fry "under grass" at St. Vincent during the month of October, I can see nothing whatever to warrant their separation from the European *P. Faminii* of Mediterranean latitudes, occurring in Sicily, the south of France, Spain, &c. One would have rather anticipated *à priori* that they would be referable to the nearly allied *P. mauritanica* from the north of Africa, or to another species (closely resembling it) which I possess from Egypt; but such, nevertheless, does not appear to be the case.

Genus Calosoma.

Weber, Observat. Entom. 20 (1801).

5. *Calosoma Senegalense*, Dej.

Calosoma Senegalense, Dej., Spec. Gén. des Col. v. 562 (1831).

Two specimens (male and female) of this fine *Calosoma* have been communicated by Mr. Fry, who took them at St. Vincent, "under loose grass," in the month of October. They agree exactly with the *C. Senegalense* found on the opposite coast of Africa.

6. *Calosoma imbricatum*, Klug.

Calosoma imbricatum, Klug, Symb. Phys. iii. pl. 23. f. 11 (1830).

Likewise captured by Mr. Fry, and in the same locality as the last species. Two specimens (male and female) which he has kindly lent me for comparison agree precisely with a type of the *C. imbricatum*, from Cape Verd, given me by M. Jekel.

7. *Calosoma Maderæ*, Fab.

Carabus Maderæ, Fab., Syst. Ent. 237 (1775).
—— *Indagator*, Fab., Mant. Ins. i. 197 (1787).
Calosoma Indagator, Dej., Spec. Gén. des Col. ii. 205 (1826).
—— *Maderæ*, Woll., Ins. Mad. 15 (1854).

Two specimens of this insect which were captured by Mr. Fry at St. Vincent are rather more coarsely imbricated than the Madeiran and Canarian ones, and have their treble series of metallic elytral points smaller. I consider them, however, nothing more than a mere variety of the *C. Maderæ* and *Indagator* of Fabricius, a species which is widely distributed over the various Atlantic islands. I have taken it throughout the *whole* of the Madeiran group, except on the small rock of the Northern Deserta; and on *five* of the Canaries. It is also recorded in Terceira and San Miguel, of the Azores: indeed, a male from the former has been lately communicated by Mr. Fry, which is as rough in sculpture as those from the Cape de Verdes, and has its elytral impressions quite as small and obscure. Mr. Fry's examples have been transmitted to me under the name of *C. Olivieri*, Dejean; and as such the insect is quoted in M. Morelet's 'Histoire Naturelle des Açores.' What Dejean's true *C. Olivieri* (which was described from a Bagdad specimen) may be, I have no means of ascertaining; but I cannot detect in the Cape de Verde and Azorean individuals any differential characters of sufficient importance to separate them specifically from the Madeiran and Canarian ones.

Genus Chlænius.

Bonelli, Observat. Entom. i. tab. synopt. (1813).

8. *Chlænius Boisduvalii*, Dej.

Chlænius Boisduvalii, Buquet, in litt.
—— ——, Dej., Spec. Gén. des Col. v. 625 (1831).

Three specimens of this insect have been kindly lent me by Mr. Fry, by whom they were captured at St. Vincent, "under grass and beneath stones of an old wall," in the month of October. They agree precisely with an example of the *C. Boisduvalii* (from Senegal) in Mr. Bowring's collection at the British Museum, and accord equally well with Dejean's description (as compared with that of the nearly allied species *C. cæcus*), except where he states that "le corselet est un peu *plus* étroit que celui du *cæcus* et un peu *plus* rétréci postérieurement." So exactly, indeed, does the latter tally with the Cape de Verde species, that I am inclined to suspect that the word "plus" in the diagnosis is a *lapsus calami*, and should be read "moins," in which case the description altogether suits our present *Chlænius*. According to an example of the *C. cæcus* now in my possession, for the loan of which I am indebted to Mr. Waterhouse, the *C. Boisduvalii* differs in being rather smaller, a little less parallel anteriorly, and more pubescent. It is also a trifle less deeply striated and more finely punctured; the punctures of its prothorax are especially much less coarse, the hinder foveæ of the latter are rather shorter and shallower, and the margin, particularly towards the posterior angles (which are not so rounded), is very much less developed or recurved. Its antennæ, moreover, are somewhat paler and less robust, and its elytral patch is perceptibly smaller and more dentate.

Genus Amblystomus.

Erichson, Käf. der Mark Brand. i. 59 (1837).

9. *Amblystomus viridulus*, Erich.

Hispalus viridulus, Erichs., in Wiegm. Arch. ix. 217 (1843).

Several specimens of this distinct *Amblystomus* were captured at St. Vincent by Mr. Gray and the Rev. Hamlet Clark, in December 1858, amongst light soil around the roots of a succulent plant which they described as common near Porto Grande; and two more from the same locality have lately been communicated by Mr. Fry. Judging from the diagnosis, there can be no doubt that it is the insect recorded by Erichson, in Wiegmann's 'Archiv für Naturgeschichte,' amongst the Coleoptera professedly from Angola,—but many of which were from these islands, and not from Angola at all. The unfortunate mistake, indeed, which involved Erichson in the serious error of believing that *all* the specimens amassed by the collector, who died before his return to Germany, *were from Angola*, cannot be too much regretted; for an amount of confusion has been introduced thereby into the question of the geographical distribution of species which will scarcely ever perhaps be completely dissipated. It appears that this collector touched at the Cape de Verdes on his passage to the African coast, and that the material from both localities were mixed up indiscriminately, which will, at any rate, account for the fact that so many of the Cape de Verde insects are wrongly associated with Angola, and were inadvertently described by Erichson in his paper above alluded to.

Fam. **Dytiscidæ.**

Genus Eunectes.

Erichson, Gen. Dytic. 23 (1832).

10. *Eunectes conicollis*, n. sp.

E. ovatus, angustulus, luteo-griseus, clypeo antice vix emarginato; capite postice nigro et macula frontali magna plus minus suffusa antice bipartita ornato; prothorace vitta transversa abbreviata ornato, ad latera oblique rectissimo, angulis posticis acutiusculis; scutello subtriangulari; elytris punctis magnis sat profundis triplici serie et punctulis minoribus nigro-notatis, singulis maculis duabus minutis sublateralibus et fascia transversa tenui dentata postica (plus minus obsoleta) nigro-ornatis.

Long. corp. lin. $5\frac{1}{4}$–$6\frac{1}{4}$.

Although fully aware of the many phases which the universal

E. sticticus is apt to assume, I am nevertheless induced to regard the present *Eunectes* as truly distinct from it, through the fact of its possessing several minute structural characters (apart from the less important but not unsuggestive ones of markings and colour) which would tend to separate it from that insect. It would seem probable, indeed, that a small cluster of indubitable species may yet be brought to light from a close observation of the supposed "geographical states" of the *sticticus*,—its evident powers of variation having, not unnaturally, been taken advantage of to cast into one discordant, unexamined mass many nearly allied forms, which, nevertheless, have not ever been connected with their assumed prototype. In fact, until Erichson described two new exponents of the group (the *E. australis* from Van Diemen's Land, and the *occidentalis* from Peru), everything was looked upon indiscriminately as an aberration of the Linnæan original; and yet I am satisfied, after a careful comparison of them, that I have, even myself, *three* additional species (of which the present is one), from the Cape de Verdes, Canaries, and Madeira respectively. Through the kindness of my friend the Rev. Hamlet Clark, I have been enabled to overhaul a very extensive series of the members of this genus, and from localities far removed *inter se*; and I have come to the conclusion that, although the *E. sticticus* is very unstable in its fascia and fragmentary patches, it nevertheless retains its essential features of form and sculpture in a remarkably constant manner; so that I have never myself found any difficulty in at once identifying it.

The *E. conicollis* is just perceptibly narrower than the *sticticus* *, and has the edges of its prothorax (although very oblique) excessively straight, and free from any tendency to curvature; its scutellum is rather more triangular (being less obtusely rounded behind); its clypeus is somewhat less emarginate in front; and its threefold series of elytral points are more evidently *impressed*. Associated with these small distinctions, its frontal *macula* is very much larger than is the case, I believe, in any of the known varieties of the *sticticus*,—being, instead of small and transverse, more or less suffused, and bipartite anteriorly; its prothoracic *vitta* is thicker, but more abbreviated laterally;

* I subjoin the following diagnostic description of the *sticticus*, drawn out from many varieties, which will sufficiently express its characters, when compared with the corresponding ones of the *conicollis*:—

E. ovatus, luteo-griseus, clypeo antice emarginato; capite postice nigro et macula frontali parva transversa ornato; prothorace vitta transversa interrupta ornato, ad latera oblique subcurvato, angulis posticis obtusiusculis; scutello sub-semicirculari; elytris punctis magnis triplici serie et punctulis minoribus nigro-notatis, utroque maculis duabus parvis sublateralibus et fascia transversa dentata postica (plus minus obsoleta) nigro-ornato.—Long. corp. lin. $5\frac{1}{2}$–$6\frac{1}{2}$.

whilst the submarginal patches of its elytra are smaller, and the hinder fascia (when present) *thinner* and less suffused.

A single specimen of it is in Mr. Fry's collection from St. Vincent, though not captured by himself; and seven older ones, all quite invariable and labelled "Cape Verd," are in that of the Rev. Hamlet Clark. Whether this signifies the Cape de Verde group or the Cape Verd promontory, on the opposite coast, Mr. Clark has no note to decide; but the question is not a very important one, since it is more than probable, from the short distance between the islands and the mainland, that the same species would occur in both localities.

The present *Eunectes* cannot be confounded with the *E. australis* (of which, judging from the diagnosis, I have two undoubted examples now before me, from Mr. Clark's collection—but which, *possibly* through mistake, are also labelled "Cape Verd"), Erichson's species being not only smaller, paler, narrower, and more oblong, but likewise with its frontal patch greatly reduced, its prothorax immaculate, and its elytral punctures much denser and more impressed. It possesses also an important character (not noticed by Erichson) in having the elytra of its females quite plain, or unprovided with that deep lateral elongate depression which is more or less evident in the other species.

In its abbreviated prothoracic band the *E. conicollis* would seem to agree with the *helvolus* of Klug (registered by Aubé as "var. γ" of the *sticticus*), and the fact of Erichson's mentioning the *helvolus* amongst his (supposed) Angolan Coleoptera might perhaps lead one to suspect that he referred to this actual species from the Cape de Verdes; but, still, Aubé's var. γ is described as having no elytral fascia (which the *E. conicollis* undoubtedly has), and therefore Klug's insect may have been a mere state of the common European *sticticus*, and Erichson may have consequently been wrong in identifying our present *Eunectes* with it. Be this, however, as it may, I think that the Cape de Verde exponent (whether it be the true *helvolus* of Klug, or now for the first time characterized) has at any rate a fair claim to be treated as *distinct* from all the aberrations of its more northern ally. And hence, I cannot but think, it follows that, if it indeed be Klug's veritable *helvolus*, Aubé was mistaken in regarding it as a phasis of the *sticticus*.

Fam. Dermestidæ.

Genus Dermestes.

Linnæus, Syst. Nat. ii. 561 (1767).

11. *Dermestes vulpinus.*

Dermestes vulpinus, Fab., Spec. Ins. i. 64 (1781).
—— ——, Oliv., Ent. ii. 9. 8, pl. 1. f. 6 (1790).

Dermestes vulpinus, Gyll., Ins. Suec. i. 147 (1808).
——— ———, Woll., Ins. Mad. 202 (1854).

Several specimens of the cosmopolitan *D. vulpinus* were taken at St. Vincent by Mr. Gray and the Rev. Hamlet Clark, during their day's collecting there, in December 1856.

Fam. **Histeridæ.**

Genus Saprinus.

Erichson, in Klug Jahrb. i. 172 (1834).

12. *Saprinus equestris*, Erichs.

Saprinus equestris, Erichs., in Wiegm. Arch. ix. 226 (1843).
——— ———, de Marseul, Ann. de la Soc. Ent. de France, 3 sér. 358 (1855).

This elegant *Saprinus* was captured by Messrs. Gray and Clark, in tolerable abundance, *in stercore humano*, near the sea-beach of Porto Grande, during their few hours' sojourn at St. Vincent in December 1856; and also in the same locality by my nephew, F. W. Hutton, Esq., on the 11th of June, 1857. It is recorded by De Marseul as occurring likewise at Angola and Benguela; but whether it is truly found there, or whether that "*habitat*" merely rests on the authority of Erichson's paper, in which the insects from Angola and the Cape de Verdes were indiscriminately mixed up, I cannot undertake to say.

Fam. **Elateridæ.**

Genus Heteroderes.

Latreille, Ann. de la Soc. Ent. de France, iii. 155 (1834).

13. *Heteroderes grisescens*, Germ.

Cryptohypnus grisescens, Germ., Zeitschr. f. d. Entom. v. 151 (1844).
Monocrepidius? Grayii, Woll., Ann. of Nat. Hist. ser. 2. xx. 505 (1857).
Heteroderes grisescens, Candèze, Mon. Elat. ii. 377 (1859).

A single specimen of this insect was found beneath a stone, at some little elevation above the sea, by the Rev. Hamlet Clark, during his day's sojourn at St. Vincent with Mr. Gray, in December 1856; and I have also two more examples now before me, likewise taken in the island by Mr. Fry. In my short paper on the Coleoptera collected by Messrs. Gray and Clark, in the 'Annals of Natural History' for January 1858 (Suppl. to vol. xx.), I described this *Elater* as new, under the name of "*Monocrepidius? Grayii*;" but the identical individual from which I drew out my diagnosis has since been identified by M. Candèze with the *Cryptohypnus grisescens* of Germar. It seems to have a rather wide geographical range, occurring in Mesopotamia, Syria, Senegal, &c.; and I possess specimens captured by the late Mr. Melly in Egypt.

Fam. Cleridæ.

Genus Necrobia.

Olivier, Entom. iv. 76 *bis* (1795).

14. *Necrobia rufipes*, Thunb.

Anobium rufipes, Thunb., Nov. Ins. Spec. i. 10 (1781).
Corynetes rufipes, Fab., Syst. Eleuth. i. 286 (1801).
—— ——, Klug, Abhandl. der Wissensch. Acad. zu Berl. 340 (1840).
Necrobia rufipes, Redt., Fna Austr. 339 (1849).

A single example of this universally distributed insect is in Mr. Fry's collection of St. Vincent Coleoptera; but he informs me it was not taken by himself. It is a species easily naturalized, and one which has established itself in nearly all parts of the world. It abounds at Ascension and the Cape of Good Hope; and I have myself taken it in profusion in the Canary Islands, and at Mogador, on the opposite coast of Morocco.

Fam. Curculionidæ.

Genus Cleonus.

Schönherr, Curc. Disp. Meth. 145 (1826).

15. *Cleonus mucidus*, Germ.

Curculio mucidus, Germ., Mag. der Ent. i. 132 (1813).
Cleonus velatus, maculipes, et *mucidus*, Schönh., Gen. et Spec. Curc. ii. 196, 197, 221 (1834).
—— *mucidus* et var. β, Schönh., id. vi. (pars 2) 48 (1842).

It appears that the *C. mucidus* is a somewhat variable insect, and one which ranges more peculiarly along the western regions of Africa (Guinea, Cape of Good Hope, &c.), in the same manner as its near ally the *C. arenarius* does towards the east (Egypt, &c., and even India). The particular phasis of it which occurs in the Cape de Verde Islands was regarded, in vol. ii. of Schönherr's work, as specifically distinct, and named *C. maculipes*, but was subsequently (in vol. vi.) registered as "var. β" of the *mucidus*,—being of a more flavescent tinge above, with its abdominal patches brighter, and its legs more clearly annulated. I must confess, however, on comparing four recent and beautiful specimens of it, which were collected (in the month of October), "running under succulent plants," by Mr. Fry, at St. Vincent, with a type of the *C. mucidus* given me by M. Jekel, that I detect many other differences (of a small kind) which would incline me to doubt whether the *C. maculipes* might not have been better kept apart as it was originally described; and, amongst other *minutiæ*, the more evidently *dehiscent* apex of its elytra, at their extreme point, might be especially referred to. Nevertheless, as it has been already amalgamated with its supposed type, I will not attempt to isolate it afresh.

Genus Rhinocyllus.

Germar, Neue Wetter. Annal. i. 137 (1819).

16. *Rhinocyllus lypriformis*, n. sp.

R. angustus, lineari-cylindricus, piceo-niger, dense flavescenti-cinereo-squamosus et pilis suberectis cinereis sat rigidis obsitus; prothorace rugose punctato, subrecto, postice vix angustiore; elytris cylindricis, punctato-striatis; antennis rufo-ferrugineis, capitulo acuminato obscuriore; pedibus rufo-piceis, subgracilibus.

Long. corp. lin. $1\frac{2}{3}$.

Most closely allied to the *R. Lareynei*, Jacq. Duval (which I have received from M. Léon Fairmaire of Paris, and for the loan of four additional specimens of which I am indebted to M. Jekel), a species found at Montpellier, &c., in the south of France, but altogether narrower and more elongate, with its elytra not quite so wide just behind their humeral angles (where they are but very slightly broader than the base of the prothorax), with its suberect bristles shorter and less dense, and with its legs a trifle less robust. It is possible, indeed, that it may be only a geographical phasis of that insect. In general *outline* it is a little suggestive of the *Lyprus cylindricus*, from which circumstance I have borrowed its trivial name. It is hitherto unique, a single example only having been captured at St. Vincent by Mr. Fry.

Fam. Anthribidæ.

Genus Trigonorhinus (nov. gen.).

Corpus sat parvum, breviter oblongum, densissime pubescenti-variegatum: *rostro* brevissimo, subtriangulari, basi lato, apicem versus angustiore et ad apicem ipsum bisinuato-rotundato [haud emarginato, nec etiam truncato]; *oculis* subrotundatis antice anguste emarginatis, demissis: *prothorace* convexo, æquali (nec tuberculato, nec strigato), subconico, postice lato et ibidem fere elytrorum latitudine, margine postico (necnon laterali versus basin) anguste marginato: *scutello* distincto: *elytris* æqualibus, postice obtuse truncato-rotundatis, pygidium haud tegentibus. *Antennæ* breves graciles, apice abrupte et valde clavatæ, infra sinum oculorum in fovea laterali insertæ, articulis 1^{mo} et 2^{do} (illo præcipue) longiusculis robustis, reliquis ad clavam parvis latitudine subæqualibus (3^{tio} quarto vix longiore), 9^{no}, 10^{mo} et 11^{mo} clavam magnam valde abruptam crassam triarticulatam efficientibus (9^{no} et 10^{mo} subpoculiformibus, hoc paulo latiore transverso, ultimo subovato basi truncato). *Labrum* parvum, antice rotundatum. *Pedes* sat validi, *postici* paulo breviores: *femoribus* muticis: *tarsis* pseudotetrameris, articulis 1^{mo} et 2^{do} longitudine subæqualibus, hoc apice leviter emarginato, tertium profunde bilobum recipiente, 4^{to} minutissimo, inter lobos tertii abscondito, ultimo clavato *unguiculis* simplicibus munito.

Obs. Genus *Anthribo* affinitate proximum, et oculis antice emarginatis cum illo congruens; sed rostro brevissimo triangulari, apicem versus attenuato et apice in medio leviter producto (nec emarginato), oculis valde demissis, antennarum funiculo gracili (articulo 3tio sequente vix longiore) clavaque latiore magis abrupta, necnon prothorace subconico et (una cum elytris) æquali ab *Anthribis* omnino discedit.

A τρίγωνον, triangulum, et ῥὶν, rostrum.

The insect described below is closely allied to *Anthribus*, but differs from the whole of Schönherr's Anthribideous genera in many important particulars,—amongst which its exceedingly short and triangular rostrum (which is wide behind, regularly attenuated anteriorly, and produced, or rounded, at its extreme apex, instead of being scooped-out), in conjunction with its sunken eyes, greatly abbreviated, abruptly-clubbed antennæ, subconical prothorax, and *even* surface, should be especially noticed. Amongst other points of its structure, I may remark that it has no trace whatsoever of the antebasal prothoracic costa, which is usually more or less apparent in these immediate Orthocerous groups, and that its antennæ have their third and fourth joints subequal in length, with their clava very wide and abrupt.

17. *Trigonorhinus pardalis*, n. sp.

T. breviter subcylindrico-oblongus, supra squamis nigris et flavo-cinereis demissis densissime variegatus; prothorace convexo, indistincte squamoso-maculato; elytris lætius maculatis, flavo-cinereis, punctis nigris rotundatis irroratis et utroque macula majore discali (fasciam transversam abbreviatam fractam communem efficiente) nigro-ornato; antennis rufo-ferrugineis, clava pedibusque nigrescentibus.

Long. corp. lin. $1\frac{3}{4}$–$2\frac{1}{4}$.

Two specimens of this insect were taken by Messrs. Gray and Clark during their day's sojourn at St. Vincent in December 1856; and I may add that it appeared to be identical with a species found by Mr. Clark at Blidah, in Algeria, during June of the same year, when I compared it hastily with an example in his collection some time ago. Whether a more critical examination, however, would prove the two to be absolutely conspecific, I have no means at present of ascertaining.

Fam. Coccinellidæ.

Genus Coccinella.

Linnæus, Syst. Nat. edit. 1 (1735).

18. *Coccinella 7-punctata*, Linn.

Coccinella 7-punctata, Linn., Fauna Suec. 477 (1761).

A single example of the universal *C. 7-punctata* was captured at St. Vincent by my nephew, F. W. Hutton, Esq., on the 11th of June, 1857.

[To be continued.]

XIV.—*Diagnoses of new Canarian Land-Mollusca.* By the Rev. R. T. Lowe, M.A.

The following new species were discovered by Mr. Wollaston and myself in the course of a few months' visit to all the different islands of the Canarian group in the early part of 1858. Several opportunities afforded me by Dr. Gray and Dr. Baird of consulting the original types in the British Museum of the species published by D'Orbigny in Webb and Berthelot's 'Histoire,' and a careful examination of authentic examples of Mr. Shuttleworth's subsequently described Canarian shells, accorded me with equal liberality and kindness by Hugh Cuming, Esq., enable me with some degree of confidence to offer these still more recent discoveries as genuine additions to the Canarian Molluscan fauna.

Helix (L.).

Group or § Lucilla, Lowe.

1. *H. putrescens.*

T. orbiculato-depressa discoidea large et subperspective umbilicata spadiceo-fusca nitida læviuscula, supra convexo-depressa obsolete et tenuiter crebristriolata, subtus nisi circa umbilicum lævior; spira plano-convexa apice albida, anfr. $5\frac{1}{2}$–6 convexiusculis arcte transversim obsolete striolatis, ultimo haud descendente, sutura distincta impressa; umbilico largo spirali aperto $\frac{1}{3}$ diam. maj. æquante; apert. oblique lunata subdepressa s. latiore quam alta; perist. recto simplici tenui acuto.

Diam. maj. 9–$9\frac{1}{2}$, min. $8\frac{1}{2}$–9, alt. 4–$4\frac{1}{2}$ mill. Anfr. $5\frac{1}{2}$–6.

Hab. sub truncis putrescentibus humidis in sylvis convallis Galgæ Ins. Palmæ rariss. Inv. T. V. Wollaston.

Perfectly distinct from its nearest ally, *H. textilis,* Shuttl.

§ Crystallus, Lowe.

2. *H. vermiculum.*

T. parvula orbiculato-depressa discoidea perforata ecarinata omnino vitrea nitidissima glabra; spira convexiuscula; anfr. $4\frac{1}{2}$–5 planiusculis lente v. æque crescentibus, ad suturam distinctam præsertim leviter v. obsolete striolatis; umbil. minimo cylindrico profundo vix subspirali; apert. transversa depressa oblique lunari; perist. recto simplici acuto.

Diam. maj. 5–6, min. $4\frac{1}{2}$–$5\frac{1}{2}$, alt. $2\frac{1}{2}$–3 mill. Anfr. $4\frac{1}{2}$–$5\frac{1}{4}$.

Hab. sub lapidibus ad villulam "La Dehesa" dictam prope Portum Orotavæ Ins. Teneriffæ.

Intermediate in some sort between its frequent companions in the above locality, *H. crystallina* and *H. cellaria,* Müll., having a much smaller umbilicus than the former, and more equably increasing volutions than the latter. It has one volution and a half less than *H. crystallina,* and one more than *H. cellaria* of the same size.

§ Euromphala, Beck.

3. *H. concinna.*

T. orbiculato-depressa arctispira convexiuscula obtuse angulato-carinata aperte et sat large perspectivo-umbilicata sericeo-nitidiuscula tota albo-cerina v. pallide subvirescens subpellucens, supra obsolete crebricostulata, subtus nisi circa umbilicum magis lævigata; spira convexiuscula, anfr. $7\frac{1}{2}$ convexiusculis lente crescentibus oblique transversim obsolete æquicostulatis, ult. subobsolete carinato, subtus circa umbilicum rotundato (nec angulato) distinctius costulato-striato, antice non descendente; sutura simplici distincta impressa; umbilico mediocri sat magno ($\frac{1}{4}$ diam. maj.) patulo spirali profundo, lateribus spiraliter scalatis, anfr. intus usque ad apicem perspicuis; apert. oblique lunata subdepressa latiore quam alta haud angulata; perist. simplici recto tenui acuto.

Diam. maj. 8, min. $7\frac{1}{4}$, alt. 4 mill. Anfr. $7\frac{1}{2}$.

Hab. in sylvis sub cortice truncorum putrescentium in loco "El Golfo" dicto Ins. Ferri. Inv. T. V. Wollaston.

Certainly distinct from *H. engonata* and *retexta,* Shuttl.; and equally so apparently from *H. scutula,* Shuttl. (Diagn. i. 5), of which, however, I have not seen a specimen.

§ Hispidella, Lowe.

4. *H. nubigena.*

T. umbilicata depressa orbiculato-subdiscoidea subcarinata subpellucida tenuiuscula hispidula fusca atro (intus) plerumque punctulata v. maculata; spira convexo-depressa, anfr. 4 convexiusculis, sutura distincta impressa; umbilico majusculo cylindrico subspirali profundo; apert. oblique lunato-ovali; perist. simplici tenui acuto.

Diam. maj. 5, min. $4\frac{1}{2}$, alt. $2\frac{1}{2}$ mill. Anfr. 4.

Hab. sub lapidibus ad radices "*Retamæ*" (*Cytisi nubigeni,* Ait.), in excelsioribus "Cumbre v. Cañadas" dictis montis "Pico de Teyde" Teneriffæ, Maio 1859, T. V. Wollaston.

An obscure insignificant species, without sculpture, and possessing no very distinctive or striking character of any sort: nearest undoubtedly to *H. hispida,* L., and its allies, but a little reminding one of *H. conspurcata,* Drap., from which, however, it is totally distinct.

None of my examples appear perfectly adult; but I am not acquainted with any Canarian species of which they can be the young; for it is perfectly distinct from the young of *H. hispidula,* Lam., for which it might easily be mistaken.

5. *H. deusta.*

T. orbiculato-convexa omnino adulta subgloboso-depressa obtusa carinata subobtecte perforata tenuis fragilis sericeo-nitens argute crebristriata rufescens fere concolor, aliquando strigellis albidis maculisque fuscis ad suturam carinamque fasciato-tessellatis indistinctis v. obscuris subvariata, subtus lævior immaculata; spira elevatiuscula plus minus depressa apice obtusissima, anfr. 5–5½ convexis arcte et tenuiter oblique striatis, ultimo haud descendente, carina antice evanida; sutura distinctissima valde impressa; perforatione minima semiaperta labro ad axin reflexo partim obtecta; apert. depressa transverse lunato-ovali duplo fere latiore quam alta; perist. recto simplici tenui acuto ad axin breviter reflexo.
Diam. maj. 8, min. 7½, alt. 5½–6 mill. Anfr. 5–5½.
Hab. in sylvis montosis editioribusque convallium Ins. Palmæ.

Of two authentic examples of *H. oleacea*, Shuttl., from Mr. Cuming's collection, one is most assuredly only the ordinary thin-shelled sylvan form (γ nob.) of *H. phalerata*, Webb (*H. nivariensis*, Shuttl.); of the other, in Mr. Wollaston's possession, examined somewhat cursorily, I can only say that it may be a legitimate *H. deusta.* Hence it is impossible to adopt Mr. Shuttleworth's name and diagnosis for the present shell, which it either excludes, or at most admits only incidentally, and not by direct or precise definition.

H. deusta itself may indeed well prove to be merely another variety or form of *H. phalerata*, Webb. But, besides its very different habit, it is distinguishable technically by its greater smoothness, especially beneath, by its obtusely rounded (often merely convex) spire and apex, less sharp keel, more discoidal shape or, at least, entire absence of conical outline, distinctly convex volutions, and plain brown colour—except sometimes a tessellated carinal band, and more rarely the faintest possible traces of others, placed as in *H. phalerata.*

§ Actinella, Lowe.

6. *H. torrefacta.*

T. orbiculato-depressa umbilicata subcarinata spiraliter striis sublamellatis argute et æqualiter filo-cincta, transversimque subtilissime et creberrime arcte striolata, albida fusco tessellatim fasciato-picta v. lentiginoso-maculata; spira convexiuscula, sutura valde distincta impressa, anfr. 4½–5 convexis, ult. antice descendente; umbil. parvo subspirali; apert. depressa transverse ovali labris approximatis v. continuis; perist. tenui simplicissimo.
Diam. maj. 5½–6½, min. 5–6, alt. 3¼–4 mill. Anfr. 4½–5.
Hab. in rupium facie aridissima aprica, sole occidentali calefacta, supra "Salinas" Ariæ ad oram septentrionalem Caurum versus

Ins. Lanzarotæ, in foraminulis superficialibus basalticis vesicularibus præsertim latitans.

The nearest ally of this very distinct and well-marked pretty little species is the Madeiran *H. lentiginosa.* The numerous fine thread-like or lamellar spiral striæ resemble those of the common sylvan Tenerifan *H. circumsessa,* Shuttl., which is, however, as distinct in habit as in *habitat,* belonging to the group *Lucilla.*

§ Discula, Lowe.

7. *H. pulverulenta.*

T. orbiculato-depressa umbilicata carinata solidiuscula concinniter crebristriata (nec granulata) cinerea fusco 1-2-fasciata fasciis sæpe interruptis tessellatis, supra lentiginosa; carina acuta simplici (nec limbata nec serrulata) submedia, supra expressa subsulcata; spira convexiuscula, anfr. 5 convexiusculis, sutura simplici (nec marginata) distincta antice præsertim impressa; umbil. parvo angusto, pariete subangulato abrupte declivi; apert. depressa oblique lunato-ovali; perist. simplici recto, labris subapproximatis interruptis.

Diam. maj. $6–7\frac{1}{2}$, min. $5\frac{1}{2}–7$, alt. $4–4\frac{1}{2}$ mill. Anfr. $4\frac{1}{2}–5$.

H. Argonautula, Webb et Berth. Hist. ii. 2, t. 2. ff. 13–15 (nec descriptionis, nec ff. 16–18, quæ veram *H. Argonautulam,* Webb, Syn. App. 21. no. 3, designant).

Hab. sub lapidibus in saxosis aridis apricis regionis "El Charco" dictæ prope Maspalomas in Canaria Magna australi, cum *H. Despreauxii* Orb. degens rarior.

Approaches nearest to *H. granostriata,* Mouss., in Hartung's 'Geolog. Verhältn. Lanzar. und Fuertev.;' but it is perfectly distinct in the want of granulated striæ, in the rather deeply hollow impressed suture, more convex volutions, and simply sharp not limbate keel. From *H. Argonautula,* Webb, and *H. setubalensis,* Morelet, it is constantly distinguishable by its raised (not flat tabellate) spire, its small narrow umbilicus, simple keel, and fine close-set even (not somewhat coarse, irregular and flexuose) striæ.

§ Turricula, Beck.

8. *H. Mirandæ.*

T. aperte perforata s. subumbilicata subconico-depressa v. depresso-trochiformis, carina media, utrinque fere æqualiter convexa, supra rugosa rudiuscula grosse oblique corrugato-costata, infra lævior æqualiter plicato-striata albida fusco 1-fasciata; spira subtectiformi-depressa parum elevata, anfr. 5 planiusculis obsolete bicarinatis, ult. carina superiore indistincta, inferiore media acuta grosse plicato-crenulata, sutura distincta obsolete subcrenulato-plicata; perforatione aperta distincta cylindrica nec coarctata; apert. depressa transversa oblique ovali extus (carina) subangulata; perist. simplici recto ad axin expansiusculo subreflexo, labris distinctis remotis.

Diam. maj. 7, min. 6, axis 4–5½ mill. Anfr. 5.

Hab. sub lapidibus in apricis Insulæ Gomeræ ad Portum S^ti Sebastiani, in collibus prope mare.

With a little of the aspect of my Desertan *H. laciniosa*, this is a close ally and kind of modified or toned-down representative of *H. Despreauxii*, D'Orb., from which, however, it is abundantly distinct in its altogether feebler, less marked or elegant sculpture, less prominent keels, coarse oblique ribs on the upper, and regular equidistant ring-like plaits on the lower side, larger open perforation, distinct brown narrow band beneath, and generally much more depressed shape.

Named after the yacht 'Miranda,' belonging to John Gray, Esq., with whom and Mr. Wollaston I enjoyed the opportunity of two or three days' botanizing in Gomera.

§ Iberus, Montf.

9. *H. Berkeleii.*

T. obtecte perforata lenticularis depresso-planata acute carinata, subtus subconvexior, utrinque scobinato-granulata scabra oblique substriata fusco-cinerea, supra carinam saturate 2- infra 1-fasciata; spira plano-convexiuscula, anfr. 4–4½ plano-convexiusculis, sutura simplici distincta, ult. supra carinam subsulcato, carina perinde superne expressa, antice valde deflexo; apert. lunato-ovali, perist. late reflexo plano-expanso tenuissimo fragillimo intus umbilicum penitus obtegente, labris parallelis subapproximantibus distinctis callo tenui aliquando junctis.

Diam. maj. 20, min. 17, alt. 7 mill. Anfr. 4–4½.

Hab. sub lapidibus in convallecula arida aprica inter "Juan Grande" et "Maspalomas" Canariæ Magnæ australioris.

Speciem rariss. inter nobiliores et pulchriores generis censendam amiciss. M. J. Berkeley, mycologo summo notissimoque dicavi.

I know no species with which this can be confounded. It is a highly curious and interesting addition to the very peculiar and striking though small and restricted group of *H. Gualtierana*, L., *Wollastoni*, Lowe, *scabriuscula*, Desh., &c.

§ Macularia, Alb.

10. *H. Plutonia.*

T. subobtecte perforata subgloboso-depressa distincte angulato-carinata, jun. acute carinata, supra argute scabro-striolata obsolete et exilissime granulata, subtus lævigata lucida (decorticata albo-cretacea antice v. supra carinam fuscescens); spira convexo-depressa, sutura parum impressa distincte marginata, anfr. 6 planatis, ult.

angulato-carinato antice rotundato haud aut vix descendente; apert. lunato-ovali labris remotis disjunctis; perist. subincrassato subreflexo ad axin subdilatato umbilicum partim obtegente.

Diam. maj. 24, min. 20, alt. 15 mill. Anfr. 6.

Hab. in torrente vulcanica (lava-stream) in convalle supra Portum "Pozo Negro" dictum Fuerteventuræ: v.m.

I could find only five or six dead and bleached examples of this very distinct species. Its only recorded Canarian near ally (except *H. saponacea*) is the Gomeran *H. Gaudryi*, D'Orb.

11. *H. saponacea.*

T. obtecte perforata orbiculato-depressa subtus convexior, jun. subcarinata, adulta vix aut obtuse angulata lucidiuscula exilissime granulato-scabra, subtus lævior pallidior circa axin opaco-albida, supra corneo-flavescens subpellucidiuscula anguste 3-fasciata; spira convexo-depressa, sutura distincta simplici (nec marginata), anfr. $4\frac{1}{2}$ vix convexiusculis, ult. obsolete angulato antice abrupte deflexo; apert. lunato-subquadrata labris remotis, inferiore rectiusculo stricto ad axin late albo-reflexo umbilicum penitus obtegente; perist. lato-reflexo plano albo, axin versus incrassato-calloso interdum plica relevata intus aucto.

Diam. maj. 17, min. 15, alt. 9 mill. Anfr. $4\frac{1}{2}$ vix 5.

Hab. sub lapidibus in sterilibus apricis Canariæ Magnæ australioris; sc. in excelsioribus (Pinetis) S^ti^ Bartholomæi, in submaritimis ad El Charco prope Maspalomas, Arguineguin, &c.

Resembling *H. Plutonia* in general shape and character, but smaller, flatter, without keel or margined suture, more regularly closely or distinctly scabrous, and with the umbilicus always completely closed in the adult shell. It connects the present group with the following, in which perhaps it might be placed.

§ Mycena, Alb.

12. *H. psathyra.*

T. *majuscula* depressa *obsolete v. haud carinata obsolete et subtiliter malleata tenuis fragilis lucida lævis* (juniore granulata) oblique crebristriata interstitiis hinc inde obsoletissime aliquando spiraliter interruptim striolatis fulvo- v. corneo-virescens *pallidiuscula* fusco pallide et obscure 4–5-fasciata, subtus fulvo-virescens; spira convexo-depressa, anfr. 5 planis, ult. obsoletissime aut non carinato antice *valde deflexo et pone labrum* valde et profunde *constricto-sulcato,* sutura subobsoleta; apert. oblique depressa deltoidea subsinuata; perist. latissime expanso-limbato plano tenui fragillimo pallide purpurascente v. albo ad basin *medio dilatato-calloso intus subprominente plano, labris convergentibus subapproximatis.*

Diam. maj. 22–24, min. 18–20, alt. 14–16 mill. Anfr. 5.

Hab. in Canaria Magna australiore, præsertim ad Mogan et Aldea de San Nicolas sub saxis in locis aridis apricis.

13. *H. Paivana.*

T. *parvula* solidiuscula depressa *distincte carinata malleata* lucidiuscula lævigata oblique distincte v. argute crebristriata interstitiis hinc inde obsoletissime spiraliter interruptim striolatis, *supra fusconigrescens* fasciis continuis obscuris, subtus fulvo-virescens; spira convexo-depressa, anfr. 4–4½ planiusculis, ult. *distincte carinato* antice deflexo, sutura distincta; apert. obliqua depressa deltoidea subsinuata; perist. latissime expanso-limbato plano tenui fragillimo purpurascente ad basin strictiusculo intus dilatato-calloso v. *horizontaliter subplicato* v. *excavato* albo, *labris subparallelis* disjunctis.

Diam. maj. 18–20, min. 16–17, alt. 12–13 mill. Anfr. 4–4½.

H. Bethencourtiana, Coll. Cum. (not Shuttl.).

Hab. in Tenerifæ convalle Sancto (Barranco Santo) ad villam S^m^ Crucem abunde, nec alibi.

Nomen in honorem Baronis Castello de Paiva, viri de gente Lusitanica nobilitate illustris, in rebus præsertim botanicis versati, necnon de omni scientia naturali animi studio eximiaque liberalitate bene merentis.

A very close ally to *H. psathyra,* but sufficiently distinct,—though more so, perhaps, in habit and aspect than is expressible in characters.

Of two distinct shells in Mr. Cuming's collection (one marked "*H. Bethencourtiana,* Shuttl., S^ta^ Cruz," the other simply "*H. Bethencourtiana*"), the first is merely a small, pale, thin-shelled form or var. of *H. Adansoni,* Webb; the latter is the present species.

14. *H. valverdensis.*

T. parvula subgloboso-depressa v. depressa tenuiuscula *obsolete v. haud carinata* lucidiuscula læviuscula *haud malleata* sed arcte et subobsolete tenuiter crebristriata et aliquando hinc inde obsoletissime reticulatim *subundulato-rugulosa subtilissime granulosa coffæacea fulvo- v. flavo-fusca subconcolor* fasciis continuis valde obscuris, *sutura angustissime albo marginata*; spira convexo-depressa, *anfr.* 4–4½ *planiusculis,* ult. sæpius haud carinato antice *paulo deflexo, sutura distincta*; apert. oblique *rotundato-ovali æquali*; perist. *simpliciusculo subincrassato-expansiusculo v. convexo-reflexiusculo angusto* albo, labris *æqualiter omnino arcuatis* subconvergentibus.

Diam. maj. 16–20, min. 15–17, alt. 12–16 mill. Anfr. 4–4½.

"*H. Gaudryi,* D'Orb., Pfeiffer," in Coll. Cuming! (not *H. Gaudryi,* D'Orb.).

Hab. in Ins. Ferro ad Villam Valverde in horto D^ni^ Isidro, ad alt. 2500 fere ped. sub dio humido, nec alibi.

A single example of this species, differing only in being slightly more depressed than usual in my numerous examples, is marked in Mr. Cuming's collection "*H. Gaudryi,* D'Orb., Pfeiffer," though it is certainly not *H. Gaudryi*, D'Orb., in Webb. and Berth. Hist. ii. 2. 57, t. 3. ff. 15–17. But though it would thus seem by its ticket to be the very shell described by Mr. Shuttleworth under the name of *H. Maugeana*, Shuttl., Diagn. 3. 32, it is neither properly "reticulatim-malleata," nor has it the last volution "antice subgibboso-inflatus." Hence *H. Maugeana*, Shuttl., can be only quoted as a doubtful synonym to the Valverde shell; having been either incorrectly defined, or founded possibly on some other really distinct example in the same collection marked "*H. Gaudryi*, D'Orb." besides the one marked "*H. Gaudryi*, D'Orb., Pfeiffer," examined by myself.

Nearly allied to *H. Paivana*, but certainly distinct.

15. *H. Manriquiana.*

T. parvula subglobulosa tenuiuscula *omnino ecarinata* lucido-nitens lævigata (nec granulata) *tota reticulatim malleata* et subtilissime obsoletissimeque *spiraliter hinc inde striolata*, striolis vel tenuissimis exilissimis creberrimis interruptis vix perspicuis, fulva v. furva *fasciis* 5 (raro 4, 3^{a} et 4^{ta} confusis) *distinctis* coffæaceo-fuscis continuis, *suprema ad suturam subtessellata*, rarissime unicolor fulva fasciis evanidis; *spira elevatiuscula*, sutura distincta, *anfr.* 5 *convexiusculis*, ult. antice deflexo; apert. oblique ovali simplici æquali; perist. simpliciusculo convexo-reflexo subincrassato angusto purpureo, labris subæqualiter arcuatis subconniventibus, basali strictiusculo simplici subdilatato plano-concavo v. subsulcato.

Diam. maj. 20–22, min. 16–18½, alt. 15–17 mill. Anfr. 5.

Hab. in æde Manriquiana et in fissuris rupium in convallibus ad Teror in Canaria Magna. Etiam in cavis Laurorum ad "Laureales," El Monte, Can. Magnæ, consors *H. sarcostomatis* β.

Nomen in honorem familiæ perillustris antiquæ Canariensis in Ins. præsertim Canaria Magna et Fuerteventura degentis, et imprimis in gratam recordationem D[ni] *Pedro Manrique de Lara y Cabrera*, qui in Ins. Fuerteventura nos nobilissime et amicissime hospitavit et expedivit.

H. consobrina, Fér., proxima, inter hanc et *H. sarcostoma*, Webb, quasi media.

16. *H. spumosa.*

T. imperforata *transverse v. oblique oblonga naticoidea* ruguloso-malleata *prætenuis* fulvo- v. furvo-flavescens, fasciis 4 inæqualibus fusco-nigrescentibus subinterruptis aliquando evanidis flavo-reticulata; spira *brevissima* conoideo-obtusa *parvula tertiam fere partem totius longitudinis æquante*, anfr. 4 *convexis*, ultimo maximo transverse oblongo *antice leniter descendente*; apert. *oblique ovali antice deorsum producta effusa* (cet. fere ut in *H. aspersa*, Müll.).

Diam. maj. 30–32, min. 15–16, alt. 30, spiræ alt. 10–12 mill. Anfr. 4.

Hab. in fissuris rupium in convalle "Barranco de Herradura" dicta, necnon inter saxa ad basin ascensus "las Vueltas" dicti ("Breña alta") inter Villam S^m Crucem et "La Banda" Ins. Palmæ.

Compared with its very near ally *H. aspersa*, Müll., which is, in fact, exactly intermediate between itself and *H. Mazzullii*, Jan, *H. spumosa* has a notably smaller and more depressed spire, only equalling one-third instead of nearly one-half of the whole height; the last volution has its transverse diameter much greater in proportion to its height, rendering the shell transversely oblong rather than globose, and the aperture more produced obliquely downwards anteriorly, or oval instead of rounded or circular. Lastly, the suture descends gradually instead of being abruptly deflexed anteriorly. But however difficult to distinguish from *H. aspersa*, Müll., by the shell alone, I am inclined to consider it a really distinct species, because, in addition to these characters of the shell, and the remote and isolated habitat, the animal has the singular property of throwing out, when captured, a quantity of mucous froth or bubbles, so as to become presently entirely enveloped in a mass of foam.

In further confirmation of this view, it should be noted that the true *H. aspersa*, Müll., occurs in no other island of the Canarian or Madeiran group, though within the last ten or fifteen years it has been introduced by some inconsiderate person into a garden at Funchal. Nor did I meet with it on the opposite coast of Africa at Mogador.

Lea Rectory, Jan. 15, 1861.

XV.—*On an Echinoderm new to Science, from Ireland.* By the Rev. Alfred Merle Norman, M.A.

[Plate IX. figs. 1–4.]

ECHINODERMATA. Fam. Priapulacidæ.

Genus Strephenterus*, n. g.

Forma cylindrica, antice truncata, infundibuliformis, sine tentaculis, postice subito acuminata, tentaculisque ornata. Intestinum longissimum multumque convolutum, maximam corporis partem penetrans, inde rediens per anum haud longe ab ore situm se effundit.

Echinoderm naked, cylindrical; mouth funnel shaped, unprovided with appendages; the posterior extremity ending in a point, and furnished with tentacular appendages. The intestine is very long, and descends in a spiral coil through at least two-thirds of the entire length of the animal; it is then reflected, and, returning to the fore part of the body, has its anal orifice situated not far from the anterior extremity.

* *στρέφειν*, to turn; *ἔντερον*, the intestine.

This genus is provisionally placed in the family Priapulacidæ. In the absence of tentacles around the mouth, and in their presence at the posterior extremity of the animal, *Strephenterus* resembles *Priapulus*; but in the latter genus the anal opening is situated in the filamentous pyramidal tail.

Strephenterus claviger, n. sp.

Os infundibuliforme. Corpus in medio glabrum, ad extremitates minutissime corrugatum, postice paucis tuberculis (microscopio modo visendis) sparsum, tentaculisque (20–30) claviformibus instructum.—Long. $1\frac{1}{2}$ unc., lat. $\frac{1}{4}$ unc.

Habitat sinum Bantry in Hibernia.

The mouth is funnel-formed. The body is smooth, except at the extremities, which are finely corrugated. On the hinder portion there are also a few microscopic tubercles scattered over the surface, and that extremity is furnished with from twenty to thirty club-shaped tentacular appendages.

These tentacular appendages are of peculiar construction. The longest and most fully expanded present the appearance of fig. 2. The club is somewhat spathulate; and about the centre of the upper half is seen a small round aperture, apparently opening into the interior; below this there are two projecting processes, one of which is larger than the other, and between the bases of these two processes is seen the rudiment of a third. Another state of the tentacles is shown in fig. 3, which is taken from one of the shorter tentacles—shorter because less expanded, or more probably less developed. Here there is no sign of the central opening; but the head seems to contain several pear-shaped bodies, one of which has a blackish central spot. On subjecting this tentacle to the compressorium, these pear-shaped bodies escaped, and appeared to be composed entirely of granular matter enclosed in thin sacs.

What purpose in the life of the animal can these posterior tentacles serve? Professor Forbes called attention to the same question with respect to the filamentous tail of *Priapulus*, the function of which Sars has suggested to be respiratory; it seems probable that the tentacles of *Strephenterus* perform a similar office. The opening in their heads would admit the water through the pedicels into the wide space that exists between the inner and outer tunics of the animal (see fig. 4); and on examining the inner tunic with the microscope, it is seen to be traversed by veins, while its outer surface (that of the upper portion, at any rate) is clothed with fine cilia calculated to produce currents and cause the water to pass gently over its delicate membrane. At the same time, the tentacles themselves may perhaps in some measure act as external branchiæ.

In the specimen described, the cloaca has been torn away from the anal opening by muscular contraction in death, and is lying in the body. A short distance above, is seen an opening in the integument (fig. 4), from whence the cloaca would appear to have been torn.

The total length of the expanded Echinoderm is $1\frac{1}{2}$ inch, the breadth $\frac{1}{4}$ inch.

Strephenterus claviger was taken in the autumn of 1858 in Bantry Bay.

EXPLANATION OF PLATE IX. figs. 1–4.

Fig. 1. *Strephenterus claviger* (Norman), slightly enlarged.
Fig. 2. A tentacle-head magnified, showing, *a*, the opening into the interior; *b* and *c*, supplemental processes.
Fig. 3. Another tentacle-head magnified, in which the pear-shaped bodies (*d, e, f*) are seen within the investing membrane.
Fig. 4. Internal organs of fore part of body: *g*, inner tunic; *h*, the funnel-formed mouth; *i*, the œsophagus; *k*, the cloaca of the intestine, which has been torn away from the anal aperture, *l*.

Sedgefield, co. Durham, Dec. 31, 1860.

XVI.—*On the Discovery of* Physa acuta (*Drap.*) *in England.* By the Rev. Alfred Merle Norman, M.A.

[Plate IX. figs. 5–9.]

Physa acuta (Draparnaud).

Physa acuta, Drap. Moll. T. et F. France, p. 55, pl. 3. f. 10, 11; Brard, Coq. Envir. Paris, p. 169, pl. 7. f. 5, 6; Brown, Illus. L. and F. Conch. Great Britain, pl. 3. f. 9, 10 (copied from Drap.).; Moquin-Tandon, Hist. Nat. Moll. T. et F. France, vol. ii. p. 452, pl. 32. f. 14–23, and pl. 33. f. 1–10; Michaud, Comp. Drap. Moll. France, pl. 16. f. 19, 20.*

?*Bulla rivalis*, Mat. and Rack. Trans. Linn. Soc. vol. viii. p. 126, pl. 4. f. 2; Mont. Test. Brit. Supp. p. 97.

?*Physa rivalis*, Turton, Man. L. and F. Shells, p. 128. f. 112 (copied from Mat. and Rack.).

Animal pinkish ash-colour, thickly sprinkled on all parts of the upper surface with black specks, those on the head being largest. Head bilobed in front and slightly expanded. Tentacles a little thickened towards their apices, and remarkable for having a black central line. Foot short, only reaching to the suture that divides the second from the third whorl, neither carinated nor acutely pointed behind. Mantle-edge bounded by the margins of the aperture of the shell, and not at all reflected

* The references given are only to those works that I have had an opportunity of consulting. For additional synonyms see Moquin-Tandon and 'The British Mollusca,' vol. iv. p. 146.

upon them; behind, it sends forth four (sometimes three) minute digitations, of which three, almost rudimentary, lie on the body; the fourth, somewhat larger, occupies the angle formed by the junction of the outer lip and body; in front, five or six short digitations are spread fan-fashion upon the reflected lip of the columella; one, two, or even three of these (those nearest the head) are often quite rudimentary. The armature of the lingual membrane does not differ materially from that of *P. fontinalis,* the denticles being similarly serrulate.

Shell long ovate, acute, thin, transparent, horn-coloured, and glossy; length $5\frac{1}{2}$ lines, breadth $2\frac{1}{2}$ to 3 lines. Whorls four and a half to five and a half, swollen, with longitudinal, curved, microscopic striolæ; suture deep. Mouth occupying about half the total length, apple-pip-formed, contracted above, slightly expanded and produced below; outer lip simple, acute; pillar-lip twisted, the swelling body-whorl projecting into and contracting the mouth above, while, below, the lip is strongly reflected upon the columella, and by its reflexion forms a distinct narrow umbilical chink.

The *Physa* from which the above description is taken has recently been met with in one of the water-tanks in the Botanic Gardens at Kew. Mr. Choules, the discoverer, to whom I am indebted for specimens, succeeded in tracing the species thence to its original habitat—a ditch in the immediate vicinity of London, whence it must have been introduced into the Gardens, attached to aquatic plants. I abstain from mentioning this locality, as Mr. Choules fears lest the rapacity of collectors should exterminate this interesting addition to our list of inland Mollusca.

The ordinary form of *Physa acuta* as found on the Continent differs considerably from our shell in being much larger, more solid, opake, greyish-white, and having the throat generally pinkish; the body-whorl is also less swollen, and the pillar-lip consequently less twisted. I have received, however, a form similar to our own from Mr. M'Andrew, who took it at Seville; and the same variety is among the West Indian shells of M. d'Orbigny's collection in the British Museum. It would seem to be Moquin-Tandon's variety γ. minor, which he thus distinguishes from the type—"Coquille plus petite, plus ventrue, mince, assez transparente." Many of our specimens are girt with fine, opake-white, spiral lines, thus evincing a tendency to opacity.

The *Bulla rivalis* of Maton and Rackett has of late years been regarded as an erroneously introduced West Indian shell. The description in the 'Linnæan Transactions,' however, sufficiently accords with *P. acuta* (to which shell, indeed, Moquin-Tandon has assigned it as a synonym); and the discovery of this species in Great Britain adds to the probability that it was previously taken in Hampshire. It is worthy of notice, moreover, that Montagu was well aware that *Bulla rivalis* was a common West Indian shell, and that, knowing this, he did not call in question the discovery of Mr. James Hay.

The shell brought by Mr. Sowerby from Anglesea, and erroneously named by him *Physa acuta*, has nothing to do with the present species, but is merely a produced form of *P. fontinalis*.

The recent addition to our lists of two freshwater Mollusca, *Sphærium pallidum* (Gray) and *Physa acuta* (Drap.), and the rediscovery in some abundance of *Vertigo alpestris* (Alder) in the Lake district—a shell of which only one British specimen was previously known, and the specific value of which had consequently been called in question—shows that the conchologist need not despair of novelties even in that well-worked branch of his hobby, land and freshwater shells.

My mentioning that I am indebted to the pencil of my kind friend Mr. Alder for the figures that illustrate this paper will at once assure zoologists that they are all that could be desired as regards correctness.

EXPLANATION OF PLATE IX. figs. 5-9.

Figs. 5 & 6. *Physa acuta* (Draparnaud), variety, front and back view of shell.
Fig. 7. The animal of the same, viewed from below; the digitations of the mantle are represented at their fullest expansion.
Fig. 8. Outline of head, viewed from above.
Fig. 9. Two denticles of the lingual membrane.

Sedgefield, co. Durham, Jan. 1, 1861.

XVII.—*Notes on Cambridge Palæontology**. By Harry Seeley.

[Plates V. & VI.]

I. *Some new Upper Greensand Bivalves.*

The following list is far from including all our local species: of several the fragments of casts yet obtained are not sufficient for description; these, with others not in Cambridge, would probably outnumber those enumerated.

It is with pleasure I acknowledge much kind assistance in forming the list, such as it is. Mr. Carter has allowed me constant access to, and the loan of specimens from, his rich collection; Mr. Farren, the careful collector and dealer, placed the con-

* In these notes it is intended to describe such new forms as have been met with in the country round Cambridge. They will include the formations from Middle Oxford Clay to Upper Chalk, and form an appendix to an intended memoir to illustrate Mr. Barrett's geological map.

tents of his drawers at my disposal; Mr. Liveing (M.A., St. John's Coll.) favoured me with all his rarer bivalves; and Dr. Cookson, whose cabinet has always been accessible to me, procured from Dr. Guest the loan of some beautiful specimens. To all these gentlemen I offer my sincere thanks.

Ostrea cunabula. Pl. V. fig. 1.

Shell oblong, slightly ovate. The right valve nearly flat; the left deeply hollowed like a cradle, the excavation extending under part of the hinge area; in general the interior line which supported the upper valve is remarkably rectangular. Hinge area triangular, bordered by a continuation of the collar, which projects above and surrounds the upper valve. Under side rugosely laminated and plicated in the minor degree. Upper valve excentrically and closely laminated; sometimes rather convex, and always more or less hollow internally between the hinge and muscular impression. Muscular impression on the left side ovate, below the middle of the shell, and touching the marginal thickenings. It is shallow and nearly smooth.

In the young state the shell appears, as seen behind the umbo of one specimen, to have been a little flat circle indistinguishable from the countless small things which occur on every fossil and on almost every nodule the bed contains. It is generally partly attached, and sometimes becomes deformed from want of space. One specimen commenced growth in the interior of a broken Radiolite, and impressed its shell into the prismatic cavities.

I know no Cretaceous Oyster with which this may be compared. It has relatives both in the Purbeck and Eocene, but too distant to require distinguishing.

Rare; gregarious. Coll. Dr. Guest, Dr. Cookson, Mr. W. Farren, and University.

Loc. Fen-Ditton and Cambridge*.

Ostrea lagena. Pl. V. fig. 2.

Ovate, narrow across the hinge area. The right valve flat, marked with very fine lines of growth; the left attached (throughout its length) and hollow, the hollow extending slightly under the hinge area. The right side is developed upwards, while the left is but a little thickened, thus making the (adult) shell wedge-shaped; the edge of the lower valve projects above the upper. Hinge area subquadrate, and bordered by a continuation of the projecting fringe. When the

* Where no locality is mentioned, the specimens are obtained from the immediate neighbourhood of Cambridge.

base is free, it shows indications of coarse plication. Muscular impression semicircular near the left side and below the middle of the shell. It is shallow, and marked with crescentic lines.

In partially grown specimens there is scarcely any hollow, the right side not being much elevated till a large size is attained; young specimens are also more elongated. In the full-grown form the sides are very massive, and the attached base exceedingly thin. The upper valve figured appears to have been a feeding-ground for limpets, one having excavated for itself a hollow in the shell; and in their foraging excursions they have so eroded it, that scarcely a trace is left of the lines of growth. This very distinct oyster has some resemblances to *O. cunabula* and to *O. Leymerii*. From the former it is distinguished by its attached mode of growth, spreading form, wedge shape, and muscular impression. Its hollow shell, wedge shape, &c., sufficiently distinguish it from the latter. If the upper part of the muscular impression in it were removed, D'Orbigny's figure of the interior of the *lower* valve of *Leymerii* might resemble an interior of the *upper* valve of *O. lagena*.

Very rare. Coll. University; J. Carter, Esq.; Mr. W. Farren. *Loc.* Ashwell and Cambridge.

Some Exogyræ show, on weathering, a cellular structure not unlike that in the principal layer of the Radiolite.

Pecten Barretti. Pl. VI. fig. 1.

Oval, slightly elongated, subequivalve, depressed. The upper valve rather inflated, the lower nearly flat. The left valve is ornamented with some forty-eight radiating, straight, rather depressed ribs, of which about a dozen are subordinate, the remainder nearly equal. All are imbricated; the imbrications are not in circles of growth. The spaces between the ribs in the centre are more than half the width, and at the sides more than the width of the ribs. It is on the anterior side, in these spaces, that the subordinate ribs are chiefly developed. The interstitial spaces are very finely striated—those in the centre longitudinally, and those of the sides obliquely—reminding one of *P. Aptiensis*. The posterior ear is marked with very fine, close, sharp transverse striations; the anterior ear has two series, one radiating from the umbo, the other parallel to the long diameter of the shell. On the flat valve the ribs appear less prominent and more numerous. There are subordinate ribs on the anterior side. All are imbricated.

This shell approaches very near to the *Pecten Espaillaci*, D'Orb., which appears to have existed with it. The chief distinctions are its transversely marked posterior ears, the interstitial radiations, greater number of ribs, and greater inflation of the left valve (and probably its smaller size). The radiations and posterior ear indicate its affinity with *P. Aptiensis*; but the great difference in the number of ribs, their square form, and the imbrications in irregular lines, the substitution of oblique markings on the anterior ear for radiations, and on the posterior ear for close transverse lines, sufficiently distinguish it. With *P. Robinaldinus* it has some distant affinity.

Rare. Collected by Mr. Perceval (Trin. Hall), to whom I am indebted for the use of it. University, Mr. Farren.

Hinnites trilinearis. Pl. VI. fig. 2.

Shell suborbicular; one valve flat, the other somewhat convex; both very thin and irregular. Ornamented with radiating ribs, which are closest on the flat valve. The ribs are ornamented with three longitudinal lines or keels, of which the middle one is generally the largest, and also with exceedingly close transverse striæ, which, from their delicacy, are seldom preserved. On the convex side the ribs number from fifteen to about twenty, and have intervening spaces, more than twice their own width, which are quite smooth. On the flat side are some twenty-five or more ribs, which are slightly smaller than those of the other valve. The cast shows in the intermediate spaces indications of each having had two or three striæ.

Small worn fragments of this species, which are not uncommon, may easily be mistaken for *Pecten Beaveri*, to which the shell, but for its irregular growth, would bear some resemblance. None of the specimens have the umbones perfect, or show trace of an ear.

Coll. University; J. Carter, Esq.; Mr. Farren, &c.

A very marked variety occurs which has good claims to be considered a distinct species. It is distinguished by having all the ribs much closer and higher, and those of the convex side nearly as wide as the intervening spaces; it also commonly has a striation in each interspace, and as many as five wide folds on each rib. On the flat valve the folds on the ribs are very obscure; the interspaces commonly have a single strong striation, and appear to have been finely striated transversely. I have provisionally marked it *Hinnites pectinatus*.

Rare. Coll. University; J. Carter, Esq.

Loc. Cambridge and Ashwell.

Arca (?) *sulcata.* Pl. VI. fig. 3.

Oblong, narrow at the posterior end; very inflated, small. Umbones level with the anterior side, and (apparently) recurved. Anterior side abrupt and rounding; the posterior sloping and compressed. From the top of the umbo descends a wide sulcation, which gradually widens until it equals, at the base, a fourth of the shell's length: it is nearer to the anterior than to the posterior end. The elevation which bounds it on the posterior side is more prominent than that on the anterior. The sulcus and adjacent part of the shell are greatly thickened internally, so that in the cast the hollow is very deep. From the under side of the umbo descends a ridge, which terminates at the point where the straight posterior end makes a right angle with the base.

The characters which have induced me to place this remarkable form provisionally with the Arks are its shape, posterior ridge, (apparently) straight hinge-line, and unsinuated pallial impression. The position of the muscular scars, the posterior of which is near the hinge-line, the angular bend in the pallial impression, and the dorsal thickening, might, with some of the foregoing, be thought sufficient characters to place it in or near to the Anatinidæ. Such a combination of characters would alone render its position perplexing; but between the anterior muscular impression and the bend which the anterior side makes with the hinge-line are two folds, reminding one of the *Rudistes*. Additional specimens may give its generic characters and affinities.

Unique. Collected by Mr. W. Farren.

Nucula subelliptica. Pl. VI. fig. 4.

Form subelliptical, slightly elongated, rather compressed. Umbones central; hinge-line on each side straight, equal, and similar. Lips smooth. Apical angle about 135°; width 7 lines; length 6 lines.

This species is intermediate in form between the *N. Vibrayeana* (D'Orb.) and *N. subrecurva* (Phil.); from the former it is distinguished by the elongated form, and from the latter by its width and similar sides.

Not common. Shell unknown. Coll. University; J. Carter, Esq.; Mr. W. Farren.

Nucula rhomboidea. Pl. VI. fig. 5.

Form a lozenge, slightly elongated, nearly symmetrical, compressed. The four sides nearly equal; angles, except the apical, rounded. There are indications of a lunule. Owing to the angle opposite the apical being rounded, as well as those at the ends, the halves of the base are not so straight as are those of the hinge. The specimens appear quite adult, and had the lips, which were smooth, much thickened.

This remarkable species, which approaches *N. Vibrayeana* (D'Orb.), is distinguished by its quadrilateral figure.

Very rare. Collected by Mr. W. Farren.

Perna oblonga. Pl. VI. fig. 6.

Shape elongated, rectangular, narrow, very moderately compressed. An inflation, often prominent, occurs along and near to the upper part of the anterior side. Posterior extremity rounded, rarely subangular. Hinge-line short and straight, making with the anterior side (not with the beaks) an angle of about (75° to) 90°, and with the posterior side some greater angle. The posterior side is generally gently curved, causing the shell to be widest in the middle. The beaks are generally very moderately curved outwards, sometimes not at all. The muscular impression is midway between the hinge and base, and rather large.

This species is no exception to the general variableness of *Pernæ*; but there is never any difficulty in recognizing the specific type. In one specimen both pairs of sides are parallel.

This species is intermediate between *P. subspathulata* (Reuss) and *P. lanceolata* (Geinitz), combining with the growth of the former the width of the latter. It is distinguished from *P. lanceolata* chiefly by its large apical angle and perpendicular form, and from *P. subspathulata* by its elongated figure.

Not uncommon. Cambridge and Ashwell. Coll. University; J. Carter, Esq.; Mr. W. Farren.

Perna semielliptica. Pl. VI. fig. 7.

Shape semi-elliptical, with the anterior side of the base rounded. Anterior side straight or hollowed in the byssal region. Hinge-line short, straight, uniting imperceptibly with the curve of the posterior side, and making with the anterior side a large angle (about 75° to 90°). In the half-grown state it is moderately inflated; but aged specimens have a very compressed aspect, owing probably to internal thickening of the shell. It is generally a fourth longer than wide, and has its greatest width midway between the hinge and base.

This species is intermediate between *P. Rauliniana* of D'Orb. and *P. subspathulata* (Reuss). From the former it is easily distinguished by its greater proportionate width and greater apical angle; and from the latter by the short hinge-line curving into the posterior side. Most of the half-grown specimens are marked by excentric folds. Muscular impression very elongated.

Not uncommon. Cambridge and Ashwell. Coll. University. J. Carter, Esq.; Mr. Farren.

Mr. Carter possesses a cast of the exterior of *Perna lanceolata* showing the shell to have been lamellar, like that of an oyster. The *Pernæ* appear to have commonly produced pearls in prodigious numbers. These are often met with detached, sometimes as large as peas: they mostly have a yellowish colour. The casts of shells are often marked in the lower part with radiations like the Unionidæ. But, besides the free pearls, pearls attached to the shell were far from uncommon, and in some individuals so numerous as to remind one more of artificial productions in the Chinese *Anodon* than of a natural growth. No nacreous specimens have been found which can satisfactorily be considered as attached pearls; but their impressions, left on phosphatic casts, are unmistakeable. They mostly occur on the upper part of the shell. The specimen figured (Pl. VI. fig. 6), collected by Mr. Blake (Caius Coll.), had sixty-five such pearls, and is a fine example of their occurrence.

Pholadomya decussata, var. *triangulata*.

Form triangular, subequilateral, somewhat rounded at the posterior extremity, inflated. The anterior and posterior outlines are nearly straight. The anterior side is abrupt, being bent at about right angles with the shell, and has descending from the umbo, and near to the hinge, an inflation, between which and the keel formed by the bend is a slight depression. The inflation of the shell from the anterior side to the posterior extremity is very much less than that from the umbones to the base. The umbones prominently recurved. Posterior side steadily rounded. The whole shell is ornamented with excentric folds with slight depressions between them: in the young state they are very narrow ribs. These are crossed by fine radiating ribs placed close together; they are not present on the truncated portion; and though, in the young state, extending over the remaining part, those of the posterior third become obsolete, with a diameter of about half an inch. One rib, however, near to the hinge-line descends to the base.

This fossil appears to be a dwarfed variety of *P. decussata* (Mant. sp.). All the specimens are about an inch in each diameter.

Rare. Coll. University; J. Carter, Esq.; G. D. Liveing, Esq.

Several free valves have been found of an attached bivalve, apparently of a new genus; but the lower valves have not yet been seen. There are two species.

The following characters are probably generic :—"Shell thin, attached, smooth or reproducing the sculpture to which it is fixed. Hinge-line straight. Posterior end gaping. The hinge has a ledge for lodging a tooth, ossicle, or internal cartilage. The anterior muscular impression is near the hinge; from it descends the pallial line in a curve to near the base; it is then bent back so as to form half a crescent, and continued along the shell at about one-third its width from the hinge."

These structures would appear to give it a place between the Tellinidæ and Solenidæ; but, as the internal characters were not quite clear, the shells are provisionally referred to *Anomia*, which externally they much resemble.

?*Anomia transversa*. Pl. VI. fig. 8.

Shell ovate, elongated, inflated. Umbo large, prominent, and inclining to the posterior end rather than central.

This species appears to have been attached to Pectens, and in such a way that all the specimens I have seen (five) reproduce the plications at right angles to their long diameter. As the shells increased in size, the lower valve probably became free at its margin, for the margin of the upper one is smooth. Attached by the left valve.

Rare. Coll. University; J. Carter, Esq.

The other species is smooth and more elongated.

Trigonia Hunstantonensis *. Pl. VI. fig. 9.

Form an ovate rectangle, narrow at the posterior end; compressed. Ornamented by rows† of large tubercles, which are oblique and not strictly parallel. They also form rows at right angles with these. Between those in the antero-posterior direction the spaces are much wider than between the rows from hinge to base. The tubercles do not appear to have extended beyond the pallial line. There are faint traces of a posterior area, the line marking which descended from the posterior side of the umbo, curved below the muscular impression, and continued horizontally to the edge (fig. 9 *a*). It was probably marked with a few narrow ridges parallel to the hinge-line.

The cast would indicate a thin shell marked with close regular

* Hunstanton is pronounced by the natives Hunston; the specific name might be similarly shortened.

† In the cast there are five or six rows; but the shell probably had more than twelve.

lines of growth,—though it probably thickened with age; for casts of large specimens show no indications of tubercles.

The general resemblances come near to *T. Fittoni* (Desh.); but the crenulated ridges of that species are not to be confounded with the tubercles of this. The tubercles remind one of *T. rudis* (Park); but their arrangement, and the shape of the cast, which is a third longer than wide, and has the base but slightly curved, render identification easy. On the casts are thin films of pyrites.

Length $2\frac{3}{16}$ inches; width $1\frac{8}{16}$ inch; through the valves $\frac{12}{16}$ inch.

Red limestone, near Hunst'on*.

Coll. Dr. Cookson. Four specimens were obtained.

The following species have not previously been noticed in the Upper Greensand of England:—

Ostrea semiplana (*Mant.*).
—— macroptera (*Sow.*).
Exogyra laciniata (*Nilss.*).
Plicatula pectinoides (*Sow.*).
Perna subspathulata (*Reuss*).
—— lanceolata (*Geinitz*).
—— Rauliniana (*D'Orb.*).
Nucula albensis (*D'Orb.*).
—— simplex (*Desh.*).
—— ovata (*Mant.*).
—— bivirgata (*J. Sow.*).
Leda solea (*D'Orb.*).
?Venericardia tenuicostata (*Sow.*).
?Scrobicularia phaseolina (*Phil.*).

All from the immediate neighbourhood of Cambridge.

EXPLANATION OF PLATES V. & VI.

Pl. V. *Fig.* 1. *Ostrea cunabula*, from specimens in the collection of Dr. Guest. The figure of the lower valve is from a dead shell; a small oyster has commenced growing on the inner margin.

Fig. 2. *Ostrea lagena*, a fine specimen from Ashwell. Though the valves were united and close, several oysters were found attached to the interior.

Pl. VI. *Fig.* 1. *Pecten Barretti*. This specimen has a hole, apparently drilled by some carnivorous Gasteropod. It is the only shell so perforated which we observed. Upper, under, and side views.

Fig. 2. *Hinnites trilinearis*, upper and under views.

Fig. 3. ?*Arca sulcata*, enlarged and natural size.

Fig. 4. *Nucula subelliptica*.

Fig. 5. *Nucula rhomboidea*.

Fig. 6. *Perna oblonga*; a full-grown specimen.

Fig. 7. *Perna semielliptica*; a young individual, in the collection of Mr. Carter.

Fig. 8. *Anomia? transversa*; a rather small specimen, in the collection of Mr. Carter.

Fig. 9. *Trigonia Hunst'onensis*; a young individual.

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* In a paper recently read before the Cambridge Philosophical Society, an attempt was made by the Author to show the relation of the so-called Red Chalk to the Upper Greensand; and, as a subordinate member of that formation, it was proposed to name it the Hunst'on Limestone.

XVIII.—*On some new Species of* Eulima, Leiostraca, *and* Cerithiopsis *from Japan.* By Arthur Adams, F.L.S. &c.

Genus Eulima, Risso.

The smaller species of *Eulima,* I believe, have never been very minutely examined. Only a few species have hitherto been detected in the China Sea, and none are recorded from the Sea of Japan. From the similarity of form and colour (subulate and white) common to all the species, and from the entire absence of sculpture, the study of this genus is very difficult; and the specific differences can only be appreciated by making careful outlines of all the species. The only division I could have made in the twenty-one species here indicated would have been into *straight* and *flexuous*; but this being quite an arbitrary character, I have not adopted it.

1. *Eulima robusta,* A. Adams.

E. testa pyramidato-subulata, flexuosa, apice recurvato; anfractibus convexiusculis, ultimo magno, obliquo, ad basin rotundato, suturis marginatis; apertura ovata, producta; labio superne incrassato; labro arcuato. Lactea, semiopaca.

Hab. Mino-Sima; 63 fathoms.

2. *Eulima clavula,* A. Adams.

E. testa acuto-pyramidali, apice postice inclinato; anfractibus 8, planatis, suturis marginatis; anfractu ultimo lato, ad peripheriam vix angulato, ad basin obliquo; apertura parva, ovata, effusa; labio incrassato. Lactea, solidiuscula, opaca.

Hab. Mino-Sima; 63 fathoms.

3. *Eulima pinguicula,* A. Adams.

E. testa acuto-pyramidali, arcuata, apice antrorsum inclinato; anfractibus 8, convexiusculis, ultimo magno, obliquo, ad peripheriam obtuse angulato, ad basin perobliquo; apertura parva, porrecta, ovata; labio tenui, arcuato. Lactea, solida, opaca.

Hab. Mino-Sima; 63 fathoms.

4. *Eulima curvata,* A. Adams.

E. testa subulata, arcuata, tenui, antrorsum inclinata; anfractibus 7, planatis; anfractu ultimo elongato, antice producto; apertura elongato-ovali; labio tenui, curvato. Alba, opaca, solidiuscula.

Hab. Mino-Sima; 63 fathoms.

5. *Eulima mundula,* A. Adams.

E. testa subulata, tortuosa; spira lateraliter curvata; anfractibus 9, convexiusculis, ultimo amplo, ad basin obliquo; apertura ovata, producta; labio incrassato; labro arcuato, vix inflexo. Lactea, subopaca.

Hab. Tsu-Sima; 16–26 fathoms.

6. *Eulima stylata*, A. Adams.

E. testa subulata, vix flexuosa; spira lateraliter curvata; anfractibus 8, planatis, suturis obsolete impressis; anfractu ultimo elongato; apertura oblonga, antice producta; labro arcuato. Alba, opaca.

Hab. Mino-Sima; 63 fathoms.

7. *Eulima acicularis*, A. Adams.

E. testa subulato-pyramidali, postice subrecurvata, apice obtuso; anfractibus 7, planatis, ultimo ad peripheriam angulato; apertura subrhomboidea; labro in medio angulato. Alba, semiopaca.

Hab. Mino-Sima; 63 fathoms.

8. *Eulima flexa*, A. Adams.

E. testa subulata, flexuosa; spira lateraliter et deinde postice inclinata; anfractibus circa 12, planatis, suturis obsoletis; aufractu ultimo elongato, rotundato; apertura ovata, postice acuminata; labio tenui. Lactea, semiopaca.

Hab. Mino-Sima; 63 fathoms.

9. *Eulima pandata*, A. Adams.

E. testa subulata, gracili, flexuosa; spira lateraliter inclinata; anfractibus 8, planatis, ultimo elongato, antice producto; apertura oblonga, antice dilatata; labio tenui; labro arcuato. Lactea, semiopaca.

Hab. Korea Strait; 46 fathoms.

10. *Eulima reclinata*, A. Adams.

E. testa subulato-pyramidali; spira acuta, postice recurva; anfractibus 6, planatis, ultimo magno, elongato, ad peripheriam vix angulato; apertura oblonga, antice producta; labro in medio subangulato. Lactea, opaca.

Hab. Tsu-Sima; 26 fathoms.

11. *Eulima stenostoma*, A. Adams.

E. testa subulato-pyramidali; spira postice inclinata; anfractibus 7, planatis, ultimo elongato, magno, ad basin perobliquo et producto; apertura angusta, oblonga; labio tenui, rectiusculo; labro subinflexo. Alba, vitrea, semipellucida.

Hab. Tsu-Sima; 26 fathoms.

12. *Eulima semitorta*, A. Adams.

E. testa subulata, subflexuosa; anfractibus 10, planatis, ultimo elongato, ad peripheriam rotundato; apertura ovata, postice acuta, antice producta et dilatata; labio tenui, arcuato. Alba, rufo tincta, tenui, semipellucida.

Hab. Tsu-Sima; 26 fathoms.

13. *Eulima eburnea*, A. Adams.

E. testa subulata, flexuosa; spira recurva; anfractibus 8, planatis, ultimo magno, lato, rotundato; apertura ovata, acuta; labio rectiusculo; labro arcuato. Eburnea, solida.

Hab. Tsu-Sima; 26 fathoms.

14. *Eulima dentaliopsis*, A. Adams.

E. testa subulato-pyramidali, recta, apice subobtuso; anfractibus 9, planatis, suturis distinctis; anfractu ultimo ad peripheriam angulato; apertura ovata; labio tenui; labro in medio arcuato. Alba, vitrea, semipellucida.

Hab. Korea Strait; 46 fathoms.

15. *Eulima angulata*, A. Adams.

E. testa pyramidato-subulata, flexuosa, apice recurvato; anfractibus 11, planatis, ultimo angulato; apertura brevi, ovata; labio incrassato, brevi, recto; labro in medio angulato. Alba, opaca, solida.

Hab. Tabu-Sima; 25 fathoms.

16. *Eulima valida*, A. Adams.

E. testa subulata, recta; anfractibus 10, planatis; anfractu ultimo et penultimo varicosis, anfractu ultimo rotundato; apertura oblonga, antice producta; labio brevi, incrassato; labro arcuato. Alba, opaca, solida.

Hab. Mino-Sima; 63 fathoms.

17. *Eulima odontoidea*, A. Adams.

E. testa subulata, subflexuosa; spira attenuata; anfractibus 10, planatis, ultimo amplo, rotundato; apertura ovata, antice producta et angustata; labro producto ac arcuato; labio brevi, tenui, curvato. Lactea, semiopaca.

Hab. Mino-Sima; 63 fathoms.

18. *Eulima chrysallida*, A. Adams.

E. testa subrimata, ovato-subulata, in medio incrassata, recta, apice vix inclinato; anfractibus 11, convexiusculis, suturis marginatis; anfractu ultimo rotundato; apertura ovata; labio tenui, rectiusculo; labro margine in medio producto. Alba, solida, semiopaca.

Hab. Mino-Sima; 63 fathoms.

19. *Eulima debilis*, A. Adams.

E. testa brevi, subulata, recta; anfractibus 7, planatis, ultimo elongato, ad basin dilatato; apertura ovata; labio tenui, vix curvato; labro margine producto ac arcuato. Semipellucida, tenui, vitrea.

Hab. Mino-Sima; 63 fathoms.

20. *Eulima indeflexa*, A. Adams.

E. testa pyramidato-subulata, recta; anfractibus 10, planatis, suturis marginatis; anfractu ultimo magno, rotundato; apertura ovata, antice dilatata; labio regulariter curvato; labro margine dilatato et in medio arcuato. · Alba, opaca, solida.

Hab. Mino-Sima; 63 fathoms.

21. *Eulima scitula*, A. Adams.

E. testa subulata, ad basin dilatata, vix flexuosa; spira lateraliter inclinata; anfractibus 9, planatis, ultimo rotundato, in medio dilatato, ad basin obliquo; apertura ovata; labio arcuato. Alba, tenui, semipellucida.

Hab. Tabu-Sima; 25 fathoms.

Genus Leiostraca, H. & A. Adams.

1. *Leiostraca turgidula*, A. Adams.

L. testa subulata, recta, in medio turgida, sordide alba, opaca; anfractibus 8, convexiusculis, ultimo subventricoso, antice angustato ac producto; apertura elongata, antice et postice angusta.

Hab. Tsu-Sima; 16 fathoms.

2. *Leiostraca lanceata*, A. Adams.

L. testa subulata, recta, teretiuscula, sordide alba, opaca; anfractibus 9, convexiusculis, ultimo elongato; apertura oblongo-ovata, antice dilatata, postice angustata; labio subincrassato, antice everto.

Hab. Korea Strait; 46 fathoms.

3. *Leiostraca nixa*, A. Adams.

L. testa subulata, antrorsum inclinata, albida, pellucida, anfractibus 9, planatis, linea rufa interrupta ad suturas ornatis; anfractu ultimo ad basin rufo tincto et in medio linea rufa interrupta cincto; apertura elongato-ovata.

Hab. Mino-Sima; 63 fathoms.

4. *Leiostraca Leachii*, A. Adams.

L. testa subulata, recta, teretiuscula, semipellucida; anfractibus 8, planatis, ultimo magno, elongato, subventricoso; apertura elongato-oblonga, antice valde producta ac angustata, postice angustata.

Hab. Mino-Sima; 63 fathoms.

5. *Leiostraca spiculum*, A. Adams.

L. testa parva, subulata, antrorsum subinclinata, alba, semiopaca, obsolete rufo fasciata; anfractibus 6, planatis, ultimo elongato et antice producto; apertura angusta; labro subinflexo.

Hab. Mino-Sima; 63 fathoms.

6. *Leiostraca paxillus*, A. Adams.

L. testa subulata, recta, alba, opaca; anfractibus 6, planatis, suturis latis marginatis; anfractu ultimo mediocri; apertura elongata, antice dilatata; labio antice effuso.

Hab. Mino-Sima; 63 fathoms.

7. *Leiostraca pura*, A. Adams.

L. testa elongato-subulata, recta, semiopaca, lactea; anfractibus 10, planatis, suturis pellucidis late marginatis; anfractu ultimo elongato, angustato; apertura oblonga, postice angustata, antice producta; labio antice subreflexo.

Hab. Tsu-Sima; 26 fathoms: Mino-Sima; 63 fathoms.

8. *Leiostraca nivea*, A. Adams.

L. testa subulata, recta, in medio turgidula, lactea, semiopaca; anfractibus 10, planatis, suturis latis marginatis; anfractu ultimo tumidulo; apertura oblongo-ovata, antice dilatata et producta; labro valde arcuato et in medio producto.

Hab. Tsu-Sima; 26 fathoms.

9. *Leiostraca clara*, A. Adams.

L. testa subulata, recta, apice rubro tincto, alba, translucida; anfractibus 10, planatis, suturis latis indistinctis; anfractu ultimo elongato; apertura angustiore, antice dilatata.

Hab. Mino-Sima; 63 fathoms.

10. *Leiostraca labiata*, A. Adams.

L. testa parva, subulata, recta, semiopaca, sordide alba; anfractibus 6, convexiusculis, ultimo magno, valde elongato; apertura oblonga, antice dilatata; labro in medio valde producto ac arcuato.

Hab. Mino-Sima; 63 fathoms.

11. *Leiostraca clavella*, A. Adams.

L. testa parva, subulata, recta, albida, subopaca, gracili, apice obtuso; anfractibus 6, planatis, suturis impressis; anfractu ultimo mediocri; apertura ovata, antice dilatata.

Hab. Sado; 30 fathoms (Nullipore).

12. *Leiostraca nitida*, A. Adams.

L. testa parva, subulata, recta, alba, opaca; anfractibus 8, planatis, ultimo subvaricoso, ad peripheriam subrotundato; apertura oblonga, antice producta; labio subincrassato, antice reflexo.

Hab. Okosiri; 35 fathoms.

Genus Cerithiopsis, Forbes.

I have described the following little shells as species of *Cerithiopsis*; but, without an examination of the animals, it is impossible to distinguish them from the Cerithideous group named *Bittium* by Dr. Leach. With them I have associated some shells regarded by me formerly as dextral *Triphorides*, but which I now consider to be nearer allied to *Cerithiopsis*, from which they are distinguished by a prolongation of the fore part of the aperture, and by their whorls being crenulate instead of cancellate.

1. *Cerithiopsis rosea*, A. Adams.

C. testa rosea, subulato-turrita; anfractibus $8\frac{1}{2}$, convexis, costellis longitudinalibus et liris transversis cancellatis, anfractibus liris duabus (in anfractu ultimo tribus) instructis, basi lævi; apertura rotundata, antice emarginata; labio brevi, recto, antice oblique truncato.

Hab. Tsu-Sima; 16 fathoms.

2. *Cerithiopsis cerina*, A. Adams.

C. testa subulato-pyramidali, gracili, sordide alba, quasi cerea; anfractibus circa 14, planiusculis, liris subtuberculatis transversis quatuor (interstitiis valde punctatis) instructis; anfractu ultimo basi plano; apertura ovata, canale brevi sinistrorsum directo; labio tortuoso; labro intus sulcato.

Hab. Mino-Sima; 63 fathoms.

3. *Cerithiopsis baculum*, A. Adams.

C. testa subulata, gracili, pallide brunnea; anfractibus circa 13, convexiusculis, costellis longitudinalibus et liris transversis valde cancellatis, liris in anfractu ultimo tribus, in cæteris singulis duabus; apertura subquadrata, canale brevi; labio brevi, recto, oblique truncato; labro in medio obtusim angulato.

Hab. Mino-Sima; 63 fathoms.

4. *Cerithiopsis clavula*, A. Adams.

C. testa subulato-pyramidali, pallide fusca; anfractibus circa 14, convexiusculis, costellis longitudinalibus et liris transversis valde cancellatis, anfractibus liris tribus (in anfractu ultimo quatuor) instructis, liris ad costas nodulosis; basi lævi; apertura subquadrata, antice emarginata; labio brevi, recto; labro margine rectiusculo.

Hab. Mino-Sima; 63 fathoms.

5. *Cerithiopsis paxillus*, A. Adams.

C. testa subulata, apice subobtuso, sordide alba; anfractibus 12, planiusculis, costellis longitudinalibus et liris transversis regulariter clathratis, liris in anfractu ultimo tribus, in cæteris singulis duabus; anfractu ultimo basi liris spiralibus tribus instructo; apertura subquadrata, canale brevi; labio brevi, recto, antice oblique truncato; labro vix effuso, margine antice subeverso.

Hab. Korea Strait; 46 fathoms.

6. *Cerithiopsis pagodula*, A. Adams.

C. testa subulato-pyramidali, pallide fusca; anfractibus circa 12, convexis, costellis longitudinalibus et liris transversis regulariter cancellatis, liris in anfractibus 11 duabus (in anfractu ultimo tribus); anfractu ultimo ad peripheriam biporcato; apertura subquadrata, canale brevi; labio curvato, oblique truncato.

Hab. Korea Strait; 46 fathoms.

Subgen. Seila, A. Adams.

Testa subulata, gracili; anfractibus spiraliter liratis, interstitiis sculptis; apertura canale brevi instructa.

This small section is founded on *Triphoris dextroversus*, Adams & Reeve, and an allied new species. In form and general aspect they certainly resemble some species of *Triphoris*; but they are both dextral, and do not possess the closed canal of that genus. They differ from the other species of *Cerithiopsis* in being transversely lirate, and not ribbed or cancellated.

7. *Cerithiopsis* (*Seila*) *dextroversa*, Adams & Reeve. *Triphoris dextroversus*, Adams and Reeve, Voy. Sam. Zool. (pl. 11. fig. 31).

Hab. Tsu-Sima; 16 fathoms: Korea Strait; 46 fathoms.

8. *Cerithiopsis* (*Seila*) *cingulata*, A. Adams.

C. testa subulato-pyramidali, griseola; anfractibus planatis, cingulis tribus transversis elevatis simplicibus (7 in anfractu ultimo), interstitiis creberrime longitudinaliter striatis; apertura subquadrata, antice breviter canaliculata; labio brevi, crasso, oblique truncato; labro effuso, in medio vix producto.

Hab. Tsu-Sima; 16 fathoms.

Ta-Lien-Whan, China,
July 20, 1860.

BIBLIOGRAPHICAL NOTICES.

A History of Infusoria, including the Desmidiaceæ and Diatomaceæ, British and Foreign. By ANDREW PRITCHARD, Esq., M.R.I. Fourth Edition, enlarged and revised by J. T. ARLIDGE, M.B., B.A. Lond.; W. ARCHER, Esq.; J. RALFS, M.R.C.S.L.; W. C. WILLIAMSON, Esq., F.R.S.; and the Author. Illustrated by Forty Plates. London: Whittaker & Co., 1861.

IN no department of natural history have so many and such important revolutions been effected of late years as in that which treats of the minute forms of animal and vegetable life. In other branches of science, the application of more comprehensive views than previously existed, and the consequent improved systems of classification, had already established a solid basis whereupon each new fact and discovery could with ease and safety be engrafted. But in the case of certain large groups of organisms belonging to the minute world, our information has, even up to the present time, been undergoing such a continuous process of transition, that it has become extremely difficult, if not absolutely impossible to render any work, comprehending the whole field of microscopic natural history, conformable at every point with the latest state of our knowledge. Were every work of this kind to be withheld until each separate department of science discussed in its pages had received the last finishing touches imparted by monograph writers to their own special subjects, the chances are that the shelves of the publisher would never be relieved of their burden, and that those who labour so diligently to supply the student with the information he thirsts after would speedily become bankrupt in zeal, in the power to do good, and, last, but unfortunately not least, in that gross element in the absence of which any enterprise, whether purely commercial or scientific, can hardly be expected to succeed.

Under this view of the case (and it is the only rational one, as far as we can judge), we hail the appearance of the fourth edition of Pritchard's 'History of the Infusoria' as supplying a distinct want, and placing before the lovers of microscopic literature, in a condensed but most lucid form, the whole of the reliable information collected by writers both at home and abroad.

In retaining a title which militates somewhat against the latest systems of classification, Mr. Pritchard has simply accepted the least objectionable of two alternatives; for the most cursory perusal will show that, whilst it has been found expedient to retain the commercial value which has gradually accumulated, as each succeeding edition of the work was published, by adherence to its original designation, the doing so has not interfered in the slightest degree with the completeness of the information conveyed under each distinct heading. Indeed, it is only necessary to glance at the names of the coadjutors who have so ably assisted the author, to guarantee this fact.

Mr. Pritchard tells us, in his preface, that he proposes to lay before his readers a "*résumé*" of the present state of our knowledge of the multitude of living beings called "*Infusoria*"—a term employed by Ehrenberg to include a wide range of animal and vegetable life, but now restricted in a great measure, and specially confined, by Dr. Stein and MM. Claparède and Lachmann, to denote the ciliated members of the group of *Protozoa*; and he adds that, as the former editions of the work have included the *Rotatoria*, together with a history of the *Bacillaria*, *Phytozoa*, and *Protozoa*, *under the name of Polygastrica*, he has felt it incumbent on him to retain these groups, although the researches of late years have so extended our acquaintance with them, that much difficulty has been experienced in the attempt to comprise the whole in a single volume, so necessary for a practical manual.

In the first portion of the work is comprised an immense mass of valuable information regarding the general history of the minute forms of the animal and vegetable worlds, derived from the published researches of almost every British and Continental authority. With reference to this section of the volume before us, we can safely say we have rarely met with a more comprehensive and ably arranged "*résumé.*"

The second portion, which enters into special descriptions of the separate families, genera, and species, furnishes us, for the first time in a collected shape, with notices of a large number of new or very imperfectly known forms, hitherto dealt with only in monographs for the most part inaccessible to the student. And lastly, Mr. Pritchard has enhanced the usefulness of his work by the addition of no less than twenty-one admirably executed plates containing figures of all the most novel and important accessions in each department treated of.

We have no hesitation, therefore, in recommending the 'History of the Infusoria' to all who are anxious to possess a really standard work of reference on the minute forms of animal and vegetable life.

Cybele Britannica; or, British Plants and their Geographical Relations. By Hewett Cottrell Watson. Vol. IV. Longman & Co., 1859.

[Second notice.]

At the beginning of the tenth chapter it is urged that no comparisons should be attempted as to the number of species found in different countries, unless due care be taken that the areas contrasted be themselves equal. Other conditions being the same, the smaller the district, the more numerous, *relatively*, is the flora found upon it, but the less similar the plants, because they represent more orders and genera in proportion to the absolute number of species: this shows that original centres of creation are more likely for species, than for orders and genera (p. 399).

It is well known that no two countries, unless very small and adjacent tracts, present the same flora. The differences between the two are more in *species* than in *genera*, more in *genera* than in *orders*.

Moreover, these differences may be positive or negative; that is, they may depend upon the presence or absence of certain species. It is very desirable that increased attention be paid to the latter point, which is so often neglected.

The British flora is not remarkable for the possession of many species peculiar to itself. Mr. Watson tells us that the flora of Britain is, with very few exceptions, a simple fragment of the European, and has, on that account, been too readily considered as derived from the European continent. Our author says (p. 386), "It is likely enough that many species have reached the present surface of Britain by a migration from East to West; but it is not to be too hastily assumed that migration has been exclusively in the one longitudinal course.........other species may have spread from West to East. Looking at the present distribution of the European flora, a gradual migration eastward seems as well supported by facts as is a like migration westward. Britain is no exception: there are western species quite absent from the eastern side of Britain; there are species much more prevalent on the western side of our island; and there are many plants found in Britain and western Europe which have early limits eastward on the continent." We believe especial stress should be laid upon the principle expressed in the last sentence, and that it is to a proper observation of the direction and degree of "thinning-out" of species that we must look for forming any opinion upon their probable original home or metropolis. Such seems the course advocated by Mr. Watson (at pp. 442 and 452) when he recommends including in our estimate "all the species of a flora, and placing them fairly under the same arrangements, tests, and aspects," and tells us that "the truest line of eastern and western species would be made out by selecting them in accordance with any decided predominance on the one side, though not absolutely restricted thereto." From this point of view, the question of assigning the species to their respective "types of distribution" rises greatly in importance. "The northern and southern tendencies are far more obvious than those in relation to longitude; even at the present time southern plants appear to be extending northwardly within the limits of our own island, chiefly perhaps through the agency of man:" but the thinning-out northwards becomes still more evident if we turn to the respective numbers of the three floras, which are given (at p. 455) as—*South Britain* 1280, *Mid Britain* 1148, *North Britain* 930; whereas *West Britain* has 1305 species against the 1355 of *East Britain*. Of these, 50 are western exclusively, and 120 peculiar to the east side of Great Britain. Similarly, "*South Britain*" has 209 peculiar species, "*North*" and "*Middle Britain*" together 139. This is further shown by the distribution of the local species (p. 443, &c.); for out of 77 plants restricted to a single "subprovince," *South Britain* has 44, *Mid* and *North Britain* together 33. So, of the 111 plants peculiar to a single "province," 76 belong to *East Britain*, against 35 in *West Britain*. "The most local species tend in three directions; namely, to the south-east of England, to the south-west of England, and to the Highlands. In other words, the very local plants are australs and arctics, with some very few others, scattered elsewhere" (p. 445).

"The number of species common to Great Britain and to countries more southward is greater than the number of those common to Britain and countries more northward. The floral resemblance, however, is greater with the northern countries, because these latter commingle with them a less number of non-British species" (p. 387).

"Regarding the British Isles collectively, the *most distinctive* peculiarities in their flora are found *on the western side*." The Irish *Spiranthes gemmipara* is the only plant cited as absolutely restricted to our islands. Again, it is in the west that occur the Saxifrages and Heaths, so characteristic of the Irish Highlands, as well as *Eriocaulon septangulare*, the sole representative in Europe of its order and genus, and, on this side of the Atlantic, found in Ireland and Scotland only. A few other species are quoted as mentioned only in the British Floras, but with the caution that they are too little known, or too closely related to other species, to be considered more than local races; yet, even as such, their existence is considered by our author important evidence of a "local inchoation." But more weight is probably to be attached to the position and abundance of plants characteristically prevalent in, though not peculiar to, Britain. It is not a little remarkable, as bearing upon the theory of progressive development, that so few varieties even have hitherto been found restricted to the British Isles. Had both been developed from the same pre-existing form, it would hardly have been expected that, when occurring under circumstances so different, the British species and varieties should be found to correspond so closely with their continental representatives. It is true, the British varieties are often less marked, as might be expected, under the less varied conditions offered by a narrower range of soil and by a more equable climate.

The plants enumerated by Mr. Watson as perhaps peculiar to Britain may be summed up as follows:—*Dryas depressa* (Bab.), too closely related to *D. octopetala*. *Helianthemum Breweri* (Planch.), probably a state of *H. guttatum*. *Geranium lancastriense* (With.), which preserves its characters when grown in a garden, though it is not stated whether its distinctness from *G. sanguineum* has been tested by sowing. *Sedum Forsterianum* (Smith), whose aspect is admitted to be distinctive, though its characters are ill-defined; but the genus is so little known, that our plant may yet be identified with some continental species or variety. *Allium Babingtonii* (Borr.), perhaps a variety of *A. Ampeloprasum*, and not certainly indigenous in the British stations. *Viola Curtisii* (Forst.), which, under cultivation, approaches *V. tricolor*, and has lately been identified with *V. sabulosa* of Boreau, a plant of Belgium and the north-west of France. Last comes *Saxifraga Andrewsii* (Harv.), now believed to be a garden hybrid. There are, besides, a few *Hieracia*, *Rubi*, *Rosæ*, and *Salices* described by British authors only; but these genera are as yet too imperfectly understood to be reckoned in the estimate,

As to the presumed relationship between the British and North American floras, shown by the presence of *Eriocaulon septangulare*, whether this be owing to the former existence of some intermediate land (*i. e.*, to the north-west of Europe having once formed a portion of the same floral region as North America), or whether the plant was conveyed across the Atlantic by some means of ocean transport at a remote period, no more than one species is quoted in proof of this link of connexion,—*Spiranthes gemmipara* being proved peculiar to Ireland and distinct from the American *S. cernua*, while *Anacharis Alsinastrum* and *Sisyrinchium anceps* are recent importations. *Potentilla tridentata*, as a British plant, rests upon very dubious authority; and the identity of the Scotch *Alopecurus alpinus* with the American or European species is not sufficiently ascertained. Here, too, we much need a more exact knowledge of the comparative abundance, in their different localities, of the arctic species common to both continents. Not the least objection to the idea of marine transport having been sufficient to establish the *Eriocaulon* in its present Scotch and Irish stations consists in the difficulty of explaining its position in so many mountain lakes, whose waters flow towards the sea, instead of being able to convey the seeds from the coast inland; the fact too of its being found in many different localities unconnected with each other, is another point in favour of its being aboriginal.

Great Britain claims more than a seventh of the whole number of European plants—about one-third of those found in Middle Europe (France, Germany, and Switzerland). In the present diversity of opinion as to the value of species, Mr. Watson adopts 1400 as the figure best adapted for general comparisons; other writers reckon as many as 1800, while a free use of the combining system will reduce our flora to about 1000.

With respect to the numerical value of the orders, *Filices*, *Juncaceæ* and *Orchidaceæ* hold a higher position in the British series than in the European,—the prevalence of the two former being no doubt due to the humidity of our insular climate, as is the high position of *Leguminiferæ* in Middle Europe indicative of its drier and warmer clime (p. 412). The resemblance is closer between Britain and Scandinavia, than between either of these and "Middle Europe." Mr. Watson states that he would prefer to measure these differences "by ascertaining which of the important orders present the widest dissimilarities" (p. 406).

The "*vegetation*" of a country is quite different from its "flora,"—the flora being simply the list of species, the vegetation the mass of individual plants. The terms "rare," "frequent," "common" are in use as a rough method of indicating the comparative abundance of individual plants; but it is clear that a more precise estimate is to be derived from the "Census of species" contained in the sixth chapter of the 'Cybele' (already quoted), where the plants are arranged in the order of their comparative frequency.

In the Ordinal census of the vegetation of Britain, *Compositæ* still take the lead, next come *Gramina*, then *Cyperoides*, following in the same order as they do when arranged by the number of their species: but here, from their greater abundance, *Leguminiferæ* take precedence of *Rosaceæ*; *Lamiaceæ* gain three, and *Polygonaceæ* two places; while, on the other hand, *Cruciferæ* lose four, *Orchidaceæ* two steps in the series.

What is said of the alpine floras is worth attention as regards the theory of their transport across a glacial sea. We are told (at p.461) that "the highest flora of intertropical countries at levels bordering on the snow line is not at all identical with the arctic flora by its species, nor yet exclusively so by its genera or even by its orders. The alpine floras of North Africa include few boreal or arctic species. These southern countries have their own mountain floras, bearing considerable resemblance in genera and orders to the arctic floras, but with little identity among the species. Even on the Alps and Pyrenees there is found a portion only of the subpolar flora; and along with it are many other non-arctic species, whose affinities are those of the surrounding flora of the plains." And further on, "It may be quite true that the change is less rapid and complete among the alpine plants than is the case with those of the plains; still, as we advance southwards, the polar and arctic species cease to be seen even upon the highest mountains, their place being supplied by other species which have a closer alliance with the comparatively southern species of the low grounds, and are less adapted to bear extreme cold."

In Great Britain, the mountain flora "still corresponds with the lower flora of arctic lands, although it wants many of the arctic species. Several of the boreal species fail to reach the hills of Britain, though found in Iceland or Faroe, and numerously in Scandinavia:" and, of our Scottish alpine plants, some very few in turn fall short of the Alps and Pyrenees; for example, *Arenaria rubella*, *Saxifraga rivularis*, *Alopecurus alpinus*. On the other hand, the British hills possess a few species which do not reach so far north as the polar regions, such as *Cherleria sedoides* of the Scotch Highlands; and, at a lower elevation, the Irish Saxifrages, *Meconopsis cambrica*, and *Helianthemum canum* are examples of mountain plants which find their polar limits in Great Britain. Still such instances are rare, owing no doubt to the absence of lofty mountains in the south of Britain; and, for the same reason, the Scottish alpine plants thin-out southwards, without being replaced by others.

The higher mountain region is distinguished by the prevalence of *Filices*, *Juncaceæ*, *Saxifragaceæ*, and *Caryophyllaceæ*. Allowance being made for the smaller extent of the upper arctic zone, the diminution in species is very striking, since only 262 reach above the height of 700 yards. The lower limits of species of course descend as we advance northwards. Thus, at or near the sea-level in the north of Scotland may be seen *Thalictrum alpinum*, *Carex capillaris*, *Dryas octopetala*, *Saxifraga oppositifolia*, &c., which, further south, occur only at a certain elevation.

In the 10th section of this chapter, as often elsewhere, it is urged that the influence of climate is paramount in determining the present distribution of plants—climate being itself the result of physical conditions; but exception is taken to the course adopted by A. DeCandolle, of measuring its effect by the sum of daily temperatures experienced by a plant during one season. It is objected that "the sum of useful temperatures will be found scarcely reckonable for any species; and no ordinary thermometrical records are fairly available, on account of the variable rates and degrees required by the different species of the same flora or country, and differently required by the same species at their different stages of growth,"—to say nothing of the relations of temperature to dryness or humidity, which still further complicate the subject. The established routine of annual mean temperature is therefore adhered to in the 'Cybele,' not as being the truest, but because it is the only test practically available at present.

It will have been seen that, notwithstanding a comparatively uniform climate and a surface which seldom rises to any considerable elevation, the flora of Great Britain exhibits, on a small scale, all the effects of longitude, latitude, elevation, climate, and even of isolation. Considering the careful and judicious manner in which Mr. Watson has collected and arranged his information, the 'Cybele Britannica' deserves to be most attentively studied by all who are interested in the general questions of Geographical Botany.

As a standard of comparison for local Floras, its value will be admitted by every botanist who has made himself acquainted with the varied contents of the present volume.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 26, 1860.—Mr. E. W. H. Holdsworth in the Chair.

On some Hybrid Ducks. By Alfred Newton, M.A., F.Z.S.

The phænomena of Hybridism are in themselves so interesting, and at present so little understood, that I venture to call attention to some examples illustrating the subject, which I now have the honour of exhibiting to the Society, and to make some observations thereon.

The proverbial fidelity of Pigeons, when once mated, has been found a matter of much convenience to at least one gentleman who has studied the great question of the "Origin of Species," by enabling him to experimentalize, comparatively without difficulty, on the different races, breeds, or varieties which can be produced from one common stock *. I would remark, on the other hand, that the tendency, under certain circumstances, to polygamy which obtains among many of the Ducks, combined with their natural salacity, is such as to render that family, perhaps, the one of all others in which experiments on hybridism can be the most easily tried.

The frequent occurrence of hybrids among the *Anatidæ* has already attracted the notice of ornithologists, and among them of one of the

* C. Darwin, 'On the Origin of Species,' London, 1859, p. 42.

most distinguished European naturalists, M. de Selys-Longchamps, who in 1845 enumerated no less than *twenty-five* different crosses produced between various members of this family, and who eleven years later was enabled to raise the number to *forty-four* *. Others have also been recorded.

Although by far the greater proportion of these crosses take place in a state of partial domestication, there can be, I think, no doubt that some occur among birds in a wild state. As an instance I may mention one (the offspring of which has been described, it is true, as a distinct and good species under the various names of *Anas mergoïdes, Mergus anatarius,* or *Clangula angustirostris*), which I cannot but join such high authorities as Naumann, Hartlaub, Baldamus, von Homeyer, Blasius, and De Selys in considering to be the produce of *Anas clangula* and *Mergus albellus,* though Kjærbölling, Cabanis, Reichenbach, and Hennecke are of a contrary opinion.

The specimens which I beg leave first to submit to your notice were most kindly sent for my use by Mr. Daniel G. Elliot of New York, one of our Corresponding Members. They have been already exhibited at a former meeting (November 22, 1859); but I do not hesitate again to call your attention to them, because on that occasion the origin of two of them was, in my opinion, erroneously accounted for. They were then considered to have been respectively produced by crosses between (1) the Wild Duck (*Anas boschas*) and Pintail (*Dafila acuta*), (2) the Wild Duck and Muscovy Duck (*Cairina moschata*), and (3) the American Scaup (*Fuligula affinis*) and the Canvas-back (*F. valisneria*) or the American Pochard (*F. americana*) †. Now, the first of these betrays, to my eye, no sign of descent from the Pintail. Indeed it differs in one respect only from the ordinary appearance of the common hybrid between the Wild Duck and the Dusky Duck (*A. obscura*); and in this one respect—the rufous colouring of the vent—it differs equally from the Pintail. But of this, more presently. The pedigree of the second bird I am disposed to think has been correctly suggested; but it may be remarked that it is not unlike that curious domesticated variety of the Wild Duck which is known to dealers as the "Labrador," the "Buenos Ayres," the "Black," or the "Velvet" Duck. The origin of the third I believe to be due to a cross between the Collared Duck (*Fuligula collaris*) on one side, and, on the other, one of the before-mentioned species, but probably the American Pochard. A resemblance to the Collared Duck is observable in the *white spot* under the chin, and the *grey speculum,*—characters which are not possessed by either of the Scaup Ducks found in the New World. This last specimen is a particularly interesting one. It will no doubt be fresh in the recollection of the ornithologists whom I have the honour of addressing, that in April 1847, Mr. Bartlett

* Edm. de Selys-Longchamps, "Récapitulation des Hybrides observés dans la Famille des Anatidées," Bulletin de l'Acad. Roy. de Bruxelles, tom. xii. no. 10 (1845); and "Additions à la Récapitulation," &c., Bull. de l'Acad. Roy. de Belgique, tom. xxiii. no. 7 (1856).

† Proc. Zool. Soc. 1859, p. 437.

exhibited, at a meeting of this Society, three ducks, which he considered to form a new species, and accordingly described them by the name of *Fuligula ferinoides* * ; one of them having been previously, but erroneously, figured by the late Mr. Yarrell in his 'British Birds' as an example of the American Scaup (*Fuligula affinis*). At the time, I believe that some doubts were expressed as to the validity of this species; and these doubts appear to me to be well-grounded. In the 'Naumannia' for 1851 (pp. 12–15), Herr Bädeker described some birds killed near Rotterdam as forming a new species under the name of *Fuligula Homeyeri*; and in that Journal for the next year two of these examples were figured, which were subsequently exhibited by Mr. Gould at the meeting of this Society, March 28, 1854, and by him identified with Mr. Bartlett's *F. ferinoides* †.

In the 'Revue et Magazin de Zoologie' for March 1853 (p. 117), M. Jaubert, under the name of *Anas intermedia*, gave an account and description of four male hybrids, as he considered them, between *Fuligula ferina* and *F. nyroca*.

Now, both *F. ferinoides* and *F. Homeyeri* I believe to have been produced from the cross which M. Jaubert has suggested; and my belief is strengthened by the perfect analogy shown by the present hybrid from the New World. The subject has been much discussed upon the Continent; and those who support the view of the validity of the supposed species have relied principally on the assertion that birds in a state of nature do not hybridize,—an assertion which I venture to believe is not according to facts.

The specimens which I next have the honour to exhibit to you are, in my opinion, of no common interest. The statement has been again and again reiterated, with some slight variation of language, but always to the same effect, that hybrids between two distinct species are *inter se* infertile. I presume that no naturalist, whatever may be the views he takes of species, will have any hesitation in declaring that the Wild Duck (*Anas boschas*), with all its domesticated varieties, and the Pintail (*Dafila acuta*), are perfectly distinct species. It is well known that they will readily, in a state of confinement, breed together. In the winter of 1855–6 I received from a friend a pair of birds (male and female) which were bred by him from a Pintail Drake and a farm-yard Duck. These I turned down on my pond. It is fair to say that on this pond were also examples of both species. I watched them very closely; the male hybrid—as hybrids constantly do—at once reigned supreme over its denizens. As spring approached he became a most devoted and at the same time jealous husband: not a drake of any description would he allow to come near his mate; and in the battles in which he engaged in defence of his prerogative, he invariably came off victorious. I was never fortunate enough to obtain ocular proof of the consummation of his nuptials, but I most firmly believe that the male of no other species on the water ever had access to his wife. My brother, who was as

* Proc. Zool. Soc. 1847, p. 48. † Ibid. 1854, p. 95.

constant in his observations as myself, entirely coincided in this opinion. In the month of April the female hybrid made her nest, and sat upon her eggs, in due time hatching four ducklings, which proved to be two females and two males. The skins of the latter I now exhibit, and I have no scruple whatever in regarding them as actually the produce *inter se* of a pair of hybrids between totally distinct species. In the breeding-seasons of 1857 and 1858 I was away from home. Last year I was anxious to ascertain if these hybrids of the second generation would produce again *inter se*; and I watched them narrowly. The result of my observations was, that they were probably infertile; and after their death my suspicions were strengthened by the dissection I made. I may add that in the present season the old hybrid female, the mother of the subjects of these remarks, has brought out two broods of young ones, which I cannot but regard as also the offspring of their putative father, but, through other occupations, I have not been able to afford the necessary time to watch them. I forbear, therefore, to adduce them in support of my argument. It, however, appears to me that the common assertion to which I have alluded requires considerable modification, and that all that can be said is, that, though the hybrid offspring of two animals clearly distinct may of themselves be perfectly fertile, it is not proved that this fertility extends to a second generation.

There is one other point which I must be allowed to mention before quitting the subject. It will be seen that the two birds exhibited differ remarkably in plumage, although of the same parentage, sex, and age; for they were born and killed within a day or two of each other. The larger specimen almost exactly resembles his father; but perhaps his colours are not so warm or brilliant. The smaller bird is of an appearance altogether distinct; and the almost uniform mottled grey of his breast and belly would make it perhaps difficult to guess his parentage. I can account for the divergence only in this way, that the Domestic Duck from which these birds are descended was of that almost whole-coloured variety which is not unfrequently seen in farm-yards, and that, while one of her grand-children shows nearly the typical plumage of the hybrid between the Wild Duck and the Pintail, the other takes after some progenitor of the variety I have mentioned. Whether this will serve to illustrate the peculiarity I have above mentioned, and also a curious fact alluded to by our Secretary in a late communication on some Hybrid Ducks bred in the Society's Gardens, wherein it is stated that the produce of a cross between *Tadorna vulpanser* and *Casarca cana* present a character "scarcely deducible from either,*" I do not say. It is, however, not difficult to see what use may be made of this singular circumstance by those who advocate the views of Mr. Darwin; but into any consideration of this question I forbear to enter, contenting myself merely by noticing the fact.

* Proc. Zool. Soc. 1859, p. 442, Aves, Pl. CLVIII.

On two New Genera of Acephalous Mollusks. By Henry Adams, F.L.S.

My attention having been lately directed to the genera *Cultellus* and *Macoma,* the former belonging to the *Solenidæ,* and the latter to the *Tellinidæ,* both families of Acephalous Mollusca, it may, I think, be interesting to point out two species hitherto included in those genera, viz. *Cultellus cultellus* and *Macoma Bruguieri,* which are so aberrant in their characters as to render it desirable that they should be constituted the types of distinct groups. The former may be considered a genus, for which I would propose the name *Ensiculus,* and the latter a subgenus of *Macoma,* and be distinguished under the name *Macalia.*

Genus Ensiculus, H. Adams.

Testa tenuis, transverse elongata, arcuata, utraque extremitate rotundata et hiante ; umbonibus subanterioribus, interne costa brevi curvataque firmatis. Cardo in dextra valva duobus dentibus, in sinistra valva tribus dentibus instructus. Anterior impressio muscularis subtrigonalis ; sinus pallialis brevis et latus.

E. cultellus, Linn.

Shell thin, transversely elongated, arcuated, rounded and gaping at each end ; beaks sub-anterior, strengthened internally by a short curved rib. Hinge composed of two teeth in the right, and three in the left valve. Anterior muscular impression subtrigonal ; pallial sinus short, wide.

This genus is most nearly allied to *Cultellus,* but differs from it in its arcuated and more elongated and parallel form, and in the strengthening callus of the umbo being short and curved.

The genus *Macoma,* I would observe, will probably, when an opportunity of examining the animal of *Gastrana* shall occur, be found, as pointed out by Mr. Clark in his ‘British Mollusca,’ to have closer relations with *Gastrana* than with *Tellina* ; and the chief peculiarity of *Macalia,* as distinguishing it from *Macoma* proper,—viz. the large size and strength of the hinge-teeth, which are strikingly similar to those of *Gastrana,*—tends to confirm this opinion. The general form of *Macalia,* however, which is subrotundate and compressed, together with the solidity of the shell, prevents its being included in that genus. The entire absence of lateral teeth serves to distinguish the species of *Macoma* and *Gastrana* from the *Tellinæ.*

Nov. 13, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Note on the Japanese Deer living in the Society's Menagerie. By Philip Lutley Sclater, M.A., Secretary to the Society.

I venture to call particular attention to one out of several important additions made to the Menagerie since the last meeting for scientific business.

A pair of a very beautiful small species of Deer, quite new to the collection, were presented to the Society in July last by J. Wilks, Esq. They were obtained at Kanegawa, in Japan, and brought to this country by Captain D. Rees, of the ship 'Sir F. Williams.' Dr. Gray has described these animals, believing them to be new, in a recent number of the 'Annals of Natural History,' as *Rusa japonica* (Ann. N. H. ser. 3. vol. vi. p. 218, Sept. 1860). But on reference to the figure of *Cervus pseudaxis* of MM. Eydoux and Souleyet in the 'Zoology of the Voyage of the Bonite' (Atlas, pl. 3, Zool. p. 64), and to the further details concerning the same animal given by Dr. Pucheran in the 'Archives du Muséum d'Hist. Nat.' (vi. pp. 416, 489), it seems probable that our new acquisition may belong to the same species. The locality of the example figured in the 'Voyage of the Bonite' was not ascertained; but a second specimen, brought home by the expedition of the 'Astrolabe and Zelée,' was said to have come from the Sooloo Islands. This discrepancy of localities is a fact which would lead me to believe that our animals are different from *Cervus pseudaxis*; but in the structure of the horns, in the general colouring of the body, in the elongation of the hairs of the mane and throat, and in the disappearance of the white spots in winter, our specimens seem to me to agree well with the peculiarities indicated by the French authorities; and the male possesses partially developed canines, which are likewise spoken of in the case of *Cervus pseudaxis*.

Mr. Blyth has also recently described a Deer from the island of Formosa, under the name *Cervus taiouanus* (Journ. As. Soc. Beng. xxx. p. 90), which is probably likewise referable to this same species. At the time of writing this description, Mr. Blyth was inclined to consider the Formosan animal different from a pair of the small Deer of Japan which he had living with him in Calcutta at the same date. This opinion, however, he has subsequently modified, stating, in a letter addressed to me, dated July 4th of the present year, with reference to the Formosan and Japanese Deer, which he had then turned out together in his garden at Calcutta, that he was "satisfied that they were of one and the same species."

My opinion therefore is—though I do not state it without hesitation, against so high an authority on the subject of the *Cervidæ* as Dr. Gray—that *Rusa japonica* is probably a synonym of *Cervus pseudaxis*, Eydoux and Souleyet, and *Cervus taiouanus*, Blyth. But there is, perhaps, a still older appellation for this little Deer. The figure of Temminck and Siebold's *Cervus sika*, in the 'Fauna Japonica,' certainly looks very little like the male of this species. The uniform colouring and the third branch to the horns are very noticeable points in which it differs from our male Deer. To the description given in the same work I have unfortunately had no access, the sheets containing it being deficient in the only copy I have been able to consult. But Mr. Bartlett, who has lately returned from Holland, informs me that a female Deer living in the Gardens at Amsterdam, and there considered as *Cervus sika*, is undoubtedly the same as ours; and as the Dutch naturalists have consulted the type in the Leyden Museum, there appears to be little doubt of the fact. I am therefore induced to believe that the following may prove to be the correct synonymy of this species of Deer:—

CERVUS SIKA.

Cervus sika, Temm. & Sieb. Fauna Japonica, Mamm. pl. . (fig. mala).

Cervus pseudaxis, Eyd. & Soul. Voy. Bonite, Zool. p. 64, pl. 3; Puch. Arch. Mus. Par. vi. pp. 416, 489; Wagn. Suppl. Schreber's Säug. v. p. 364 (?).

Cervus axis, ex China, Cantor, Ann. N. H. ix. p. 274.

Cervus taiouanus, Blyth, J. A. S. B. xxix. p. 90.

Rusa japonica, J. E. Gray, Ann. N. H. ser. 3. vi. p. 218.

Mr. Blyth, it may be remarked, is of opinion (J. A. S. B. xxix. p. 90) that this Deer "belongs strictly to the *Elaphine*, and not to the *Axine* group," and states that its skull "has the same large round infra-orbital foramina as *C. elaphus* and its immediate congeners.

ON THE AFFINITIES OF BALÆNICEPS. BY PROFESSOR J. REINHARDT, FOR. M. Z.S.

The majority of ornithologists seem to look upon the *Balæniceps* as approaching nearest to *Cancroma*, and to consider it the African representative of this South American type. Now it shall be freely conceded that it indeed appears more nearly allied to the Boatbill than to the Pelicans, to which Mr. Gould was inclined to refer this, perhaps the most extraordinary of the numerous highly interesting new forms introduced by him into ornithology. The *Balæniceps* seems, further, better placed in the neighbourhood of the *Cancroma* than between the Spoonbills and the Flamingos, as proposed by M. Des Murs,—a position admissible, I think, only when the texture of the egg is made the ruling principle of classification. But it may be questionable whether the large Storks (*Leptoptilos*) do not make a nearer approach to it than the Boatbill; and I do not hesitate to advance that at all events this last-mentioned bird is not its next of kin.

When, several years ago, I first became acquainted with the description and the admirable figures of the bird in question in the 'Proceedings' of the Zoological Society of London, I was struck with some features in the gigantic new form, recalling to my mind another curious bird, and I wondered why it had not been compared with this as well as with the Pelicans, Cranes, Herons, and the Boatbill; but having no opportunity to examine the *Balæniceps* itself, I could not arrive at any settled opinion.

The Museum at Copenhagen having last year obtained a female specimen of this rare bird from the Imperial Museum at Vienna through the generous intermediation of Prof. Steenstrup, I have at length been able to substantiate, through immediate comparison, that (indeed as I presumed) the equally African *Scopus* is the nearest relation of the *Balæniceps*. I may be permitted shortly to state my reasons for this *rapprochement*.

The *Cancroma* does not, in my opinion, represent a peculiar subfamily; it is in every respect a Night Heron, gifted with a very singular beak. The plumage, the feet and their serrated middle claws, and, further, the colour, manifest the affinity. Even in the bill, anomalous as at first sight it may appear, a minute examination will enable us to recognize the beak of a stout-billed Night Heron (*A. violacea*, for instance), strongly modified, it is true, in shape, but still exhibiting many of the essential characters. To the beak of the *Balæniceps*, on the contrary, it seems to afford only an analogy (and not even a very strong one), but no true affinity. Its flattened form, and the slender and pliable branches of the lower jaw, prove, in my opinion, that the beak of the Boatbill is calculated rather to be a very capacious than a very strong one; whilst the bill of the *Balæniceps*, being higher than broad, evinces an extraordinary strength in almost every feature, but especially in the powerful hook in which the culmen terminates. In the Boatbill there is no such hook, but the upper mandible is provided with the usual notched tip of the Night Herons, not separated from the sides of the bill by a well-marked groove, as is the hook of its presumed kindred; and if we carry on the comparison further, we shall find that the lower jaw does not offer the truncated apex characterizing this part in the *Balæniceps*, and being indeed the consequence of the shape of the hook. The different form of the nostrils and the different size and extent of the nasal groove afford other notable points of diversity between the two birds; and though the skin of the throat may be dilatable in a certain degree in the living *Balæniceps*, I should not think that this bird possesses a true pouch like that of the *Cancroma*. At all events, the fact of the mentum being very thick-feathered throughout two-thirds of its length induces me to doubt it; and the stout and apparently little-pliable under jaw seems also to make it not very probable.

It must be conceded that the *Balæniceps* approaches much to the *Cancroma* in the general structure of the feet; but it has not, like this bird, a pectinated middle claw; and this circumstance affords, in my opinion, a strong warning not to class it with the Boatbill, as this peculiar serrature never fails in any member of the Heron tribe.

As to what relates to the nature of the plumage the *Balæniceps* differs also, in not unimportant points, from the *Cancroma*, the downy part of each feather being proportionally larger, and genuine down being intermixed in considerable quantity among the feathers, as in *Leptoptilos*, while in the *Cancroma* and the Herons there is hardly any down at all amongst them: moreover the hyporhachis is well developed in the last, but very small in the *Balæniceps*, which also in this point seems to adhere to the Storks, in certain species of which it is even entirely wanting. The distribution of the feathers on the body (the pterygose) cannot be accurately studied on a stuffed skin; therefore I am not able to give any sufficient account of it in the *Balæniceps*; but even now I think I may say that the pterygose of this bird, when minutely examined, will probably show notable differences from that of the Boatbill. It especially appears that the neck is feathered nearly all over, while in the Boatbill and the whole Heron-tribe there are large *apteria* on this part. A point of some consequence to be cleared up, but about which I can say nothing myself, is whether the *Balæniceps* is gifted or not with those curious limited spots, clothed only with a peculiar sort of down (the "Puderdunenfluren" of Nitzsch), which characterize the *Cancroma* as well as the Herons, but are wanting in the *Scopus* and the Storks.

If, on the other hand, we now compare the beak of the *Balæniceps* with that of the *Scopus*, we shall find a very remarkable accordance in nearly all material points. In both of them the nostrils are shaped exactly in the same way, being narrow, just perceptible slits. In *Scopus* as well as in *Balæniceps* the culmen is separated throughout its whole length from the sides of the bill by a deep narrow groove or furrow, and terminates in a powerful hook, though it is conceded that the hooked tip is proportionally not quite so large in the former. The very sharp *carina* into which the culmen is compressed in the *Scopus*, is indicated by a ridge along the broad culmen of the *Balæniceps*; the apex of the lower jaw is truncated in the same way in both birds; and notwithstanding the nearly perpendicular position of the sides of the bill in the *Scopus*, the tomia are convex and bend inwards, as in the *Balæniceps*. In a word, the minute details of the bills of these two remarkable birds are, as far as I can see, very much the same; and indeed, if we fancy the beak of the *Balæniceps* so much compressed that the ridge along the culmen becomes converted into a sharp cutting edge, and the branches of the lower maxilla touch each other in the anterior half of their length, it will assume most exactly the shape of that of a gigantic but somewhat short-billed *Scopus*.

With regard to the feet, it is true that the toes are connected by a short interdigital membrane in the *Scopus*, while there is no vestige of it in the *Balæniceps*. The importance of this difference may perhaps be differently appreciated by zoologists, but I need not enter into a discussion as to its value; for, should the disappearance of the interdigital membrane be considered a serious obstacle against classing this bird with the *Scopus*, it must likewise divorce it from *Cancroma*, where such a membrane also exists, being only somewhat smaller than in the *Scopus*. For the rest, there is no material difference in the structure of the feet of the two birds, the hind toe even in the *Scopus* being inserted at the level of the other toes. It must, however, be confessed that in this oft-mentioned bird also the middle nail is pectinated, though indeed not quite so regularly as in the Boatbill. This is certainly a remarkable deviation from the *Balæniceps*; but it is obvious that this fact, at all events, cannot be adduced as an argument in favour of a nearer relationship to the *Cancroma*.

In the ptilose of the *Scopus* seem to prevail nearly the same peculiarities which have been mentioned as distinguishing the plumage of the *Balæniceps* from that of the Boatbill; and even in this respect it certainly proves a nearer relation than the last-mentioned American bird. With regard to the pterygose, the *Scopus* is known in a certain point to deviate from, I believe, all the other waders, the feathers on the neck being arranged in a manner quite peculiar; should, therefore, the neck of the *Balæniceps* really prove to be feathered all round, there will so far be a difference: but it must be remembered that a neck feathered throughout might possibly approximate the *Balæniceps* to the Storks, but never to the Boatbill.

I believe that a minute consideration of the external characters of the *Balæniceps* will sufficiently enable us to recognize in this gigantic wader a near relative of *Scopus*; but, no doubt, new and important proofs are to be derived from the skeleton when compared with that of the last-mentioned bird. I have, however, not the means of making such a comparison, never having seen any part of the skeleton of the *Balæniceps*. Even of the skeletons of the *Scopus* and the *Cancroma* I have only more or less imperfect skulls and some few bones at hand. I should therefore only wish to mention here, that the interorbital septum is entire in the *Scopus* (as it is in *Leptoptilos* and *Tantalus*), but perforated (as far as I can see, in the mutilated skull now before me) by a large opening in the *Cancroma* as well as in the Herons; and that the zygomatic arch, formed by the malar bones, is longer in the Boatbill than in the *Scopus*,—so much so indeed, that in the shorter skull of the first it is nearly twice as long as it is in the longer skull of the *Scopus*—this bird approaching even in this respect to the Storks, while the Heron type prevails in the *Cancroma* even in this point. It would be very interesting to know how the *Balæniceps* is shaped in these respects*.

And now, to finish my cursory remarks, I shall beg only to advance, as the final conclusion to which I have been led by my examination of the *Balæniceps*, that this most curious bird should be removed from the neighbourhood of the *Cancroma*, to constitute, together with the *Scopus*, a small exclusively African subfamily in the great circle of the *Ardeidæ* of Leach, approaching nearer to the Storks than to the Herons.

Description of a New Species of Hornbill from Western Africa. By John Gould, F.R.S., etc.

Toccus Hartlaubi, Gould.

All the upper surface, back, wings, and tail uniform dark brownish-black, glossed with green; three outer tail-feathers on each side tipped with white, the inner one of the three less so than the others; under surface sooty-black, each feather fringed with grey, giving these parts, particularly the abdomen, a mottled appearance; under surface of the shoulder greyish-white; basal portion of the inner webs of the primaries silvery-grey; bill rather stout and deep at the base, with a small sharp keel or ridge near the base of the culmen; basal three-fourths of the bill black, apical fourth obscure blood-red.

Total length, 14 inches; bill, $2\frac{1}{2}$; wing, 6; tail, $6\frac{3}{4}$; tarsi, 1.

* My friend Mr. A. Newton, to whom I had communicated my opinion with regard to the *Balæniceps* during his visit to Copenhagen last year, has lately informed me that the malar bones are enormously large and strong in this bird; the same cannot be said of them in *Scopus*.

At first sight, the specimen from which the above description was taken, and which is the only one I have seen, would appear to be immature; but when the tail-feathers are closely examined, they will be found to comprise both old and new feathers of precisely the same character, proving that such cannot be the case. In the size of its body this new Hornbill does not exceed the common Blackbird (*Merula vulgaris*); it must therefore be regarded as one of the smallest members of its group.

I have named this bird *Hartlaubi*, in honour of my friend Dr. Hartlaub of Bremen, a gentleman who has paid great attention to general ornithology, but especially to that of Western Africa, where this bird is believed to have been procured, but from what precise locality is unknown.

Description of a New Species of the Genus Moho, of Lesson. By John Gould, F.R.S., etc.

Moho apicalis, Gould.

Opposite page 357 of Dixon's 'Voyage round the World,' published as long back as 1798, will be found the figure of a bird under the name of the "Yellow Tufted Bee-eater," which appears never to have received a specific appellation: this has probably arisen from the circumstance of no examples having yet found their way into our museums. The description given by Captain Dixon, copied from Latham's 'Synopsis,' doubtless has reference to the bird which my late friend M. Temminck called *Moho fasciculatus*.

Two examples of this curious bird, male and female, which will hereafter be deposited in the National Collection, having lately come into my possession, I avail myself of the opportunity of characterizing the species, and have assigned to it the name of *apicalis*, from the circumstance of all but the two middle tail-feathers being tipped with white; in which respect Capt. Dixon remarked that the bird he had figured differed from Latham's description of the Yellow-tufted Bee-eater.

Dixon's bird was obtained at Owhyhee; and I believe that my two specimens were brought from the same island.

This bird may be described as having the general plumage sooty-black; tail brown, all but the two middle feathers largely tipped with white; the two central feathers somewhat narrower than the others, and gradually diminishing in the apical third of their length into fine hair-like or filamentous upturned points; axillæ or under surface of the shoulder white; flanks and under tail-coverts bright yellow; bill and legs black.

Total length, 12 inches; bill, $1\frac{1}{2}$; wing, $4\frac{3}{4}$; tail, $6\frac{3}{4}$; tarsi, $1\frac{1}{2}$.

The plumage of the female is in every respect similar to that of the male; but, as in the Honeyeaters of Australia generally, particularly amongst the members of the genus *Ptilotis*, the body is fully a fourth less in size.

Description of a new Odontophorus.
By John Gould, F.R.S., etc.

Odontophorus melanonotus, Gould.

Throat, fore part of the neck, and chest rich chestnut-brown; abdomen deep blackish-brown, very finely but obscurely freckled with chestnut; lower part of the abdomen, thighs, under tail-coverts, tail, back of the neck, wings, and rump uniform velvety brownish-black; legs apparently horn-colour in front, with a wash of orange between the scales; bill black.

Total length, 10 inches; bill, $\frac{7}{8}$; wing, 6; tail, $2\frac{1}{2}$; tarsi, $2\frac{1}{8}$.

Hab. Ecuador.

There do not appear to be any markings about the face, as is usual with the other members of this genus; but, as my specimen is somewhat injured in that part, I am unable to speak positively on this point: the orange colouring, too, between the scales of the legs may or may not be natural; it is probably due to some extraneous cause.

This new species, which I have received direct from Ecuador, is in every respect a typical *Odontophorus*, and is very nearly allied to *O. nigrogularis*, *O. erythrops*, and *O. hyperythrus*; but when the four species are seen together, their specific distinctness is very readily apparent.

When shall we acquire a knowledge of the whole of this group of birds?

Description of a New Entomostracous Crustacean, belonging to the Order Phyllopoda, from South Australia. By Dr. Baird, F.L.S., etc.

Estheria Birchii.

The animal appears in all respects to resemble that of the *Estheria gigas*, except that the eye is placed on a more prominent pedicle. The specimen examined was a female, and full of ova. These were disposed all along the body of the parent, were very numerous, and presented a very pretty appearance when seen under the microscope. They are small, round, and grooved, the grooves running in a circular manner like those of a rifle.

The shell or carapace is of a greenish colour, of an oval shape, and flattened. The umbo is anterior, situated about 2 lines from the margin. The dorsal margin slopes slightly downwards, and is dentated on the edge, in consequence of the ridges, with which its surface is strongly marked, terminating at the external edge in a prolongation or tooth. The ventral margin of the carapace is rounded anteriorly, and terminates posteriorly in one of the strong tooth-like prolongations mentioned above.

The surface of the shell is marked with 13 ribs or ridges, which near the umbo are slight, but become stronger, well-marked, and prominent as they descend. The surface between the ridges is different from any previously described; it is rather opake, not polished, and presents somewhat the appearance of ground glass.

This species is the giant of the family to which it belongs. Of the three specimens in the Collection, the largest measures rather more than a full inch in length, and about three-fourths of an inch in breadth, the other two being slightly smaller. They were sent to the British Museum by Sir W. Denison, Governor of Australia, who in a letter to Dr. Gray informs him that they were taken "in water-holes or lagoons on the plains, on the banks of the Wamoi (a river which discharges itself into the Darling, and ultimately by the Murray into the sea), in South Australia." They were collected by Mr. W. Birch, who in a note to the Governor says :—"My attention was first drawn to the Bivalves by observing them *in motion*, apparently in search of food; and until a specimen was obtained, I was under an impression, from the rapidity of their movements, that they were small fishes. Undeceived in this respect, I determined to ascertain, if possible, the means by which the mollusk progressed. I observed that the serrated part of the shell was downward and the valves were in constant motion, and that four antennæ were protruded from the shell, evidently for grasping food. The anatomical structure of the animal appeared so much at variance with other mollusks, that I preserved the specimens intact. I found by experience that if the shells are immersed in tepid water for about ten minutes, the animals will be sufficiently developed for minute observation."

In compliance with Sir W. Denison's request that the name of the collector "should be commemorated in connexion with the species," I have named it *Estheria Birchii.*

Magnitude, 1 inch in length, $\frac{3}{4}$ of an inch in breadth.

Hab. Pools of fresh water on the banks of Wamoi River, Australia.

Mus. Brit.

MISCELLANEOUS.

On a Hybrid between Saturnia Pavonia-major *and* S. Pavonia-media (Bombyx Pyri *and* B. Spini, *Borckh.*). By M. Guérin-Méneville.

M. Guérin-Méneville has brought before the Academy of Sciences of Paris a case of hybridism between the two species of moths above mentioned. He states that the hybrids were obtained by a German dealer in insects, who sold them at forty francs apiece, and who naturally would be unwilling to sacrifice any portion of his profits to an experiment upon the possible fecundity of the insects. The only fact ascertained was that the males were far more numerous than the females; the four or five individuals sent to Paris were all males. The male parent was *S. Pavonia-major*.

On comparing the hybrids with their parent species, they are found to resemble the female more than the male in their general coloration; in size they are intermediate between the two species.

The antennæ of the males resemble those of the male parent, being paler and more slender than those of the male *S. Pavonia-media*; they further resemble their male parent in the darker colour of the base of the wings. The resemblance to the female parent consists in the greyish coloration, the white space in which the ocellated spot of the anterior wings is situated, the white bands of the abdomen, and other characters not specially mentioned by M. Guérin-Méneville.

Some writers vaguely mention a case of hybridism between *S. Pavonia-media* and *minor* (*B. Carpini*); but this observation, which was made in Germany by Treitschke, was very incomplete, as that author only obtained three hybrid caterpillars, which spun cocoons from which nothing was produced.—*Comptes Rendus*, Nov. 19, 1860, p. 774.

On the Mode of Nutrition of the Mucedineæ. By L. Pasteur.

Eighteen months ago, the author communicated to the Academy of Sciences an experiment performed by him with beer-yeast. On placing a mere trace of this microscopic fungus in pure water holding in solution certain crystallizable principles which may be called inorganic—namely, sugar-candy, an ammoniacal salt, and some phosphates—the little globules of the yeast were seen to multiply, deriving their nitrogen from the ammoniacal salt, their carbon from the sugar, and their mineral materials from the phosphates; at the same time the sugar fermented. The suppression of any one of the three alimentary matters prevented the development of the yeast. The author subsequently obtained the same results with lactic yeast.

This experiment set at rest the discussion as to the organized nature of beer-yeast, which was regarded by Berzelius to the very last as a chemical precipitate of globular form.

All the author's investigations concur to establish the principle that Mycodermic plants, occupying the lowest place in the scale of existences, are the origin of all fermentations properly so called. The results published in the present paper furnish a fresh support to this opinion. With those just referred to, they show a great analogy between the ferments and both the lowest and highest species of plants. The author hopes that they may furnish physiologists with a new method adapted to facilitate the rigorous examination of various questions relating to the nutrition of plants.

In pure distilled water, M. Pasteur dissolved a crystallized acid salt of ammonia, sugar-candy, and the phosphates produced by the incineration of beer-yeast. In this liquid he sowed some spores of *Penicillium*, or of some other mucedinous plant. These spores germinated freely; and in two or three days the liquid was filled with flocculent masses of mycelium, of which a great number soon spread upon the surface of the liquid, where they fructified. The vegetation was by no means languishing. By employing an acid salt of ammonia, the development of Infusoria is prevented, as the presence of these would soon stop the progress of the microscopic plant by absorbing the oxygen of the air, which the fungus cannot do without.

All the carbon of the plant is derived from the sugar, its nitrogen from the ammonia, and its mineral material from the phosphates. There is consequently upon this point, of the assimilation of nitrogen and the phosphates, a complete analogy between the ferments, the Mucedineæ, and plants of complicated organization.

If, in this experiment, any one of the principles in the solution be suppressed, the vegetation is arrested. The mineral material is that which would appear least indispensable for plants of this nature; yet if the phosphates be omitted, no vegetation is possible, whatever be the proportion of sugar and ammoniacal salts. The germination of the spores scarcely commences by the influence of the phosphates, which the spores themselves introduce in infinitely small quantities. If the ammoniacal salt be suppressed, the plant undergoes no development; there is only a very abortive commencement of germination in consequence of the presence of the albuminoid matter of the spores themselves, although there may be an abundance of free nitrogen in the surrounding air, or in solution in the liquid. The same effect is produced by the omission of the sugar, whatever proportions of carbonic acid there may be in the air or in the liquid. In fact, as regards the origin of their carbon, the Mucedineæ differ from the Phanerogamic plants. They do not decompose carbonic acid and evolve oxygen; but the absorption of oxygen and the evolution of carbonic acid are necessary and constant actions of their life.

The preceding results give us clear notions as to the mode of nutrition of the Mucedineæ, upon which scarcely any observations had been previously made. They show us a method by which we may, without difficulty, enter upon the most delicate questions in the life of these little plants, so as to prepare a certain way for the investigation of the same problems in the higher plants.

M. Boussingault stated, in connection with M. Pasteur's results, that M. Bineau had found that the nitrates and ammonia disappeared from rain water holding them in solution, under the influence of Cryptogamic vegetation. Rain water is well known to contain nitrates and ammoniacal salts, together with salts of potash, soda, and lime; and M. Barral has recently ascertained the existence of phosphates in rain-water.—*Comptes Rendus*, Nov. 12, 1860, p. 709.

Description of a new Species of Pithecia (P. albicans). By Dr. J. E. Gray, F.R.S. &c.

Hair very long and loose; that of the head, neck, and upper part of the thighs whitish; that of the shoulders, back, sides, tail, and fore legs black, with short white tips; on the hind legs, sides of the neck, inside of limbs, chest and belly, reddish. The hair of the head very long, covering a great part of the face.

Young.—Hair of the head, neck, and shoulders very long (longer than in the adult), blackish near the roots, and on the under side of the body rather more rufous; the moustaches more distinct.

Hab. Brazil: Upper Amazon (*Mr. Bates*).—*Proc. Zool. Soc.* April 24, 1860.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 39. MARCH 1861.

XIX.—*Observations on the* Bignoniaceæ.
By John Miers, F.R.S., F.L.S. &c.

This beautiful family, the species of which impart a glory to the tropical forests of both hemispheres, but more especially to those of the New World, has been hitherto imperfectly investigated, and a more complete examination of the order is still a great desideratum in the science of botany. It has occurred to me that the few observations I made long ago upon several points of structure in this order may be of use in the pursuit of such an investigation; and in this hope the following remarks are offered as a small contribution towards that end. It is to be wished that some able botanist would take the trouble to re-examine carefully all the materials existing in the principal herbaria, re-model entirely the disposition of the order, determine the more essential characters and limits of the genera, and identify the species: he will find this labour amply rewarded by the interesting results which such an investigation will assuredly afford. At the time when Prof. Lindley published his 'Introduction' (in 1836), he remarked that the order "is in great confusion, and requires to be carefully revised by some good botanist." The renowned elder DeCandolle made the first step towards this inquiry in his 'Revue des Bignoniacées,' in 1838, and again, on a more extended scale, in his 'Prodromus,' in 1845; but the materials at his command at that time seem to have been far from complete; consequently we there find the greater part of the individuals of the family massed together in the genus *Bignonia*, all of which require sifting and separating into their proper places. This valuable contribution to the knowledge of the order in the 'Prodromus' was enriched by many notes relating to structural points of great importance, furnished by his eminent son, Prof. A. DeCandolle. Few additions to our knowledge of the family have been made since that time: among these may be mentioned those of Dr. Seemann on the *Crescentiaceæ* and some of the genera of the *Catalpeæ*: the attention of the same botanist has also been for some time directed to the study of the family; and it is to be hoped that he will publish the results of his investigations.

The order is divided by DeCandolle into two tribes, distinguished in great measure by the presence or absence of winged margins to the seeds: in the former case (*Bignonieæ*) the fruit is capsular and dehiscent, with winged seeds; in the latter case (*Crescentieæ*) it is either fleshy or ligneous and indehiscent, with apterous seeds, often imbedded in pulp. I have already pointed out, in the former tribe, the anomalous instance of *Oxycladus* *, where the fruit is an indehiscent nut, normally 2-locular and pluriovular, but by abortion unilocular and monospermous, the seed being perfectly apterous, with two thick fleshy cotyledons conjoined by a very small terminal radicle. I indicated also another instance in *Adenocalymna* †, where, although the fruit is capsular and dehiscent, the seeds have no wings, their integuments being coriaceous and hard, and their cotyledons very thick and fleshy. In *Platycarpum* and *Henriquezia* the seeds are likewise fleshy and wingless. In *Argylia*, also, some species have the seeds quite apterous, in others the wing is only rudimentary. Thus it appears that this feature is not sufficiently constant to serve as a basis for tribual distinction. I propose in the following remarks to search for other characters; and with this view I will first notice several modifications I have observed in the structure of the seeds, and then inquire into the modes in which the carpels are combined.

In the *Bignonieæ* the seed usually consists of a coating, considerably flattened, with a coriaceous centre surrounded by a broad, delicately membranaceous wing, generally broader than long: it has no funicle, but near the margin of the coriaceous portion, contiguous to its base, a small linear hilum is seen, which corresponds with a similar cicatrix on the dissepiment, where it was attached. As an example of the general structure of the seed in the *Bignonieæ*, we may take that of *Pithecoctenium squalus*. Here it is surrounded by a very broad wing, of extreme tenuity, delicately reticulated, perfectly hyaline, with a number of strong nervures radiating from the coriaceous discoidal centre. After sufficient maceration, it is easy to introduce a blunt needle into the substance of the wing, when it can be separated into two very distinct laminæ, even to the utmost margin, proving that the wing, although in this case of extreme tenuity, is not a simple

* Linn. Trans. xxi. 145; Linn. Proc. ii. 270.

† Linn. Proc. ii. 272.

pellicle, as Prof. A. DeCandolle concluded (Prodr. ix. 142, note). The many radiating lines that diverge from the coriaceous discoid portion are formed by the plicature of the laminæ at those parts, evidently from the effect of pressure, for they contain no vessels of any kind, and have no connexion with the raphe. The discoid centre, where these laminæ are not conjoined, is quite hollow and opake, forming a distinct cell lined with a quantity of opake white cellular tissue; and the next integument lies in the centre of this space, filling about two-thirds of its diameter. This intermediate integument is somewhat opake, transversely oval, with a deep emarginature in its summit, reaching nearly to the centre; and in the bottom of this sinus the chalaza is clearly seen: at the base is another emarginature, of less depth, from the bottom of which proceeds a tube of the length of the whole tunic, which extends downwards to the basal hilum through the coriaceous portion of the winged integument, to the sides of which this tube is agglutinated by solid deposits; and in this manner it forms a semiseptum in the lower part of the coriaceous cell, which thus becomes bimarsupiate at its base. The third integument that immediately invests the embryo is thinner and of the same form as the intermediate coating, only that a very short sac surrounding the radicle occupies the place of the long tube. The embryo is of the same transversely oval form, and consists of two very flat foliaceous cotyledons, deeply cordate at base, with a very short obtuse radicle in the sinus that occupies half its length: in the summit is a similar emarginature that reaches the centre, thus cleaving the cotyledons almost in two, and leaving a very short space between the two emarginatures, so that the embryo appears almost to consist of four cotyledonary lobes. The semiseptum above mentioned coincides with the line of the simple raphe that is imbedded in the ventral discoid lamina of the outer winged tunic, but has no connexion with it more than is due to the subsequent agglutination of the parts. The raphe, starting from the hilum, follows the course mentioned, imbedded in the outer lamina, until it arrives opposite the apical sinus of the embryo, when it suddenly pierces its way through the coriaceous deposits of the tunic, and immediately communicates with the chalaza.

It is thus seen that the embryo in the *Bignonieæ* usually consists of a very short radicle seated in the basal sinus of two very deeply lobed cotyledons, which are again 2-lobed at their summit: this form is subject to several modifications, one of the most remarkable of which is found in *Argylia*, where the embryo appears cleft only at the base, being quite truncate at the summit; but this scissure extends from the base to the very apex. The embryo is thus divided into four equal lobes, greatly flattened, foliaceous, and lying in adpressed pairs, free all round their margins, but united together at a small point to the very apex of the terete accumbent radicle, which is of the length of the lobes, and lies recondite in the centre, concealed by the free margins of these lobes: this radicle, which points to the basal hilum, is placed transversely and centrifugally in regard to the axis of the capsule, as in most genera of the family. The cavity of the coriaceous integument which encloses it is nearly orbicular or transversely oval, though sometimes much compressed, without any tendency to the formation of a semiseptum at its base, as occurs in many genera. The reason of this is that the neck of the intermediate integument is not agglutinated to the sides of the outer tunic, but remains free; and in *Argylia* this neck is extremely elongated, indeed longer than the integument itself, so that it is coiled up into a shorter space, much in the same way that Dr. Wight represents it in *Calosanthes* (Icon. tab. 1339, upper figure).

There are some exceptions to the occurrence of this deep emarginature of the cotyledons,—for instance, in *Calampelis*, where the embryo assumes the ordinary form of two simple cotyledons, nearly orbicular, compressed, and foliaceous, with a short, terete terminal radicle, all united together at their slightly cordate base. In *Oxycladus*, and probably also in *Monttea* and *Reyesia*, the embryo is similarly developed, the cotyledons being simple, oval, very thick, and fleshy, with a short terminal radicle. In *Platycarpum* and *Henriquezia*, the cotyledons are simple, thick, fleshy, and transversely elongated, with a deep hollow upon their inner face, at their true base (or apparent side), in which the radicle lies concealed. In *Crescentia*, *Sesamum*, *Pedalium*, and their congeners, the embryo is constructed as in *Oxycladus* and *Calampelis*. In the *Cyrtandraceæ* the embryo is said to be terete, with cotyledons shorter than the radicle.

In *Anemopægma*, however, where the embryo is of the form described in *Pithecoctenium*, we find not only the broad membranaceous wing, but the coriaceous discoidal portion also, cleft at its summit; so that the tunics become bilobed, and as it were 2-celled at that extremity, and the apices of the cotyledons nestle in these spaces: but although the base of these tunics has no such corresponding cleft, we find there a short transverse septum, as before explained, connecting the dorsal and ventral faces of the integument; and within the two marsupial pouches so formed the lower lobes of the cotyledons are isolated and enclosed.

This structure is carried to the utmost extreme in *Adenocalymna*, where the seeds are not highly compressed, as usual, but are very thick, nearly circular, with a hard, polished, crustaceous covering, without any membranaceous wing, and with only the sharp angular edges produced by the strong mutual pressure of growth: had they been relieved from this pressure, their shape would have been nearly spherical. A longitudinal section of one of these seeds shows, within the thick coriaceous testa, a nearly circular space, which is divided by a broad septum into two equal complete cells: this septum is entire throughout, except a very small linear foramen in the centre, which aperture is filled by the central radicle of the embryo, while the space of the two cells is occupied by the cotyledonary portion, which is divided into four equal lobes, as in the instances before described: these lobes are thick and fleshy, plano-convex, in contiguous pairs, and are united by the central short terete radicle, the extremity of which is centrifugal, pointing to the large broad basal hilum.

In *Spathodea campanulata* the 4-celled capsule is represented by Palisot de Beauvois * as having numerous orbicular lenticular seeds, with a narrow wing, all packed together in a horizontal position, as in *Calampelis* (not parallel to the dissepiment), and attached to the inner angle of each cell by a linear hilum along its truncated margin, and this margin is somewhat induplicated within the testa. The embryo is shown to be formed of four cotyledonary lobes attached to the apex of the terete radicle equal to them in length, as in *Argylia*; they are not spread out in opposite pairs, as in that genus, but are folded and parallelly superposed upon one another, their outer margins lying in pairs right and left of the induplicature of the testa, the cross-section of its internal space being thus hippocrepiform: the radicle is placed in contiguity to this semiseptum, so that the edges of all the four cotyledonary lobes are thus accumbent upon it and close to the line of the raphe. A similar induplicature of the cotyledonary lobes is figured in Delessert's 'Icones' (v. tab. 93 B), in *Kigelia*, a genus of *Crescentiaceæ*.

In *Stereospermum chelonoides* (taking Dr. Wight's analytical figures † for guidance, the correctness of which I am able to verify), the integuments of the seed are inflected, by a deep plicature, into the dorsal face, and thus produce a transverse semiseptum within the discoidal portion, in a contrary direction to that of *Anemopægma*: this protrudes into the middle of the cavity of the crustaceous integument. The cotyledons are cleft almost to the base, and are folded as in the last instance, so that their four lobes lie with their external edges in pairs on each side of the semiseptum, and in this manner are lodged in the incomplete cells so formed: the internal edges of the lobes thus become accumbent on the radicle, which corresponds in direction

* Flor. Owar. tab. 28. † Icones, tab. 1341.

with the line of the raphe. The radicle is consequently transverse as regards the axis of the capsule, being neither centrifugal nor centripetal, but horizontal and parallel to a diametral line drawn across the axis of the fruit, and its free extremity points to a small hilum on the integument.

From these facts it is clear that, generally, the seeds of *Bignoniaceæ* are furnished with three distinct integuments. The broad wing is a real tunic, being part of an extremely lax testa, often enlarged to ten times the diameter of the intermediate coriaceous coating, its sides becoming agglutinated together by pressure into the form of a delicate wing: it is proved to be the real testa by the passage of the cord of the raphe through its tissue along its ventral face, which cord does not enter into the substance of the second tunic until it pierces its way through it, in order to arrive at the chalaza of the inner integument. The intermediate, more or less coriaceous integument, with its very elongated, narrow neck, which is sometimes coiled up and free, and at other times hardened and adherent in the form of a septum, must be considered to be a development of the secundine, while the inner integument, with its mouth converted into a short sac, must be viewed as a product of the tercine; it cannot be a very thin albumen, because it fits too loosely upon the embryo, and because it is provided with a distinct chalaza.

The few observations I have made relative to the structure of the carpels may not be uninteresting in this inquiry. Prof. DeCandolle, to whom we owe the best monograph of the family, has divided his tribe *Bignonieæ* into four subtribes:—1. *Eubignonieæ*, where the flattened and elongated capsule is 2-valved and opens by two sutures along the lateral margins, having the dissepiment parallel to the valves, which separate from it, showing numerous imbricated seeds attached to it, in one or more rows, near its two margins on both faces. This subtribe is again formed into divisions (*Monostictides* and *Pleiostictides*), according to the number of series of seeds on each margin of the dissepiment. 2. *Catalpeæ*, where the capsule is also bilocular and bivalvular, but where the dissepiment lies across both valves at a right angle: the capsule here opens by two sutural lines, as in the preceding subtribe, and the dissepiment separates from the middle of the two valves; the seeds are attached to the dissepiment, as in the former case; and the subtribe is again subdivided in like manner, according to the number of series of the seeds. 3. *Incarvilleæ*, where the capsule has either one or two cells; in the latter case, as in *Amphicome*, each cell opens by a simple suture, and the valves remain attached to the dissepiment, which is placentiferous in the axis on both faces: in *Incarvillea* the capsule is also bilocular, and it splits into two valves, with a contrary dissepiment, which becomes quite free from them, upon the lateral margins of which the seeds are attached on both faces,—a structure quite that of the *Catalpeæ* : there is therefore an inconsistency in this small group, to which I will presently refer. 4. *Eccremocarpeæ,* where the capsule, though bivalvular, is unilocular, the seeds being affixed upon a prominent linear placentation that runs along the middle of each valve. This subtribe consists only of the genus *Eccremocarpus,* but the structure of its capsule and placentation differs in no way from that of *Jacaranda,* which is placed in the *Catalpeæ*; if therefore this subtribe be maintained, *Jacaranda* must be transferred to it.

In the first subtribe, the structure above defined, as regards the capsule, is universal. In the *Monostictides* the dissepiment is generally thin and coriaceous, but in the *Pleiostictides* it is thick and almost ligneous, in both cases consisting of two parallel plates firmly conjoined together, and which frequently may be separated: when the seeds fall away, we may observe upon it the lines of cicatrices distinctly marked on both sides, near to and parallel with the margins, thus indicating the points of attachment and number of series of the seeds. In *Amphilophium Vautherii,* for instance, these parallel plates easily come apart; the dissepiment is at the same time marked by a nervure along its axis, showing where the carpels have been conjoined; the imbricated seeds are attached near the margins, in four parallel rows (that is to say, sixteen series in all the four marginal surfaces), and the points of their attachment are marked by long deep furrows, which, being close to one another and alternating, give to the margin the appearance of being cancellated by a lattice-work of coarsely reticulated open spaces. A similar appearance is seen in *Pithecoctenium,* where the margins of the plates are severally turned up at a right angle, like the edge of a tray, and this reflected portion is cancellated in the same manner, showing there the points of attachment of the seeds.

In most of the *Eubignonieæ,* as in *Adenocalymna, Arrabidæa, Amphilophium, Anemopægma, Pithecoctenium,* &c., the two valves of the capsule, upon falling away, leave upon each side of the dissepiment (which remains attached to the peduncle, though at some distance from it) a concentric line of ligneous fibre, or replum, like that seen in the fruit of the *Capparideæ,* but which cords do not remain attached to the placentæ or seeds as in that family. These replum-like cords, which, before the dehiscence of the capsule, produce lateral ridges by intervening between the margins of the valves, remain attached at their base to the peduncle, and often at their other extremity to the apex of the dissepiment. In *Cybistax,* where the dehiscence is in the middle of the two faces, no such replum becomes manifested, as might be expected; nor does it exist among other genera of the *Catalpeæ*, the *Incarvilleæ*, or the *Eccremocarpeæ*. This replum, which results from the union of the adjacent midribs of the conjoined carpels, though simple in *Pithecoctenium* and *Amphilophium*, splits into two in most of the genera.

In the second subtribe, the *Catalpeæ*, the seeds are not affixed near the edges of the valves, as in the preceding group, but close to a line down their middle, where they are attached to the margins of the narrow transverse dissepiment; the latter is at first united to the valves, but it afterwards separates from them, bearing upon each face a single series of seeds placed alternately on the right and left. The same occurs in *Argylia*, where the seeds are attached in that manner—not along its median line, as incorrectly represented in Endlicher's 'Iconographia,' tab. 71. It sometimes happens in this group that a septiform extension of the dissepiment takes place nearly across the cellular spaces, so that the capsule becomes apparently 4-celled; this occurs in *Sparattosperma*, *Spathodea*, and *Heterophragma*, where the cruciform dissepiments thus formed are greatly thickened, and occupy nearly the whole capacity of the valvular spaces. It is well to observe that in these cases the two longer arms of the cruciform dissepiment terminate at the sutural commissures of the capsule, the two shorter ones in the middle of the valves, and that the seeds are borne by the latter: the ovary, at an early stage, is bilocular, when the dissepiment, which is transverse, appears much swollen in the axis, where it is not ovuligerous, but the ovules are affixed on each side of the axial line: it is this barren axial portion that subsequently extends in a cruciform direction, ultimately reaching the commissures of the valves. These indications are of use as leading to a knowledge of the normal structure. In *Stereospermum* a curious but analogous increment takes place: the ovary is 2-locular, with a thin dissepiment, and with numerous ovules remotely placed in distinct series; the capsule is cylindrical, very elongated, 2-valved, the central space being now filled up with a solid plug of a cork-like substance, in transversely articulated, separable, vertebra-like sections, in each of which a single seed is imbedded, attached by its hilum to the bottom of its foveolar nest, with its two wings extending upwards and downwards rectangularly along the inner face of the valves: these seminiferous cavities are placed alternately in the middle of the four quarters, indicated by four narrow longitudinal cicatrices that run down the entire plug, showing the lines of its attachment to the middle of the two valves, and where it has touched their sutural margins. It would seem that a very analogous structure exists in *Parmentiera*.

On the other hand, in some few genera, as in *Jacaranda, Fridericia, Eccremocarpus,* and *Calampelis,* there is no actual dissepiment, but the placentations are parietal along the middle of two parallel valves, which lines of placentation nearly touch one another, but do not meet in the axis: this linear placentation projects but little above the surface of the valves, and is reflected right and left into narrow plates parallel with the valve, which plates are crenately lobed, each lobe bearing a seed. In *Jacaranda* the seeds are arranged parallel to the valves. In *Eccremocarpus* (I speak rather of *Calampelis,* which has sufficient claim to be generically distinct) the seeds are more imbricately pendent. In *Fridericia* the structure of the capsule and seeds completely agrees with that of *Jacaranda.*

It has been held as a general rule that, throughout the order, the direction of the radicle is centrifugal in regard to the axis of the fruit: this is true in all the *Eubignonieæ,* and in such genera of the *Catalpeæ* as have a simple transverse dissepiment; but many exceptional cases occur. The instances of *Spathodea* and *Stereospermum* have already been mentioned (p. 160), where the radicle is neither centrifugal nor centripetal, but lies in a transverse direction parallel to the diameter of the fruit: a similar direction exists in *Sparattosperma* and *Heterophragma*: in *Jacaranda* it has the same position, while in *Calampelis* it is almost centrifugal. On the other hand, in *Platycarpum* and *Henriquezia* the radicle is decidedly centripetal, as I have shown it to be in certain species of *Spathodea.* In *Oxycladus* its direction is equally abnormal: here the ovary is bilocular, and the ovules, all heterotropal, are in a divaricating position, placed in collateral pairs down the middle of the dissepiment, with the micropyle directed to the axis. One of the cells becomes abortive, and in the other one only a single superior ovule becomes perfected, which occupies the entire space of the cell, and by the pressure of growth thus becomes pendent, so that the radicle is neither centrifugal nor centripetal, but points to the apex of the fruit.

Having brought together these facts, we are better prepared to inquire into the construction of the carpellary arrangement in the *Bignoniaceæ.* We find here, generally, an ovary formed of two cells separated by a complete dissepiment, a simple style, and a stigma consisting of two dilated lamellæ, corresponding most frequently in position with the cells. Upon this *prima-facie* evidence, the inference would naturally be that the normal number of its carpels must be two; but when we come to inquire a little further, we find great difficulty in accounting for the mode of dehiscence of the capsule and the position of the seeds on the dissepiment, upon this hypothesis. We must bear in mind that the normal carpellary leaves would be ovuligerous either on their margins or on their midribs: if on their margins, supposing them to be only two in number, how are we to account for the production of a thick dissepiment, which could have formed no part of such original carpels? if on their midribs, the same objection supervenes, unless we imagine that the midrib of each carpel grew out in the form of a septum, both of which, uniting by their edges, might constitute the dissepiment; but such kind of growth is contrary to the usual law of development, and, upon examination of the ovary in its earliest stages, there is no appearance of its having taken place. Such a conjecture may therefore be dismissed, because it is quite unsupported by rule or evidence.

We may, however, satisfactorily explain the morphological changes that have taken place in *Eubignonieæ* upon the hypothesis that the ovary is normally composed of four carpels with sterile margins, and which are ovuligerous on their midribs, all severally plicated and arranged in opposite pairs, as in fig. 1:

Fig. 1.

Fig. 2.

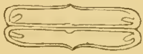


Fig. 3.

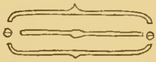


Fig. 4.

these, by the confluence of their sterile margins and adjacent faces, would constitute a bilocular ovary, such as we find it in *Bignonia* and its congeners, with the ovules fixed, not in the axis, but in the marginal angles of the two cells (fig. 2). We may in this manner account for the separation of the two valves of the capsule from the dissepiment close to the four lines of placentation, and also for the production of the replum before described, which originates in the union of the midribs of the normal carpels (fig. 3), that sometimes remain agglutinated together (as in *Pithecoctenium*), sometimes become divided in two (as in many other genera). This view is further confirmed by the fact observed in *Peltospermum*, where the dissepiment is fenestrated at its apex for one-third of its length, and nearly its whole breadth (as in fig. 4), by a very large aperture, which no doubt is caused by the incomplete junction of the edges of the normal carpels where they meet together to form the septum, in the manner shown in fig. 1. This fact presents the strongest argument in favour of the view here taken. In *Tanaecium*, *Distictis*, and probably in *Dolichandra*, where, as in *Bignonia*, the dehiscence is marginicidal, the valves are partly split down their middle, thus partaking of both kinds of dehiscence. I do not see how we can explain the development that takes place in the *Eubignonieæ* under any other hypothesis. We find a striking evidence in favour of this conclusion in the fruit of *Pithecoctenium*, of which mention has been previously made. Here the seeds are affixed upon a broad, prominent zonal reflexion formed round each margin of the thick dissepiment, which, as we have seen, is separable into two plates; and the thick valves at the line of their separation are seen to be respectively moulded around these seminiferous inflexions, leaving the replum on each margin free both from the valves and the dissepiment, though still connected with the latter at its base and apex (fig. 5).

Fig. 5.

This conviction is more forcibly confirmed by the examination of the ovary in the *Eubignonieæ*. Upon the fall of the corolla, we find the ovary grown to a length a little exceeding that of the calyx, and compressed as usual, with a deep groove along each edge coinciding with the margins of the dissepiment, which there bears the ovules close to that line, at the furthest possible distance from the axis; upon each face is a prominent line, which is continued up the style: this structure is shown in fig. 2. The same appearance is observed in the ovary, in a very early stage of the bud, long before the anthers are perfected; we have then the same deep marginal inflexion, showing the line of confluence of the component carpels, as in the manner shown. The stigma consists of two broad petaloid lamellæ, which are smooth within, and apparently are not provided with the usual papillose stigmatic surface, which here seems to reside in the infundibuliform mouth of the style: this is hollow for half its length, and on each side dark longitudinal lines are distinctly seen, which appear to correspond with the stigmatic channels in communication with the four placentiferous lines of the ovary: the longitudinal line seen upon each face of the ovary is continued along the style, in the form of a nervure, through the middle of the stigmata, and on each side of this nervure the dark lines just mentioned are distinctly seen. These appearances are all confirmatory of the assumption that the ovary is composed of four carpels combined in the manner previously shown; and we may also infer that each lamella of the stigma is composed of two confluent stigmata. The occurrence of a bifid stigma, with four united carpels, at first thought might be considered to be an improbability; but we must remember that it is no unusual combination, for it is constant in the extensive families of the *Ehretiaceæ*, *Boraginaceæ*, and *Labiatæ*, and also frequent in *Verbenaceæ*.

In the *Catalpeæ*, where the capsule is loculicidal, the dissepiment being contrary to the valves, which separate from it, there is evidently a different structure, the nature of which may probably be more readily understood from the examination of the ovary. This is here compressed, as in the former tribe, 2-celled, with a precisely similar style and stigma; but the dissepiment is not, in like manner, parallel to its two faces, but, contrariwise, transverse, its ovuligerous margins corresponding with the antical and postical longitudinal ridges; the cells, therefore, instead of being anterior and posterior in regard to the axis, stand on its right and left, so that the stigmata are contrary to the cells: the ovules, in two series, are borne upon the dissepiment (in *Tecoma ochracea*) (fig. 6), not along the axis, but, as in the

Fig. 6.

Fig. 7.

Fig. 8.

former instance, at the utmost distance from it. Now, in this case the ovary may be assumed to be constituted either of two carpels, ovuligerous on their midribs, and placed back to back, as in fig. 7; or it may be formed of four carpels arranged somewhat as in the *Bignonieæ*, but differently disposed, as in fig. 8, the sterile margins being afterwards united, and the adjacent faces becoming confluent. Upon comparing these figures, it will be seen that the former view must be rejected, because, under that hypothesis, the ovules ought to be found arranged along the axis; and the latter view must be adopted, because it satisfactorily accounts for the position of the ovules in the ovary and of the seeds in the fruit. Owing to a somewhat different inclination of the carpels, as shown in fig. 9 (which will be seen

Fig. 9.

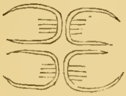
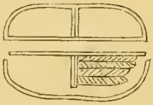


Fig. 10.



to be a modification of fig. 8), the ovary and fruit become 4-locular in *Heterophragma*; and the resulting form of fruit is shown in fig. 10, where the dissepiment is cruciform, with two longer and two shorter arms; the latter, bearing the seeds 3- or 4-serially on both sides, terminate in the middle of the valves, the former touching the sutural and dehiscent margins of the valves. When the valves open, the corresponding barren portion of the dissepiment becomes split across into two longitudinal halves, each half bearing the seminigerous portion of the dissepiment in the form of the letter **T**, which at the same time detaches itself from the middle of the valve. We see here the most complete verification of the hypothesis above suggested of the carpellary constitution of the ovary and fruit in the *Catalpeæ*. In some species of *Spathodea*, in *Stereospermum*, in *Parmentiera*, and partially in *Sparattosperma*, the dissepiment seen in fig. 6 becomes swollen and enlarged by solid deposits into a cylindrical plug, which nearly fills the entire cavity of the two valves, the body of the seeds being left imbedded in corresponding cavities of the plug (as in fig. 11), while the wings remain pressed against the inner face of the valves. In *Spathodea falcata* and in *Spathodea alternifolia*, the capsule is much compressed, and the dissepiment, instead of being cylindrical, is greatly flattened, though still filling the entire space formed by the two valves: this dissepiment is deeply sulcated along the middle of both faces, almost to the centre, the groove being divided by an extremely narrow ridge, the margins of which are attached to the middle of the valves, from which they afterwards separate: this ridge is an extreme abbreviation of the shorter seminigerous arms of the cruciform dissepiment described in *Heterophragma* (fig. 10), and is in like manner seminigerous; it contains the same placentary threads which are seen in the centre of the large cylindrical plug of *Stereospermum chelonoides*. In a section of the dissepiment of *Spathodea falcata* (fig. 12) there are seen two of the deep cavities alternately formed in it upon each side of the ridge, each of which cavities is filled with a single seed attached by its marginal hilum to the ridge. From this arrangement it is seen that the seeds are strictly centripetal, the radicle of the embryo pointing to the axis of the fruit, contrary to the usual disposition of the order. These several developments therefore may all be referred to one simple normal structure, different from that of the *Bignonieæ*; and the *Catalpeæ* thus constitute a second very natural tribe.

Fig. 11.

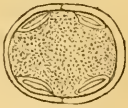
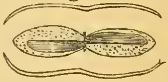


Fig. 12.



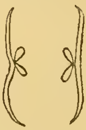
From the last-mentioned group, as indicated by DeCandolle, we must exclude *Platycarpum* (and, of course, *Henriquezia*), as it is evident that their ovary is constructed of two carpels only, which, though placentiferous on the midrib of their folded carpellary leaves, as in the two preceding divisions, are differently placed in regard to each other; for the midribs of the carpels are disposed back to back, as in fig. 7, and conjoined so as to form a bilocular ovary, as in fig. 13, with the placentation in the axis and the ovules fixed in the angle of each cell: the fruit thus resulting is a 2-celled loculicidal capsule, the valves remaining attached to the axis, and the cells opening along the sutural line of the sterile margins of the carpels. In this group the

Fig. 13.

anomalous genus *Oxycladus* will naturally find a place, as also the *Monttea* and *Reyesia* of Gay*—genera evidently allied very closely to it, but of which little is yet known. We have thus a third natural tribe, the *Platycarpeæ*.

I have already described (in p. 161) the development that takes place in the fruit of *Jacaranda*, which is quite analogous to that of *Fridericia*, *Calampelis*, and *Eccremocarpus*. Here the ovary, as in the *Platycarpeæ*, is normally constituted of two carpels only, which are in like manner placentiferous on their midribs, but they are differently arranged, being placed with their placentiferous lines opposed to each other, and conjoined by their sterile margins, as in fig. 14. The ovary is therefore unilocular, with two opposite longitudinal parietal placentæ, and the result is a compressed, 1-celled, 2-valved capsule, with the seeds attached to the middle of the valves, which open along the sutural line of union of the original carpels. These genera thus constitute a fourth very natural tribe, the *Eccremocarpeæ*, a group of greater extension than the subtribe of the same name of DeCandolle.

Fig. 14.



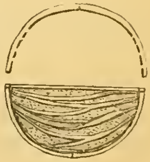
It appears to me that the fourth subtribe of DeCandolle, the *Incarvilleæ*, cannot be maintained. That group consists only of *Incarvillea* and *Amphicoma*. In regard to the former genus, I am able to confirm the accuracy of the details given by Correa da Serra (Ann. Mus. viii. 391, tab. 63. fig. 2), which prove that the structure of its fruit and the position of the seeds, in the only known species, are precisely the same as in *Argylia*, which has been noticed in page 160. The resilient process often observed in the anthers, which seems like an arista, has been urged as a distinctive character; but this arises (as was long ago indicated by Mr. Brown, Pl. Jav. Rar. 111), not from any emanation of the connective, but from the rending of the thickened nerve-like sutural margins of the anther-cells, which separate at the base and remain attached at the apex, as I have shown to occur in *Argylia*. It was upon this circumstance that Presl was induced to found his *Oxymitra*, a genus which cannot stand. A similar resilience in the anther-cells is occasionally met with in other Bignoniaceous genera, for instance in the *Pyrostegia* of Presl (*Bignonia venusta*). The general habit of *Incarvillea* is quite that of *Argylia*, as is acknowledged by DeCandolle; and there is a remarkable similarity in its leaves, which are in like manner bipinnatisected, with linear segments; it has also a terminal raceme, with large handsome crimson flowers. *Incarvillea*, therefore, may safely be placed among the *Catalpeæ*, and near *Argylia*.

* Gay, Chile, iv. 416, tab. 51; *ibid.* 418, tab. 52; Walp. Ann. iii. 92, 93.

In *Amphicoma* the capsule appears differently constituted from that of *Incarvillea*, as before shown; and in several other respects the genus is at variance with *Bignoniaceæ*: it seems more conformable with *Cyrtandraceæ*, as Mr. Brown long ago indicated (*loc. sup. cit.*); in the structure of its flower it quite agrees with that family, especially in its stamens with large appendiculate connective, which in *Bignoniaceæ* is not so strongly developed; its fruit is also in perfect accordance with *Cyrtandraceæ*, particularly in its long comose seeds, which are pendent (not transverse), with a superior (not centrifugal) radicle. The genus, at one time placed in *Cyrtandraceæ* by DeCandolle, was afterwards removed, in great measure on account of its divided leaves; it must, however, be remembered that it agrees better with the last-mentioned family in its herbaceous habit and general aspect, and that if in *Cyrtandraceæ* the leaves are not pinnatisected, they are only one degree removed from this condition in their deeply and unequally serrated margins.

Before I dismiss this inquiry into the carpological structure of the *Bignoniaceæ*, I will mention a novel and interesting form of development which I have noticed in a fruit brought from Jamaica, and now in the Collection of the British Museum, where there are two specimens, collected by different individuals at distant periods, from which we may infer that the plant which produces it is not of rare occurrence in that island. It is to be regretted that these fruits are not accompanied by any dried specimen of the plant from which they were gathered. I have no doubt that it is the fruit of *Tanaecium albiflorum*, DC. (*Tanaecium Jaroba* of Swartz, and the *Cucurbitifera fruticosa*, Sloane), agreeing in every essential respect with the account given of it by Swartz. The specimen I have seen is 6 inches long (according to Swartz sometimes a foot in length), $2\frac{1}{4}$ inches in diameter, and nearly circular in its transverse section; it splits into two valves of a solid ligneous texture, about $\frac{1}{8}$ inch in thickness; it has a rather thin coriaceous dissepiment, quite smooth on both sides, parallel to and quite free from the valves, and a bipartible compressed replum, which lies between the margins of the valves; these valves partly split down the middle, as in *Distictis* and *Dolichandra*: the two cells are filled with a great many irregularly orbicular and compressed seeds, much resembling those of *Adenocalymna*, closely packed together and imbricated, apparently without the least trace of intervening pulp (fig. 15): the outer tunic of each seed is hard and smooth, and is truncated on one side by a straight marginal edge, forming an oblong

Fig. 15.



linear hilum, by which it is attached to the inner face of the valves; upon this face, along the margins of each valve, there is seen a broad longitudinal seminiferous zone, leaving the intervening portion, which is as broad as the two zones united, covered with a polished yellow endocarp: these seminiferous zones are marked with a number of dark, rough, oblong cicatrices, placed alternately in three or four parallel series, which correspond with the hilar points of attachment of the seed, as in *Pithecoctenium.* From this it will be seen that the attachment of the seeds is strictly parietal—a feature hitherto novel in *Bignoniaceæ.* This circumstance has probably led botanists to suppose that it belonged to the *Crescentiaceæ,* as it resembles *Crescentia* in its hard shell, of similar shape and size; but as it is decidedly 2-valved and dehiscent, has a perfect and free dissepiment, with a distinct replum, and quite devoid of pulp, it is strictly *Bignoniaceous* and belongs to the tribe *Bignonieæ,* differing in no respect except in its parietal placentation. It should be observed, however, that the direction of the seeds and their attachment by a marginal hilum, precisely in the same position, occur in *Pithecoctenium* (see fig. 5, page 163); but in the latter case the zonal bands of placentation remain fixed at a right angle to the inflected margins of the free dissepiment, whereas in this fruit they are attached to the valves: in all other respects there is a perfect agreement between the two cases. The structure of the seed and the form of its integuments in this instance are precisely as I have described them in *Pithecoctenium,* the testa being in like manner bimarsupiate at the base of its discoid cell by a short septum; and in the recesses thus formed the lower portions of the embryonary lobes are sheltered. In *Pithecoctenium,* the broad expanded part of the testa which forms the pellucid winged margin around its discoidal portion is of the same extent as in the fruit under consideration; but it is filled to its extreme edge by a thick deposit of cellular tissue between its faces, so that it loses its transparent character, and becomes thick, hard, and coriaceous, as in the seeds of *Heterophragma*: the inner integuments, which closely invest the embryo, are about half the length and half the breadth of the testa.

I shall presently recur to the genus *Tanaecium* of Swartz, respecting which a strange degree of confusion has existed.

[To be continued.]

XX.—*A Revision of the History, Synonymy, and Geographical Distribution of the recent* Terebratulæ. By Lovell Reeve, F.L.S., F.G.S.

Forty years ago, when M. Valenciennes prepared for Lamarck, who was already blind, the monograph of this genus for his 'Histoire des Animaux sans Vertèbres,' the shells of only twelve or fourteen species of recent *Terebratulæ* had been observed, the soft parts of only one, and the organization of the Brachiopods generally was very imperfectly known. Although Linnæus had remarked that the animal of *T. caput-serpentis* differs not less from any other animal that he had found in shells, than night from day—"animal quod intus conditur a vermibus qui aliis in conchis omnibus sibi invicem fere sunt similes non differt minus quam a nocte dies,"—the *Terebratulæ* and their allies were still arranged with the lamellibranchiate Conchifera.

De Blainville, and subsequently, by a more elaborate investigation, Professor Owen, ascertained that the branchiæ do not exist in the form of lamellæ, but are incorporated by a system of vessels with the mantle-lobes. Along with the discovery of the phenomenon that the mantle-lobes of the Brachiopods perform not only the office of secreting the shell, but also that of respiration, another peculiarity was observed, namely, that the valves are differently placed from those of other bivalves with regard to the position of the animal—that, in fact, they are not side-valves connected dorsally by a cartilage and ligament, but dorsal and ventral valves, connected, in the *Terebratulæ*, by closely interlocking tooth-like processes in relation with an internal apophysial skeleton, and a complicated system of muscles to which may be added a force acquired through the animal's habit of affixing itself to foreign bodies by a fibrous byssus-like tendon. Another peculiarity which presented itself was the presence of a pair of internal ciliated arms. The Brachiopods, even as late as 1830, were arranged by Cuvier and his contemporaries in immediate proximity to the Cirripedes: it had, however, been observed that the ciliated arms of the Brachiopod are quite distinct organs from the cirri of the Cirripede; and Professor Owen's beautifully detailed exposition of its anatomy removed all doubt on the subject. Projecting from the mouth of the animal on either side, they correspond (or, to speak scientifically, are homologous) with the labial palps of other bivalves, prolonged, as it were, on muscular tubes, so as to require being folded or coiled up. In *Terebratula* an internal bony skeleton or apophysis is formed, proceeding from the hinge in connexion with the dorsal valve, for the support of the arms; and being extremely variable in structure, it affords excellent characters to the conchologist for the distinction of groups.

The *Terebratulæ* are chiefly deep-dwelling Brachiopods; and from the little trouble devoted to dredging them from their native haunts, the varieties of the apophysial skeleton were not until lately known. The dredgings of M. Gaudichaud, M. D'Orbigny, MM. Quoy and Gaimard, Capt. King, Mr. Cuming, Capt. Belcher, Professor Forbes, Mr. MacAndrew, Mr. Barlee, and others, have furnished specimens with internal skeletons, coupled with valuable bathymetrical observations; and the different forms of apophysis, and corresponding development of the arms, have been well observed by M. D'Orbigny, Mr. Davidson, Mr. Woodward, and Mr. King. Excellent systematic catalogues of both recent and fossil species have been published by Mr. Davidson, and by Dr. Gray, assisted by Mr. Woodward, in which the different forms of apophysis are employed as the grounds of subdivision; and the geographical distribution of the species in space, in depth, and in time has been worked out with much ingenuity by Professor Suess. One thing appeared to me to be wanting—a more extended comparison and verification of the recent species. No generalizations on geographical distribution can be relied upon, unless the recorded specific existence and habitat of the subjects are well authenticated. Prof. Suess's dissertation on the geographical distribution of the Brachiopods is a most able work, but bears evidence of his not having sufficiently tested the species. The very characteristic subgenus *Argiope*, for example, has its home in the Mediterranean; the Mediterranean is undoubtedly its southern limit; but Dr. Suess gives New Zealand as a habitat *, on the ground that an obscure specimen in the Paris Museum, which Mr. Davidson somewhat too precipitately described (as he has himself generously acknowledged to me) as a new subgenus with the name of *Waltonia Valenciennesii*, is an *Argiope*. This shell is identical with a species, now well enough known, described subsequently by Mr. Davidson with the name *Terebratella Evansii*. Dr. Gray places it under *Magas*, and I incline to concur with this view; but with *Argiope* the species has no relation whatever; and Professor Suess might have detected this, even without any examination of the specimen, from Mr. Davidson's excellent figures of it. Again, Professor Suess gives *Terebratella* as one of the types of the South African province of geographical distribution; but this conclusion is drawn from a statement that a shell in the British Museum, named by Sowerby *T. Algoensis*, from Algoa Bay, is a *Terebratella*. Upon examining this shell, I

* "Die fünfte und letzte Art dieser kleinen Sippe ist in Neu-Seeland zu Hause."—Wohns. der Brach. p. 34.

find it to be a bleached fragmentary odd valve of the South African *Kraussia rubra*. Professor Suess gives *Kraussia* as one of the types of the Corean waters, on the authority of Mr. Davidson, adding that the original habitat given by Mr. Adams and myself, in the 'Mollusca of the Voyage of the Samarang,' for *T. Capensis* (now *Kraussia Deshayesii*) ("Cape of Good Hope, dredged at the depth of 120 fathoms"), is probably erroneous. The Cape of Good Hope is especially the home of the *Kraussiæ*; the only species out of that locality is an abnormal one, *K. Lamarckiana*, a native of South Australia and New Zealand. Mr. Davidson's mistake in giving Corea as the habitat of *Kraussia Deshayesii* arose from a displacement of tickets in Mr. Cuming's cabinet. I mention these instances, not with the view of casting disparagement on Dr. Suess's philosophy, but as exemplifying the inconvenience of going into philosophical dissertations before the materials have been thoroughly sifted and verified. The specimens which have come under my notice (and I have examined some hundreds, embracing every form of apophysis hitherto known) are from the Paris Museum, kindly forwarded to me by M. Valenciennes, at the suggestion of Professor Milne-Edwards, and from the fine collections of the British Museum, Mr. Cuming, Mr. Lombe Taylor, Mr. Metcalfe, and Mrs. De Burgh.

Synopsis of Species.

Subgenus 1. Terebratula, Lhwyd (pars).

Apophysis a small, simple, unreflected loop projected on a pair of rather elongated blades.

1. *Terebratula vitrea*, Born, Test. Mus. Cæs. p. 119, p. 116 vign.; Conch. Icon. pl. 3. f. 8 *a, b, c*.

Anomia vitrea, Born.
—— *terebratula*, Gmelin.
Terebratula vitrea, Val. apud Lamk.
Anomia terebratula, Dillwyn.
Terebratula euthyra, Philippi.
—— *minor*, Suess.

Hab. Mediterranean (in nullipore mud, at a depth of from 92 to 150 fathoms); *E. Forbes*. Vigo Bay (at a depth of 40 fathoms); *MacAndrew*.

This and the following are the only species left to *Terebratula* proper.

2. *Terebratula uva*, Broderip, Proc. Zool. Soc. 1833, p. 124; Conch. Icon. pl. 3. f. 11.

Hab. Bay of Tehuantepec, Guatemala (dredged from sandy mud at a depth of 10 to 12 fathoms); *Capt. Dare.* Falkland Islands, fide *Cuming.*

Mrs. De Burgh possesses a specimen of *T. uva* exactly similar to the original specimen, hitherto considered unique, in Mr. Cuming's collection; and Mr. Cuming has recently received three *Terebratulæ* of smaller size from the Falkland Islands, specimens of which are also in the British Museum, which I can only assign (and Mr. Woodward agrees with me) to this species.

Subgenus 2. Terebratulina, *D'Orbigny.*

Apophysis a small unreflected loop arched into a circle on projecting blades.

3. *Terebratula (Terebratulina) caput-serpentis,* Linnæus, Syst. Nat. p. 1153; Conch. Icon. pl. 4. f. 15 *a, b.*

Anomia caput-serpentis, Linnæus.
—— *retusa,* Linnæus.
—— *pubescens,* Linnæus.
Terebratula pubescens, Müller.
—— *caput-serpentis,* Val. apud Lamk.
—— *costata,* Lowe.
—— *aurita,* Fleming.
—— *striata,* Leach.
—— *septentrionalis,* Couthouy.
—— *conica,* D'Orbigny.
Terebratulina caput-serpentis, D'Orbigny.
Delthyris spatula, Menke.

Hab. North and South European and North American Seas (at depths of from 10 to 150 fathoms).

The oldest, best-known, and most widely spread of the *Terebratulæ.* It ranges throughout the European Seas, from the Arctic to the Mediterranean, and appears in North America in a more finely striated form, known as *T. septentrionalis.* It is represented in the Corean and Japanese waters by *T. abyssicola* and *T. Japonica.*

4. *Terebratula (Terebratulina) Japonica,* Sowerby, Thes. Conch. i. p. 344, pl. 68. f. 7, 8; Conch. Icon. pl. 4. f. 16.

Terebratula angusta, Adams and Reeve.

Hab. Corea, Japan.

Closely allied to *T. caput-serpentis,* and, without doubt, its typical representative in the Corean and Japanese Seas.

5. *Terebratula (Terebratulina) cancellata,* Koch, Küster, Conch. Cab. vii. pl. 2*b.* f. 11–13; Conch. Icon. pl. 4. f. 13.

Hab. West Australia? *Koch.*

This species partakes very much of the character of the two preceding, but it appears distinct. Great doubt, I think, attaches to the habitat, "West Australia," given by M. Koch.

6. *Terebratula* (*Terebratulina*) *abyssicola*, Adams and Reeve, Moll. Voy. Samarang, p. 72, pl. 21. f. 5; Conch. Icon. pl. 4. f. 14.

   Hab. Corea; *Belcher.*

Mr. Davidson has truly remarked that this and the preceding species require further examination; but no other specimens have been collected since he wrote. One important error needs to be corrected. In the original description of *T. abyssicola* in 'Moll. Voy. Samarang,' the habitat of *Kraussia Deshayesii* was accidentally repeated. Mr. Cuming possesses the shell correctly labelled "Corea."

7. *Terebratula* (*Terebratulina*) *radiata*, Reeve, Conch. Icon. pl. 3. f. 7 *a, b.*

   Hab. Strait of Corea?

Of this black-rayed species, which appears to me to be a very distinct one, Mr. Cuming possesses three exactly similar specimens, procured, he fancies, from the dredgings of Capt. Sir E. Belcher in the Strait of Corea.

8. *Terebratula* (*Terebratulina*) *Cumingii*, Davidson, Proc. Zool. Soc. 1852, p. 79, pl. 14. f. 17–19; Conch. Icon. pl. 4. f. 12.

   Hab. China Seas.

A small, well-defined species, rather prominently bifurcately ridged.

Subgenus 3. Waldheimia, *King.*

Apophysis a free, largely-produced, riband-like loop, considerably reflected.

9. *Terebratula* (*Waldheimia*) *globosa*, Valenciennes apud Lamarck, Anim. sans Vert. vii. p. 330; Conch. Icon. pl. 2. f. 3 *a, b, c,* and pl. 6. f. 3 *d, e.*

   Terebratula Californica, Koch.

   Hab. California, Coquimbo.

When publishing this species four months since, in pl. 2 of my monograph in 'Conch. Iconica,' I ventured to assign to it the shell well known in collections as *T. Californica*, Koch. On receiving subsequently from M. Valenciennes the original type of his *T. globosa*, very clumsily figured in the 'Encyclopédie Méthodique' (which figure is copied, with all its infirmities, on a reduced scale in De Blainville's 'Malacologie'), I found the opinion that I had formed to be the correct one.

10. *Terebratula* (*Waldheimia*) *physema*, Valenciennes, MS. in Mus. Jardin des Plantes; Conch. Icon. pl. 6. f. 23 *a, b, c.*

Hab. Coquimbo; *Gaudichaud.*

This fine shell, belonging to the Museum of the Jardin des Plantes, had been regarded as a variety of *T.* (*Waldheimia*) *dilatata*; but when M. Valenciennes was making a selection of the specimens of *Terebratulæ* to send me, it appeared to him to be distinct, and he made the following note on the back of the tablet:—"Grande et belle espèce de *Térébratule* (*Waldheimia*) confondue avec mon *T. dilatata*, rapportée de Coquimbo en 1833 par M. Gaudichaud, et donnée par lui à M. Férussac. Achetée en 1837 avec la collection." It is intermediate in its characters between *W. globosa* and *W. dilatata*, inclining rather to the former species, of which it may possibly be only a colossal, broadly inflated variety.

11. *Terebratula* (*Waldheimia*) *dilatata*, Valenciennes apud Lamarck, Anim. sans Vert. vii. p. 330; Conch. Icon. pl. 2. f. 2, and pl. 6. f. 2 *b, c.*

Terebratula Gaudichaudi, De Blainville.

Hab. Coquimbo? Strait of Magellan?

This species I have also had the pleasure of verifying from the original type, formerly belonging to M. Dufresne, and now in the Paris Museum. The habitats rest in doubt. Coquimbo seems the most likely to be correct; but I have just been favoured with a visit from a gentleman recently arrived from the first-named habitat, who assures me that he collected some mutilated remains of a large shell, like *W. dilatata*, at the Falkland Islands. Unfortunately he threw them away.

12. *Terebratula* (*Waldheimia*) *lenticularis*, Deshayes, Rev. Soc. Cuv. 1839; Mag. de Zool. 1841, pl. 41; Conch. Icon. pl. 2. f. 4.

Hab. New Zealand (dredged in the Strait of Faveau at the depth of 15 fathoms); *Deshayes.*

Except in colour, this species is scarcely distinguishable from *T.* (*Waldheimia*) *globosa*.

13. *Terebratula* (*Waldheimia*) *flavescens*, Valenciennes apud Lamarck, Anim. sans Vert. vii. p. 330.

Terebratula dentata, Val. apud Lamk.
—— *australis*, Quoy.
—— *recurva*, Quoy.
Waldheimia australis, King.

Hab. South Australia.

The most abundant of any *Terebratula* yet collected. In the

British Museum there is a large stone, brought by Mr. Jukes from Port Jackson (a portion of which is figured in Conch. Icon. pl. 1), covered with them; and MM. Quoy and Gaimard relate, in their account of the Mollusca of the Voyage of the Astrolabe, that at Port Western, Bass's Straits, hundreds were brought up at each haul of the dredge, affixed by their pedicles to the débris of shells, or to one another. On the stone in the British Museum are clustered also a few specimens of the small *T.* (*Kraussia*) *Lamarckiana*.

14. *Terebratula* (*Waldheimia*) *picta*, Chemnitz, Conch. Cab. xi. p. 247, pl. 203. f. 2011, 2012; Conch. Icon. pl. 3. f. 9 *a*, *b*.

Anomia picta, Chemnitz.
Terebratula sanguinea, Sowerby (in 'Genera,' not in 'Thesaurus').
—— *erythroleuca*, Quoy.

Hab. Java.

A smooth, elegantly-painted orange-red species with very little variation.

15. *Terebratula* (*Waldheimia*) *Grayi*, Davidson, Proc. Zool. Soc. 1852, p. 76, pl. 14. f. 1–3; Conch. Icon. pl. 2. f. 5 *a*, *b*, *c*.

Hab. Strait of Corea; *Belcher*.

When the shells collected in the 'Samarang,' under the command of Capt. Sir Edward Belcher, were under the examination of Mr. Adams and myself, the apophyses of the *Terebratulæ* had not been carefully observed, and we took this species to be the *T.* (*Kraussia*) *rubra*. Two years later, when Mr. Davidson made the apophyses a special study, he found this to be a *Waldheimia*, and a perfectly distinct species.

16. *Terebratula* (*Waldheimia*) *cranium*, Müller, Zool. Dan. Prodr. p. 209; Conch. Icon. pl. 3. f. 6.

Anomia cranium, Gmelin.
Terebratula vitrea, Fleming.
Macandrevia cranium, King.

Hab. North European Seas (at depths of from 40 to 200 fathoms).

Dr. Gray incorrectly quotes *Anomia vitrea*, Chemnitz, as a synonym of this species. Dr. Fleming named a specimen (in the 'Edinburgh Cyclopædia' and in his 'Philosophy of Zoology') *T. vitrea*; but the *Anomia vitrea* of Chemnitz is the true *Terebratula vitrea*. *T.* (*Waldheimia*) *cranium* is a Scandinavian species, and is only included in the British fauna on the ground of its discovery on two different occasions, by Dr. Fleming and Mr. Barlee, about thirty miles east of Zetland.

17. *Terebratula* (*Waldheimia*) *septigera,* Lovén, Index Moll. Scand. p. 29.

Hab. Norway, Finmark.

Another Scandinavian species, recently described by Lovén, of a more oblong form than *T. cranium,* more concavely depressed towards the anterior margin, and possibly distinct; but the species needs further research.

Subgenus 4. TEREBRATELLA, D'Orbigny.

Apophysis a freely produced riband-like reflected loop, resembling that of Waldheimia, *attached towards the middle by a cross process affixed to a central septum.*

18. *Terebratula* (*Terebratella*) *Magellanica,* Chemnitz, Conch. Cab. viii. p. 101, pl. 78. f. 710, 711; Conch. Icon. pl. 5. f. 21 *a, b, c, d.*

Anomia striata Magellanica, Chemnitz.
—— *dorsata,* Gmelin.
Terebratula dorsata, Lamarck.
—— *Sowerbyi,* King.
—— *Chilensis,* Broderip.
Delthyris dorsata, Menke.
Terebratella dorsata, Davidson.

Hab. Straits of Magellan; *King.* Valparaiso; *Cuming.*

I include Mr. Broderip's *T. Chilensis* with Gmelin's *A. dorsata,* as well as *T. Sowerbyi* and *flexuosa* of Capt. King, already referred to it by Professor Suess; and I restore to the species the prior and very characteristic name of *Magellanica* given to it by Chemnitz.

19. *Terebratula* (*Terebratella*) *transversa,* Sowerby, Thes. Conch. i. p. 361, pl. 72. f. 114, 115; Conch. Icon. pl. 5. f. 22.

Hab. —— ?

This shell (kindly transmitted to me by Mr. Norris, nephew of the late owner of it), which I have examined with much care, is intermediate between certain varieties of the very variable *T. Magellanica* and *T. Bouchardii.* I have not seen the second specimen of it, referred to by Mr. Sowerby as being in the collection of M. Janelle, and still leave the species in doubt.

20. *Terebratula* (*Terebratella*) *Bouchardii,* Davidson, Ann. and Mag. Nat. Hist. 1852, ix. p. 367; Proc. Zool. Soc. pl. 14. f. 4–6; Conch. Icon. pl. 5. f. 17.

Hab. —— ?

This is another species founded on a single specimen of somewhat doubtful specific character.

21. *Terebratula* (*Terebratella*) *suffusa*, Reeve, Conch. Icon. pl. 5. f. 18.

Hab. ——?

A third doubtful species, partaking of the general typical character of *T. Magellanica*, but equally distinguished by details of form, sculpture, and colour which seem peculiar to it.

22. *Terebratula* (*Terebratella*) *cruenta*, Dillwyn, Syn. p. 295; Conch. Icon. pl. 5. f. 20 *a, b*.

Terebratella cruenta, Gray.
Terebratula sanguinea, Leach, Quoy (not of Chemnitz).
—— *rubra*, Sow. (not of Pallas).
—— *Zelandica*, Deshayes.
Terebratella Zelandica, Davidson, Suess.

Hab. New Zealand (dredged in Cook's Straits at a depth of 15 fathoms).

This beautiful and well-known species was described half a century ago by Dillwyn, and admirably figured about the same time by Leach in his 'Zoological Miscellany.'

23. *Terebratula* (*Terebratella*) *rubella*, Sowerby, Thes. Conch. i. p. 350, pl. 69. f. 40–42; Conch. Icon. pl. 7. f. 26 *a, b*.

Terebratella rubella, Davidson.

Hab. Bass's Straits, South Australia (dredged from a depth of about 27 fathoms); *Calvert*.

This species was thought at one time to be a variety of *T.* (*Waldheimia*) *picta*; but it is uniformly of smaller size, and it not only has the doubly-attached loop of *Terebratella*, but is from a widely remote habitat. Japan (quoted by Professor Suess, from Sowerby, for this species) is a wrong habitat.

24. *Terebratula* (*Terebratella*) *rubicunda*, Solander, Sowerby, Thes. Conch. i. p. 351, pl. 70. f. 45–47; Conch. Icon. pl. 7. f. 27 *a, b*.

Terebratula inconspicua, Sowerby.

Hab. New Zealand.

This species occurs either of a purplish or deep coral-red colour, or it is colourless. It has been dredged abundantly at New Zealand; but we have no record of the depth of its habitat.

25. *Terebratula* (*Terebratella*) *Coreanica*, Adams and Reeve, Moll. Voy. Samarang, p. 71, pl. 21. f. 3; Conch. Icon. pl. 7. f. 28 *a, b*.

Hab. Corean Archipelago; *Belcher*.

A delicate crimson-rayed species, of which many specimens were dredged by Capt. Belcher among the islands of the Corea. Professor Suess describes an unpublished *Terebratella* received from Dr. Gould with the habitat "Hakodadi" and name in manuscript "*T. miniata.*" Can it be our *T. Coreanica*?

26. *Terebratula* (*Terebratella*) *sanguinea,* Chemnitz, Conch. Cab. viii. p. 96, pl. 78. f. 706; Conch. Icon. pl. 7. f. 25 *a, b, c.*

Anomia sanguinea, Chemnitz.
Terebratula sanguinea, Sowerby.
—— *pulchella,* Sowerby.
Terebratella sanguinea, Davidson.
Megerlia pulchella, Davidson.

Hab. Philippine and Sandwich Islands.

An examination of more than a dozen specimens of this charming little species, most of them with the soft parts macerated, so as to afford excellent comparisons of the loops, has convinced me that Mr. Sowerby's *T. pulchella* is merely a variety of his *T. sanguinea* (*Anomia sanguinea,* Chemnitz), in which the deltidium plates are forced asunder by circumstances in its mode of attachment. The apophysis is the same in both forms, differing somewhat from the typical form of the apophysis in *Terebratella,* and partaking of that in *Megerlia.*

27. *Terebratula* (*Terebratella*) *Labradorensis,* Sowerby, Thes. Conch. i. p. 362, pl. 71. f. 89, 90; Conch. Icon. pl. 5. f. 19.

Terebratella Labradorensis, Davidson.

Hab. Labrador; *Goodsir.*

A rounded, opake-white, ribbed species, of rather small size.

28. *Terebratula* (*Terebratella*) *Spitzbergensis,* Davidson, Proc. Zool. Soc. 1852, p. 78; Conch. Icon. pl. 7. f. 24.

Hab. Spitzbergen.

T. Spitzbergensis is a small, narrowly-ovate species, smooth and semipellucid like the large *T. vitrea.* Professor Suess remarks that the figure of a species of Middendorf, which is unknown to me (*T. frontalis*), is like it. Can they be one and the same species? But Professor Suess goes on to ask, is *T. frontalis* the same as *T. transversa*?—which has no relation whatever, as a comparison of our figures of that species in 'Conch. Icon.' with *T. Spitzbergensis* will show.

Subgenus 5. Magas, Sowerby.

Apophysis a loop resembling that of Terebratella, *but contracted, and having the cross piece broadly laminated next the central septum.*

29. *Terebratula* (*Magas*) *Valenciennesii,* Davidson, Annals and

Mag. Nat. Hist. 1850, v. pl. 15. f. 1; Conch. Icon. pl. 8. f. 31 *a, b, c.*

Waltonia Valenciennesii, Davidson.
Terebratella Evansii, Davidson.
Magas Evansii, Gray.
Argiope Valenciennesii, Suess.

Hab. New Zealand.

Mr. Davidson generously yields to my suggestion that his *Waltonia Valenciennesii* and *Terebratella Evansii* are one and the same; the loop has, however, the contracted laminated structure characteristic of *Magas*, and I agree with Dr. Gray in assigning it to that genus. Professor Suess's assigning it to *Argiope* is obviously a blunder. Several specimens have come under my notice, all of a bright orange-red colour.

30. *Terebratula* (*Magas*) *crenulata*, Sowerby, Thes. Conch. i. p. 358, pl. 71. f. 96–98; Conch. Icon. pl. 8. f. 32.

Terebratella crenulata, Davidson.
Magas crenulata, Gray.

Hab. Santa Cruz, Canaries; fide *Cuming.*

This species has somewhat the appearance of *T.* (*Terebratella*) *Labradorensis*, or of a young *T.* (*Terebratella*) *Magellanica*; but it is convex, and ribbed in both valves, and it has distinctly the contracted laminated apophysis of the preceding species. The recorded habitat is peculiar, and, I fancy, a little doubtful.

Subgenus 6. Bouchardia, Davidson.

Apophysis represented by a central septum, with the laminated cross piece of Magas *callously produced and thickened into the form of an anchor.*

31. *Terebratula* (*Bouchardia*) *Cumingii*, Davidson, Proc. Zool. Soc. 1852, p. 78, pl. 14. f. 10–16; Conch. Icon. pl. 8. f. 29.

Terebratella? Cumingii, Davidson.
Magas Cumingii, Gray.

Hab. New Zealand.

This very interesting species is in my opinion neither a *Terebratella* nor a *Magas*. It begins to show internally the callous thickening both of the valves and of the apophysis of *Bouchardia tulipa*, and is, above all, distinguished by the acuminated beak and terminal foramen peculiar to that and to the following species.

32. *Terebratula* (*Bouchardia*) *fibula*, Reeve, Conch. Icon. pl. 8. f. 30 *a, b*.

Hab. Bass's Strait, South Australia; *Calvert*.

This remarkable shell is curiously intermediate in its characters between *T.* (*Bouchardia*) *Cumingii* and *tulipa*. The beak is more acuminated than in the former; and the area of the deltidium, which in *B. Cumingii* and *tulipa* is excavately grooved, is in *B. fibula* flat. In respect of the callous development of the interior, it is about intermediate between the other two. Mr. Calvert, of whom the *B. fibula* was purchased for the British Museum, reports that he dredged it in Bass's Strait from a depth of 200 fathoms; but Mr. Milligan, of Hobart Town, Secretary to the Royal Society of Tasmania, now in London, informs me that Bass's Strait, when sounded by Captain Stokes, was found not to be deeper in any part than from 70 to 75 fathoms.

33. *Terebratula* (*Bouchardia*) *tulipa*, De Blainville, Dict. Sci. Nat. liii. f. 144.

Bouchardia tulipa, Gray.
Terebratula rosea, Humphreys, ined.
Bouchardia rosea, Davidson.
Pachyrhynchus roseus, King.
Terebratula unguis, Küster.

Hab. Brazil (dredged at Rio Janeiro from a depth of about 10 to 13 fathoms); *Macgillivray*.

T. (*Bouchardia*) *Cumingii*, *fibula*, and *tulipa* are distinguished from all other *Terebratulæ* by the structure of the shell's beak, which is acuminated and has the foramen at the extremity. The deltidium plates are therefore dispensed with, and the lengthened area which occupies their place is either flat, as in *B. fibula*, or excavately grooved, as in *B. Cumingii* and *tulipa*. Concomitant with this change in the structure of the beak there is a change in the interior of the shell. The apophysial skeleton, retaining the cross piece of *Magas*, becomes solidified and comparatively rudimentary, and callosities begin to be formed about the hinge of *B. Cumingii*, until they assume in *B. tulipa* the function of heavy interlocking plaits.

Subgenus 7. Megerlia, King.

Apophysis a rather small loop on a pair of projecting blades affixed by a laminated cross piece to a central septum, and on either side by a short intermediate lobed process.

34. *Terebratula* (*Megerlia*) *truncata*, Linn. Syst. Nat. p. 1152; Conch. Icon. pl. 11. f. 48 *a, b, c*.

Anomia truncata, Linnæus.
—— *disculus*, Pallas.

Terebratula truncata, Lamarck.
—— *disculus*, De Blainville.
Terebratella truncata, D'Orbigny.
Terebratula monstrosa, Scacchi.
Orthis truncata, Philippi.
Megerlia truncata, King.
Orthis oblita, Michelotti.
Megathyris oblita, D'Orbigny.

Hab. Mediterranean (affixed to corals at depths of from 50 to 100 fathoms). Cape Finisterre (at a depth of 90 fathoms). Canaries.

Mr. Jeffreys possesses a specimen of this well-known species, formerly belonging to Dr. Turton, which is said to have been dredged in Torbay; but its recorded British habitat has not been confirmed by the discovery of any further specimens.

Subgenus 8. Kraussia, Davidson.

Apophysis a central septum, from the extremity of which diverge a pair of fan-like processes.

35. *Terebratula* (*Kraussia*) *rubra*, Pallas, Misc. Zool. pl. 14. f. 2–11; Conch. Icon. pl. 9. f. 37 *a, b, c*.

Anomia rubra, Pallas.
—— *promontorii Bonæ Spei*, Chemnitz.
—— *Capensis*, Gmelin.
Terebratula rubra, De Blainville.
—— *Capensis*, Krauss.
—— *Algoensis*, Sowerby.
Kraussia rubra, Davidson.

Hab. South Africa.

This very interesting species, though admirably figured, with its loopless bifurcating apophysis, nearly a century ago by Pallas, and again a few years later by Chemnitz, was not known to Valenciennes when preparing his monograph of the genus for Lamarck's 'Animaux sans Vertèbres,' nor even to Sowerby when publishing his monograph in the 'Thesaurus.' It is characterized by a remarkably short beak and large foramen; and the deltidium plates are accordingly very widely separated. The colouring, which is mainly on the radiating ribs, is bright coral-red. Mr. Sowerby's *T. Algoensis*, pronounced by Mr. Davidson to be a *Terebratella*, and by Dr. Gray to be a *Kraussia* "scarcely differing from *K. pisum*," is founded on a bleached fragmentary ventral valve, preserved in the British Museum, of *Kraussia rubra*.

36. *Terebratula* (*Kraussia*) *cognata*, Chemnitz, Conch. Cab. viii. p. 78, pl. 76. f. 688 *a, β*; Conch. Icon. pl. 9. f. 36 *a, b*.

Cognata Anomiæ craniolaris basi perforata, Chemnitz.

Hab. South Africa.

Kraussia cognata (of which a single specimen in Mr. Cuming's collection, notwithstanding that the species was described and figured by Chemnitz, is the only one known to me) might readily be taken for a worn mis-shapen specimen of *K. rubra* but for one important character: the dorsal valve is conspicuously serrated within the margin by a row of spinous teeth. No mention is made of this character in the diagnosis of the British Museum Catalogue; but it is figured and carefully described by Chemnitz—"margine interiori subtilissime et acutissime denticulato."

37. *Terebratula* (*Kraussia*) *pisum*, Valenciennes apud Lamk. Anim. sans Vert. vii. p. 330; Conch. Icon. pl. 9. f. 36 *a, b*.

Terebratula Natalensis, Krauss.
Kraussia pisum, Davidson.

Hab. South Africa.

This little species, which M. Valenciennes named "the pea," and likened to a cherry-stone, resembles *K. Lamarckiana*; but it is constantly distinguished by the fineness of the radiating ridges, while it is of larger size.

38. *Terebratula* (*Kraussia*) *Deshayesii*, Davidson, Proc. Zool. Soc. 1852, p. 80, pl. 14. f. 20, 21; Conch. Icon. pl. 9. f. 35 *a, b*.

Terebratula Capensis, Adams and Reeve (not of Gmelin).
Kraussia Deshayesii, Davidson.

Hab. Cape of Good Hope (dredged from a depth of 120 fathoms); *Belcher*.

Very closely allied to *K. pisum* and *Lamarckiana*, but of a more triangular form, and painted in a characteristic manner with crimson rays. The habitat "Corea" given by Mr. Davidson for this species, on the authority of Mr. Cuming, is incorrect. *Kraussia Deshayesii* was dredged off the Cape of Good Hope in the same vessel in which *Terebratulina abyssicola* was dredged at Corea; and the labels got confounded together. *Kraussia* is as exclusively a type of the south temperate zone as *Terebratulina* is of the north temperate.

39. *Terebratula* (*Kraussia*) *Lamarckiana*, Davidson, Proc. Zool. Soc. 1852, p. 80, pl. 14. f. 22, 23; Conch. Icon. pl. 9. f. 34.

Terebratella Lamarckiana, Davidson.

Hab. Sydney and New Zealand.

This little species is of a broadly ovate pouch-like form, flexuous in growth and rather strongly wrinkled. It has the bifurcated apophysis of *Kraussia*, but is a little removed from the typical forms of the group, all of which are natives of South Africa. The septum in this species is continued beyond the point of bifurcation nearly to the margin, which is in both valves neatly spinulose.

Subgenus 9. Gwynia ?, King.

Apophysis unknown.

40. *Terebratula* (*Gwynia* ?) *capsula*, Jeffreys, Ann. & Mag. Nat. Hist. 1859, iii. pl. 2. f. 7 *a*, *b*; Conch. Icon. pl. 10. f. 39.

Terebratula capsula, Jeffreys.
Gwynia capsula, King.

Hab. Plymouth; *Norman.* Belfast Lough; *Hyndman.* Etretat, Normandy; *Jeffreys.*

Is this very minute form, it has been asked, an adult shell, or the fry of *Argiope cistellulum* or of some other *Terebratula*? An *Argiope* it certainly is not; and I am unable, after a most tedious examination of specimens, to add anything to what is known on the subject. Its history is as follows:—In the 'Annals and Magazine of Natural History' for August 1858, Mr. Jeffreys announced that a very minute brachiopodous shell ($\frac{1}{25}$th of an inch in length and $\frac{1}{40}$th in breadth) had been found by Mr. Norman (a well-known collector of British shells resident in Durham) among some shell-sand received by him from Plymouth. "Being so excessively small," adds Mr. Jeffreys, "as to defy any attempt to examine the internal structure without injuring the specimen, it is impossible to say whether it is an *Argiope*; but having carefully compared it with *A. cistellula*, which varies greatly in form, I am inclined to consider it at present an extreme variety of that species." Attention being drawn to the subject, other specimens were dredged by Mr. Hyndman in Belfast Lough (reported, however, to be *Argiope cistellula*), and by Mr. Jeffreys himself at Etretat, on the coast of Normandy. After an examination of specimens under a magnifying power of 100 diameters, Mr. Jeffreys came to the conclusion that the shell was not an *Argiope*, but a form more allied to *Terebratulina*. Is it then the fry of *T. caput-serpentis*? Mr. Jeffreys thought not, because the valves are nearly equal, and have no indication of the radiating dichotomous ridges of that species. But what do we know of the Brachiopods in the fry state? Is it at all likely that they bear the detailed characteristics of the adult? He described it in the following year (Ann. and Mag. Nat. Hist. January 1859) simply as a *Terebratula*, with the remark, "it may be a question whether it ought not to be placed in a new subgenus." Prof. King, of Queen's College, Galway, upon seeing this announcement, lost no time in borrowing the specimens, and, in compliment to Mr. (J. Gwyn) Jeffreys, created the genus *Gwynia* for its reception (Proc. Dubl. Univ. Zool. Assoc. April 1859). Prof. King says, "The principal generic character of *Gwynia* is in the labial appendages being attached directly to the shell, and not to a loop."

The grounds for this conclusion appear to me to be very insufficient. No loop, it is true, has been observed; but it is to be remarked that the shell much more resembles that of the free-looped *Terebratulæ* than that of the subgenera in which the labial appendages rest more directly on the shell. The most remarkable peculiarity of this shell, as compared with ordinary adults, is the prominence of the dorsal umbo. The shell is almost double-beaked. Its internal structure is not yet understood. "Woodward and myself," writes Mr. Davidson to me, in a letter just received, "wasted a whole day at the British Museum (April 27th, 1859) in endeavouring to find some kind of loop in *T. capsula*, but could find none, and thought it the fry of some other species."

Subgenus 10. Morrisia, Davidson.

Apophysis a short simple loop attached to a central process in the form of a spur.

41. *Terebratula* (*Morrisia*) *anomioides*, Scacchi, Philippi, Enum. Moll. Sicil. ii. p. 69, pl. 18. f. 9; Conch. Icon. pl. 10. f. 40.

Orthis anomioides, Scacchi.
Terebratula appressa, Forbes.
Morrisia anomioides, Davidson.

Hab. Mediterranean (dredged in the Ægean from a depth of 95 fathoms); *Forbes.*

An *Anomia*-like form, in which the ventral valve is very little beaked, and the foramen encroaches upon the dorsal valve, occupying the place of the umbo; there is consequently no deltidium.

42. *Terebratula* (*Morrisia*) *Davidsoni*, Deslongchamps, Ann. and Mag. Nat. Hist. 1855, xvi. pl. 10. f. 20 *a, b, c, d.*

Hab. Mediterranean (dredged at Tunis, adhering to *Caryophyllia ramea*); *Deslongchamps.*

I do not see that the differences alleged to exist between this species and the preceding are clearly specific. Far greater differences may be observed in bivalves of similar habit of which specimens are more abundant, as of the common *Anomia ephippium* for example, which it so closely resembles externally, though minute and of a different organization. *Morrisia Davidsoni* is distinguished from *M. anomioides*, so far as the few specimens known permit of a distinction being noted, by the following characters:—The shell is larger and of a more transverse growth, with the concentric lines of increase rising almost to the sharpness of asperities. The foramen is large, and encroaches so much upon the dorsal valve as to appear almost to belong to it alone; and the dorsal valve is flat and irregularly indented, denoting a close attachment to the body to which the pedicle is affixed.

43. *Terebratula* (*Morrisia*) *lunifera*, Philippi, Enum. Moll. Sicil. i. p. 97, pl. 6. f. 16 *a–f*.

Orthis lunifera, Philippi.
Morrisia lunifera, Gray.

Hab. Mediterranean; *Philippi.*

A delicate hyaline species, of a more triangular form than either of the preceding two, puckered with indentations at the margin.

Subgenus 11. Argiope, Deslongchamps.

Apophysis a loop sweeping round the valve on either side, supported in front by from one to three short marginal septa.

44. *Terebratula* (*Argiope*) *decollata*, Chemnitz, Conch. Cab. viii. p. 96, pl. 78. f. 705 *a, b, c, d*; Conch. Icon. pl. 10. f. 43 *a, b*.

Anomia decollata, Chemnitz.
—— *detruncata*, Gmelin.
Terebratula decollata, Deshayes.
—— *detruncata*, De Blainville.
Megathyris detruncata, D'Orbigny.
Terebratula aperta, De Blainville.
—— *dimidiata*, Scacchi.
—— *cardita*, Risso.
—— *urna-antiqua*, Risso.
Orthis detruncata, Philippi.
Argiope detruncata, Deslongchamps.
—— *decollata*, Davidson.

Hab. Mediterranean (affixed to corals at depths of from 50 to 100 fathoms).

The loop is in this well-known species supported in front by three marginal septa.

45. *Terebratula* (*Argiope*) *cuneata*, Risso, Eur. Mérid. pl. 4. f. 179; Conch. Icon. pl. 10. f. 44.

Anomia Pera, Mühlfeldt.
Orthis Pera, Philippi.
Terebratula Soldaniana, Risso.
Argiope cuneata, Davidson.

Hab. Mediterranean (at depths of from 30 to 70 fathoms); Canaries.

A narrower form than the preceding species, with the beak more tumidly produced, and the hinge-area consequently less abruptly truncated. The loop rests upon only one marginal septum.

46. *Terebratula* (*Argiope*) *Neapolitana*, Scacchi, Oss. Zool. ii. p. 18; Conch. Icon. pl. 10. f. 45.

Terebratula seminulum, Philippi.
Orthis Neapolitana, Philippi.
Argiope Neapolitana, Davidson.
—— *Forbesii*, Davidson.

Hab. Mediterranean (at depths of from 60 to 100 fathoms); Canaries.

Of a more triangular form than the preceding species, while the valves are plicately indented at the margin in rather a characteristic manner, the radiating ribs being arranged in three fasciculi, or as it were on three shields. The apophysis is the same as in *A. cuneata*; but the margin of the valve is more thickened internally, and between it and the loop there is a distinct row of spinous teeth.

47. *Terebratula* (*Argiope*) *cistellula*, Searles Wood, Ann. and Mag. Nat. Hist. vi. p. 253 (fossil); Conch. Icon. pl. 10. f. 46.

Megathyris cistellula, Forbes and Hanley.
Argiope cistellula, Davidson.

Hab. Mediterranean and British Seas.

This little species, originally discovered by Mr. Searles Wood in a fossil state, has been found alive in the British seas at Zetland, in Belfast Bay, and at Exmouth, on the coasts of Guernsey and Normandy, and lastly in the Mediterranean, which is the specific home of the group.

Subgenus 12. Thecidea, Defrance.

Apophysis callously affixed to the bed of the valve.

48. *Terebratula* (*Thecidea*) *Mediterranea*, Risso, Eur. Mérid. pl. 4. f. 183.

Thecidea testudinaria, Michelotti.
—— *spondylea*, Scacchi.

Hab. Mediterranean (attached to corals).

Thecidea is rather a difficult subject to observe, by reason of its habits. It bears much the same relation to the rest of the *Terebratulæ* that *Hinnites* bears to *Pecten*. The pedicle, like the byssus in that genus, loses its function and is dispensed with, and the animal affixes itself by the shell. The shell, as in most such instances, is of very callous and irregular growth, and it is only by the casual development of its structural details in a numerous series of specimens that its characters can be ascertained. In some fossil forms of *Thecidea* a minute terminal foramen has been shown to exist, but I find no trace of one in the recent species. The umbo of the ventral valve is largely produced into a thickened spondyloid beak; and in its front area a large triangular rudimentary deltidium is soldered. The dorsal valve, rudely indented and flattened, is of a horse-shoe shape; and the ventral valve, densely convex, is rayed outwardly with close-set grooves, which produce serrations on the inner margin. The apophysial system is modified into a fixed ridge in the bed of the valve, accompanied by a profusion of little indentations. When describing *Thecidea* twenty years ago (Conch. Syst. i. p. 184), I remarked that "the upper valve is flat and curiously indented, as if to fit certain corresponding parts in the body of the animal. These indentations, which spread round in a semicircular direction from the hinge, look exactly as if they were picked out in wax; and in a specimen which I have examined with considerable minuteness, they were filled with the dried remains of numerous fine cilia." No sort of loop had been observed in *Thecidea,* and it is now obvious that this indented bed of the ciliary arms is a modification of it.

Geographical Distribution.

It is difficult to generalize on the geographical distribution of the *Terebratulæ,* with the hope of arriving at many conclusions of interest, without embracing the fossil species. As might be expected in the case of a tribe of animals which existed so much more abundantly in the Silurian seas, and are perhaps destined at no very remote period to disappear altogether, they are much scattered, and are not abundant in individuals. Nevertheless there are few genera of mollusks of which the habitats and specific nature are now so well known. Of the 48 recorded species of *Terebratula* (cited rather at random by authors at from 60 to 70 in number), 4 are based upon single specimens of somewhat doubtful specific value, without any information as to their habitats—*cancellata, Bouchardii, transversa, suffusa*; but their relationship with undoubted species is not sufficiently obvious to admit of their being discarded. Of 3 species, *radiata,* supposed to be a native of Corea; *crenulata,* of the Canaries; and *dilatata,* of Coquimbo, or the Strait of Magellan, the habitats are not well authenticated, and appear to me to be doubtful. Of the habitats of the remaining 41 species there is no manner of doubt; but of two of these the specific value is open to criticism—*physema* and *capsula.* There remain, then, 39 species of which the subgenus (founded on the structure of the apophysis) and the habitat may be relied on.

Distribution of Species in Provinces.

Eastern Hemisphere.

I. *North European Province.*

Waldheimia cranium.
—— septigera.
Terebratulina caput-serpentis.
Terebratella Labradorensis.
—— Spitzbergensis.

II. *Lusitanian Province.*

Terebratula vitrea.
Terebratulina caput-serpentis.
Megerlia truncata.
Morrisia anomioides.
—— Davidsoni.
—— lunifera.
Argiope decollata.
—— cuneata.
—— Neapolitana.
—— cistellula.
Thecidea Mediterranea.

III. *North Asiatic Province.*

Waldheimia Grayi.
Terebratulina Japonica.
Terebratulina abyssicola.
Terebratella Coreanica.

IV. *Indo-Pacific Province.*

Waldheimia picta.
Terebratulina Cumingii.
Terebratella sanguinea.

V. *Australo-Zealandic Province.*

Waldheimia flavescens.
—— lenticularis.
Terebratella cruenta.
—— rubella.
—— rubicunda.
Magas Valenciennesii.
Bouchardia fibula.
—— Cumingii.
Kraussia Lamarckiana.

VI. *South African Province.*

Kraussia rubra.
—— cognata.
—— pisum.
—— Deshayesii.

Western Hemisphere.

VII. *Magellanic Province.*

Terebratula uva.
Terebratella Magellanica.

VIII. *Panamic Province.*

Terebratula uva.
Waldheimia globosa.

IX. *Brazilian Province.*

Bouchardia tulipa.

X. *North American Province.*

Terebratulina caput-serpentis.

Distribution of Subgeneric Types.

Terebratula.—Lusitanian, Magellanic, and Panamic provinces.
Waldheimia.—North European, North Asiatic, Indo-Pacific, Australo-Zealandic, and Panamic provinces.
Terebratulina.—North European, Lusitanian, North Asiatic, Indo-Pacific, and North American provinces.
Terebratella.—North European, North Asiatic, Indo-Pacific, Australo-Zealandic, and Magellanic provinces.
Magas.—Australo-Zealandic province.
Bouchardia.—Australo-Zealandic and Brazilian provinces.
Megerlia.—Lusitanian province.
Kraussia.—Australo-Zealandic and South African provinces.
Morrisia.—Lusitanian province.
Argiope.—Lusitanian and Celtic provinces.
Thecidea.—Lusitanian province.

Summary.

1. Of the thirty-nine species cited in the foregoing analysis, thirty-five belong to the Old World, only four to the New. None of the species are common to both, with the single exception of *Terebratulina caput-serpentis* of the North European and Lusitanian provinces, which ranges in a modified form (*T. septentrionalis*, Couthouy) to the eastern shores of North America. Two species of *Terebratula* have been described by Dr. Gould in Wilkes's 'Exploring Expedition' (*T. caurina* and *pulvinata*), from Puget Sound, Oregon; but I have not seen them.

2. The distribution of subgenera illustrates a few characteristic centres of creation. *Megerlia, Morrisia, Argiope,* and *Thecidea,* all have their homes in the Lusitanian province,—one species only, *Argiope cistellula,* passing into the Celtic province, which has no centre of specific creation of its own. *Kraussia* has its home in the South African province, embracing four species. A fifth species, *K. Lamarckiana,* is found in the Australo-Zealandic province; but the apophysis, on which the subgenus is founded, is abnormal in its structure.

3. Of subgeneric types widely removed, *Bouchardia* presents curious instances. *B. tulipa,* a solitary species on the shores of Brazil, is undoubtedly identical in type with *B. fibula* and *Cumingii,* which are natives of Australia and New Zealand, though no faunas of any two provinces can be more generally dissimilar. The same may be said of *Waldheimia* and *Terebratella*; but these subgenera are more abundant in species and individuals, distributed in local centres of creation of more varying specific character.

4. Of specific types widely removed, a notable instance is presented in *Waldheimia globosa* of California, and *W. lenticularis,* a native of New Zealand. Not only are these very remote species of the same specific type, but the difference of their specific details is scarcely appreciable.

5. The most characteristic assemblages of species are those of *Terebratulina* in the North European and North Asiatic provinces, of *Waldheimia* in the Panamic, of *Terebratella* in the Magellanic, and of *Morrisia* and *Argiope* in the Lusitanian province.

6. Species are fewest within the Tropics. The Indo-Pacific province, which extends from Australia to Japan, and from the Red Sea and east coast of Africa to Easter Island in the Pacific, embracing three-fifths of the circumference of the globe and forty-five degrees of latitude, yields only three species—*Waldheimia picta, Terebratulina Cumingii,* and *Terebratella sanguinea*; and of the first two, very few individuals are known.

7. Species, with few exceptions, are very local. The excep-

tions are *Terebratulina caput-serpentis,* which ranges, as already noticed, from the Arctic to the Mediterranean Seas and to the seas of North America, and is very closely represented in the North Asiatic provinces by *T. Japonica* and *abyssicola.* Another exception to the local distribution of species is presented in *Waldheimia picta,* which is found both at Java and at the Friendly Islands. A third exception is one of similar character: *Terebratella sanguinea* inhabits both the Philippine and Sandwich Islands. And a fourth exception occurs in *Terebratula uva,* collected originally at Guatemala, but of which small specimens, in the British Museum and in Mr. Cuming's collections, have been received from the Falkland Islands.

8. Lastly, the Australo-Zealandic province may be noticed as being the most prolific of forms and brilliancy of colour; but all the subgenera of this province, with the exception of *Magas,* have species, though not the same, in other provinces.

XXI.—*On the Immature State of the Sea-devil* (Lophius piscatorius). By Dr. Albert Günther.

[Plate X. figs. C–E.]

Small specimens of the European species of the Fishing-Frog or Sea-devil are extremely scarce in collections, and scarcely any attention has been paid to the remarkable changes in the form of the body and fins to which this fish is subject with age. Valenciennes is the only author who enters upon the subject at all: he says (Cuv. & Val. Hist. Nat. Poiss. xii. p. 375), "The specimen examined is 2 inches long; the disk of its head is only one-third of the total length; and the pectoral fins, which are as long as the head, appear to be more elongate than in old individuals. The same is the case with the tail, measured from the gill-opening. It appears to have a greater number of tentacles on the skin, especially on the pectorals; the margin of the pectorals appears to be finely ciliated. D. 11." The differences from old individuals, as we find them stated here by Valenciennes, agree in the chief points with our observations; but it is evident that Valenciennes took his notes from a mutilated specimen, in which the delicate appendages of the fins had been lost or shrivelled up, either previously to or during its preservation in spirits.

The two specimens observed by Düben and Koren on the western coast of Norway were much more perfect; they were 94 mm. and 78 mm. long, and exhibited such remarkable differences from the specimens commonly observed, that those naturalists were induced to describe them as a new form, under the name of *Lophius eurypterus* (Vet. Akad. Handl. 1844, p. 63, tab. 3. figs. 1–3), a species which we find adopted by Professor Nilsson in his work 'Skandinavisk Fauna,' iv. Fisk. p. 251.

The books referred to being written in Swedish and not easily accessible, we give a copy of the figures (figs. C and D), from which it will at once be seen (and this is a point of importance) that the view of the fish represented is the most depressed one possible. In consequence of this, the lateral view shows only a portion of the pectoral fin, the other being retracted below the abdomen; and moreover, the portion shown is scarcely intelligible if compared with the view given from above. The ventral fin is expanded and carried forward.

I extract the following notes from the very detailed descriptions. The head is described as broader than long, less depressed than in *Lophius piscatorius*,—its length (from the extremity of the snout to the posterior margin of the gill-cover) being one-half of that of the remainder of the body, the caudal fin not included. The dorsal spines are comparatively short, the length of the first being only one-half of that of the second, or one-fifteenth of the total length of the fish: the first terminates in a transverse cylindrical knob, which is provided with minute cilia; the two others have alternate fringes on both sides. The spines which form the continuous dorsal are similarly fringed; and the rays of the soft dorsal project very slightly beyond the membrane. The pectoral is exceedingly broad, and extends beyond the origin of the anal. The ventral also is broad, and can be expanded like a fan. "The disproportion of this fin, however, in the two individuals observed is very remarkable; it is nearly twice the length in the larger one that it is in the smaller, or its length is to that of the fin of the smaller one as 5:3, relatively to the total length of the individuals. The pectoral, also, is absolutely as well as relatively larger in this specimen than in the one figured—a difference by which, perhaps, the sexes are distinguished."

During my last visit to Frankfort, Dr. Rüppell showed me several small specimens of a *Lophius*, collected by himself at Messina, which, after a careful comparison with mature ones, I declared to be the young of *L. piscatorius*, in spite of their apparent dissimilarity—an opinion which had been entertained by Dr. Rüppell from the time they first came into his hands. Having since compared those specimens and the account of Düben and Koren with a sketch fortunately made by Dr. Rüppell on the spot, and kindly presented to me, I have now not the slightest doubt that *L. eurypterus* is identical with the Frankfort specimens, and that both are the young of *L. piscatorius*. Every one who has had a specimen of the Sea-devil in his hand knows the great mobility which the lateral parts of the head possess. Whilst Düben and Koren preferred to figure their specimen in the most depressed (and perhaps the most natural) position, Dr. Rüppell had his specimen compressed as much as possible, in order to be able to show the insertion of the ventral fins in a lateral view of the fish: this accounts for the difference in general form. In the Mediterranean fishes, the first ray is comparatively longer than in the Scandinavian, and terminates in two compressed flaps, which, perhaps, are only a more developed form of the transverse cylindrical knob in *L. eurypterus*. How variable the length and the shape of the fins and of their appendages are, even in specimens of the same size and age, is fully proved by the two Scandinavian specimens, one of which has the ventral twice as long as the other. Further, the anterior dorsal spine, whether it serve as a bait to attract other fish (which is by no means improbable), or as an organ of touch, is constantly exposed to injury from the delicacy of its structure as well as from the peculiarity of its function. Finding it, however, sometimes very long and fully developed in old fishes, we cannot hesitate to assume that it is *reproduced* when lost; and this appears the more probable if we consider that portions of the fin-rays as well as of the barbels are reproduced in other fishes. We therefore cannot be surprised, or think it a matter of any importance, when we find the anterior dorsal spine of different length and its tentacle of different shape; both are subject to an indefinite number of accidental and individual changes, besides the constant differences by which the young fish is distinguished from the old one. Finally, another source of discrepancy in the descriptions and representations of the authors named is the alteration which the fishes undergo by their preservation in spirits: a part, or all, of the tender filaments in which the rays terminate are easily lost, and the fins themselves are considerably shrivelled up; so that it would be impossible to reproduce a figure of the present Frankfort specimens similar to that which was made from them when they were quite fresh. The ventral fins are still longer in the Mediterranean fish than in one of the Scandinavian specimens—being, with the filaments in which the rays terminate, as long as the whole fish. Düben and Koren believe that the length of the ventrals indicates a sexual difference. I cannot share this opinion, which is contrary to what we observe in other fishes. If there are external sexual differences in a species, they do not appear before the individuals approach maturity: the young male and female of *Callionymus lyra* are perfectly alike; and the dorsal and caudal fins begin to grow, and the bright colours to make their appearance, only in male specimens of more than 6 inches in length. The same is the case in that singular Ceylonese lizard, *Ceratophora*, in which the *long* rostral horn is a character peculiar to the *mature* male. I need not mention the numerous analogous examples in mammals and birds.

The Mediterranean and Scandinavian specimens agree in the chief points: their head, compared with mature individuals, is shorter and less depressed; the anterior dorsal spine is shorter than the following ones, which are more fringed; the pectoral and ventral fins are much longer and much more expansible; the fin-rays are produced into delicate filaments; in short, the young Sea-devils are provided with a *down*, which is lost with age.

One objection might be raised against this opinion:—Young specimens of the Asiatic species of Sea-devil (*Lophius setigerus*) exist in almost every collection, as the artful Chinese dealers in objects of natural history dry them, and having pinned them down, sell them as insects to the European collector. These specimens are 2 inches or less in length; and one ought naturally to expect, from the close affinity of the European and Asiatic species, that the young state of the latter would be conformable with that of the former. Although this is not the case (these small Chinese specimens not showing any striking difference from larger ones), we cannot admit that this fact contradicts our opinion as to *L. eurypterus* being the young of a known species,—first, because many species which are extremely similar in a mature state are widely different from each other in an earlier stage of development; secondly, because it is not fully proved that these small Chinese specimens are of an age corresponding to that of European ones of the same size. *L. setigerus* may be a smaller species than *L. piscatorius*; and the Chinese dried fishes which come under our observation may have already exceeded the age in which they show the downy development of their fins. The largest specimen of *L. setigerus* measured 2 feet, whilst *L. piscatorius* attains to a length of 6 feet.

There are two distinct species of Sea-devil in the European seas—*Lophius piscatorius* and *L. budegassa*. The distinctness of these two species has been doubted by most ichthyologists, the second (called by Cuvier *L. parvipinnis*) having been founded on apparently variable characters, as coloration and number of the dorsal rays. The latter may be relied upon, if immature specimens (not more than one foot in length) be examined,—*L. piscatorius* having not less than eleven, and *L. budegassa* not more than nine dorsal rays. But the anterior rays become very indistinct in adult specimens of the former, and are totally lost to observation by the process of stuffing to which large specimens are submitted. In consequence of this, the short-finned Sea-devil has not been admitted as a species by Valenciennes, Nilsson, and others, who, perhaps, never examined an individual really belonging to it, always taking incomplete specimens of *L. piscatorius* for *L. budegassa*. Both, however, may be readily recognized, at any age, by the form of the humeral spine, which has two or three tooth-like processes in the former, whilst it is smooth, simple, and lanceolate in the latter. *L. budegassa* does not appear to grow to the same size as *L. piscatorius*.

It will be evident from these remarks, to which of the two species we refer the *L. eurypterus*. Although no mention has been made of the form of the humeral spine, the number of its fin-rays (D. 12, A. 11) and the absence of the true *L. budegassa* in the northern seas prove its identity with *L. piscatorius*: this is confirmed by my examination of the specimens in the Frankfort Museum. Dr. Rüppell's figure makes a lengthened description unnecessary, and I add only the following comparative notes:—

Mature specimens.	*Young specimens.*
Head much depressed, its length being nearly one-half of the total. The distance of the gill-opening from the base of the caudal is two-fifths of the total length.	Head moderately depressed, its length being one-third of the total. The distance of the gill-opening from the base of the caudal is rather more than one-half of the total length.
Pectorals rather stout, subtruncated, one-seventh of the total length.	Pectorals very broad and long, rounded, their length being two-sevenths of the total; the middle rays produced into long filaments.
Ventrals rather narrow, stout and truncated, about one-ninth of the total length.	Ventrals exceedingly broad and long—with the filaments in which several of the rays terminate as long as the fish.
One or two of the dorsal rays slightly fimbriated; the first is the longest, half as long as the fish; the third shorter than the second.	The four middle dorsal spines with distinct tentacles; the first is the shortest.

The Frankfort specimens are greyish above; pectoral and ventral fins black towards the margin; filaments black. There are several series of tentacles on the posterior side of the pectoral fins. D. 3/3/12. A. 10. C. 8. P. 23. V. 1/5.

EXPLANATION OF PLATE X.

Figs. C, D. *Lophius piscatorius,* young; taken from specimens when depressed; copied from Düben and Koren: C, lateral view; D, view from above.

Fig. E. *Lophius piscatorius,* young; taken from a compressed specimen.

XXII.—*On the Dentition of* Herpeton tentaculatum. By Dr. Albert Günther.

Exactly a year ago, when describing and figuring Siamese specimens of *Herpeton tentaculatum,* Lacép., I stated that "all the teeth are of equal size, and not one is grooved*." When, therefore, I found that Prof. Jan, in the first part of his 'Iconography,' just published, which he has kindly sent me, represents the two posterior maxillary teeth as *twice the size of the anterior ones, and both of them distinctly grooved,* I was induced to reexamine the specimens in the British Museum, to test the correctness of either of the two contradictory assertions. For this purpose I have removed the mucous membrane from the teeth *of both specimens on both sides,* thus obtaining *four* views of the dentition, which fully confirm the correctness of my observation. There is not the slightest trace of a groove on either of these teeth; and when Prof. Jan represents them with a groove, he either does it on the sole authority of Duméril, who *suggests* that *Herpeton might* have a grooved tooth, like the other snakes of the family of *Platyrhiniens,* or he has been misled by the accidental juxtaposition of a second tooth destined to replace that in function: in this case, the two teeth which are standing close together may appear as a single tooth with a longitudinal groove. Yet Prof. Jan represents two teeth, each with a groove!

Now, with regard to the size, I admit that, strictly speaking, the posterior tooth is larger than the anterior ones; but it is, comparatively, not larger than in species of *Herpetodryas* or other so-called *Isodontes,* and to call that tooth twice as large as the anterior ones would be a great exaggeration as far as regards the specimens in the British Museum. We cannot assume that the dentition is modified in different ages of this snake, as one of the specimens examined is considerably larger, the other much smaller than that in the Milan Museum.

These observations have been considered necessary, inasmuch as many herpetologists will be guided by the dentition in assigning to this snake its place in the system.

* Proc. Zool. Soc. Feb. 14, 1860.

XXIII.—*On the Animal of* Alycæus *and some other Cyclophoroid Genera.* By Arthur Adams, F.L.S. &c.

1. Alycæus.

The animal of a species of *Alycæus*, from the island of Mahlu-San, or Port Hamilton, in the Korean Archipelago, is semi-opake white, with a pale orange blotch on the upper part of the rostrum, which is caused by the buccal mass shining through the transparent skin. The tentacles are short and gradually tapering; the eyes small, black, and basal; the muzzle is rather narrow, annulate, and strongly bilobed at the end. The flat operculum is carried on the dorsum of the foot, midway between the shell and the end of the tail. The chief peculiarity, however, is the great anterior development of the body, which, when the animal is on the move, is considerably extended, giving it in this respect some resemblance to a *Helicina*.

2. Hydrocena.

A species, from the island of Awa Sima, one of the Japanese Archipelago, is of a pale brown colour. The muzzle is broad and transversely strongly wrinkled; the tentacles are cylindrical and obtuse at the ends; the eyes are large, black, prominent, and basal; the foot is short, with parallel sides, and obtuse and rounded behind. The operculum is on the back of the foot, close to the body of the animal.

3. Pterocyclos.

The colour of a species which I discovered in the island of Tsu-Sima, in the Korea Strait, is blackish brown, with a lighter streak down the sides of the foot; the tentacles and end of the muzzle are darker than the rest of the head. The muzzle is broad, and finely wrinkled across as in other genera of Cyclophoridæ; the eyes are not prominent, but small and basal; and the foot is long, narrow, and tapering behind.

The chief peculiarity, however, is in the position of the operculum, which, one would imagine, would be carried on the extreme end of the tail, free from the shell. It is, however, borne close to the body, and, during progression, is received into the deep funnel-shaped umbilicus, where it is concealed and out of the way. The locomotive powers are limited; and the animal is easily alarmed, when it withdraws far into the shell, the apex of the conical operculum being just level with the peritreme. I found this species in rocky places where the vegetation was abundant, crawling among dead leaves at the roots of trees.

4. Pupinella.

A little species which I discovered at Chosan, in the Korean Peninsula, is grey, flecked with dirty opake white. The animal is very like that of *Cyclostoma* proper. The muzzle is broad and ringed; the tentacles are cylindrical, short, and obtuse at the end. The foot is short, and obtuse behind and in front. The operculum is borne on the hind part of the foot, close to the shell.

I obtained figures of these animals, which possibly may be published, with some others, at a future period. Meanwhile I consider it advisable to forward brief notices of the animals for the information of zoologists and other parties interested in these matters.

XXIV.—*On certain Coleoptera from the Island of St. Vincent.*

By T. Vernon Wollaston, M.A., F.L.S.

[Continued from p. 103.]

Fam. **Tentyriadæ.**

(Subfam. Tentyriades.)

Genus Hegeter.

Latreille, Hist. Nat. des Crust. et Ins. iii. 172 (1802).

19. *Hegeter elongatus*, Oliv.

Blaps elongata, Oliv., Ent. iii. 60, pl. 1. f. 7 (1795).
Hegeter striatus, Latr., Hist. Nat. des Crust. et Ins. x. 276 (1804).
—— ——, Solier, Ann. de la Soc. Ent. de France, iv. 377 (1835).
—— *elongatus*, Woll., Ins. Mad. 510, tab. 11. f. 7 (1854).

The *H. elongatus* appears to be a common insect at the Cape de Verdes, having been taken abundantly at St. Vincent by Mr. Gray and the Rev. Hamlet Clark, in December 1856, and subsequently by Mr. Fry. It is essentially an Atlantic species, extending even to the Azores, where it is recorded by M. Morelet. I have myself captured it in profusion in Madeira and Porto Santo, as well as (I believe I may add, without reference to my material) on the *whole seven* islands of the Canarian group.

Genus Oxycara.

Solier, Ann. de la Soc. Ent. de France, iv. 254 (1835).

The *Oxycaræ* (= the *Melancri* of Dejean's Catalogue) appear to be common in these islands,—or, at any rate, the two species enumerated below. The genus is remarkable amongst the true *Tentyriades* for the form of its mesosternum, which is much thickened and horizontal in the centre, and, in the typical members of the group, bifid in front, where it receives the backwardly produced lobe of the prosternum. In the normal species (which, besides the two here recorded, include the *O. blapsoides* of Solier, from Senegambia and the coast of Guinea) this structure is very conspicuous; but in three described by MM. Reiche and Saulcy from Syria the prosternal point is said to be shorter and less evident (so that the sterna merely *touch* each other); and for these they have retained Dejean's generic title of *Melancrus*. The distinctive differences, however, of these latter are so small, that Lacordaire has suggested that they should not be employed for more than sectional purposes. The *O. hegeteroides* and *pedinoides* have no visible scutellum, and are remarkable, *inter alia*, for the sides of their prothorax *beneath* being very coarsely grooved or longitudinally strigulose. They are characterized in Erichson's paper on the Coleoptera of Angola; but, from reasons which have been already alluded to, it seems more than probable that they have in reality nothing to do with Angola at all, but are strictly peculiar to the Cape de Verdes. I subjoin the following diagnoses of them, because those given by Erichson (perhaps from the deficiency of specimens to judge from) are not quite correct, and also fail in drawing attention to one or two of the most differential features of the insects referred to.

20. *Oxycara hegeteroides*, Erichs.

Oxycara hegeteroides, Erichs., in Wiegm. Archiv, ix. 236 (1843).

O. obovata, subdepressa, picea; prothorace coleopteris angustiore, postice ad latera subrecto, angulis posticis acutis, minutissime punctulato; antennarum articulo secundo tertio vix latiore; pedibus longiusculis.
Long. corp. lin. 3–4.

Taken in tolerable abundance by Mr. Gray and the Rev. Hamlet Clark, during their day's sojourn at St. Vincent, in December 1856. In *both* of these species (though especially the present one) the head is closely and rather strongly punctulated, the prothorax more finely so, and the elytra more minutely still.

21. *Oxycara pedinoides*, Erichs.

Oxycara pedinoides, Erichs., in Wiegm. Archiv, ix. 236 (1843).

O. ovalis, subconvexa, nigra; prothorace fere coleopterorum latitudine, ad latera leviter rotundato, angulis posticis minus acutis, versus latera distincte punctulato; antennarum articulo secundo sat fortiter clavato, crassiusculo, breviusculo; pedibus breviusculis.
Long. corp. lin. $2\frac{1}{2}$–$3\frac{1}{4}$.

Apparently very abundant at St. Vincent; more so than the preceding species. It was captured in profusion by Messrs. Gray and Clark in December 1856, as also by my nephew, Mr. F. W. Hutton, on the 11th of June, 1857, and subsequently ("under stones"), during the months of June and October, by Mr. Fry.

Fam. **Opatridæ.**

(Subfam. Stizopides.)

Genus Eremonomus (nov. gen.).

Corpus sat parvum, breviter rotundato-ovale, convexum: *fronte* ad latera leviter elevata et ibidem valde exstante, ad apicem fere integra; *oculis* antice profunde emarginatis: *prothorace* transverso, antice late sed leviter emarginato, postice truncato (vix sinuato), angulis posticis haud productis, ad latera valde rotundato et anguste explanato: *scutello* sat magno, triangulari: *sternis abdomine*que fere ut in *Halonomo*, sed *lobo prosternali* paulo minus horizontali (i. e. postice paulo magis deflexo, ibidem nec acuto nec suberecto), necnon *excavatione triangulari mesosternali* minus argute determinata et ad apicem ipsum truncata (haud acuta): *elytris* liberis: *alis* sat magnis, tenuibus. *Antennæ* capitis prothoracisque longitudine, basi graciles, apicem versus leviter incrassatæ, articulo 1^{mo} sat robusto subcurvato, 2^{do} paulo breviore vix graciliore subclavato, 3^{tio} primi longitudine, 4^{to} secundi longitudine, 5^{to} 6^{to}que brevioribus æqualibus, reliquis quinque latitudine gradatim crescentibus (ultimo subrotundato). *Labrum* submembranaceum, transverso-subquadratum, ad latera et præsertim ad angulos anticos rotundatum, apice leviter emarginatum. *Mandibulæ* validæ, corneæ, triangulares, una valde incurva apice obtuse bifida necnon infra apicem profunde fissa coriacea, altera vix incurva apice integra necnon versus basin fissa coriacea. *Maxillæ* bilobæ: *lobo externo* pubescente, setoso; *interno* ad apicem biuncinato, intus pubescenti-setoso. *Palpos* haud observavi. *Mentum* transverso-quadratum, ad latera rectum, antice latissime sed haud profunde emarginatum. *Ligula* ad basin tegumento submembranaceo connexivo cum mento conjuncta, cornea, robusta, subcordata (i. e. basin versus facile attenuata, ad latera et angulos anticos rotundata necnon ad apicem vix emarginata), angulis anticis fortiter setoso-ciliatis. *Pedes* robusti: *femoribus* sat crassis, muticis: *tibiis* fortiter setulosis; *anticis* late dilatatis compressis, per marginem externum irregulariter sed profunde eroso-subdentatis ac breviter setoso-spinulosis, in dentes duos vel tres obtusos valde irregulares plus minus distinctos erosis: *tarsis* heteromeris, *posterioribus* (sed præsertim *posticis*) articulo 1^{mo} longiusculo.

Obs. Genus tibiis anticis dilatatis extus profunde sed irregulariter subdentato-erosis, superficie ubique granulato-asperatis (vix punctulatis), striis elytrorum obscure nigrescentibus sed haud impressis limboque (ut in *Phaleriis*) ciliato, necnon structura ligulæ robustissimæ subcorneæ cordatæ sat anomalum distinctum, et cum *Styzopidibus* secundum clariss. Lacordaire recte ponendum.

Ab ἔρημος, desertum, et νέμω, colo.

Out of four specimens of the insect from which the above structural characters have been drawn, three were originally found dead, and were quite imperfect; and as all of them were taken to India for a couple of years by my nephew, F. W. Hutton, Esq. (who collected them at St. Vincent, on his passage to Calcutta, in June 1857), they have at last reached me in such a mutilated state, that I have been quite unable to observe their (entirely destroyed) palpi. The other parts of their mouth, however, I have succeeded in mounting for the microscope; and since the palpi of the whole of these immediate Heteromerous groups are modified within very narrow limits, they are not very important; so that the remaining details (described above) are abundantly sufficient for every generic purpose.

Concerning the affinities of this curious genus, I am more than content to abide by the opinion of Prof. Lacordaire, whose late admirable volume on the genera of the *Heteromera* must of necessity give a weight to his judgment which few will be inclined to dispute. In reply to a communication from me on the subject, he writes as follows:—

"Je n'ai rien vu de pareil à cet insecte, qui est assez embarrassant. C'est évidemment un Opatride, mais il ne rentre bien dans aucun des groupes que j'ai établis parmi ces derniers. Tout bien considéré, c'est dans celui des *Stizopides* qu'il va le mieux, et je le mettrais à côté et à la suite des *Cædius*."

22. *Eremonomus Huttoni*, n. sp.

E. rufo-ferrugineus, subnitidus et setulis brevibus demissis cinereis irroratus; capite prothoraceque sat confertim granulato-asperatis; elytris obsolete nigrescenti-striatis (striis haud impressis), minutissime et parcius granulato-asperatis, versus humeros rotundatis et per limbum longissime sed parce ciliatis; pedibus vix obscurioribus. Long. corp. lin. 2.

The remarkable surface of this singular insect, which is minutely *granulate* (rather than punctate), and is obsoletely striated on the elytra with somewhat darker *but unimpressed* lines, removes it from everything with which I am acquainted; whilst the wonderful structure of its dilated anterior tibiæ, which are *eroded* (or irregularly eaten-out) along their external margin, so as to be armed with two or three misshapen subdentiform spinulose *humps*, is not the less anomalous. Its clypeus is much expanded laterally, just in front of the eyes; and the outer margin of its elytra is beset with long and erect hairs, in exactly the same manner as we observe in most of the *Phaleriæ*. As already stated in the preliminary notes to this paper, it was taken at St. Vincent, on the 11th of June, 1857, by my nephew, F. W. Hutton, Esq., to whom I have much pleasure in dedicating the species. It was found "in the valley near the town, under a low creeping plant;" and in the proper season it must evidently be common, for Mr. Hutton informs me that he saw at least 200 specimens, of which only one was alive.

(Subfam. OPATRIDES.)

Genus HALONOMUS (nov. gen.).

Corpus sat parvum, breviter ovale, convexum: *fronte* ad latera leviter elevata, ad apicem biloba; *oculis* antice valde emarginatis: *prothorace* transverso, antice leviter emarginato, postice bisinuato, angulis posticis paulo productis sed haud acutis, ad latera rotundato anguste explanato: *scutello* magno triangulari: *sternis abdomine*que fere ut in *Opatro*, sed *lobo prosternali* horizontali (nec deflexo, ad apicem ipsum etiam suberecto) et paulo magis producto necnon *mesosterno* antice argute triangulariter exciso (nec mere concavo): *elytris* liberis: *alis* magnis. *Antennæ* capitis prothoracisque longitudine, basi graciles, apicem versus subclavatæ, articulo 1^{mo} sat robusto, 2^{do} paulo breviore, 3^{tio} primi longitudine, 4^{to}, 5^{to}, 6^{to} longitudine decrescentibus, reliquis latitudine crescentibus, fere clavam elongatam laxam minus abruptam 5-articulatam efficientibus (ultimo breviter subovato). *Labrum* tenue, subquadrato-transversum, angulis anticis rotundatis ciliatis, apice integrum. *Mandibulæ* validæ, corneæ, triangulares, apice inflexæ et obscure bifidæ, intus in medio fisso-sinuatæ coriaceæ. *Maxillæ* breves, bilobæ: *lobo externo* pubescente, setoso; *interno* leviter inflexo, biuncinato, intus versus apicem fortiter pectinato-setoso. *Palpi maxillares* longissimi, articulo 1^{mo} parvo flexuoso, 2^{do} elongato clavato, 3^{tio} breviore, ultimo magno securiformi: *labiales* breviores, articulo 1^{mo} sat parvo, 2^{do} majore crassiore clavato, ultimo hoc majore crassiore elongato-ovato apice acuminato. *Mentum* transverso-quadratum, postice gradatim paulo angustius, antice late sed haud profunde emarginatum. *Ligula* ad basin tegumento albido coriaceo connexivo cum mento conjuncta, in toto rotundato-ovata, sed vere nisi fallor veluti e duplici parte formata, alia sc. supera media cornea angustula ad apicem valde setosa et ibidem triangulariter excisa, alia infera multo latiore minus robusta (apice etiam membranacea pubescente) illam omnino superante. *Pedes* subgraciles: *tibiis* setuloso-pubescentibus, *anticis* vix dilatatis, sed ad angulum externum in denticulum spiniformem plus minus exstantem productis: *tarsis* heteromeris, *posterioribus* (sed præsertim *posticis*) articulo 1^{mo} longiusculo.

Obs. Genus affinitate haud longe ab *Opatro* distans, sed species breviores (ovales) minus sculpturatæ ac magis convexæ sunt; insuper pedibus minus robustis, tibiis anticis haud dilatatis et ad angulum externum in spinam parvam dentiformem productis, antennis paulo magis clavatis, labro apice integro, lobo prosternali haud deflexo (etiam ad apicem ipsum suberecto), mesosterno antice triangulariter exciso, necnon structura ligulæ et menti toto cœlo ab *Opatris* omnibus recedunt. *Halonomi* in locis valde salinis, nisi fallor, solis habitant.

Ab ἅλς, sal, et νέμο, colo.

The insect from which the above characters have been compiled appears to be identical with one which I have received from M. Deyrolle of Paris as the *Heterophaga ovata* of Dejean *. It is also congeneric with a closely allied species which I have taken in the Canary Islands, and which I lately transmitted to Prof. Lacordaire, for his opinion on its affinities, with the observation that it was very nearly akin to the former. In reply to my remarks, he writes as follows :—

"Vous avez parfaitement reconnu la place de cet insecte. Il appartient en effet à ce groupe dont j'ai parlé (p. 269) dans les notes relatives au genre *Opatrum,* en citant, comme en faisant partie, l'*Heterophaga ovata* de Dejean dont vous me parlez. C'est donc aussi un genre nouveau du groupe des Opatrides vrais." The "note" to which M. Lacordaire refers, in the 5th vol. of his 'Genera des Coléoptères,' is this : "Il existe dans les collections toute une suite d'espèces Africaines, de forme brièvement ovale, qui ont besoin d'être examinées pour voir si elles pourront rester parmi les *Opatrum* dont elles semblent présenter tous les caractères. L'une d'elles du Sénégal, dont les jambes antérieures sont finement denticulées, a été placée par Dejean (Cat. éd. 3. p. 220) dans les *Heterophaga,* sous le nom de *H. ovata.*"

The almost undilated anterior tibiæ of the *Halonomi,* the outer edge of which is perfectly edentate †, in conjunction with other details of their structure, show them to be properly referred to the "Opatrides vrais;" nevertheless from the *Opatra* proper they are abundantly distinct, being not only shorter, more oval, less sculptured, and more convex, but having likewise their legs less robust, and their anterior tibiæ produced at their outer apical angle into a little spine. Their antennæ, also, are rather more clavate at the apex than those of the *Opatra,* their upper lip is entire in front, their prosternal lobe is a little more developed and less deflexed (being in fact *horizontal,* and at its extreme point even subereet), their mesosternum is triangularly and sharply cut-out in the centre (instead of being simply concave), whilst the construction of their ligula and mentum (as will be at once gathered from the diagnosis) is altogether different. They

* The *H. ovata* of Dejean's Catalogue is registered as coming from Senegal, whereas M. Deyrolle's specimen is marked as Sicilian. I suspect, however, that there must be some mistake as regards the latter, and that Dejean's *habitat* is correct; for it is certainly more *probable* that the Cape de Verde insect is conspecific with one from Senegal than with one from Sicily.

† Prof. Lacordaire, in the "note" above quoted, states that the *H. ovata* has its anterior tibiæ finely denticulated; but I confess I am unable to perceive in my specimens this structure. The tibiæ are very strongly *setulose,* and the inner apical angle is produced, but the external edge appears to me to be simple.

are insects, moreover, of somewhat peculiar habits, being found only, so far as I have myself observed, in extremely salt places, such as the immediate vicinity of salt-works and other spots of a very briny nature.

I may just mention that the insect received from M. Deyrolle as the *Heterophaga ovata* of Dejean's Catalogue, and which is apparently identical with the species from the Cape de Verdes, was also named by him as "*Cædius crypticoides*, Dej.;" but the genus *Cædius* is altogether distinct from the present one, and belongs in fact to another group of the *Opatridæ*, namely, the *Stizopides*, in which, *inter alia*, the anterior tibiæ are dilated, and more or less dentate along their outer edge.

23. *Halonomus Grayii*, n. sp.

H. fusco-piceus (fere niger), subopacus et setulis brevibus demissis cinereis irroratus; capite dense rugoso-punctato, clypeo ad latera picescente et mox ante oculos ampliato recurvo; prothorace sat minute punctulato, ad latera picescente; elytris obsolete crenato-striatis, striis versus suturam subevanescentibus, interstitiis obsolete subrugulosis et minutissime punctulatis; antennis fusco-ferrugineis, apice pallidioribus; pedibus fusco-piceis, tibiarum anticarum angulo externo leviter producto.

Long. corp. lin. $2\frac{1}{2}$–vix 3.

Heterophaga ovata, Dej., Cat. (edit. 3) 220 (1837).

The present species is very closely related to one* which I have taken abundantly in the neighbourhood of the Salinas, or salt-pans, in the north of Lanzarote; but its clypeus is a little more developed and recurved immediately in front of the eyes, its prothorax is perhaps a trifle more distinctly punctulated, its elytra are just perceptibly more rugulose and *very* much less evidently crenate-striated (the striæ towards the suture being

* I subjoin the following description of this nearly allied Canarian *Halonomus*, which will serve to point out its distinctions from the *H. Grayii*:—

Halonomus salinicola, n. sp.

H. fusco-piceus (fere niger), subopacus et setulis brevibus demissis cinereis irroratus; capite dense rugoso-punctato, clypeo ad latera picescente et mox ante oculos minus ampliato subrecurvo; prothorace minute punctulato, ad latera picescente; elytris distincte crenato-striatis, interstitiis minutissime punctulatis; antennis nigro-piceis, basi vix rufescentioribus; pedibus fusco-piceis, tibiarum anticarum angulo externo magis producto exstante.

Var. β, affinis [an species distincta?], vix minor, vix densius punctulatus setosusque, antennis vix pallidioribus tibiarumque anticarum angulo externo paulo minus exstante.

Long. corp. lin. $2\frac{1}{2}$–vix 3.

Habitat sub lapidibus prope salinas in Lanzarota boreali, valde gregarius, a meipso et Dom. Gray mense Januario A. D. 1858 copiose repertus: varietatis β exemplar unicum ad Maspalomas in Canaria Grandi australi adhuc solum inveni.

subevanescent), its antennæ are considerably paler, the outer angle of its anterior tibiæ is less developed, and its entire surface (beneath the microscope) is less coarsely alutaceous. I make no apology for not adopting Dejean's specific name,—first, because he never characterized the insect, and secondly, because it is *not* "ovate" (but strictly oval); and I have therefore much pleasure in dedicating it to my excellent friend John Gray, Esq., by whom, in conjunction with the Rev. Hamlet Clark, it was captured at St. Vincent in December 1856. It has also been taken, subsequently, in the same locality, by Mr. Fry; and I have specimens likewise now before me which were found by my nephew, Mr. F. W. Hutton, on the 11th of June, 1857.

Genus Opatrum.

Fabricius, Syst. Ent. 76 (1775).

24. *Opatrum fuscum*, Hbst.

Opatrum fuscum, Hbst., Käf. v. 225, tab. 52. f. 1 (1793).
—— *tomentosum*, Dej., Cat. (éd. 3) 214 (1837).
—— *septentrionale*, Falderm., in litt.
—— *fuscum*, Woll., Ins. Mad. 500, tab. 11. f. 1 (1854).

The *O. fuscum* was captured at St. Vincent by Mr. Gray and the Rev. Hamlet Clark in December 1856, and on two subsequent occasions, in the months of June and October, by Mr. Fry. It is a universal insect throughout these Atlantic groups. I have taken it in four (out of the five) Madeiran islands, and in the whole seven of the Canaries; and it is recorded by M. Morelet at the Azores.

25. *Opatrum patruele*?, Erichs.

Opatrum patruele, (Dej.) Erichs.? in Wiegm. Archiv, ix. 248 (1843).

It is with doubt that I assign this insect to the *O. patruele* of Erichson's memoir on the (supposed) Coleoptera of Angola. Upon the whole, it agrees sufficiently well with his diagnosis to render it desirable not to erect a new species in so obscure a genus as the present one; nevertheless it does not tally entirely with his description. Unfortunately Erichson has omitted all reference to what I believe to be the best (and by far the most constant) character in these closely allied *Opatra*, namely the form and exact amount of development of the lateral portion of the clypeus immediately in front of either eye. The present insect is very nearly akin to one which I have taken abundantly in Lanzarote and Fuerteventura (the two eastern islands of the Canarian group), but has the angle of its clypeus a little more obtuse, and its prothorax rather longer, a trifle more narrowed behind, and with its posterior angles less recurved and somewhat more acute. Several specimens of it, including both sexes, were captured at St. Vincent, during the month of October, by Mr. Fry.

(Subfam. Phylacides.)

Genus Trichosternum (nov. gen.).

Corpus sat magnum, ovato-oblongum : *fronte* ad latera leviter elevata, ad apicem profunde biloba ; *oculis* antice valde emarginatis : *prothorace* transverso, antice leviter emarginato, postice bisinuato, ad latera vix explanato : *scutello* magno, semicirculari-triangulari : *sternis abdomine*que fere ut in *Hadro*, sed *lobo prosternali* valde setoso et anguste marginato : *elytris* subconnatis : *alis* obsoletis. *Antennæ* capitis prothoracisque longitudine, robustæ, apicem versus leviter incrassatæ, articulo 1^mo^ sat robusto breviusculo, 2^do^ brevi, 3^tio^ elongato, 4^to^ hoc breviore, 5^to^ 6^to^que quarto paulo brevioribus inter se æqualibus, reliquis quinque paulo crassioribus (ultimo transverso-rotundato). *Labrum* (sat anomalum) magnum, corneum, robustum, crassum, ad latera rugose inæqualiter serratum, rotundato-quadratum et quasi e laminis duabus (una ad alteram arcte applicata) efformatum, supera sc. robustiore et apice profunde biloba (necnon per emarginationem parce ciliata), infera ad angulos anticos dense ciliata et apice calva minus excavata (ergo superne, inter lobos partis superioris, conspicua). *Mandibulæ* validissimæ, corneæ, crassæ (ad basin præsertim valde incrassatæ), triangulares, apice multo inflexæ et obtuse bifidæ, intus in medio fissæ coriaceæ. *Maxillæ* bilobæ : *lobo externo* pubescente, setoso ; *interno* multo breviore, apice inflexo acuto, intus longe pectinato-setoso. *Palpi maxillares* articulo 1^mo^ parvo extus sinuato, 2^do^ elongato subclavato, 3^tio^ breviore, ultimo magno securiformi : *labiales* articulo 1^mo^ parvo, 2^do^ majore crassiore clavato, ultimo hoc crassiore subovato. *Mentum* corneum, rotundato-quadratum, basi paulo angustatum, apice integrum, angulis anticis rotundatis. *Ligula* apice vix emarginata, angulis anticis rotundatis longissime setosis. *Pedes* robusti, crassi : *tibiis* (præsertim *posterioribus*) dense setulosis, *anticis* ad apicem distincte dilatatis : *tarsis* heteromeris, *posterioribus* (sed præsertim *posticis*) articulo 1^mo^ longiusculo.

Obs. Genus *Hadro* proximum ; sed scutello majore, corpore minus glabro (prosterni lobo densissime setoso), labro valde anomalo duplici, mandibulis crassioribus, mento simplici (nec e laminis duabus formato), pedibus robustioribus tibiisque anticis multo magis dilatatis, præter cætera, ab *Hadro* differt.

A θρὶξ, pilus, et στέρνον, pectus (i. e. lobus prosternalis).

The beetle from which the above details have been compiled is well known in many of the more extensive collections, where it figures under various names. I have it in my own under the title of "*Phylax validus*, Dej.," and Prof. Lacordaire informs me that he also possesses it under the same; but it is not included, as such, in Dejean's Catalogue, whilst a glance at the structural diagnosis will be sufficient to show that it is no *Phylax* at all (as now restricted and defined). It has also been lately communicated to me, by M. Deyrolle of Paris, as the "*Caragonia* (Solier) *canariensis* (Reiche);" but the genus "*Caragonia*," if indeed it were established by Solier, has certainly never been published; whilst the *specific* name, even if it were not a manuscript one (as I believe it to be), would of necessity have to be changed, since it conveys a false notion of the *habitat*, the insect being strictly a Cape de Verde one, and having nothing whatever to do with the Canaries. With respect to these two titles, Prof. Lacordaire writes to me as follows:—

"Je possède aussi depuis longtemps cette espèce, sous le nom de *Phylax validus*, Dej., et comme provenant des îles du Cap Vert. Quant au nom générique de *Caragonia*, Solier, je n'en ai jamais entendu parler, et je suis certain qu'il n'a été publié nulle part. Cet insecte est nouveau; MM. Mulsant et Rey ne l'ont pas décrit, à ma connaissance, dans leur travail sur les *Pédinides*. Il rentre dans les *Opatrides* du groupe des *Phylacides*, où il doit former un genre particulier parmi ceux qui ont les yeux incomplètement divisés. Je le placerais par conséquent immédiatement avant les *Hadrus*."

Not to mention many smaller distinctions, I may observe that *Trichosternum* differs from *Hadrus* in its larger and less transverse scutellum, its less glabrous surface (its sides above being sparingly setose, and its prosternal lobe very densely so), in its simple mentum, thicker mandibles and limbs, its more evidently dilated anterior tibiæ, and in its most anomalous and laterally-serrated upper lip. This last, indeed, is very curious, and appears to be composed of two closely-applied *laminæ*, of which the upper one is very robust, deeply bilobed and sparingly ciliated in front; whilst the under one is thickly ciliated at its anterior angles, but free from setæ at its apex, and much less scooped-out than the other—an arrangement which causes the emargination of the upper plate to be partially filled-in by the more prominent lower one.

26. *Trichosternum striatum*, n. sp.

T. nigrum, subopacum; capite leviter rugoso-punctato; prothorace parcius asperato-punctato, ad latera æqualiter rotundato; scutello ruguloso; elytris subtilissime et parce asperatis, longitudinaliter striatis, interstitiis convexis, ad utrumque latus parce setosis; antennis versus apicem tarsisque paulo picescentioribus.

Long. corp. lin. 5–6.

The present insect appears to be very common at St. Vincent, and in all probability on the other islands likewise. It was taken abundantly by Mr. Gray and the Rev. Hamlet Clark in December 1856; by my nephew, Mr. F. W. Hutton, in June 1857; and on a subsequent occasion, during the month of October, by Mr. Fry.

[To be continued.]

XXV.—*On Nobert's Test Plate and the Striæ of Diatoms.* By W. S. Sullivant and T. G. Wormley*.

The limit of the resolvability of lines, or how small a space can exist between lines and still admit of their being separated under the microscope, appears to be an undecided point. Professor Quekett† asserts that "no achromatic has yet been made capable of separating lines closer together than the $\frac{1}{75,000}$ of an inch." In the same work (p. 245) it is stated that Mr. Ross found it impossible to ascertain the position of a line nearer than the $\frac{1}{80,000}$ of an inch. We find also (p. 512) that Mr. De la Rue, in his extended examination of Nobert's test plates, was unable to resolve any lines closer than the $\frac{1}{81,000}$ of an inch. In Prof. Carpenter's work ‡ this sentence occurs: "The well-defined lines on Nobert's test plates have not yet been resolved when they have approximated more closely than the $\frac{1}{85,000}$ of an inch."

From the foregoing it appears that actual experiment fixes the limit of resolvability at about $\frac{1}{81,000}$ of an inch: this does not, as is said, vary widely from the deductions of Fraunhofer and others, based on the physical properties of light. In this connexion, the remark of Prof. Carpenter § may be cited: "There is good reason to believe that the limit of perfection (in the objective) has now been nearly reached, since everything which seems theoretically possible has been actually accomplished."

On the other hand, there are authorities who assert that lines much closer than the $\frac{1}{85,000}$ of an inch are resolvable. A few years since, Messrs. Harrison and Sollitt || published their measurements of the striæ of several diatoms, assigning to *Amphipleura pellucida* striæ as close as the $\frac{1}{120,000}$ to $\frac{1}{130,000}$ of an inch. These measurements have recently been repeated, and with exactly the same results, by Mr. Sollitt ¶ alone, who furthermore expresses the opinion that striæ as close as the $\frac{1}{175,000}$ of an inch can, with proper means, be seen. Mr. Sollitt's measurements have been adopted in the 'Micrographic Dictionary' (1860) and most of the modern works on the microscope,—no one, Prof. Carpenter** excepted, suggesting a doubt as to their accuracy; on the contrary, their correctness seems to be expressly recognized by Dr. G. C. Wallich††.

* From Silliman's American Journal for January 1861.

† Treatise on the Microscope, 3rd ed. p. 238, 1855.

‡ The Microscope, 2nd ed. p. 189, 1859.

§ *Op. cit.* p. 47.

|| Microscopical Journal, vol. ii. p. 61, 1854.

¶ Micr. Journ. vol. viii. p. 51, 1859.

** *Op. cit.* p. 188.

†† Ann. and Mag. Nat. Hist. for February 1860.

Such being the conflicting testimony and opinion of distinguished microscopists on the capacity of the modern objective for separating lines, it is somewhat surprising—in view of the high state of perfection now attained by the microscope, and of the number of its zealous devotees—that so few experiments have been made, bearing on this interesting point.

As a contribution towards that object, we propose to offer presently an analysis from actual measurements, as far as we were able to carry them, of one of those "marvels of art," Nobert's test plates. In such investigations, the quality of the instruments used being all-important, we would state that the optical apparatus at our command was ample, consisting of a first-class Smith and Beck microscope-stand; a Tolles's $\frac{1}{50}$-objective of 160° angular aperture—an objective of rare excellence in all respects —besides $\frac{1}{12}$ths and $\frac{1}{16}$ths of other eminent opticians, both English and American; also a solid eye-piece micrometer by Tolles, and an improved cobweb micrometer of Grunow's accurate workmanship. Smith and Beck's stage scales furnished the standards for fixing the micrometrical values of the eye-pieces. By means of Tolles's amplifier (an achromatic concavo-convex lens between the objective and the eye-piece), an amplification (by the standard of 10 inches) as high as 6000 times was obtained. This high amplification, with sunlight variously applied after passing through a small achromatic lens of long focus, was effective in resolution, and essential to the distinct counting under the micrometer of the lines of the test plate. The test plate used consisted of 30 bands of lines, each band varying but little from the $\frac{1}{2000}$ of an inch in width, and having its lines a uniform distance apart. On one end of the plate is engraved by Nobert, in parts of the Paris line, the distance apart of the lines composing the first band, and thence on, the distance between the lines of every fifth band, as in the 2nd and 5th columns of the following Table:—

Band.	Paris line.	English inch.	Band.	Paris line.	English inch.
1	0·001000	$\frac{1}{11,248}$	20	0·000167	$\frac{1}{67,413}$
5	0·000550	$\frac{1}{20,471}$	25	0·000143	$\frac{1}{78,737}$
10	0·000275	$\frac{1}{40,943}$	30	0·000125	$\frac{1}{90,074}$
15	0·000200	$\frac{1}{56,297}$			

We add the 3rd and 6th columns, giving the distances in parts of the English inch found by multiplying the decimals in the 2nd and 5th columns by ·088815.

Analysis of Nobert's Test Plate of 30 *Bands.*

Bands.	Lines in each band.	Parts of an English inch.	Bands.	Lines in each band.	Parts of an English inch.
1	7	$\frac{1}{11,110}$	16	30	$\frac{1}{57,519}$
2	8	$\frac{1}{13,062}$	17	31	$\frac{1}{58,623}$
3	9	$\frac{1}{15,372}$	18	32	$\frac{1}{62,155}$
4	10	$\frac{1}{17,950}$	19	33	$\frac{1}{63,328}$
5	12	$\frac{1}{20,224}$	20	34	$\frac{1}{66,947}$
6	13	$\frac{1}{23,287}$	21	36	$\frac{1}{68,047}$
7	15	$\frac{1}{27,705}$	22	37	$\frac{1}{71,960}$
8	17	$\frac{1}{32,250}$	23	38	$\frac{1}{73,190}$
9	20	$\frac{1}{37,792}$	24	40	$\frac{1}{74,256}$
10	22	$\frac{1}{40,636}$	25	41	$\frac{1}{76,200}$
11	24	$\frac{1}{45,063}$	26	42	$\frac{1}{78,105}$
12	25	$\frac{1}{47,331}$	27	43	$\frac{1}{81,213}$
13	26	$\frac{1}{50,000}$	28	44?	$\frac{1}{83,917}$
14	28	$\frac{1}{52,610}$	29	..	$\frac{1}{86,334}$
15	29	$\frac{1}{55,900}$	30		

The figures in the 3rd and 6th columns, showing the distance apart of the lines in each band, are the mean of numerous and slightly variant trials, particularly on the higher bands. Up to the 26th band there was no serious difficulty in resolving and ascertaining the position of the lines; but on this and the subsequent ones, spectral lines* (that is, lines each composed of two or more real lines) more or less prevailed, showing that the resolving power of the objective was approaching its limit. By a suitable arrangement, however, of the illumination, these spurious lines were separated into the ultimate ones on the whole of the 26th, and very nearly on the whole of the 27th band; but on the 28th, and still more on the 29th, they so prevailed, that at no one focal adjustment could more than a portion (a

* The tendency of lines near the limit, either way, of the objective's resolving power, to run into each other and produce spectral or spurious lines, is readily shown by a low objective on the lower bands. Hence the mere exhibition of lines is not always conclusive evidence of their ultimate resolution. A practised eye will generally distinguish the false from the true. Recourse to a higher objective often accomplishes the same; but when these fail, the micrometer only, together with a previous knowledge of the actual position of the true lines, can determine whether the lines exhibited are real or spurious. A $\frac{1}{12}$ or $\frac{1}{16}$ will show the three or four highest bands on this plate regularly and beautifully striped with lines much coarser than the true ones: the same with the $\frac{1}{30}$ on the last band.

third or a fifth part) of the width of these bands be resolved into the true lines.

The true lines of the 30th band we were unable to see—at least with any degree of certainty; still, from indications, we have no doubt they are ruled as stated by Nobert.

It will be observed that our measurements of the lines on the 1st, 5th, 10th, 15th, and 20th bands vary somewhat from Nobert's registration on the plate as given in the first table above. Such discrepancies are to be expected, and by microscopists familiar with operations of this kind are looked upon as unavoidable; but that on the 25th band is rather large to be accounted for in this way. We are unable to explain it, and can only say that our repeated measurements of it were very carefully made.

These experiments, together with those of others before noticed, induce us to believe that the limit of the resolvability of lines, in the present state of the objective, is well nigh established; but that this limit may be carried somewhat higher we are not prepared to doubt, since the handsome advance lately achieved by Mr. Tolles in his $\frac{1}{30}$ (combining wide aperture, fine definition, and high amplification) shows that the objective had not, as we were inclined to think, reached the stationary point.

The theoretical view of this question—that is, what may be the closest approximation of lines consistent with their separation under the microscope—we leave to those competent to the task, by whom, it is to be hoped, we may be favoured with further information on this point.

With regard to the striation of Diatoms, an opinion generally prevails that the number of striæ on a given portion of a frustule varies, among individuals of the same species, within wide extremes. This opinion is probably traceable in part to one of the earlier publications on the subject—the paper of Messrs. Harrison and Sollitt before referred to, wherein (as in the more recent paper of Mr. Sollitt) measurements of several Diatoms are given, showing great variableness in their striation. To these gentlemen much credit is due for their discovery of high markings, before unsuspected, on certain diatomaceous frustules; their measurements, however, and the alleged variableness of these markings we have not been able to verify, as will be seen by the following extract from our paper * published on this subject:

	Number of striæ in ·001″.		
	H. and S.	Sm. Syn.	S. and W.
Navicula rhomboides....	60 to 111	85	70
Pleurosigma fasciola	50 to 90	64	52 to 56
Pleurosigma strigosum ..	40 to 80	44	42
Nitzschia sigmoidea	105	85	70

* Silliman's American Journal, March 1859.

Many frustules of these species, from different localities, have been measured by us, and always with the same results. *Pleurosigma fasciola* has been specially designated by Mr. Sollitt, and also by Dr. Wallich, as very inconstant in its markings. Of this Diatom we are fortunate in being supplied with abundant specimens from various localities in England, particularly from the neighbourhood of Hull. Several hundred valves, not a few under $\frac{1}{300}$th of an inch in length, were measured, and on no one were found striæ less than 52 or more than 56 in ·001″, much the larger number being 54. A similarly uniform striation has always been observed among the individuals of many other species examined by us.

To such uniformity of striation *Amphipleura pellucida* forms, as yet, no exception; this Diatom is still a *res vexata* among microscopists; neither the striation nor the structure of its frustule is at all satisfactorily understood. The record of its striation is found to be thus:—In 1854, Messrs. Harrison and Sollitt's measurements made its striæ 120 to 130 in ·001″; Prof. Carpenter (1856) first suggests the probability of some error in these measurements; the writers of this paper declared themselves* unable to "glimpse" the striæ; Mr. Sollitt † measures them again, and finds them still as low as 120 to 130 in ·001″, but gives it as the opinion of Mr. Lobb that "even those figures are too low, and that they ought to be set down at 140 in ·001″;" in the same number of the 'Microscopic Journal' Mr. Ryland sees "striæ, but much more distant than the 130 in ·001″ of the Hull microscopists;" lastly, Mr. Hendry ‡ states that he has "come to a satisfactory conclusion that it is a sad misrepresentation to set down the lines so high in the scale as 130 in ·001″, and that on a few shells lines may be counted at 42, and many at 60, 70, and 80 in ·001″." A perplexing record, truly! reminding one of the celebrated Torbane Hill coal case §.

It is our impression, notwithstanding these conflicting statements, that the Diatom before us presented to all these gentlemen the same appearances, but their interpretations of these appearances have been widely different.

The testimony of our objectives, as we understand it, seems to indicate that this Diatom has a minutely and irregularly broken-up surface, which, even on the *same valve*, can be made to show an apparent striation, varying from moderately coarse to extremely fine, according to the obliquity or intensity of the illumination, and to the grade, whether low or high, of the objective used, thus proving beyond question that the exhibition

* Silliman's Amer. Journ. March 1859.
† Micr. Journ. Oct. 1859.
‡ Micr. Journ. July 1860.
§ Micr. Journ. ii. p. 64.

is illusory. In numerous trials, particularly on fine English specimens from Hull, sent us by Mr. G. Norman, we have entirely failed (with glasses, too, of unsurpassed excellence) to bring out *regular, distinct,* and *unmistakeable* striæ—such as would be, at once, so recognized by an eye practised on the striæ of other Diatoms.

After all, it is not improbable that true striæ, yet unresolved, may exist on the valves of this species, and furthermore, that the apparent striæ of different observers may be similar to the spectral or spurious lines before noted as occurring on the bands of Nobert's test plate when examined by an objective incapable of resolving them.

A summary of the foregoing may be briefly stated thus:—Our experiments lead us to believe,

1st, that lines on Nobert's test plate closer together than about the $\frac{1}{87000}$th of an inch cannot be separated by the modern objective.

2nd, that no *true* striæ have yet been seen on the valves of *Amphipleura pellucida.*

3rd, that the alleged variableness in the striation of Diatoms among individuals of the *same* species has been greatly exaggerated; on the contrary, we find a remarkable uniformity, thus sustaining the opinion of Prof. Smith*, that, for characterizing species, " striation is the best guide."

Columbus, Ohio, Nov. 1860.

BIBLIOGRAPHICAL NOTICE.

Suggestions for forming Collections of Birds' Eggs. By Alfred Newton, M.A., F.L.S., F.Z.S. London: E. Newman, 1860. (Reprinted from the 'Circular' of the Smithsonian Institution of Washington.)

The proper object of collecting birds' eggs is well expressed in the introductory remarks of the 'Smithsonian Circular.' It is something more than the completing of a series of specimens. It is a valuable means of obtaining a clue to the limits within which each species rears its young, as well as a knowledge of its habits and peculiarities during the breeding-season. Its nidification is an important chapter in the history of each bird; and too little is known of the nuptial garb of many species, and of the plumage of their nestlings, as well as of the form and markings of their eggs: yet all these are points which cannot be neglected by the scientific ornithologist.

Mr. A. Newton is well known as a writer on ornithology; his name is also associated with perhaps the most complete collection of the eggs of European birds. The present pamphlet therefore carries with it the authority of long practice, and contains the sug-

* Syn. Brit. Diat. vol. ii. Introd. p. xxvi.

gestions of one thoroughly familiar with his subject. A manual of this kind is likely to be especially serviceable to those who are investigating an unexplored country, and we are glad to find Mr. Newton's suggestions deservedly appreciated in America, where they were first published. Oologists at home will find the English edition very useful for transmitting to their friends abroad, or to those who are collecting for them in foreign countries.

If one feature strikes us above others in the writings of Mr. Newton, it is his scrupulous regard for strict accuracy. Everywhere he insists upon the most ample proof; and truly there is no branch of natural history where caution is more essential than in Oology.

The greatest stress is laid upon *Identification* and *Authentication.* "It is to be borne in mind that, to the oologist, specimens and labels are of very slight value unless accompanied by a statement of other circumstances which will carry conviction that the species has been accurately identified, and the eggs subsequently carefully authenticated." "The most satisfactory, and often the simplest way of identifying the species to which the nest belongs is to obtain one of the parents by shooting, snaring, or trapping;" its skin, or at least a characteristic part, is then to be carefully preserved and labelled, to correspond with the inscription put on the eggs. (pp. 3 & 4.)

We implore our readers not to attempt to carry out this practice upon our British nesting birds. Many things are justifiable and necessary in an unexplored country, and when the egg has not yet been traced to its proper parent; but eggs found in Great Britain are mostly too well known to require such measures as this; though exception may very justly be made in the case of a bird not previously known to nest in Britain, if it cannot be identified by any other means. Sad havoc has already been made among our scarcest species by reckless egg-collectors. Let us hope that a better spirit now prevails. A knowledge of the birds themselves, and of their habits, is, surely, far preferable to a collection of their eggs; and we have noticed that those who are most zealous in furnishing their egg-cabinet are not always the best field-ornithologists. Of course, we do not blame those who collect eggs with a really scientific object.

The best allies of the collector are the residents in the country, whether aboriginal or settlers; but the collector "should always insist upon any nests being shown to him *in situ*, and the gratuities paid should be proportioned to the success in identifying the species." (p. 14.)

"The most complete method of authenticating eggs is that of writing in ink upon their shells the name of the species," together with as many particulars as the space will admit of—the locality, date, name of the collector, details of how far identified, &c. Tickets attached with gum are too easily removable.

All this is excellent advice; and, besides, we are initiated into an improved system of egg-blowing,—the implements required being represented in several woodcuts. One perforation only should be made in the egg, which is then easily emptied by suction through a tube or blow-pipe. The difficult operation of removing a fully developed embryo may be successfully accomplished by means of sundry knives, scissors, and hooks, which form part of the collector's equipment.

The surest method of packing eggs for travelling long distances is "to roll up each egg separately in tow, flax, wool, or some similar material, so as to form a ball, and then to place these balls side by side in a good stout box, taking care there be no room for them to shift their position."

The unsafest way, on the other hand, is "to place the eggs in a box, filling up the interstices with bran, sawdust, corn, or sand." The eggs, if unblown, will, after sufficient jolting, be found all together at the bottom of the box; if blown, they will all rise to the top. In either case the result is equally fatal.

We may conclude, in the words of Mr. Newton, that precision in the identification and authentication of his specimens is the first duty of an egg-collector. No egg should be left without its inscription, no collection without its catalogue; and we trust that Mr. Newton's earnest wish may be realized that oologists will henceforward "exercise greater zeal in seeking and recording precise information, at the very time and place where only it may be sought and recorded." "To attain this main object no trouble is too laborious, no care too great."

Work in the Press.

We understand that Mr. Van Voorst is about to publish a new work on British Conchology, in a cheap form, but completely illustrated. The author is a gentleman of considerable eminence in the scientific world, who has especially studied this branch of our natural history.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

November 13, 1860.—Dr. J. E. Gray, V.P., in the Chair.

Description of a New Coral (Corallium Johnsoni) from Madeira. By Dr. J. E. Gray, F.R.S., V.P.Z.S., etc.

Mr. James Yate Johnson, the author of an admirable 'Guide to the Island of Madeira,' and who has for years been studying the natural productions of that beautiful island for the purpose of preparing a Fauna of it, having kindly given me some specimens of Corals from thence, I am induced to send the following description of a very interesting specimen of this hitherto very limited genus to the Society.

Corallium Johnsoni.

Coral branched, subflabelliform. Branches nearly simple, subparallel, flexuose, with a few very short ascending branchlets scattered on the side of the upper surface. Bark yellow, granular, with three or four rows of rather convex polype-cells on the upper surface of the branches, and with the under side smooth and rounded. The axis white, striated.

Hab. Madeira.

This coral differs from the Red Coral of the Mediteranean and of commerce in several important particulars. That coral, which generally grows from the under-surface of ledges of rocks in a pendent position, has the polypes equally scattered on all sides of its branches, and thus the animal can obtain food with equal facility on all sides of the coral.

The Madeiran coral, on the contrary, seems to grow in a fan-like manner, spreading out horizontally from the rock or other marine body to which it is attached; and it has the animal placed on each side of the upper surface of the stem and branches, as though the animal could only obtain nourishment on that part of the coral which is exposed to the light, or at least is parallel with the surface of the sea.

This is the case with many, indeed I may say with all the corals which grow in this expanded, fan-like manner.

There is a species of coral which grows, and has the animal likewise distributed in the same manner, which is found in the seas near the Sandwich Islands, and has hence been called *Corallium secundum* by Mr. Dana, but it is very different from the species here described. The Madeiran coral is easily distinguished from that described by Mr. Dana by the colour of its bark and axes, and the thick, elongated, subsimple, subparallel branches.

Secondly, this Madeiran coral appears to be normally of a white colour, while the Mediterranean coral is of a bright crimson-red, and has hence been called *Corallium rubrum*. The latter is sometimes bleached white, or becomes so from some defect or malady in the animal: it is rarely found naturally white, or more generally with some portion of the coral white. I have never seen it naturally of this colour, but I have seen some specimens with white portions; and I have been informed that these portions have been bleached by the sudden application of heat or some other process. The Madeiran coral, on the contrary, seems to be always white.

The "White Coral" of commerce is a species of *Caryophyllia* of Lamarck.

If this coral could be obtained in any quantity from Madeira, it would be a beautiful object for jewellers, and I have no doubt fetch a good price.

On the Genus Manouria and its Affinities.

By Dr. J. E. Gray, F.R.S., V.P.Z.S., etc.

In the 'Proceedings' of this Society for 1852, p. 133, I described, and in the quarto Catalogue of the 'Shield Reptiles in the Collection of the British Museum' I described at greater length and figured, the imperfect shield of a Tortoise which had long been in the possession of the Society, under the name of *Manouria fusca*.

Dr. Cantor, in his 'Catalogue of the Reptiles of the Malayan Peninsula,' describes a specimen of the same Tortoise under the name of *Geoemyda spinosa*, considering it as the adult of that curious and interesting species, and most unjustifiably copies my description of the animal of that Tortoise as that of the animal belonging to the shell which he was describing.

Dr. Cantor sent the specimen here referred to, to the East India Company, and it has passed from them into the Collection of the British Museum, so that there can be no doubt about the identity of the two animals.

Mr. Le Conte, in the 'Proceedings of the Academy of Natural Sciences of Philadelphia' for October 1859, vol. vii. p. 187, describes a Tortoise from Java under the name of *Teleopus luxatus*, which evidently belongs to the same genus, and is probably the same species which I had previously described and figured under the name of *Manouria fusca*.

When I first described the genus from a shell in a very imperfect condition, I referred it to the family *Emydidæ*, on account of its "depressed form and the divided caudal plate."

Dr. Cantor, in the Catalogue above quoted, not only refers it to that family, but considers it a species of the genus *Geoemyda*, and describes the animal as having the feet of that genus, which are provided with strong, separate toes.

Mr. Le Conte seems to have had a perfect animal, for he describes the feet thus:—"Toes and claws 5·5; fore-claw long and rather sharp: hind-feet clavate; claws nearly globular, the inner one wide and flat, the edge sharp-edged:" yet he places the genus *Teleopus*, in his arrangement published in the same volume of the 'Philadelphia Proceedings,' between *Platysternon* and *Lutremys* with the true *Emydes*, observing that "it possesses a strong mixture of the characters of this family with those of the next."

The British Museum has just acquired from Mr. Gould a very fine and perfect specimen of the genus, which he received with a series of skins of Kangaroos and other Australian mammalia and reptiles from Australia, thus enabling me to lay before the Society a completion of the character of the genus before established from the examination of an imperfect specimen of the shell alone, to correct the position of the genus in the order, and to show the geographical distribution of the single species on which it is founded.

The genus *Manouria* is a typical Land Tortoise (*Testudinidæ*), which verifies the fact stated by Dr. Cantor, that it is "found on the great hill at Pinang at a distance from water." Like the other genera of that family, it has very short toes on both the hind and fore feet, which are all united together into a club-like foot, with only the claws separate,—very unlike the distinct, more or less webbed toes of the Freshwater Tortoises or *Emydidæ*, with which it has been hitherto united. Its fore-feet are covered with very large, thick, triangular scales, like the feet of the genus *Kinixys*; and it has the spur-like conical scale, situated between the hinder thigh and the base of the tail, which is found in several genera of this family.

It is easily known from all the other genera of the *Emydidæ*, and from the more terrestrial genera of the family, by the small size and position of the pectoral plates and the divided caudal plate.

The pectoral plates in some genera of the Freshwater Tortoises, as in *Kinosternon* and *Sternotherus*, are smaller than the other plates, and narrowed on the inner edge; but I do not know of any genus where they are reduced to such a small size and removed so far towards the outer edge of the sternum as in the one under consideration.

The separation of the caudal plates, which is universal in all the Freshwater Tortoises and Marine Turtles which have come under my examination, is not found in any other genus of Land Tortoises that I am aware of: but in several species of the true *Testudines* there is a more or less distinct groove, showing where the plates are united; and in *Manouria* they are quite separate.

The head is covered with symmetrical small shields. The jaws are crenulated on the edge, without any distinct sharp hook at the top of the upper one. The neck is covered with small granular scales. The fore-feet are depressed, club-shaped, covered with large, thick, triangular, sharp-tipped shields, forming five rather irregular rows on the front or upper surface. The outer side of the under surface and the soles of the fore-feet are covered with large flattened plates. The fore-claws are five in number, large, thick, conical, acute, and nearly of an equal size, the outer one being rather the smallest. The hind-feet are large, with four very large, strong, conical, acute claws, the outer one on each foot being rather smaller than the others, which are all of equal size. The soles of the hind-feet are covered with large, unequal-sized scales—those on the hinder edge being largest—thick, conical, trihedral, and prominent.

On each side of the hinder part of the body, near the tail, is a group of large triangular scales,—the hindermost, nearest the base of the tail, being very large, conical, and prominent, forming a large spur.

Tail short, conical, with three rows of flat shields above, and three or four rows of squarer, smaller ones beneath.

The *Manouria fusca* appears to inhabit Pinang, where Dr. Cantor says it is "found on the great hill at Pinang at a distance from water;" also Java, as I cannot discover from Mr. Le Conte's description that there is any specific difference between his *Teleopus luxatus* and my species from Pinang; and likewise Australia, for the specimen which we have received from Mr. Gould is marked the "Murray River Tortoise," and it came with a collection of the skins of mammalia and reptiles which are all Australian. There is very little difference between the three specimens of this Tortoise which we have in the British Museum Collection, two of them from Pinang and the other from Australia. They vary a little in the size and form of the pectoral plates, and in the size of the axillary and inguinal plates, but not more than is the case with other Tortoises of the same species.

Nov. 27, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Mr. Gould brought under the notice of the meeting several Crested Penguins, and remarked that there appeared to be some species of this truly oceanic group which had not yet been characterized. Upon the present occasion, however, he only referred to those forming the genus *Eudyptes*, and, after a few cursory observations upon the described species of that form, proceeded to characterize two others from his own collection under the names of *Eudyptes nigrivestis* and *E. diadematus*.

Mr. Gould remarked that the species of this well-defined crested group now known were :—

Eudyptes chrysolophus.	*Eudyptes nigrivestis.*
—— *chrysocome.*	—— *diadematus.*
—— *pachyrhynchus.*	

The following were the descriptions given of the two new species :—

Eudyptes nigrivestis, Gould.

Face, chin, upper part of the throat, and sides of the neck black; feathers of the forehead and crown long, narrow, and silky-black; those on the sides of the head considerably prolonged; a stripe of pale straw-yellow commences at the nostrils, continues over the eye, and extends in lengthened narrow filamentous feathers behind that organ; upper surface black, each feather with a narrow line of greyish-blue at the tip; outer side of the wing shining black, edged posteriorly with white; tail black with grey reflexions; all the under surface of the body and the under surface of the wing, except at the base and tip, silky-white, the base and tip being sooty-black; bill chestnut-brown; eye pinkish-chocolate; feet livid.

Total length $21\frac{1}{2}$ inches, bill 2, wing $5\frac{3}{4}$, tail 4, tarsi $\frac{7}{8}$.

Habitat. The Falkland Islands, where it is known by the name of "Rock-hopper."

Remark. The species to which this bird is most nearly allied appears to be *E. chrysocome*; but it differs in being of a smaller size, in its much darker colouring, particularly of the throat, sides of the face, and wings; the superciliary stripe and the filamentous feathers into which it is prolonged are also much less developed.

Eudyptes diadematus, Gould.

Face, chin, upper part of the throat, and sides of the neck sooty-black; feathers of the forehead and crown long, narrow, and silky-yellow at the base, and silky-black for the remainder of their length, those on the sides of the head considerably prolonged; a stripe of chrome-yellow commences at the nostrils, continues over the eye, and extends in lengthened narrow filamentous feathers behind that organ; upper surface black, each feather with a narrow line of greyish-blue at the tip; outer side of the wing dark-grey, edged posteriorly with white; tail black with grey reflexions; under surface of the body and the under side of the wing, except at the base and tip, silky-white, the base and tip being sooty-black; bill chestnut-brown; eye pinkish-chocolate; feet livid.

Total length 25 inches, bill $2\frac{3}{4}$, wing 6, tail $4\frac{1}{2}$, tarsi $1\frac{1}{4}$.

Habitat. The Falkland Islands.

Remark. This is a somewhat large species, and bears the same relationship to *E. chrysolophus*, that *E. nigrivestis* does to *E. chrysocome*; it differs, however, from *E. chrysolophus* in the darker colouring of its chin and the presence of the rich chrome-yellow stripe which passes over the eye. It differs also from *E. pachyrhynchus* in the more lengthened and less robust form of the bill.

For both these new species, science is indebted to Captain Abbott.

The following papers were read :—

On the Genus Hyperoodon : the two British kinds, and their Food. By Dr. J. E. Gray, F.R.S., V.P.Z.S., etc.

At the preceding meeting of the Society, a letter was read from the Rev. G. Beardsworth, the Vicar of Selling, on a female Whale and its young, which had been caught on the coast near Whitstable, Kent*.

Through the kind agency of Mr. Beardsworth, the complete skeleton of the older, and part of the skeleton of the younger specimen have been secured for the British Museum. The species is *Hyperoodon rostratum*. It is well figured, from a drawing by Mr. Beardsworth, in the 'Illustrated News' for the 18th of November, 1860.

There has been some discussion about the form of the blow-hole in this genus,—some, as Voigt and Wesmael, describing the ends of the opening as pointed forwards, as in other Dolphins, while Dale, Boussard and Doumel describe them as pointed backwards. Mr. Beardsworth, in his description, calls the blow-hole straight ; but his figure represents it as slightly crescent-shaped, with the ends pointing towards the nôse ; and Mr. Crotch, who has sent me a note on a specimen of a female *Hyperoodon* which was shot near Weston-super-Mare, as exactly agreeing with the specimen obtained at Kiel in 1801, only that the cusps of the blow-hole are directed forwards ; and he inquires, "Does the cusp of the lunate spiracle turned forward mean anything ?" At any rate it appears to be the normal direction in this species.

Mr. Beardsworth observes in his note :—" I enclose you a portion of the food found in the stomach. There was more than half a bushel of this (which I am told is the claws of the Cuttle-fish), and nothing else."

It is not a new fact that Cetaceans, at least the Whales with teeth, feed on these animals ; for the beaks of some Cephalopods are found interspersed in the substance of ambergris, which is a concretion found in the intestines or stomach of the Spermaceti Whale. In this substance they are in general few in number ; but their presence is so universal that the druggists do not consider the ambergris true if they are not found in it, and they thus distinguish the artificial substitute from the real article in the market.

The Black Fish (*Globiocephalus macrorhynchus*) is said to have the remains of Cuttle-fish in the stomach ; and Bennett, in his 'Whaling Voyage,' states, " the ordinary food of the Sperm Whale is the Cuttle-fish or Squad, *Sepia* " (p. 176). I suspect that Cuttle-

* The person who procured the Whale is Mr. Smith. As his card shows a trade in an article that is new to me, I give it entire :—" Henry Smith, Horse Bridge, Whitstable, Fish Agent for Five-fingers, Mussels, and Sprats." I suppose the first are Star-fishes.

fish or Squad, or even *Sepia*, is intended to represent the Linnean genus *Sepia*, not the genus as now restricted, and is synonymous with the class *Cephalopoda*: at least that must be the case in the whale now under consideration; for if the beaks belonged to Decapodous Cephalopods either of the genus *Loligo* or *Sepia*, there would no doubt be some remains of the dorsal shell of the *Sepia*, or of the dorsal glade of the *Loligo* and its allied genera, found intermixed with the beaks.

The articles sent were certainly the horny beaks of a Cephalopod, and appear to be those of the common *Octopus*, or Sea Spider.

It is very curious that these beaks should form such a mass, as this indicates that they must be very abundant in some parts of the sea, and proves that they must form at least a large portion of the food of this animal. I have never seen the *Octopus* in large numbers either at sea, in the nets of the fishermen, or thrown up on the coast; yet that they are abundant somewhere these beaks are a sufficient proof.

The beaks sent me by Mr. Beardsworth all appear to belong to a single species; but he informs me there were some of a larger size intermixed with them when they were first taken out of the stomach, but they were selected and taken away by the bystanders. As there are only an upper and a lower beak to each fish, and they are of a small size, it would require many thousand animals to make up a half-bushel of them.

The measurement of the younger Cetacean, as given by Mr. Beardsworth's account, is interesting as showing its large size while yet in company with its mother, and proving that Dr. Knox's observation, that the fœtus of the Porpoise is half the length (that is one-fourth of the size) of the parent before it is born, and that the young appear to attain their full size very rapidly, is probably equally true in the genus *Hyperoodon*.

It is to be observed that both the female from Whitstable and the female from Weston-super-Mare have the dorsal fin on the hinder part of the back, about two-thirds the distance from the head, as in Hunter's figure of the Bottle-nose (Phil. Trans. vol. lxxvii. t. 19), and not in the middle of the back, as in the Bottle-head or Flounder's-head described and figured by Dale in his History of Harwich, p. 411. t. 149.

In my Monograph on Whales, published in the 'Zoology of the Erebus and Terror,' I described and figured a species of *Hyperoodon* from the skull of an animal which had been caught at the Orkneys, under the name of *Hyperoodon latifrons*, on account of the great height and very great thickness of the reflexed part of the maxillary bones, which form the crest in front of the blowers.

Professor Eschricht considers that this species is founded on the skull of an adult male of the common species (which he calls *Hyperoodon butzkopf*), because the specimen of the animal with this kind of skull which he received from Faroe was of that sex.

The following facts I think will dispel such an idea:—first, I think I can prove that males and females have been seen and preserved of both species; and secondly, the structure and form of the two skulls is so different, that it is much more likely that they should be referable to two very distinct genera than to species of the same genus.

I may state that I have examined four skulls of the *H. latifrons*, and Professor Eschricht has another.

There is a skeleton with the skull of an adult animal of this species in the College Museum at Edinburgh, which was obtained from the Frith of Forth on the 29th of October, 1839. Mr. William Thompson (Ann. and Mag. Nat. Hist. 1846, vol. xvii. p. 153) informs us that this specimen was a female $28\frac{1}{2}$ feet long, accompanied by a young male. So there can be little doubt that there are females of *Hyperoodon latifrons* as well as males.

It appears to be a northern species. As I have seen specimens from Greenland, the Orkneys, and the Coast of Lanarkshire, this is the most southern example that has yet occurred to me. It is also probably a much larger species than *Hyperoodon rostratum*, as the skull from Greenland in the Newcastle Museum is 92 inches long, while the largest skull of *H. rostratum* that has come under my observation does not exceed 60 or 65 inches.

It is only necessary to examine the figure of the two skulls of *Hyperoodon rostratum* and *H. latifrons* in the Plate to the 'Voyage of the Erebus and Terror,' to see how exceedingly different they are from each other, not only in the form of the skull, but also in the form of the lower jaw. The skull of *H. latifrons* not only differs from that of *H. rostratum* in the thickness and solidity of the frontal crest of the maxillary bones, but in the crest being much higher than the hinder part of the skull; while in all the skulls of *H. rostratum* I have seen, the crest is of the same height with the frontal ridge.

As regards *Hyperoodon rostratum*, Mr. Beardsworth states his specimens to be a female and a young female. The specimen which was shot at Weston-super-Mare, Mr. Crotch informs me, is a female. I may also observe that the specimen of this species described by Mr. William Thompson in the Annals and Mag. of Nat. Hist. 1846, vol. xvii. p. 150, is said to be a male: its skeleton is now in the Belfast Museum. So there are certainly male and female of this species also known.

Mr. Crotch has furnished me with the following measurements of the female specimen taken at Weston-super-Mare, which was exhibited at Bristol:—

	feet.	in.
Total length	26	0
From posterior origin of dorsal fin to insertion of the tail	6	0
Dorsal in width at base	1	11
——— in height	1	5
Tail in diameter	7	0
—— in depth	2	0
Cloaca to insertion of tail	5	3
Length of cloacal fold	2	0
From anterior of cloaca to pectoral	8	6

	feet.	in.
Length of pectoral	2	0
Height of pectoral	0	9
——— of body at anterior end of dorsal	4	0
——— of body at origin of tail	1	4
From gape to muzzle	2	0
Vertical height of forehead from gape	1	8
——— ——— from insertion of upper jaw	0	10
From eye to gape	2	0
From eye to spiracle	2	0
Girth at the dorsal	11	0
From cloaca middle to navel middle	5	0
From pectoral to pectoral, beneath	1	8

The latter measurement shows a character that the figures generally misrepresent, the closeness and lowness of the pectoral fins: they are generally represented as if they were about one-third up the sides of the body, and consequently far apart; but Mr. Beardsworth particularly says that they are so low on the sides, that a stick placed across the body, under the fins, would touch the base of each.

Notes on the Reproduction of the Australian Wattle-bird (Talegalla lathami) in the Society's Gardens. By A. D. Bartlett.

The pair of Talegallas kept in the Gardens of the Society, during the spring and summer of the present year formed a large mound composed of leaves, grass, earth, and other materials. Within this mound the female deposited twenty eggs. The *time of laying*, the *interval of time between each egg*, and the *period of incubation* are at present unknown to me.

But on the morning of the 26th of August a young Talegalla crept out of the mound, and, quite regardless of its parent, ran about searching for worms and other insects, upon which it fed with as much adroitness and apparent knowledge as the chick of a common fowl would exhibit at a month old.

Towards night this young bird flew about among the branches of the trees and shrubs in search of a safe roosting-place, and, having selected one about 6 feet from the ground, settled down and appeared as comfortable and unconcerned as an adult bird,—the female taking no notice whatever of her offspring.

Upon carefully looking into the mound two days afterwards (on the 28th), I observed a second young bird moving about and busily engaged cleaning its feathers with its bill, the wing-feathers at this time being encased in quill-sheaths. This young bird remained in the mound about twenty-four hours after it had escaped from the shell; and during this time the wing and other feathers were freed from their covering, so that the bird was enabled to fly immediately upon quitting the mound, which it did on the morning of the 29th. This second young bird conducted himself in the same manner as his predecessor. The two young birds took no notice whatever of each other, or of the old female, the three birds appearing perfectly independent of each other, *eating, drinking,* and *roosting separately* ; and although an occasional small voice was heard from the young birds, it did not appear to indicate or excite any notice among them. These young birds grow amazingly—so rapidly, that at the age of three months they can scarcely be distinguished from the adult birds.

The foregoing observations lead me to believe that two or three days may elapse between the laying of each egg. The young birds will consequently come out of the mound in the order in which the eggs were laid, as it is evident that incubation must commence immediately the egg is laid. If, therefore, twenty eggs are laid in forty or sixty days, there must be this number of days difference in the age between the first and the last of the brood, and no two of the young birds could possibly be of the same age.

Perhaps the most remarkable feature connected with this bird is the very perfect development of the young, reminding us strongly of the next division of the vertebrate animals (the *Reptiles*),—not that I can see any connecting links between the great divisions of the Vertebrata.

But although it is only in the Mammalia that the young are fed by the fluid secreted in the mammary glands, yet in the highest order of the class *Aves* (the Parrots) the young are fed partly by the fluid secreted in the œsophagus, mixed with the softened and partially digested food from the crop of the parent birds.

Now in the *Talegalla* we seem to approach the reptilian character not only in the form and general appearance of the eggs, but in the manner in which they are deposited and the absence of care bestowed upon the young.

I believe I am correct in saying that, with this exception, all birds feed or provide food for their young, while, on the other hand, I am not aware that any reptile is known to do so, and that all the reptiles that lay eggs leave them to hatch, and the young to provide for themselves,—their young, as in the Talegalla, coming forth in a very perfect and well-developed condition, and being enabled to seek and obtain their food without the aid of the parents. I therefore cannot avoid considering the Talegalla and its allies as exhibiting in this respect the lowest form in birds.

On a West-African Genus of Snakes (Meizodon). By Dr. Albert Günther.

Fischer has described a Colubrine Snake from West Africa with the name of *Meizodon regularis* *. Finding its dentition similar to that of *Coryphodon,* from which it considerably differs in general habit, he thought himself justified in separating it generically as *Meizodon.* I have had the opportunity of examining not only *Meizodon regularis,* but also two other Snakes which, in their dentition and in general habit, are the species nearest allied to it, and from which it becomes evident that all three are to be removed from the family of *Colubridæ* to that of *Coronellidæ.* In order to fix their position

* Hamburg. Abhandl. Gebiet Naturw. 1856, p. 112.

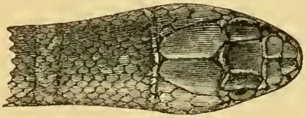
in the latter family, and to see whether it were possible to keep up a West-African *Coronelline* form of Snakes with *the maxillary teeth gradually increasing in strength*, for which the name of *Meizodon* might be retained, I was induced to re-examine all the other African *Coronellidæ*. But I could not convince myself that such a genus would form a naturally defined group. *Coronella cucullata*, with its posterior maxillary tooth grooved; *Ablabes rufulus*, with all the teeth equal in length; *Coronella olivacea*, *C. fuliginoides*, and probably *C. semiornata*, with the posterior tooth longest; and finally, the three species of *Meizodon*, with the teeth gradually increasing in strength,—are so similar to each other in the proportions of the single parts, in the arrangement of the shields of the head, in their physiognomy, in the structure and number of the scales, in the darkness of the colours, that the other character, that of dentition, must give way for generic distinction—the more so as it is very difficult in many specimens, even in some species *, to say which of the different categories of dentition is prevalent.

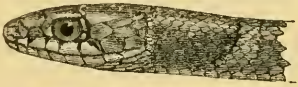
I add, for completeness' sake, the diagnosis of *Meizodon regularis*:

Coronella (Meizodon) regularis.

Syn. *Meizodon regularis*, Fischer, Hamb. Abhandl. Gebiet Naturwiss. 1856, p. 112; Gthr. Catal. Col. Snakes, pp. 109, 250.

Scales smooth, in nineteen rows; anal bifid; two posterior oculars. Eight upper labial shields, the fourth and fifth coming into the





orbit. Entirely blackish-olive; each scale with a black centre and a pearl-coloured speck at the upper edge; posterior part of the neck with a broad, darker, lighter-edged collar.

Hab. West Africa.

The typical specimen is in the Hamburg Museum; another in the Collection of the British Museum.

Coronella (Meizodon) bitorquata, n. sp.

Scales smooth, in nineteen rows; anal bifid; two posterior oculars. Eight upper labial shields, the fourth and fifth coming into the orbit. Brownish-olive above; a black band across the occipitals, a second

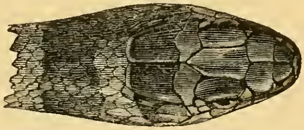
* In many specimens of *Ablabes rufulus* the teeth are, strictly speaking, not equal, but increase in strength posteriorly. In *Liophis cobella* the character of the longer posterior tooth is little marked; and there are specimens in which all the teeth are of equal size.

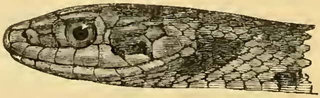
across the neck, and a black spot behind the latter on each side of the neck, extending on to the ventral shields; the lower parts dirty yellowish.

Hab. Senegal.

The typical specimen is in the British Museum.

Description.—Habit like that of *Coronella austriaca*; number and form of the shields of the head normal; the posterior frontals are rather longer than, and nearly twice as large as, the anterior ones; vertical five-sided, slender, with the posterior angle acute;





occipitals of moderate size, obtusely rounded behind. Nostril between two shields; loreal square; anteorbital high, extending on to the vertical; two posterior oculars in contact with an oblong temporal shield; three other temporals are behind the latter, the upper of which is elongate, forming a suture with the occipital. Eight upper labial shields, the fourth and fifth coming into the orbit. Scales short, rhombic, smooth, in nineteen rows. Ventral shields 205; anal 1/1; caudal 75. The colours have been described in the diagnosis; the ground-colour changes into lead-grey after the epidermis has been rubbed off. The maxillary teeth form one continuous series; anteriorly small, they gradually become longer and stouter posteriorly; none of them are grooved.

	inches.	lines.
Length of the head	0	4
——— of the trunk	8	0
——— of the tail	2	3

Coronella (Meizodon) Dumerilii, n. sp.

Scales smooth, in nineteen rows; anal bifid; three posterior oculars. Eight upper labial shields, the fourth and fifth coming into the orbit. Greyish-brown above, with a darker, white-edged longitudinal band occupying the five medial dorsal series of scales and extending from the neck to the tail, where it gradually disappears; another rather indistinct whitish line running along the fourth outer series of scales. Belly whitish.

Hab. Sierra Leone.

The typical specimen is in the British Museum.

Description.—Habit like that of *Coronella austriaca*; number and form of the shields of the head normal; the posterior frontals are as long as, and not much larger than, the anterior ones ; vertical five-sided, slender, with the posterior angle very acute ; occipitals of moderate size, tapering behind, but with the extremity rounded. The shield which is pierced by the nostril is very indistinctly divided

into two ; loreal square ; anteorbital high, not extending on to the vertical ; three posterior orbital shields ; an oblong temporal shield is in contact with the two inferior oculars ; three or four scale-like temporals behind the anterior one. Eight upper labials, the fourth and fifth coming into the orbit. Scales short, rhombic, smooth, in nineteen rows. Ventral shields 143 ; anal 1/1 ; caudal 85. The colours have been described in the diagnosis ; the ground-colour changes into lead-grey, after the epidermis has been rubbed off. The maxillary teeth form one continuous series ; anteriorly small, they gradually become longer and stouter posteriorly, and none of them are grooved.

	inches.	lines.
Length of the head	0	$4\frac{1}{2}$
——— of the trunk	8	0
——— of the tail	3	5

This species is dedicated to the memory of the late Prof. A. M. C. Duméril.

Note on Aspidochelys Livingstonii. By Dr. John Edward Gray, F.R.S., V.P.Z.S., etc.

In the 'Proceedings' for this year, p. 5, I described and figured a Soft Freshwater Turtle from the Zambesi under the name of *Aspidochelys Livingstonii* ; at p. 314 are printed some further observations on the African *Trionyches* with hidden feet (*Emyda*) ; and in both these papers I state that I had not been able to find any published description of a Tortoise from Zanzibar that Dr. Peters had indicated to me in a letter to myself in 1840 under the name of *Cyclanosteus frenatus*.

Dr. Peters, through Mr. Sclater, has kindly referred me to a paper by him on the Tortoises found during his travels, in the 'Bericht der Königl. Akad. zu Berlin,' for 1854, p. 276, where the Tortoise from Zanzibar is very briefly described, but under the name of *Cycloderma frenatum* ; and has stated that he believes it is the same as the one I described from the Zambesi. Mr. Sclater says that he has seen two or three fine perfect specimens of this Tortoise in the Berlin Museum. Under these circumstances, there can be no doubt that my name must give way to that used by my friend Dr. Peters.

I may at the same time observe that the genus *Cycloderma* is so characterized by Dr. Peters that it will include all the African *Emydæ,* all of which have the dorsal disk flexible on the margin and without any marginal bones. On the contrary, my genus *Cyclanosteus,* to which I had provisionally referred Dr. Peters's species, is by its character confined to those species of the African *Emydæ* which have nine sternal callosities.

As Dr. Peters, before he published the characters of the genus, considered it desirable to change the name of the genus which I had adopted from his MS. communication; and founded his genus *Cycloderma* on a species that has only seven sternal callosities (though he only mentions the number of the callosities in the specific character, and probably would have considered my animal with nine callosities as the second species of his genus), I think, if the two animals are to be kept in different genera, as I am of opinion they ought to be, we ought in justice to retain his name for the restricted genus, in preference to my name of *Aspidochelys,* or Mr. Cope's genus *Heptothyra,* which are founded on this peculiarity.

The synonyma of the Zambesi and Zanzibar Tortoise will then stand thus:—

Cycloderma frenatum, Peters, Bericht. 1859, p. 216.

Cyclanosteus frenatus, Peters, MS. 1848; Gray, Cat. Tortoises Brit. Mus. p. 64. 1855; Proc. Zool. Soc. 1860, p. 314.

? *Aspidochelys Livingstonii,* Gray, Proc. Zool. Soc. 1860, p. 5. t. 22, and p. 316.

As the head of the *Aspidochelys* is not known, and the colour of the head forms one of the best characters for the separation of the species of *Trionychidæ,* we cannot refer the Zambesi species to the Zanzibar animal with certainty until an entire specimen of the former animal has been examined; but, at any rate, it appears to be a species of the genus *Cyclanosteus* of Dr. Peters, restricted as I propose.

Dec. 11, 1860.—Dr. J. E. Gray, V.P., in the Chair.

Mr. A. Newton informed the meeting of the important fact, that a recent discovery of bones, supposed to be those of a Dodo (*Didus*), had been made in the Mauritius by Dr. Ayres, which would be transmitted to the British Museum.

The following papers were read:—

Note on Ovis Polii of Blyth. By P. L. Sclater, M.A., Secretary to the Society.

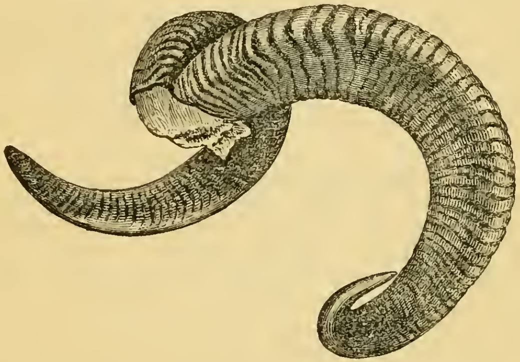
I beg leave to call the attention of the Society to a very fine pair of the horns of the Wild Sheep of Pamîr, *Ovis Polii,* Blyth (P. Z. S.

1840, p. 62, and Ann. N. H. vii. p. 196), belonging to Major W. E. Hay, F.Z.S. This is one of the several pairs brought back by Lieut. Wood in 1838 on his return from his journey to the sources of the Oxus, when detached from Sir Alexander Burnes's mission to Cabool. Having been unaccountably neglected and thrown out into the open air at Loodianeh * to perish, they were rescued by Col. Stedman in 1843, and presented to Major Hay, who brought them home on his return from India in 1858.

There being, I believe, only two pairs of the horns of this magnificent Sheep known to exist in this country, the acquisition of a third is of much interest. The following are the dimensions of this pair, which seem to be about the same size as those described by Mr. Blyth :—

	inches.
Distance between the horns, from point to point	49
Length of each horn from the base to the tip, following the curvature	46
Girth at base	15

They also perfectly agree otherwise with Mr. Blyth's description, turning at their origin backwards and outwards, then descending nearly perpendicularly, but slightly inclined outwards, whence they curve upwards, and terminate in points directly divergent from the body, as shown in the subjoined woodcut.



DESCRIPTION OF SOME NEW SPECIES OF INTESTINAL WORMS (ENTOZOA) IN THE COLLECTION OF THE BRITISH MUSEUM. BY W. BAIRD, M.D., F.L.S.

Order NEMATOIDEA.

1. ASCARIS SALVINI.

Head naked; the valves of the mouth very prominent. Body cylindrical, unequally attenuated at the two extremities, the tail being

* "A skeleton of this animal and several complete crania were deposited, I believe, at Loodianeh, with other specimens obtained by Sir A. Burnes's mission." —Wood's Journey to the Source of the River Oxus, p. 193 (note).

considerably more slender than the anterior extremity, which is obtuse. The body is of a ferruginous colour, and surrounded with very distinct striæ; striæ strong, about half a line apart from each other.

Length about $2\frac{1}{2}$ inches. The only specimen found is a female.

This species differs from *Ascaris inflexa*, to which it is nearly allied, by the head being more obtuse, and the anterior extremity altogether less attenuated; the striæ are very much stronger and more distant from each other; the valves of the mouth are much more strongly developed and prominent.

Hab. Found on the outside of the intestines of the *Oreophasis Derbianus* of Guatemala.

This rare bird formed part of the collection made in Guatemala by Mr. Salvin. I have, accordingly, dedicated this species of *Ascaris* to him.

2. Ascaris obconica.

Head naked; valves of the mouth small but projecting. Body of male slender for three-fourths of its length, then rapidly becoming thicker till within a line or two of the extremity, which is blunt, straight, or only slightly inflexed, and terminating in a little papilla. The skin is strongly striated. Male spicula within half a line of posterior extremity. Colour of body slightly yellow, or light straw.

Length (male, largest specimen) 2 inches.

Hab. Intestines of a Freshwater Snake, *Uranops angulatus*, from Brazil. For this species I am indebted to Mr. Edward Gerrard of the British Museum.

3. Ascaris Boddaërtii.

Head naked; valves of mouth distinct, large, somewhat triangular in shape. Body narrower at the anterior extremity, thicker towards the centre, and becoming narrower again at posterior extremity. Skin slightly striated; striæ rather distant. Lines on the two sides of the body very distinct. Anus nearly terminal. Colour yellowish, or a deep straw-colour.

Length of body (a female) 4 inches.

Hab. Intestines of *Herpetodryas Boddaërtii*, a snake from the West Indies. For this species I am indebted to Dr. A. Günther.

4. Gordius fulgur.

Among the various objects brought to this country and collected by Mr. R. Wallace, was a species of *Gordius*, of which he gives the following account:—"This curious *Annelid* is found on the ground in the forests of Batchian, twisted among dead leaves or twigs. It glides slowly, has no perceptible head or mouth, but resembles exactly a smooth circular thread of india-rubber, the thickness of a very fine violin-string. It is called by the natives 'Ular langit,' (*lightning-snake*)."

One of the specimens measured $41\frac{1}{2}$ inches in length; a second

$54\frac{1}{2}$ inches. After being immersed for some time in spirits (the specimens arrived dry and twisted round a piece of stick), they present the appearance of a twisted piece of copper wire, indistinctly striated across, and with a dark streak running down the centre throughout its whole length. This *Gordius* feels to the touch exceedingly slippery, like a piece of recent sea-weed. It is slightly more attenuated at the anterior than the posterior extremity. In all probability it is of a cylindrical form like other *Gordii*; but, owing to the way in which it was sent to this country, it is at present of a rather flattened form.

I have named it *Gordius fulgur* from its native name of *Lightning-Snake*.

Hab. Forests of Batchian; probably a native, in its immature state, of some large insect.

Order Cestoidea.

5. Tetrabothrium Gerrardii.

The genus *Tetrabothrium* was indicated by Rudolphi in his 'Synopsis Entozoorum,' for containing those species of *Bothriocephalus* which possess four bothria. It was afterwards fully adopted and characterized as a distinct genus by Diesing; and nine species are described by him. These were discovered all inhabiting the intestines of certain Mammalia, Birds, and marine Fishes; but none of them have been, till now, recorded as living in Reptiles.

The species now to be described, however, was found, by Mr. Edward Gerrard of the British Museum (to whom I am indebted for an opportunity of describing several new species of Entozoa), in the intestines of a *Boa constrictor* from South America.

The head is large, tetragonal; the four bothria disposed crosswise, joined by the margins; each of them large, round, and having on one side a strong ridge. Body depressed, narrow, articulated. No distinct neck. Anterior extremity of body very narrow, and the articulations there are extremely small, becoming larger as they descend, the inferior being quadrangular and rather large. The margins of the articulations somewhat annulated, but having no appearance of genital apertures. The head is about three-fourths of a line broad; but I could not discover any mouth. Apparently only fragments of these worms were obtained; but some of these detached pieces were about 18 inches in length.

Hab. Intestines of *Boa constrictor*.

MISCELLANEOUS.

On the Occurrence of Polar Species of Marine Crustacea in the Wettern Lake, Sweden. By Prof. Liljeborg.

To the Editors of the Annals of Natural History.

Gentlemen,—In a letter that I have recently received from Prof. Liljeborg, among other information, the following passage occurs, which I believe to be too interesting both to geologists and zoologists to be withheld from publication. He says:

"During the past year we have also found here, in Sweden, in the great Lake Wettern, which is very deep (400 to 500 fathoms), some marine Crustacea, some even of polar species, such as *Gammarus loricatus* (Sabine). These without doubt must have been left here since the glacial period, when all Sweden was under a sea of ice. We have many raised shell-beaches that I attribute to the same era; but undoubtedly it is new to find living marine animals that have continued in the lakes of the temperate regions since the glacial period."

Lake Wettern lies in the south of Sweden, and is in the same latitude as the north of Scotland; whereas the only habitats that have been recorded in which *G. loricatus* (Sabine) has been found are Prince Regent's Inlet, where it was taken abundantly by Sir James C. Ross; Arctic Sea, by Admiral Parry and Sir Edward Belcher; and Greenland, by Kröyer.

Prof. Liljeborg also informs me that he has recently taken *Latona setifera* (Müller), which is, I believe, the first time since it was described.

Believe me, Gentlemen,

Yours obediently,

C. Spence Bate.

Plymouth, Feb. 11, 1861.

On the Genus Bipalium. By William Stimpson.

During the visit of the North Pacific Expedition to Hongkong in 1854, my attention was called by Dr. Bowring to some remarkable vermiform animals which he had observed creeping among damp dead leaves in his garden, and which he called "ground leeches." One of these we fortunately secured, which was found upon examination to possess the following characters:—The body was linear, nearly 2 feet in length when fully extended, and scarcely more than an eighth of an inch in breadth. The surface was slimy, like that of a slug, and of a greyish colour, with two or three longitudinal black stripes above. The head was lunate, transverse to the body, with the convexity in front, and the auricles projecting laterally to a distance equalling about half the width of the body. Upon the upper surface of the head were scattered some minute black specks, which were undoubtedly imperfect eyes (ocelli). On the inferior surface of the body there were two small apertures in the median line, the anterior one of which, at the middle of the body, was the mouth.

The worm therefore belongs to the order Turbellaria and to the tribe of Planarians; it is undoubtedly one of the most remarkable forms, of a very distinct and peculiar genus. Upon a recent examination of the literary history of the group, I find that species of the genus have been seen and described by several other observers. The following is its history.

Many years ago (1835), Dr. J. E. Gray, in his 'Zoological Miscellany' (p. 5), first described one of these animals under the name of *Planaria lunata*, from Bengal. The description is short, but sufficient to show unmistakeably the place of the species in the genus under consideration. This description has been overlooked by all subsequent authors; and even Dr. Gray himself appears to have forgotten it, although he has undoubted priority.

In 1842, Dr. Cantor, in a paper on the Fauna and Flora of Chusan (Ann. & Mag. Nat. Hist. ix. 277), says, "Among the Annelides occurs a remarkable form, with the anterior part drawn out to the sides, like the head of *Zygæna*." He also speaks of two other species known to him—one from Bengal. The latter is probably *Pl. lunata*.

I can find no further published mention of such forms—not even in the 'Systema Helminthorum' of Diesing, 1851 (who overlooks Gray's description)—until the appearance of my Conspectus of the Turbellaria Dendrocœla, in the 'Proceedings' of the Philadelphia Academy of Natural Sciences for February 1857, where the genus is described under the name of *Bipalium*, which name was suggested by the resemblance of the animal, in the shape of its head, &c., to a double mattock, or pick-axe. It was placed in the family *Geoplanidæ*, with the following diagnosis:—

"Corpus lineare, depressiusculum. Caput discretum, lunatum, transversum; auriculis sat longis, retrorsum tendentibus. Ocelli numerosi, minuti, in capite, plerumque in ejus marginibus dispositi. Os centrale vel post-centrale. Apertura genitalis inter os et extremitatem posteriorem, sæpius ad dimidium distantiæ sita."

Four species were described, all from the Japanese islands. The original species observed in China was not found named in the Synopsis, as the specimens of that species were unfortunately lost.

In 1859 the genus was re-named by Dr. Schmarda in his 'Neue Wirbellose Thiere.' He calls it *Sphyrocephalus*, and gives a coloured figure and an anatomical description.

Still more recently, in the 'Ann. & Mag. Nat. Hist.' for July, 1860, it has been again named by Dr. E. Percival Wright, who calls it *Dunlopea*, and describes three species. Dr. Wright, however, having only preserved specimens to examine, has somewhat misunderstood its character. He states that there are no ocelli, and has failed to perceive the genital opening.

Both Schmarda and Wright have overlooked previous labours; so that the genus now rejoices in three distinct appellations, all given within four years: of these, *Bipalium* is the earliest. Eight species are now known.—*Silliman's Journal*, Jan. 1861.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 40. APRIL 1861.

XXVI.—*Notice of Opinions on the Stratigraphical Position of the Red Limestone of Hunstanton* *. By Harry Seeley.

It has long been known that there exists on our Eastern coast a red bed in the Upper Secondary rocks, which has received the name of Red Chalk. Its remarkable features early attracted attention, and notices of it by various authors have appeared at intervals up to the present time. None of them are exhaustive; and the fuller ones only describe sections, enumerate fossils, and give a name to the rock. The relative position of the bed, not being determinable by superposition, has been a matter for speculation, and this too often accepted as authority. It extends from Speeton to Hunstanton, and being at the former place situated between the Speeton Clay and Chalk, it is limited to being a part of the Upper Cretaceous series, to every member of which it has been referred: the Chalk, Upper Greensand, Gault, and combinations of these deposits, are all synonyms of the Hunstanton Limestone. The chief authors who have expressed opinions on its age are—William Smith, Messrs. Young and Bird, Prof. Sedgwick, Prof. Phillips, Dr. Fitton, Sir R. I. Murchison, Samuel Woodward, C. B. Rose, Dr. Mantell, Prof. Ansted, David Page, and the Rev. Thomas Wiltshire. These writers differing so greatly among themselves, it has here been thought desirable, before recording the result of my own observations, briefly to review the evidence on which their several opinions may rest. These opinions may be chiefly divided into those which refer the stratum to the Chalk and those which regard it as Gault. The former series is the older; and the name clearly indicates that the *Red* Chalk was considered as much a

* A portion of this paper was read before the Cambridge Philosophical Society, Dec. 10, 1860.

portion of the Chalk formation as those parts which are white and grey. It was William Smith who gave to us this apparently appropriate term, adopting it into use from the popular local nomenclature. Speaking of the Lower Chalk, he observes *: "A singular variety, at least in appearance, of this under part of the Chalk occurs in Lincolnshire, which, from a tinge of red oxide of iron, is there called red chalk. The same, very highly tinged with red, reappears on the opposite side of the Wash, under the cliff exposed to the sea, at the N.W. point of Norfolk." Five years later, Messrs. Young and Bird †, in describing the Speeton cliff, remark: "At the bottom of the cliff is found another species of chalk, which we may call the Lower or coloured Chalk. It has the same grain and fracture, and the same absorbent qualities with the great body of the chalk; but, instead of assuming a massive appearance, with vertical fissures, it lies in horizontal, or at least flat strata, generally of no great thickness, yet tolerably compact; and instead of a bright white colour, the greater part is of a dull white, with a greenish, and in some places a bluish tinge; while other parts are of a brick-red colour, or rather of a duller red, approximating to chocolate. The red chalk alternates with the dull white in large stripes."

Thus, then, arguing chiefly from superposition and mineral character, the relation of the red and white chalks is clearly pointed out; but the only point proven is, that below part of the Lower Chalk exist certain beds of a red colour. And it was not until Prof. Sedgwick, in 1826 ‡, noticed the beds, that a suspicion arose as to their being anything other than chalk. Anticipating others by more than thirty years, the Professor suggests that there are two Red Chalks; and to him belongs the merit of being the first who brought to the question the aid of organic remains. These pregnant observations cannot better be given than in the Professor's own words. He says: "In the Chalk-marl (which at Speeton, as in other parts of England, exists near the bottom of the formation) are many beds of a bright red colour, which alternate with others where the colouring matter is less abundant. But the red beds in Hunstanton Cliff, on the coast of Norfolk, do not so unequivocally belong to the Chalk formation, but rather seem to represent, in a very unusual form, the Cambridge Gault; for they exist under the Chalk formation, and do not alternate with any part of it, and they contain the peculiar fossils of the Gault in great abundance, and are seen to repose on the green and ferruginous sands (exactly resembling those at Shanklin in the Isle of Wight), which always have their place below the Gault."

* 'Strata Identified,' 1817. † 'Yorkshire Coast,' 1822.
‡ Annals f Philosophy

Now it is to be remarked that our Cambridge Gault is almost unfossiliferous, and that the fossils in those days referred to the Gault were in all probability such as are now acknowledged to belong to the Upper Greensand. Therefore the Professor (as interpreted by our present information) will be understood to regard the red beds of Hunstanton as an unusual form of the Upper Greensand. Hence I believe it was intended that the Speeton beds were to be referred to the chalk-marl, and those of Hunstanton to the beds immediately below it,—indicating, perhaps, a sequence of deposition. How far these remarks are supported by facts will presently be seen.

Three years later, Prof. Phillips published the first list of fossils from the red bed at Speeton—a short one, enumerating *Terebratula semiglobosa*, *Inoceramus Cuvieri* *, and *Belemnites Listeri*.

These are decidedly of the Chalk type; and on the evidence of them the Professor, in his second edition, seven years afterwards, arranges the bed with the lower part of the Chalk.

In the following year (1830) appeared Mr. Samuel Woodward's 'Geology of Norfolk.' Mr. Woodward may be considered the last author who, from original observation, advocated the idea of stratigraphical relation first set forth by William Smith; and though he had a good list of fossils, it is somewhat remarkable that this is done on stratilogical evidence. Thus, he observes, "The bed is interspersed with numerous small quartz-pebbles of a dark-green colour, identifying it with the 'chalk with silicious grains.'" This is certainly a character which remarkably attracts the observer, but it must only be valued at what it is worth. In the abstract, mineral character alone will in general be found useless, and it is only when the fossils coincide with the indications which mineral character affords that a valuable deduction may be drawn.

On comparing his fossils, we must strike out from the list *Terebratula intermedia*, which was wrongly identified, and *T. triplicata*, which Mr. Rose tells me is a fragment of *Inoceramus sulcatus*, and also alter *Spatangus planus* to *Cardiaster suborbicularis* and *Apiocrinites ellipticus* to *A. rugosus*; then, taking the known ranges, six will be common to the Lower Chalk, seven to the Upper Greensand, and five to the Gault. Two species are otherwise peculiar to the Chalk, two to the Upper Greensand, and two to the Gault. This is certainly not the fauna of the Chardstock Chalk; and with that therefore the Red Limestone cannot be identified.

Five years later, the deposit was described by Mr. C. B. Rose

* This appears to be the *I. læviusculus* (Bean).

of Yarmouth, than whom no one has more influenced opinion concerning it. Following out in its literal meaning the suggestion of Prof. Sedgwick, he has, during the last five-and-twenty years, stanchly advocated the idea of the Hunst'on rock being an equivalent of the Gault. This is not done without some expression of surprise; for he observes, "Who, without consulting the 'medals of Nature,' could imagine that the *Red Limestone* of Hunst'on and the blue Gault containing *grey limestone* at Pentney and Bilney were deposits of the same epoch?" The evidence here, from mineral character and position, is unquestionably strong, and, if at all supported by palæontological evidence, would go far to decide the question. Now, the case stands thus: the Pentney limestone contains *Terebratula biplicata*, and that of Bilney *Inoceramus gryphæoides*—characteristic Gault fossils, which also occur at Hunstanton. But on attaching the ranges to Mr. Rose's list, only one-third (nine) will be found in the Gault, and but two or three peculiar to it; another third ranges to the Upper Greensand, with two peculiar species; and the remainder to the Chalk, with five peculiar species. So, whatever the evidence from fossils may have been years ago, when their ranges were less known, it is now certain that the list published in 1835 will not justify us in a belief that the bed is unequivocally Gault. It is impossible to disguise the fact that the Hunst'on beds contain a large proportion of the Gault fossils; but to maintain therefore that they must be Gault equivalents would be no more logical than to maintain that, because the Red Crag contains many recent shells, it must necessarily be a raised sea-beach; and when so large a majority of the forms belong to deposits newer than the Gault, all that can be deduced from the presence of those peculiar to that formation is, that such forms have a longer range in time than has been hitherto supposed. It is somewhat remarkable that, from evidence but little differing, Mr. Woodward and Mr. Rose should have adopted conclusions having so little in common. That fact alone sufficiently demonstrates that one or other of them is necessarily wrong. The evidence of palæontology appears to show both to be impossible.

In 1836, Sir R. I. Murchison, who described the Hunstanton section in Dr. Fitton's paper*, was inclined, with the doubt of a double query, to believe both Gault and Greensand there represented. This is noticeable as almost the only instance in which any notice is taken of the large proportion of Upper Greensand fossils. No evidence is produced in support, however; and the opinion can only be valued as an idea. Dr. Fitton†,

* 'Strata below the Chalk.' † 'Formations below the Chalk.'

whose opinion was, I believe, founded on the same data as Sir Roderick's, not only differs from him, but also from himself. At pages 309 and 312 the Doctor speaks confidently of the red stratum representing the Gault, and falling in with its strike. At p. 315, he observes, "The Gault has but a doubtful representative;" and this is further modified by a statement at p. 319, that the Hunstanton red marly beds are *supposed* to contain Gault fossils: page 323 indicates a relapse to decided Gault; and finally, in pp. 359 to 363, it is considered (with a query) to be Chalk. According to the ranges as now known, Dr. Fitton's list of fossils gives, Chalk four, Upper Greensand five, and Gault five. The only conclusion here to be deduced is, that, in the Doctor's opinion (based on the same comparative evidence as those of Rose and Woodward), the fossils do not justify the forming of a decided opinion.

It is to be regretted that so disputed a subject should have found its way into some popular text-books. Prof. Ansted intimates that the bed is Lower Chalk coloured by the accidental presence of iron. Dr. Mantell remarks that the chalk is generally white, but that in some localities it is of a deep red.

Mr. David Page * in one place announces that in the north of England the Lower Chalk is reddish, but in the next paragraph remarks that, in York and Lincoln, a stratum of red chalk is thought to represent the Gault of the southern counties; and two pages further on, he again says that the Chalk is red in the north. Such inconsistent remarks, based apparently on second-hand information, cannot require comment; but it is to be hoped that in future editions they will be avoided.

In the preliminary observations to his great work on Fossil Brachiopoda, Mr. Davidson thinks it probable that the Red Chalk will prove to be the representative of the Belgian Tourtia; but further on in the body of the work he relinquishes the idea, and appears to adopt the suggestion of Mr. Rose, that the bed represents the Gault.

These, then, were, till last year, the only opinions published, when Mr. Wiltshire produced a little pamphlet on the subject—the largest contribution to our knowledge and speculations. On the question at issue Mr. Wiltshire presents no definite opinion, or rather, none of which he justifies the acceptance. On the first page the reader is informed that the geologist gives so wide an interpretation to the term Chalk as to include the red beds of Norfolk and Yorkshire; and at page 4 it is further stated that the change from the white chalk to the red is gradual: this is one opinion. At page 11, the author gives, with-

* Advanced Textbook, 2nd ed. 1859.

out expression of doubt, or even a comment, the statement by Mr. Rose, that near Lynn the Red Chalk and the Gault are actually incorporated: this is a second opinion. At page 13 is a third opinion. This paragraph may be quoted entire. "Geologists," Mr. Wiltshire says, "generally consider the Red Chalk as really equal to the Gault. Many of the fossils certainly are *Gault species*, others no doubt belong to the *Lower Chalk*; and therefore probably it is better to regard it as an intermediate formation between the Lower Chalk and the Lower Greensand, which comes into being when the *Gault* and *Upper Greensand* have almost died out." What I understand this passage to say is, that the fossils are those of the Gault and Chalk, and therefore the deposit must be Gault and Upper Greensand—in other words, that Chalk fossils indicate Upper Greensand. To say the least, this is clearly illogical; and it would seem that opinions so deduced and so changing as are those just considered, can but little influence scientific views. But, while differing from the conclusions drawn, we must feel thankful to the industry which has brought together so much valuable information on this obscure subject.

If Mr. Rose's statement about the incorporation of the Red Chalk and Gault were really a fact, the discussion would be at an end; for, although the fossils hitherto noticed are not such as are met with in Gault-clay, it would be impossible to estimate how far the fauna of that period would approximate to those of succeeding ages, when the conditions of depth, and mineral character, and the origin of deposited matter were the same in them. So, although it is very possible that deposits of chalk may be found clearly of Gault age, it is also very possible to conceive, from the known relations of life to the sea-bottom, that some of the fossils would be the same as those of the true Chalk formation. But we are relieved from the necessity of adopting this not altogether satisfactory hypothesis by a correspondence with which Mr. Rose has favoured me. From this I learn that Mr. Rose first assumes that the Red Chalk represents the Gault, and then, because some thin beds of red clay are interstratified with the blue gault, that the Red Clay represents and is a prolongation of the Red Chalk. Thus, then, the argument for the bed being incorporated with the Gault is reduced to a supposition. The evidence for considering it Chalk has already been shown to be barely possible; and so we have yet to ask what the bed really is.

The experience of the opinions considered will sufficiently indicate that, if it be possible to answer the question, it will only be by a strict adherence to facts. The geological position and fossils limit it, at Hunstanton, to being Gault, Upper Greensand, or a subordinate member of the Chalk. *The Red Limestone everywhere conformably underlies the white Chalk,* and unconformably overlies the Speeton Clay, the upper part of which would appear to be newer than the Lower Greensand. At Speeton there is said to be a gradual change from the red chalk to the white; and at Hunstanton, but for the colour, it would be scarcely possible to separate the chalk from the red bed below, since they are linked together by the ramose sponge, which, commencing in the red stratum, grows on into the grey beds above. From this latter circumstance it is impossible to imagine any vast epoch between the deposition of the red beds and the white; the fact would rather indicate a sequence of deposition. The chalk above is clearly Lower Chalk. The red bed is as clearly, by the evidence of two-thirds of its fossils, not Lower Chalk. If, then, it is below the Lower Chalk, and to some extent linked to it by a succession of characteristic animal growth, the presumption would appear very strong that the deposit should be a member of the formation immediately below in the stratigraphical succession, *i. e.* of the Upper Greensand. Like the Gault, the Greensand may be said to fall in with the strike of the Limestone, with the thickness of which, in the Eastern counties, it corresponds. And should the fossils sanction it, there would, on a Greensand hypothesis, be much less difficulty in accounting for the presence of Chalk and Gault fossils than by any other supposition; for where, in a deposit near to the Chalk age, there are the conditions of Chalk strata, there probably will be found some Chalk species. Of the Gault shells it would be impossible to say how many are derived from denudation of that formation, and how many may have lived on and migrated from the Gault sea; but the fact that the larger proportion of the fossils of the Cambridge Greensand was previously only known from the Gault should warn us against laying much stress on their presence, or endeavouring to account for them by other than the most natural causes. And, supposing the deposit to be Greensand, it would not appear absolutely necessary that it should correspond with our English types; for there are some indications of a tract of land having separated the seas between Cambridge and Lynn during the Cretaceous era; and if such existed, there might be any amount of divergence in the respective faunæ of deposits of the same age. It does not closely approach any Continental deposit, though the Tourtia and our English Farringdon gravel present palæontological conditions essentially similar.

The following analytical Table of the fossils of the red bed will show its affinities with, and differences from, the other Upper Cretaceous rocks:—

			Species.
Peculiar to the Chalk			7
„	„	Upper Greensand	12
„	„	Gault	2
„	„	deposit	10 or 11
Common to the Chalk and Upper Greensand			9
„	„	Upper Greensand and Gault	6
„	„	Chalk, Upper Greensand, and Gault	10
Ranging to the Chalk			26
„	„	Upper Greensand	39
„	„	Gault	18

From this Table, the probability of the bed being Gault is seen to be so small that it may safely be dismissed, since out of the species ranging to other strata but 8 occur in the Gault. Nor is the probability strong in favour of it being Chalk, since there is, besides the fact of a greater number of species actually existing in the Greensand than in the Chalk, the difficulty of supposing that, in this district alone, Gault fossils would have lived on to the Chalk sea. But if the bed is admitted to be Greensand, there will be 27 species occurring in that formation to weigh against 16 ranging to the Chalk. This, when the chalky nature of the deposit and other conditions already mentioned are taken into consideration, must go far towards determining the question. Granting, then, that the Red Limestone is one of the newer members of the Greensand, and adding the 10 species peculiar to the red bed, there will be 37 Greensand species to compare with 16 of the Chalk; or, limiting the comparison to peculiar species, there would be 22 of the former to balance against 7 of the latter. And when it is remembered that more than two-thirds of the fossils of some deposits indubitably Greensand have never occurred in that formation previously, and when we bear in mind the evidence from stratigraphical position, little further evidence will be needed to place the Hunst'on Limestone in that Cretaceous zone.

As already remarked, the Tourtia presents the nearest analogue. Very few species are common to the two beds; but the palæontological conditions are essentially the same; many of the fossils are those of the Chalk, a majority occur in the Upper Greensand, and some in the Gault. The proportions are not very dissimilar. The Tourtia is admitted to be a member of the Upper Greensand. And thus the Red Limestone may also be referred to Greensand on evidence as good as that which proves the identity of distantly situated Tertiary deposits. Judging from some of the fossils, it is not impossible that when the Speeton Clay shall be carefully investigated, its upper part will prove to be of Gault age, if not newer *. Should it be so, the

* For in the middle of the formation is a bed containing *Rostellaria*

position of the Red Limestone would then be evident from the stratigraphical succession alone.

Thus I have endeavoured to indicate some of the circumstances by which we shall be influenced in forming an opinion on the age of the stratum in question; and if it has not been absolutely proved that we must henceforth adopt the absurd name of Red Greensand, some evidence has been produced tending to show that it is not altogether indefensible. It would appear to be newer than any English representative of that rock, and perhaps a little newer than the Tourtia—a name by which it might not inappropriately be known; but as the fossils differ so widely from those of that bed, it may be better, and avoid confusion, if it were named, from its typical exhibition, the *Hunstanton Limestone.*

The whole problem is scarcely yet solved, since in Yorkshire there appear to be two red beds, the upper one fairly enclosed in the Lower Chalky rock. What the relations of these beds may be, has yet to be determined; but, be they whatever they may, the result cannot greatly influence the conclusions here arrived at respecting the age of the bed, since the stratum has been traced almost continuously from Speeton to Hunstanton.

Some stress has been laid on the difference of mineral character in the bed at different places; but that becomes unimportant, since Dr. Cookson has lately obtained, from near Hunst'on, fossils in the same mineral matrix as those from Speeton, and Mr. R. Mortimer has noticed that pebbles are found in the limestone near that locality.

PS. Perhaps nothing has contributed so much to mislead, in the opinions formed on the age of the Red Limestone, as its colour, which appears to separate it clearly from the Chalk above. Its colouring matter is the peroxide of iron. Professor Sedgwick and Sir R. I. Murchison have suggested that this was obtained from the rubbing-up of the Shanklin sands below; but as, in part of its length, it overlies a clay far distant from any ferruginous deposit, this is very improbable. Moreover, that the bed was not deposited thus coloured is absolutely certain from the abundance and preservation of the fossils; and hence it is evident that it could only have been coloured by the decomposition of some other colouring matter deposited with it. That this was not a layer of iron-pyrites on the top, is certain from the fact that where the colour is banded it is banded laterally, and not longitudinally as it would have been had the colour been

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Parkinsoni, Inoceramus concentricus, Nucula ovata, Terebratula subundata, Pholadomya decussata, &c. (Leckenby).

washed down from above; and moreover, the darkest part of the bed is the lowest. Nor is it likely that the decomposition of nodules of pyrites diffused throughout its mass could have obtained without leaving some marks both of longitudinal banding and of centres of colour. Iron pyrites may have occurred sparingly, as in many other beds; but we must look for a more diffused and finely-divided source of colour than the experience of its occurrence in other cretaceous deposits would induce one to believe could have here prevailed. I know of no such source but the colouring matter of the Upper Greensand. This, as is well known, consists of one-fourth of iron, which on decomposition passes into a different state of oxidation; and that in this process it does become red is very evident from the occurrence of red patches at Blackdown. Thus we have a cause capable of producing the effect, which is exactly such as all the other evidence would lead us to look for. But there is another argument in the composition of the rock, which goes far to support this idea of the origin of the colour. In Mr. Wiltshire's paper it is stated to be—

Carbonate of lime with a little alumina	82·3
Peroxide of iron	6·4
Silica	11·3

Now, according to one analysis given by Dr. Fitton, the colouring matter of the Greensand consists chiefly* of

Alumina	1·75
Protoxide of iron	6·25
Silica	12·50

This can scarcely be an accidental coincidence; and when it is remembered that the proportions of the components vary slightly with the locality, it is impossible, on taking into consideration all the previously considered circumstances, not to give great weight to the fact of the identity between certain constituents of the Hunst'on Limestone and those of the colouring matter of the Upper Greensand.

Since the above was written, I have received from near Louth a pale-coloured specimen of the red limestone, with the green particles in an undecomposed condition. I had previously observed at Hunst'on what I believed to be chloritic particles; but from their small size, and from decomposition having in most cases set in, the identification was not sufficiently satisfactory.

* Besides these ingredients, there is mentioned some potash; but in another analysis it was scarcely perceptible; it is thus shown not to be essential, and, as the comparison does not require it, has been omitted.

Table of Fossils, with their Ranges.*

[Those in *italics* have not been previously noticed.]

	Peculiar.	Chalk.	Upper Green-sand.	Gault.
[Globigerina cretacea (*vide* Morris's Cat.)]				
Cristellaria rotulata	..	*	*	*
Siphonia pyriformis	..	..	*	
Spongia paradoxica	..	*		
?Apiocrinites rugosus †	* ?			
Pentacrinus Fittoni	..	*	*	*
Cardiaster suborbicularis ‡	..	..	*	
[Cidaris Gaultina (?)]				
Cidaris (n. sp.), spine	*			
Cidaris (n. sp.) §, spine	..	* Lowest bed at Hunst'on.		
Cidaris sceptrifera	..	*		
Diadema tumidum	..	Chalk-marl. *		
Diadema (sp.?) ‖				
Serpula antiqua	..	*	*	*
Serpula irregularis	*			
[*Serpula proteus* ?]				
Serpula triserrata				
Serpula, sp.				
Vermicularia umbonata	..	*	*	*
Vermicularia elongata	*			
[*Astrogonium Furnivalli*, var. ?]				
Cytherella ovata	..	*	*	*
Remains of a Crustacean				
Pollicipes glaber	..	*	*	
Idmonea dilatata	..	..	*	
Diastopora ramosa	..	*	*	
Ceriopora spongites	..	..	*	
Diastopora (n. sp.) ¶	*			
Terebratula capillata	..	..	*	
Terebratula Dutempleana	..	..	*	
Terebratula biplicata	..	*	*	*
Terebratula faba	..	..	*	
Terebratula semiglobosa	..	*	*	
Terebratula				
[*Terebratulina gracilis*] **	..	*	*	*
Kingena lima	..	*	*	*
Rhynchonella Cuvieri	..	*		

* The list of names is from Mr. Wiltshire's paper.

† This is referred by Mr. Wiltshire to *Bourgueticrinus rugosus* (D'Orb.); but the base is expanded, and more like *Apiocrinites*.

‡ This is the *Ananchytes planus* of Morris's Catalogue.

§ At least one more species occurs.

‖ A large species seen by Dr. Cookson.

¶ A large species most nearly related to *D. spongiosa*.

** This I had the misfortune to lose a few seconds after it was obtained.

TABLE—*continued.*

	Peculiar.	Chalk.	Upper Green-sand.	Gault.
Rhynchonella sulcata, var.	..	..	*	
Ostrea frons	..	..	*	
Ostrea vesicularis	..	*	*	
Ostrea Normaniana	..	*	*	
[?*Ostrea*]				
Exogyra conica	..	*	*	?
Exogyra haliotoidea	..	..	*	
Exogyra Rauliniana	..	..	*	
Anomia (n. sp.)	*			
Pecten orbicularis (*fide* Murchison)	..	*	*	
Pecten Beaveri	..	*	*	*
Avicula gryphæoides *	..	*	*	
Inoceramus Coquandii	..	..	*	
Inoceramus Crispii	..	..	..	*
Inoceramus gryphæoides	..	..	*	*
Inoceramus læviusculus	*			
Inoceramus sulcatus	..	..	*	*
Inoceramus tenuis	..	*		
Spondylus latus	..	*	*	
Spondylus				
Trigonia Hunstantonensis	*			
Crioceras occultus	*			
Ammonites alternatus	*			
Ammonites complanatus	..	*		
Ammonites rostratus	..	..	*	*
Ammonites serratus	..	..	*	*
Ammonites auritus	..	..	*	*
Belemnites attenuatus	..	..	..	*
Belemnites minimus	..	..	*	*
Belemnites ultimus	..	*	*	*
Nautilus simplex	..	..	*	
Edaphodus (n. sp.)	*			
Otodus appendiculatus	..	..	*	
Polyptychodon				

XXVII.—*Note on a Species of* Plectopylis, *Benson, occurring in Southern India.* By W. T. BLANFORD, of the Geological Survey of India.

IN looking over a collection of shells made last year in the Nilgiri Hills of Southern India, I noticed that all the specimens of the little *H. retifera*, Pfr., were marked with white dots upon the translucent base of the last whorl, resembling those which correspond to the internal plaits and teeth in *H. plectostoma*, Benson. On cutting into the shell, I found it to possess the following characters, which prove evidently that it must be classed with that group of *Helices* for which Mr. Benson (in the

* Scarcely less abundant than in the Upper Greensand of Cambridge.

'Annals' for April 1860) proposed the name of *Plectopylis*. On the parietal side there is a single transverse ridge-shaped lamella, with a short plait, at right angles, running forward towards the aperture at the outer end, and another running backwards at the extremity* nearest the inside of the whorls. The palatal portion of the barrier is double, with four short raised plaits in front, and two in the rear of the parietal lamina. Those in front are oblique—the innermost, which is close to the parietal margin, being the largest, and the outermost very small; those behind are transverse, and lie end to end. In the full-grown shell the whole barrier is placed opposite to the mouth, at the distance of half the circumference of the whorls.

It will be seen that, although somewhat simpler and rather less numerous, the lamellæ correspond generally in their arrangement with those found in *H. plectostoma*,—thus forming an interesting link between the shells of the Himalayas and those of the mountains of Southern India, in addition to those already noticed by my brother and myself when describing the new forms of *Alycæus* and *Diplommatina* from the Nilgiris †. It is singular that these genera have not yet been found in Ceylon, where *H. clathratula*, Pfr., is said by Mr. Benson to show a resemblance to *Plectopylis* in the presence of internal teeth on the whorl. It may be interesting to mention that new species of both *Alycæus* and *Diplommatina* have lately been discovered in the Kolamullies, another group of hills 100 miles east of the Nilgiris, by Mr. King, of the Geological Survey of India. *H. retifera* has also been obtained from the same hills, and from the Shevaroys a third group.

Mr. Benson, in his paper in the 'Annals' for April 1860, speaks of several epiphragms in each shell of *Plectopylis*, "intus pylis sive epiphragmatibus *pluribus* distantibus plicatis ...... obstructa." From the examination of a considerable number of specimens of *H. plectostoma*, B., and *H. Achatina*, Gould, I am persuaded that in fully adult shells there is never more than one; but on examining a considerable number of partly-grown specimens of *H. retifera*, of all ages, the existence of a greater number was explained. The plaits are evidently formed close behind the mouth, and exist even in a very young stage; but when the shell has been increased by nearly half a revolution ‡,

* The terms "horizontal," "vertical," &c., used by Mr. Benson in reference to the discoid Burmese and Himalayan species of *Plectopylis*, would cause confusion if applied to the trochiform *H. retifera*. Transverse and longitudinal are simply used above in reference to the whorls of the shell.

† Journal of the Asiatic Society of Bengal, 1860, vol. xxix. p. 119.

‡ In some of the species the distance is probably greater between the series of teeth. In *H. Achatina* it is nearly a whole revolution.

a second series is formed in the neighbourhood of the aperture, and the former series begins to be re-absorbed. Thus, during the growth of the animal, a considerable number of barriers are formed; but in the adult shell, only that last secreted remains, and this is placed, as before mentioned, in *H. retifera,* at a distance of half the circumference from the mouth, or in such a position that another would be formed close to the aperture if the shell had not attained its full growth.

H. Guérini, Pfr., *H. tabida,* Pfr., and *H. crinigera,* Bens., although closely related in external appearance to *H. retifera,* show no internal plication.

XXVIII.—*On certain Coleoptera from the Island of St. Vincent.* By T. Vernon Wollaston, M.A., F.L.S.

[Concluded from p. 206.]

Fam. Trachyscelidæ.

Genus Phaleria.

Latreille, Hist. Nat. des Crust. et Ins. iii. 162 (1802).

27. *Phaleria Clarkii,* Woll.

Phaleria Clarkii, Woll., Ann. of Nat. Hist. ser. 2. xx. 505 (1857).

The present beautiful *Phaleria* is most variable as regards the development of its darker portions, its large semicircular post-medial patch being sometimes so immensely increased in size as to be diffused over almost the whole elytra, under which circumstances the prothorax and head are more or less darker also. Despite, however, this great instability in colour, the *P. Clarkii* is remarkably constant in its other characters, which do not perceptibly vary. It is closely related to a species which I have captured in profusion on the sandy shores of Fuerteventura and Lanzarote*, but is considerably more depressed and less shining

* The following comparative diagnosis will point out the distinctions of this Canarian *Phaleria* from its representative at the Cape de Verdes:—

Phaleria picta, n. sp.

P. ovata, convexa, nitida, pallido-ferruginea; capite minute punctulato, rarius infuscato; prothorace minutissime punctulato, antice ad latera leviter rotundato, postice subrecto, angulis posticis fere rectis, basi utrinque foveola brevissima punctiformi impresso, vel immaculato vel in disco plus minus infuscato; coleopteris læte testaceis, macula communi (postice acuminata, antice in elytris singulis dentata) plus minus magna suffusa nigro-ornatis, sat profunde punctato-striatis, limbo longe setoso; antennarum articulis subapicalibus sat compressis transversis.

Long. corp. lin. $2\frac{1}{2}$–$2\frac{3}{4}$.

Habitat per oras maritimas arenosas insularum Lanzarotæ et Fuerteventuræ, sub putridis et confervis hinc inde vulgaris.

(being *coarsely alutaceous* beneath the microscope), with its antennæ rather longer and less compact (the subapical joints of which are less transverse), with its prothorax a trifle shorter, smaller, narrower in front, more rounded (or less straightened) behind (which causes the posterior angles to be more obtuse), with its two basal prothoracic foveæ most evidently longer, and with its elytra very much more finely punctate-striated, and nearly free from the strong erect hairs which in its Canarian ally are so conspicuous at the outer margins and shoulders. In their colouring the two species are almost equally unstable; nevertheless the elytral macula of the *P. picta*, when reduced to a small size, takes less of the semicircular form which characterizes that of the *P. Clarkii*,—its anterior edge not being so *straightened*, but more or less angular or dentate on each elytron. Both the *P. Clarkii* and *picta* differ from the common European *P. cadaverina* in having, *inter alia*, the basal joints of their fore feet (in proportion to their size) more dilated, and the penultimate one comparatively smaller—it being almost received within the preceding (emarginate) articulation; but in the small *P. ciliata* from the Madeiras these tarsal joints are on the ordinary type.

We have thus three *Phaleriæ* apparently peculiar to the Atlantic islands, and all of them remarkably distinct *inter se*,—viz. the *P. Clarkii* from (St. Vincent of) the Cape de Verdes, the *P. picta* from (Lanzarote and Fuerteventura of) the Canaries, and the *P. ciliata* from (Porto Santo of) the Madeiras. And it is curious that from the rocks of the Salvages (midway between the two northern of these groups) I should have lately received, from my friend the Barão do Castello de Paiva, an example of the "var. *bimaculata*" (if indeed it *be* a true variety, for I am by no means convinced that it is not specifically distinct) of the European *P. cadaverina*—a state which appears to be common in Spain and Portugal,—thus giving us a separate exponent for each of these island-clusters! And further, the *P. cadaverina* (probably the *typical* form, as he does not allude to it as the bimaculate "variety") is recorded by M. Morelet from the Azores!

The *P. Clarkii* was taken abundantly in St. Vincent by Mr. Gray and the Rev. Hamlet Clark, *sub stercore humano*, on the sea-beach at Porto Grande in December 1856, and subsequently in the same spot, during the month of June, "under stones and rubbish," by Mr. Fry.

Fam. **Ulomidæ.**

Genus Pseudostene (nov. gen.).

Corpus parvum, lineari-angustum, nitidum, calvum: *fronte* ad latera vix elevata, ad apicem rotundata integra; *oculis* antice valde emarginatis: *prothorace* magno, subquadrato, antice latiore, postice recte truncato (nec sinuato); *lobo prosternali* crasso, angusto, subhorizontali, retrorsum producto: *mesosterno* antice triangulariter et sat argute exciso; *scutello* sat magno, semicirculari-triangulari. *Antennæ* prothorace paulo breviores, apicem versus gradatim clavatæ, articulo 1^{mo} (sub margine clypei recondito) elongato valde bicurvato apice sat robusto, 2^{do} breviore paulo angustiore, 3^{tio} ad 6^{tum} minoribus subæqualibus latitudine vix crescentibus, reliquis clavam magnam laxam minus abruptam 5-articulatam efficientibus (ultimo subgloboso). *Labrum* submembranaceum, ad latera tenuissimum, transverso-quadratum, postice gradatim angustius, angulis anticis rotundatis, apice paulo emarginatum et densissime pubescens. *Mandibulæ* validæ, corneæ, triangulares, apice incurvæ acutæ et breviter bifidæ, intus in medio fissæ coriaceæ. *Maxillæ* bilobæ: *lobo externo* longissimo, subovato, pubescente, ad apicem ipsum inflexo et etiam subarmato; *interno* brevissimo, apice inflexo pubescente sed haud uncinato. *Palpi maxillares* sat elongati, articulo 1^{mo} parvo, 2^{do} majore crassiore intus sinuato-concavo, 3^{tio} breviore, ultimo sat magno subsecuriformi-ovali: *labiales* haud distincte observavi. *Mentum* fere ut in *Halonomo*, i. e. transverso-quadratum, postice gradatim angustius et antice late emarginatum. *Ligula* obtriangularis, postice gradatim angustata subrobusta, apicem versus latior membranacea, angulis anticis subangulato-rotundatis, apice valde pubescens integra. *Pedes* validi, *antici* fossorii: *tibiis* parce setulosis, *anticis* valde, *posterioribus* minus (sed distincte) compresso-dilatatis, *anterioribus* (sed præsertim *anticis*) per marginem externum minute crenulatis: *tarsis* heteromeris, posticis articulo 1^{mo} longiusculo.

Obs. Genus in collectionibus cum *Tribolio* conjunctum, sed a *Triboliis* (i. e. *ferrugineo* et *madenti*) species hujus generis toto cœlo recedunt; non solum fossorii sunt (per oras maritimas arenosas sub confervis vel in locis valde salinis degentes), prothorace multo majore antice lato basi haud sinuato clypeoque ad latera minus elevato necnon ad apicem rotundato (nec emarginato), sed lobo prosternali majore crassiore sublineari-angusto (nec spatuliformi), mesosterno in medio profundius et argutius triangulariter exciso, mandibulis ad apicem brevius bifidis [apex collateralis nisi oculo obliquo haud observandus], mento apice late emarginato, ligula recte truncata, maxillarum lobo externo multo longiore elongato-ovato loboque interno breviore magis curvato inarmato, antennis facilius incrassatis (clava 5- nec 3-articulata), articulo basilari multo longiore et valde curvato, et præcipue tibiis dilatioribus, anticis latissime compresso-dilatatis.

A ψευδής, fictus, et *Stene* (Coleopterorum genus).

The few closely-allied beetles for the reception of which I have erected the present genus appear to belong principally to African or the more southern Mediterranean latitudes, and are usually to be found in cabinets (when existing there at all) associated with *Tribolium*, from the only two described exponents of which (viz. the *T. ferrugineum* and *madens*) they are nevertheless widely distinct. I believe them to be the insects to which Prof. Lacordaire refers, in his observations under *Tribolium* (*vide* 'Genera des Coléoptères,' v. 323), where he says: "les collections renferment un certain nombre de petits insectes inédits, qui en sont très-voisins, et qui pourront entrer dans le genre, en modifiant légèrement sa formule." It is quite certain, however, that no modification of the generic formula of *Tribolium* could possibly be made so as to embrace the species under consideration, unless we enlarged it to such an extent as to include the whole group of the *Triboliides*; for in their entire structure, no less than in their habits, they are abundantly removed from the *Tribolia proper*.

These insects, indeed, would seem to be more or less fossorial, living under sea-weed on sandy shores, or in other salt places,—a mode of life which their largely dilated anterior tibiæ (accompanied by a considerable development of the prothorax) would, *primâ facie*, indicate. In this respect, as well as in their more rounded, unemarginated clypeus, and shining, deeply-sculptured bodies, they recede completely from the *Tribolia*; whilst their prosternal lobe also is thicker, narrower, and somewhat longer than is the case in that genus, their mesosternum is more sharply cut-out (triangularly) in the centre, their mandibles are more shortly bifid (the collateral apical point being so abbreviated that it does not project beyond the base of the true apex, and is therefore invisible when seen only in profile), their mentum is broadly scooped-out in front and their ligula more straightly truncated anteriorly, their outer maxillary lobe is considerably longer, and the inner one shorter, more incurved, and unarmed, and their antennæ (which have the basal joint very much longer and more flexuose) are more gradually thickened towards the apex,—the club (if such it may be called) being composed of five (instead of three) articulations.

28. *Pseudostene angusta*, n. sp.

P. lineari-angusta, rufo-picea; capite dense ruguloso, clypeo ferrugineo, mox ante oculos subampliato-rotundato; prothorace subconvexo, nitido, sat profunde et confertim punctato, lateribus oblique subrectis; elytris ad latera valde parallelis, levissime transversim rugulosis, obsolete punctulato-striatis, interstitiis minute punctulatis; pedibus piceo-ferrugineis; antennis pallido-ferrugineis. Long. corp. lin. $1\frac{2}{3}$.

The present insect is most closely akin to two species* in my possession, one taken by the late Mr. Melly in Egypt, and the other by myself in the island of Lanzarote; nevertheless the whole three differ from each other in many small characters,

* The following diagnoses of these two species of *Pseudostene* will serve

though more particularly perhaps in the relative breadth and *compactness, inter se,* of their antennal joints. The *P. angusta* is just perceptibly narrower and more parallel than its Canarian representative; its clypeus is a trifle more prominent* immediately in front of either eye; its prothorax is not quite so convex or shining, rather more densely punctured on its disk, and has its sides somewhat straighter behind; its elytra are less rugulose and more obscurely striated; and its antennæ are not quite so thick, the subapical joints being rather less transverse. It is, however, so nearly related to the *P. fossoria,* that I should have regarded the two insects as mere geographical phases of each other, were not some of the distinctions, though small, purely structural ones. A single specimen of the *P. angusta* was captured by the Rev. Hamlet Clark at St. Vincent, during his day's sojourn there with Mr. Gray, in December 1856.

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to point out the exact characters in which they differ from their Cape de Verde ally:—

Pseudostene subclavata, n. sp.

P. linearis, picea; capite dense ruguloso, clypeo ferrugineo, mox ante oculos rotundato; prothorace nitidissimo, profunde et confertim punctato, ad latera vix magis rotundato; elytris ad latera parallelis, leviter transversim rugulosis, sat distincte punctulato-striatis, interstitiis punctulatis; pedibus robustis, piceo-ferrugineis; antennis pallido-ferrugineis, distinctius clavatis, articulis subapicalibus paulo minus laxis (i.e. inter se arctius compressis).

Long. corp. lin. $1\frac{3}{4}$.

Habitat in Ægypto, a Dom. Melly olim reperta.

The present *Pseudostene* (if I may judge from a single example) is perhaps a trifle larger and broader than the Canarian one (and therefore, *à fortiori,* than the Cape de Verde *P. angusta*), its prothorax is just perceptibly more coarsely punctured and less straightened posteriorly, its legs are perhaps a little more robust, and its antennæ are somewhat more clavate, their subapical joints being a little thicker, less transverse, and not so evidently *perfoliated* (i. e. more compressed *inter se*).

Pseudostene fossoria, n. sp.

P. lineari-angustula, picea; capite dense ruguloso, clypeo ferrugineo, mox ante oculos rotundato; prothorace convexo, nitidissimo, profunde et sat confertim punctato, lateribus oblique subrotundatis; elytris ad latera parallelis, leviter transversim rugulosis, sat distincte punctulato-striatis, interstitiis minute punctulatis; pedibus piceo-ferrugineis; antennis pallido-ferrugineis, crassiusculis, articulis subapicalibus paulo magis perfoliatis transversis.

Long. corp. lin. $1\frac{2}{3}$–vix $1\frac{3}{4}$.

Habitat in salinis et per oram maritimam arenosam ins. Lanzarotæ Canariensis, mense Martio A. D. 1859 a meipso capta.

* This is very perceptible when the two insects are placed together under the microscope.

Genus Xenoglœus (nov. gen.).

Corpus sat parvum, subquadrato-oblongum, calvum: *fronte* ad latera vix elevata, ad apicem truncata (haud emarginata): *prothorace* magno, transverso-quadrato, antice vix emarginato, angulis posticis subrectis, margine postico obtuse sinuato; *prosterno* carinato (carina postice lobiformi abrupte terminata): *elytrorum* angulis ipsis humeralibus exstantibus acutis: *scutello* transverso-triangulari: *alis* obsoletis. *Antennæ* prothorace vix breviores, apicem versus moniliformes leviter incrassatæ, articulo 1^mo paulo robusto breviusculo, 2^do brevi, 3^tio longiore, reliquis latitudine gradatim crescentibus (ultimo subgloboso). *Labrum* subquadratum, postice vix angustius, antice versus angulos anticos rotundatum, apice truncatum integrum ciliatum. *Mandibulæ* validæ, corneæ, subtriangulares, apice incurvæ acutæ, intus in medio profunde fissæ coriaceæ. *Maxillæ* bilobæ, lobis valde pubescentibus: *externo* brevi, lato, apice longe setoso: *interno* paulo breviore, intus longe setoso, ad apicem subito et valde inflexo incrassato et ibidem tectiformi concavo obtuso (nec uncinato). *Palpi* clavati: *maxillares* articulo 1^mo sat parvo subgracili, 2^do magno crasso flexuoso apice clavato, 3^tio paulo minore breviore, ultimo maximo securiformi: *labiales* post ligulam inserti, articulo 1^mo sat parvo flexuoso, 2^do multo crassiore subgloboso, ultimo hoc multo majore subovali ad apicem internum oblique truncato. *Mentum* robustum, corneum, cordiformi-quadratum (i. e. basi facile attenuatum, antice versus angulos anticos rotundatum et apice vix emarginatum). *Ligula* subcornea, cordata (antice profunde biloba). *Pedes* breviusculi: *tibiis* ad apicem externum subtruncatis, ad internum calcaratis, *anticis* apicem versus inflexis latiusculis: *tarsis* heteromeris, subtus valde pubescentibus.

A ξένος, alienigena, et γλοιὸς, lævis.

In the extraordinary structure of its inner maxillary lobe—the apical portion of which is suddenly bent inwards (at right angles to the basal part), and, instead of being uncinate, is much thickened, *tectiform* (or concave), and obtuse at its extremity,—the present genus differs from every other one with which I am acquainted. In its robust, subcorneous, cordate ligula, moreover, and thick, subcordate mentum, as well as in the largely developed securiform last joint of its maxillary palpi and the acute and prominent humeral angles of its elytra, it is well characterized. With respect to its affinities, I will merely record the opinion of Prof. Lacordaire, to whom I lately transmitted for examination the unique specimen from which the above diagnosis has been compiled. "Cet insecte," says he, "m'est inconnu. Quant à ses affinités, elles ne sont pas douteuses; c'est une *Ulomide,* ainsi que le prouvent la forme de sa tête, de ses antennes, de ses pattes, et surtout l'absence de trochantins aux branches intermédiaires. C'est un genre nouveau, qui repose sur la forme générale du corps plutôt que sur aucun caractère bien précis, et qui me paraît devoir être placé dans le voisinage des *Peltoides*, Casteln. (*Oopiestus*, Chevrol.)."

29. *Xenoglœus politus*, n. sp.

X. rufo-brunneus, politus; capite subrugose punctato, oculis antice nigris; prothorace convexo, leviter sat parce punctulato, ad latera marginato et vix rotundato; elytris profunde (præsertim postice et ad latera) crenato-striatis, interstitiis minutissime remote punctulatis, antice in disco latis depressis, postice necnon ad utrumque latus angustioribus magis elevatis; antennis pedibusque vix pallidioribus.

Long. corp. lin. $2\frac{1}{2}$.

A single example of this curious insect has been communicated to me lately by the Rev. Hamlet Clark, but without any note as to its capture. Whether, therefore, it was taken by himself, during his day's sojourn at St. Vincent in December 1856, or by Mr. Gray, I am unable to ascertain.

Fam. **Cantharidæ.**

Genus Cantharis.

Geoffroy, Hist. des Ins. i. 339 (1764).

30. *Cantharis Fryii*, n. sp.

C. omnino cyanea, antennis tibiis tarsisque paulo obscurioribus et nigro-pubescentibus, supra fere calva; capite prothoraceque (præsertim hoc) nitidis, illo confertim punctato, hoc profunde sed parce punctato, antice attenuato, postice profunde canaliculato; elytris subopacis, confertissime ruguloso-granulatis, apice singulatim rotundatis.

Long. corp. lin. $6\frac{1}{2}$.

I had at first imagined that the present *Cantharis* might possibly be identical with Erichson's *Lytta chalybea*, included in his paper on the (supposed) Coleoptera of Angola; but, on closer inspection, it has a number of characters in which it apparently differs from that species. Thus, Erichson describes the *L. chalybea* as clothed with a dark pubescence above (whereas the *C. Fryii* is almost bald, and, moreover, the little pubescence which is just traceable on the elytra is fulvescent), and as having its elytra and abdomen alone cyaneous (the rest of the insect being black), whilst the St. Vincent species is *cyaneous altogether*, the antennæ, tibiæ, and tarsi being alone a little obscurer, and beset with a short, darker pile. The prothorax, also, is stated to be thickly punctured and obscurely channeled, whereas in the *C. Fryii* it is very deeply channeled, and with its punctures large and remote. Moreover, in the Cape de Verde insect the elytra can scarcely be called "ruguloso-*punctata*," but rather, ruguloso-*granulata* (there being hardly any indication of punctures). A single specimen of it was captured at St. Vincent by Mr. Fry, to whom I have much pleasure in dedicating the species.

Fam. Œdemeridæ.

Genus Ditylus.

Schmidt, in Linn. Ent. i. 87 (1846).

31. *Ditylus pallidus*, n. sp.

D. elongatus, cylindricus, pallido-testaceus (oculis, mandibularum apice tibiarumque calcariis solis nigris), undique crebre punctatus necnon longe et densissime pubescens; oculis prominentibus; prothorace subcordato, subinæquali; palpis, antennis versus apicem tarsisque vix obscurioribus.

Long. corp. lin. 3–7.

The present *Ditylus* is so closely related to the *D. concolor* of Brullé, from the Canaries, that, despite its *much* paler colour, I had considered it at first as a mere geographical phasis of that insect; nevertheless, on comparing it carefully with an extensive series of its more northern representative, I am induced to believe that we cannot safely regard it as absolutely identical with it, though it is undoubtedly a very near ally. Thus, it is not only of a *much* more pallid hue (being of a pale testaceous, and entirely free from the beautiful orange tint which is always so conspicuous in the *D. concolor*), but its pubescence is distinctly longer and coarser (particularly behind), its eyes are more prominent, its pronotum is somewhat less uneven, and the first joint of its antennæ is perceptibly thicker—a structure which is very apparent at the base. The veins of its under wings, also, are less robust; and one or two of the minor ones, which are easily traceable in the Canarian species, are, in the *D. pallidus*, scarcely, if at all, visible. In stature it appears to be even more inconstant, if possible, than the *D. concolor*; for whilst that insect ranges from four to seven lines in length, the range of the present is from *three* to seven,—the larger examples thus absolutely *more than doubling* in size the smaller ones! The six specimens now before me were taken at St. Vincent, in the month of October, "beneath trailing succulent plants," by Mr. Fry.

Fam. Staphylinidæ.

Genus Isomalus.

Erichson, Gen. et Spec. Staph. 838 (1839).

32. *Isomalus Hesperidum*, Woll.

Isomalus Hesperidum, Woll., Ann. of Nat. Hist. ser. 2. xx. 504 (1857).

A single example of this insect was captured at St. Vincent by Mr. Gray during his day's sojourn there in December 1856.

XXIX.—*On a presumed Cause of Failure in Oceanic Telegraphy; and on the Existence of Animal Life at Great Depths in the Sea.* By J. Gwyn Jeffreys, Esq., F.R.S., F.G.S.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

Public attention having been of late attracted to the subject of submarine telegraphy, and especially to the causes of failure in several of these undertakings, it may not be uninteresting to mention some facts which have fallen under my observation.

During the recent expedition to survey the North Atlantic Telegraph line, there was only one piece of drift-wood met with in the Arctic Sea which showed any marks of having been perforated by marine animals; and this piece of wood has, through the kindness of Sir Leopold M'Clintock, been submitted to my examination. It had formed part of a fir-tree, and was picked up by the 'Fox' on the 13th Sept. 1860, off the east coast of Greenland, in lat. 60° 54′ N., long. 41° 58′ W. It appeared to have been much rubbed and frayed, probably by attrition against loose or floating ice. On making sections of this piece of wood, I found that the perforations had been caused by a kind of *Annelid*, and that they extended to a considerable depth, although they were of a different nature from the tunnels made by any kind of *Teredo*. Having referred to the account given by the late Sir John Ross of his 'Voyage of Discovery to the Arctic Regions,' which was published in 1819, I find that in many of the deep-sea soundings, which he so accurately recorded, living "sea-worms" (or *Annelids*) occurred at depths varying from 192 to 1000 fathoms.

The inference I would draw from the fact of animal life existing at great depths in the sea (and which has been lately confirmed by Dr. Wallich) is, that proper precautions ought to be taken to prevent the cable being injured, and the telegraphic action affected, by marine animals of perforating habits. No vegetable substance is free from their attacks; and I have shown, in the case of the Mediterranean line, that the cable, as well as its enclosure of gutta percha, was pierced, at a depth of between 60 and 70 fathoms, by the *Xylophaga dorsalis*. I think a sheathing of copper, or of any other metal which is not liable to oxidation, would effectually prevent any such injury, and not interfere with the flexibility of the cable.

I may take this opportunity of remarking, in justice to the memory of the gallant officer to whose explorations I have above referred, that by means of his "deep-sea clamm" he succeeded in taking up and bringing to the surface considerable quantities of stones and mud (as much as 6 lbs. at a time) from the sea-bottom at great depths; and that he says (vol. i. p. 251), on one occasion "Soundings were obtained correctly in 1000 fathoms, consisting of soft mud, in which there were worms; and entangled on the sounding-line, at the depth of 800 fathoms, was found a beautiful *Caput-Medusæ*." This specimen was described by the late Dr. Leach, in the Appendix to Sir John Ross's work, under the name of *Gorgonocephalus arcticus*, and it is still to be seen in the British Museum. It appears to have measured no less than 2 feet in length when fully expanded. In the same work Sir John Ross also says (vol. ii. p. 5), "When the line came up, a small *Star-fish* was found attached to it, below the point marking 800 fathoms." The sea was then a dead calm, and the line became perfectly perpendicular. Animals of a higher degree of organization (such as *Mollusca* and *Crustacea*) were also procured by Sir John Ross, during the same expedition, at rather less depths, in Baffin's Bay. Dr. Wallich was, of course, not aware of his supposed discovery having been thus anticipated more than forty years ago. Sir James Ross's account of his antarctic voyage of discovery should also be consulted by those who take an interest in this subject with respect to the results of his deep-sea dredging.

I remain, Gentlemen,
Your faithful Servant,
J. Gwyn Jeffreys.

25 Devonshire Place, Portland Place.
March 12, 1861.

XXX.—*Observations on the* Bignoniaceæ. By John Miers, F.R.S., F.L.S. &c.

[Continued from p. 168.]

The group of the *Crescentiaceæ* merits observation in this inquiry: it was considered by Jussieu, Endlicher, and DeCandolle to be a tribe of the *Bignoniaceæ*. Gardner first proposed it as a distinct family, which view was adopted by Prof. Lindley; and lately Dr. Seemann has supported this opinion. DeCandolle divided it into two sections—the *Tanaecieæ*, possessing a bilocular ovary, and the *Crescentieæ*, a 1-celled ovary—all being distinguished from the *Bignonieæ* by their indehiscent fruit and apterous seeds. Dr. Seemann, in maintaining its claims to rank as a distinct family, also separates it into two sections under the same names*; but he simply distinguishes the *Tanaecieæ* by a persistent, and the *Crescentieæ* by a deciduous calyx; and he affirms, contrary to the statements of preceding botanists, that

* Bot. Herald, 181; Proc. Linn. Soc. ii. 269.

all alike possess at an early stage a unilocular ovary with parietal placentations, the fruit becoming bilocular by the subsequent enlargement and confluence of the placentæ: this view is not confirmed by the analyses I have been able to make, and, as regards the *Tanaecieæ*, is not supported by the evidence on record, which I here reproduce.

First, as respects *Colea*, the several details of *C. Mauritanica* (Bot. Mag. tab. 2817), of *C. Telfairii* (*ib.* tab. 2976)*, and of *C. floribunda* (Bot. Reg. v. 27, tab. 19), all prove most distinctly the presence of a broad membranaceous wing around the seeds, as in *Bignonia*; and the capsules, though covered by a somewhat fleshy epicarp, indicate, by well-marked grooves, the sutural lines of their dehiscence into two valves. Prof. Lindley has remarked that no instance is known of the existence of winged seeds in indehiscent pericarps; for as the function of the wing of the seed is to carry it from a height to a long distance by the force of the wind, this object could not be effected were the fruit indehiscent. *Colea*, with its winged seeds in a 2-valved capsule, and its ecirrhose pinnated leaves, may probably find its place near *Tecoma*, among the *Catalpeæ*; but if, as Sir Wm. Hooker states, the valves of its capsule be parallel to the dissepiment, it must belong to the *Bignonieæ*. In regard to the structure of the ovary in *Colea*, Prof. A. DeCandolle found it to be distinctly bilocular. We have not as yet sufficient knowledge of the structure of *Phyllarthron* and *Periblema* to enable us to judge of their true position: in the latter the ovary is bilocular, with only two ascending ovules in each cell, attached to the dissepiment, and the calyx is enclosed in a tubular ventricose 4-fid involucre, which characters, as Prof. DeCandolle remarks, are quite foreign to the order. Of *Phyllarthron* very little is known. Even in regard to *Tanaecium*, our information concerning the structure of the ovary, fruit, and seed, as far as has been heretofore known, has not been sufficiently positive. The genus was established by Swartz upon two species so dissimilar in floral organization, in the size and form of the fruit, in their habit, and in the shape of their leaves, that he classed them together with great doubt. DeCandolle and other succeeding botanists have not attempted to disassociate them; but when another species, closely allied to *T. parasiticum*, was first described by Miquel, he made it the type of a new genus, calling it *Schlegelia lilacina*. Prof. DeCandolle, however, expresses a doubt whether it be sufficiently different from *Tanaecium* to claim a generic distinction: this remark is true as respects *T. parasiticum*, which is certainly congeneric with it. Now, if we compare the drawings of Swartz of

* If the presence of a wing on the seed of *C. Telfairii* be questioned, there can be no doubt of its existence in *C. floribunda*.

his *T. albiflorum* (Fl. Ind. Occid. tab. 20) and of *T. crucigerum* (Plum. Am. tab. 254), on the one hand, with *T. parasiticum* (Sw. *icon. cit.*) and with *T.* (*Schlegelia*) *lilacinum*, Miq. (Aubl. Guian. tab. 254), on the other, no one can doubt that the two former species are generically distinct from the two latter. In the former group the plants are scandent, their leaves conjugate, with a long cirrhus, as in *Bignonia*; the calyx is green, long, and tubular; the corolla is white, pubescent within and without, with a very narrow hypocrateriform tube, of unusual length (6 or 7 inches), with an undulately crispate 5-lobed border; the stamens and style (of great length) are exserted; the anther-lobes are linear, widely divaricated, with a terminal excurrent connective; the fruit is very large, oblong, often a foot in length; and the seeds are large, broad, compressed, and not imbedded in pulp. In the latter group the stem is radicant; the leaves are quite simple, as in many of the *Catalpeæ*; the calyx is coloured, short, and globosely campanulate; the corolla is deep violet or purple, quite glabrous, scarcely more than $\frac{3}{4}$ inch long, much swollen and ventricose above a short basal constriction, with an oblique bilabiate border, the upper lip of which is erect, bifid, scarcely cleft to the base, and the lower lip is trifid, reflected, with the middle lobe considerably the largest, and enveloping all the others in æstivation; stamens and style only half the length of the short corolla, and of course included; anthers very small, ovate, white, with nearly parallel lobes; fruit globose, only $\frac{3}{4}$ inch diameter in one species, and not more than $\frac{1}{4}$ inch in the other, with projecting seminiferous placentæ, rendering it falsely 2-locular, as in *Kigelia*, and containing numerous minute, angular, oblong seeds enveloped in pulp. These characters are severally as opposite as possible, rendering it evident that *Schlegelia* is not only generically distinct from *Tanaecium*, but appertains to a different family. The former genus manifestly belongs to *Crescentiaceæ*, while *Tanaecium* will probably find its place near *Adenocalymna* in *Bignonieæ*, because it possesses a similar habit, has the same kind of cylindrical elongated fruit, as we have seen (p. 167), and its seeds are, in like manner, large, apterous, and closely packed together, without intervening pulp.

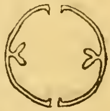
The remaining genus, *Parmentiera*, placed by DeCandolle near *Tanaecium* on account of its bilocular ovary and indehiscent fruit, is referred to his tribe *Crescentieæ* by Dr. Seemann, who, in detailing its generic character, affirms that the ovary is at first unilocular, but that by the enlargement of the placentæ it becomes 2–4-locular in the fruit *; but he nowhere states that he had examined the ovary or had witnessed the organization just mentioned, and we may infer that he copied this character

* Hook. Kew Journ. Bot. ix. 82.

from DeCandolle's account of the fruit of *P. edulis,* a description framed entirely upon the drawing and descriptions of Mocino and Hernandez. It is to be regretted that in the excellent drawing of *Parmentiera cerifera* (Bot. Herald, pl. 32), no figure of the structure of the ovary is given; but it will be there seen how remarkably that plant agrees in the peculiar shape of the spathaceous calyx and the form of the corolla with *Spathodea,* and scarcely less so in the shape of its cylindrical siliquose fruit, which, according to that drawing, is evidently 2-valvular, with numerous small apterous seeds, not enveloped in pulp, but fixed to a greatly enlarged central dissepiment that nearly fills the whole space within the valves, precisely as in the genus last mentioned and in *Stereospermum.* Dr. Seemann mentions that the fruits of *P. cerifera* are given as food to cattle, when mixed with Guinea-grass and a kind of sweet potato, but does not say which part of the fruit is eaten: this probably is the pericarpial or valvular covering, which he defines as a "*fructus carnosus,*" similar to that of *P. edulis,* described as being baccate and fleshy like a cucumber, which it resembles in form: this agrees with the fruit of *Spathodea campanulata,* which again offers much analogy in its internal structure with that of *Parmentiera cerifera,* whose fruit is said by Dr. Seemann to be "*epulposa,*"—its seeds, like small lentils, being figured as seated around the greatly enlarged dissepiment, within the small annular space left between it and the pericarpial covering. If, therefore, *Parmentiera* be found to have a bilocular ovary with numerous ovules upon the dissepiment, the genus ought at once to be consigned to the *Bignoniaceæ*; indeed its characters appear wholly at variance with the *Crescentiaceæ.* As its species form upright trees, it probably belongs to the tribe *Catalpeæ,* and will find its place near *Spathodea* (where DeCandolle was originally disposed to fix it), there being a very close approximation in the form and structure of the fruit in *Parmentiera, Spathodea,* and *Stereospermum.* Dr. Seemann considers that the growth of the flowers upon its trunk indicates its affinity with *Crescentia*; but we find the same mode of floral development in *Colea,* and I have occasionally witnessed the same in some species of *Tecoma,* where racemes grow out of the old leafless axils of the stems.

If these exclusions be adopted, the *Crescentiaceæ* would be reduced to three genera, having for their characters an indehiscent fruit and apterous seeds imbedded in pulp, this last being the chief distinguishing feature. These genera are *Crescentia, Kigelia,* and *Schlegelia*; for Dr. Seemann affirms that *Tripinnaria* belongs to *Kigelia.* The structure of the ovary in these genera appears in no way different from that of the *Eccremocarpeæ*; that is to say, it is unilocular, with two opposite longitudinal parietal placentæ; but a distinction is manifested in the subsequent development; so that, in examining the fruit, we must bear in mind the previous structure of the ovary. The want of materials has prevented me from investigating this subject. I have been able to examine only a single ovary of *Crescentia,* which was partly injured by caries; but this satisfied me that it had only two parietal placentæ. *Kigelia* I found similarly constructed, and not bilocular, with ovules borne on the centre of the dissepiment, as is represented in Delessert's 'Icones,' v. tab. 93 B. fig. 3: the appearance there shown is the result of the touching of the opposite projecting placentæ, which, in the younger state of the ovary, and even after the fall of the corolla, I have found separated by a long interval. In *Schlegelia* I have also verified the same structure. In regard to the fruit of *Crescentia,* the details of Gaertner are precise, are illustrated by good figures *, and appear worthy of full confidence: it is circular in its transverse section; its indehiscent shell, though thin in substance, is hard and somewhat ligneous, marked externally and internally by four equidistant longitudinal ridges, the cavity being filled with a soft pulp, in which the seeds are imbedded. The description of Gardner †, in regard to the fruit, is similar; but he gives a very different account of the ovary, which he says is "1-celled, with four fleshy parietal polyspermous placentæ placed one on each half of the pericarpial leaves, and at equal distances from each other." There appears some error in this statement; for it is contradicted in his account of the fruit, which states, "pericarp woody, consisting of two indehiscent carpels placed anterior and posterior to the axis of inflorescence." Of the existence of two opposite placentæ there can be no doubt; the two intervening prominent lines, in the case which I observed, were bare of ovules, and seemed to arise from the line of junction of the thickened sterile margins of the normal carpels, similar to what I observed in the ovaria of *Kigelia* and *Schlegelia*: at first sight these seem to have four lines of placentation; but a more careful observation shows the presence of two only. If this view of the structure of the ovary in the *Crescentiaceæ* be correct, it will be represented as in fig. 16, that is to say, of two carpels placed face to face, which are placentiferous on their midribs and conjoined by their sterile margins, a structure that will be seen to correspond with the *Eccremocarpeæ* (fig. 14), differing only in the greater thickening of the margins of the carpels. It remains to be ascertained whether the pulp of the fruit in these genera results from a secretion formed at the internal surface of the ovary, or

Fig. 16.



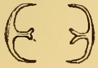
* De Fruct. iii. 230. tab. 223.

† Hook. Journ. Bot. ii. 423.

whether it arises from the existence of an arillus round each seed: if the latter be the case, as is very probable, it would offer a good discriminating character between the *Crescentiaceæ* and *Bignoniaceæ*; for no trace of any arillus has yet been observed in the latter family; otherwise there is little real distinction between the two orders. The floral characters in all the *Crescentiaceæ* are similar to those of the *Bignoniaceæ*; and there is no essential difference in the structure of their exalbuminous seeds, for it has been shown that the presence or absence of a membranaceous wing no longer offers any line of distinction between the two families. Setting aside the yet uncertain question of an arillus, the claims of the *Crescentiaceæ* to an ordinal rank are feeble, being reduced simply to the presence of pulp and the indehiscence of the fruit. If these claims should be considered of insufficient value, this small group, without inconsistency, might still be retained, after the example of DeCandolle, merely as a tribe of the *Bignoniaceæ*.

The group of the *Cyrtandraceæ* has been considered by many of the most eminent botanists as a tribe of the *Gesneriaceæ*, among whom are Mr. Robert Brown (Pl. Jav. Rar. 105), Prof. Endlicher (Gen. Pl. 716), and Mr. Bentham (Lond. Journ. Bot. v. 360). On the other hand, Prof. Lindley (Introd. 283) and Prof. DeCandolle (Prodr. ix. 258) regard it as a distinct family, more allied to *Bignoniaceæ*. It differs from *Gesneriaceæ* in its perfectly and constantly superior ovary and its exalbuminous seeds: it accords with *Bignoniaceæ* in the form of its calyx and corolla; in its stamens being often didynamous, when frequently only two of them are fertile, as in *Catalpa*; in its anthers being more or less divaricated at their base, and united at their summit by a connective, which forms an apicular excurrent appendage; and in its free 2-locular ovary, seated within a fleshy disk. It differs from *Bignoniaceæ* in the species being for the most part herbaceous, with alternate or radical leaves, which are never strictly pinnate; in its prominent bifurcate placentations, which frequently produce the appearance of four cells in the fruit; in its very numerous minute and always pendent seeds, and its terete radicle with very small cotyledons. These characters are sufficient to establish its claim to a distinct ordinal rank. The ovary in *Cyrtandraceæ* appears to be composed of two carpellary leaves, placentiferous on their midribs and conjoined by their sterile margins, as in *Jacaranda* and *Crescentia*; it is consequently unilocular, with two opposite parietal placentæ, which severally bifurcate (fig. 17). By the subsequent growth and approximation of the placentæ, the 2-valved capsular fruit frequently becomes spuriously 2-locular or falsely 4-celled: the generally comose extremities

Fig. 17.



of the seeds bear some analogy to a somewhat similar development in *Sparattosperma* and *Astianthus* among *Bignoniaceæ*.

The *Pedaliaceæ* (excluding *Sesameæ* for reasons to be presently stated) correspond in the constitution of their carpels with the *Crescentiaceæ*, and therefore, in some degree, with the *Eccremocarpeæ*. The ovary generally consists of two carpels, placentiferous on their midribs and conjoined by their sterile margins; it is therefore 1-locular, with two opposite parietal prominent placentæ formed of two very recurved lamellar plates, which bear the ovules on their margins (fig. 18): hence the fruit, by the growth and subsequent hardening of the placentæ, becomes pseudo-4-locular. The figure of the ovary and fruit of *Martynia annua* given by Gaertner (de Fruct. tab. 110) affords a very correct idea of this structure, as I had an opportunity of verifying by an examination of the seed, during its several stages of growth, when on my journey across the Pampas. Taking this example as an exponent of the general structure of this group, it appears to establish its right to a distinct ordinal rank among the Bignonial alliance.

Fig. 18.

The *Sesameæ*, in the structure of their carpels, differ from all the before-mentioned groups, and should therefore be excluded from the Bignonial alliance. Their ovary consists normally of four carpellary leaves, placentiferous (not on their midribs, but) upon their margins, which are inflected and meet in one common axis, where they form a central column surrounded by four cells which lie in parallel pairs (fig. 19); thus conjoined, the capsular fruit becomes 4-celled and 2-valved, the seeds remaining attached to the central column, which separates from the valves. DeCandolle (Prodr. ix. 253) arranged the *Pedalineæ* as a tribe of the *Sesameæ*; but, from the great difference in the normal constitution of their carpels, this union cannot be maintained. Endlicher, on the other hand (Gen. Plant. 709 and 723), places the *Sesameæ* at a considerable distance in the system from *Pedalineæ*, ranking the latter before *Orobanchaceæ*, and considering the former as a suborder of the *Bignoniaceæ*, from which they certainly differ very widely. In many respects the *Sesamaceæ* will be found to approach *Verbenaceæ*: there is a great similarity in the form of their calyx and corolla; but in the one their divisions are five, and in the other four: *Priva*, however, is 5-merous, as in *Sesamum*. *Ceratotheca* has four didynamous stamens, as in *Verbena*; while *Priva* has the rudiment of a fifth stamen, as in *Sesamum*. *Ischnia verbenacea* has flowers like those of *Verbena*, and has the habit of that genus. In *Tamonea* and *Verbena* (*Shuttleworthia*) the anthers are furnished with apicular appendages, as in *Sesamum* and its congeners; and the capsule of

Fig. 19.

Priva splits into two halves, each 2-celled, with erect seeds, thus offering much analogy with the fruit of *Sesamaceæ*: the seeds in both cases are exalbuminous, with an embryo of similar form. The capsule, also, is often echinate or cornute in *Priva* and *Tamonea*, as in *Sesamum* and *Ceratotheca*. In habit there is also much accordance between *Priva* and *Sesamum*.

Tourretia has always been considered as a doubtful genus of the *Bignoniaceæ*; but if the structure of the fruit be correctly described, it evidently belongs to *Sesamaceæ*, as Fenzl long since indicated *: it has a 4-celled capsule, which opens only at the apex by a gaping transverse fissure, greatly after the manner of dehiscence in *Sesamum*; and the seeds are affixed to a central axis, as in that genus, and are erect, not transverse as in *Bignoniaceæ*, showing that this structure results from the combination of four carpels, whose placentiferous margins meet in the axis—a structure quite incompatible with *Bignoniaceæ*. In regard to its echinate fruit, the retrorsely uncinate spines that cover its capsule are precisely analogous to those of *Harpagophytum*, which, from its axile placentation, certainly belongs to *Sesamaceæ*, and not to *Pedaliaceæ* (we find a corresponding tendency to the production of spines in the capsules of *Ceratotheca* and *Sporledera*); and its seeds have a similar rugosely expanded border. The principal difference is in the habit of the plant, which, though herbaceous, has conjugate leaves, its leaflets being again palmately divided; and they have an intermediate cirrhus, which is also pinnately branched. *Harpagophytum* and *Sesamum* have tripartite or palmatifid leaves, laciniately divided, but they have no cirrhus. But as *Eccremocarpus* and *Calampelis* are admitted into the *Bignoniaceæ*, and must be associated with *Jacaranda*, many of the species of which form large trees with ecirrhose pinnated leaves, we cannot refuse to admit *Tourretia* into the *Sesameæ* because of the presence of a cirrhus. The seeds of *Tourretia* are alike in shape and position, and have the same kind of cristate margin as in *Sesamopteris*.

In the tribe *Bignonieæ*, the cells of the ovary are anterior and posterior to the axis of inflorescence; but the four lines of placentation stand laterally right and left of the same line of axis. In the *Catalpeæ*, on the contrary, the cells of the ovary are right and left, while the lines of placentation are upon the transverse dissepiment, which has a direction radiating from the axis of inflorescence. In the *Platycarpeæ*, where the ovary is also 2-celled, the placentations being on the dissepiment, the cells as well as the placentæ preserve the same dextral and sinistral aspect. In the *Eccremocarpeæ*, where the ovary is unilocular,

* Fenzl, Denksch. Regensb. iii. 211; A. DeCandolle, Prodr. ix. 236 in adnotat.

the two component carpels and their placentæ stand right and left of the axis of inflorescence. The *Cyrtandraceæ* present precisely the same carpellary characters. In the *Pedaliaceæ*, where the sutural lines of a 2-carpellary ovary are also anterior and posterior, the two bifurcate placentæ, as in *Gesneriaceæ*, have a parietal origin on the right and left of the axis of inflorescence.

The above character, founded upon the origin of the placentæ upon the midrib of the normal carpellary leaves, is, I believe, universal among all the tribes of the *Bignoniaceæ*, the *Crescentiaceæ*, the *Cyrtandraceæ*, the *Pedaliaceæ*, the *Gesneriaceæ*, and perhaps also the *Orobanchaceæ*, which might all be associated in one general alliance. This is somewhat at variance with the Bignonial alliance of Prof. Lindley, which comprehends also the *Acanthaceæ*, *Scrophulariaceæ*, and *Lentibulariaceæ*, which ought to be rejected—the latter because of its free central placentation, the two former on account of the different nature and position of their carpels. The *Scrophulariaceæ* have a most intimate relationship with the *Solanaceæ*, as I have elsewhere demonstrated; they, as well as the *Atropaceæ*, *Gentianaceæ*, and *Acanthaceæ* (forming a Solanal alliance), are distinguished by an ovary composed normally of two carpellary leaves, which are placentiferous on their margins (not on their midribs), which margins are more or less deeply inflected and conjoined into a dissepiment: the lines of placentation here are antical and postical in regard to the axis of inflorescence, not right and left of it as in the Bignonial alliance.

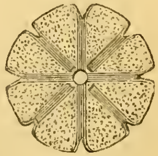
There is much evidence in favour of the conclusion that, except in the few instances where they form stunted shrubs, the *Eubignonieæ* are climbing plants, and that the *Catalpeæ* invariably form standard trees, or erect shrubs. Most of the former have 3-foliolate leaves, in which very often, and especially in the superior axils, the odd leaflet is transformed into a cirrhus, thus forming cirrhosely conjugated leaves; in rarer instances, the leaves are either simply pinnate or 2–3-pinnate, the leaflets being always petiolulated, and then generally the odd normal foliole is also converted into a cirrhus. Among the *Catalpeæ*, on the contrary, the leaves, with very few exceptions, are either pinnate or quinate; and I am not aware of the existence of a cirrhus in any legitimate species of this tribe; for I have shown that all the conjugate-leaved species of *Tabebuia* must be excluded, not only from that genus, but from the tribe. A great portion of the simple-leaved species of the order have been arranged among the *Eubignonieæ*; but it will be seen that most of them must be removed into the *Catalpeæ*. Some exceptions to this rule might be cited in the genera *Delostoma* and *Astianthus*; substantial reasons, however, will be given for transferring

Delostoma into the *Catalpeæ*. I have not seen the fruit of *Astianthus*, nor are any satisfactory characters given of it: the hairy, pappose villosity of its seeds constitutes a feature quite unknown among the *Eubignonieæ*, and the examination of its ovary leads to the belief that it belongs to the *Catalpeæ*; indeed, in the form of its capsule, the hairy covering of its seeds, and its crowded, alternate or almost verticillate, linear, simple leaves, it seems to be congeneric with *Catalpa longisiliqua*. I believe the general habit of the plant to be a constant feature, and that for purposes of generic distinction it offers a character equal in importance to that of the structure of the flower or of the fruit and seed. The presence, however, or absence of a cirrhus in a conjugate leaf, which frequently falls off at the point of its articulation with the petiole, or the substitution of a third foliole in the place of a cirrhus, are not indications of much value; for all these three conditions commonly occur in the same plant among *Eubignonieæ*; so that its adoption for a divisional character, as employed by DeCandolle, has been quite useless. The presence of simple and compound leaves in the same species, or even in the same genus, must not be held to be a feature of frequent occurrence, as some botanists have inferred; for I believe such instances to be extremely rare: they occur chiefly among the *Catalpeæ*, and then only in the few cases where the folioles are not petioled, or where the main petiole is winged, that is to say, where the leaf is rather pinnatifid than truly pinnate: in such cases the extent of division of a simple leaf may be varied, even in the same plant, as happens in many other families; but this kind of division is only the modification of the simple serrated leaf. In regard to this rule among *Eubignonieæ*, Chamisso relates that in his *Bignonia pterocarpa* and *B. samydoides*, the leaves in the primary axil only are simple, in the second and third axils they are deeply bifid, but in all the following nodes they are, as usual, 3-foliolate, or cirrhosely conjugated: in the simple leaf just mentioned, its petiole is as long as the petiole and petiolule conjoined of the conjugate leaf, showing that this circumstance arises from its stipuloid character, or is owing solely to the suppression of one of the folioles from imperfect growth, or its decadence in the early weak state of the plant, and is not the complete development; it cannot therefore be adduced as an exception to the ordinary rule.

There are a few species, among *Eubignonieæ*, with heterophyllous leaves, that offer an exception to the general rule; these, however, are not properly climbers, but are of an erect and short stature; *Bignonia brachypoda*, DC., represents the type, and among them may be classed three plants hitherto placed in *Cuspidaria*. All the instances I have seen of these truly heterophyllous species are generically alike, and they constitute a group (*Astathus*) that may be regarded as a subgenus of *Arrabidea*. By this isolation, and with this exception, we maintain a constancy in the rule of foliaceous development that I have advocated. In the group just mentioned we meet with heteromorphous varieties, where, in consequence of some morphological change in a few of their many 3-foliolate leaves, two or all three leaflets grow together, assuming the state of a single leaf, or of an unequal pair of conjugate leaves of an unusual gibbous form: the mode of distribution of the nerves in such cases shows that such coalescence is due to the same kind of monstrous growth which, under similar exceptional circumstances, we see in other families. As it sometimes happens that the cirrhus is wanting, it may be urged that one of the folioles of a conjugate leaf may also be suppressed, and the other reduced to the state of a simple leaf: of the possibility of this occurrence there can be no doubt; but observation shows that such instances are extremely rare, and then not universal in the same plant, and must be held to be entirely of an exceptional character. Under the genus *Panterpa*, of which *B. leucopogon*, Cham., is the type, I have explained how, and under what circumstances, simple and compound leaves occasionally occur in the same plant; but it is there shown that the simple leaves in such cases partake of a stipuloid nature. These instances therefore cannot be said to affect the general rule above indicated.

There is sometimes a peculiarity in the ligneous structure of the *Bignoniaceæ* that merits attention: the stems of many of them, in their transverse section, exhibit strong medullary rays, not radiating from one common central point, as generally occurs, but disposed in parallel decussating plates, in the form of a cross, as shown by Plumier in *Bignonia crucigera* (Pl. Am. Burm. tab. 78. fig. A), and by Gaudichaud in *Bignonia capreolata*, *B. unguis*, *B. lactiflora*, &c. (Rech. Org. Vég. tab. 14. fig. 4; tab. 18. figs. 4, 5, 6, 7, 8, 9 & 10). The latter botanist remarks that this peculiarity is more strongly developed in the plants of equatorial regions: he adds that only four cruciform rays are at first seen; subsequently these are increased to eight, then to sixteen, thirty-two, &c., and always in this geometrical progression. I possess the stem of a Bignoniaceous climber from the region of the Organ Mountains; it is deprived of its bark, and is about an inch in diameter: here four principal rays are prominently developed, with four other intermediate rays less strongly marked (fig. 20); and corresponding with these rays, the stem has eight deep, longitudinal, broadly gaping fissures, that run through its

Fig. 20.



entire length and extend half-way towards the centre. In these fissures, at intervals of every 4 or 5 inches apart, are seen the sprouts branching from the centre, out of which the decussating opposite leaves have originated; and it is to be remarked that these leaf-sprouts are always found in the four alternate grooves which correspond with the secondary set of medullary rays above mentioned. Each of these axillary sprouts is formed of a congeries of four sets of concentric plates united together in one common bundle—a structure probably connected with the development of conjugate leaves. The wood is extremely light and porous, and I believe it to be the stem of *Bignonia Rego*, Vell., the *Arrabidea Rego*, DC. (misspelt *Sego* in the 'Prodromus') *. I have not seen any specimen of this plant, and have some doubt whether it be a true species of *Arrabidea*; at all events, it must not be taken as the type of the genus, though placed first on its list in the 'Prodromus' by DeCandolle, who appears to have known it only from Velloz's drawing.

In the 'Prodromus' of DeCandolle too much importance has been assigned to the form of the calyx as a generic feature of distinction: on the one hand, this distinction has been little attended to in the selection of the species under the different genera, as in *Cuspidaria, Arrabidea, Tabebuia*, &c.; while, on the other hand, many species, generically distinct, are brought together in one group, as in *Spathodea, Tabebuia*, &c. It will be seen, in the descriptions I here propose to give of sundry Bignoniaceous plants, that in the same genus the size, shape, marginal dentations or fissures of the calyx vary to a considerable extent, and that the great peculiarity of form, which was thought to characterize only the genus *Spathodea*, exists also in the genera *Macfadyena, Mansoa, Dolichandra, Tabebuia*, and some others. The same may be said of *Cuspidaria*, where but few of the species enumerated by DeCandolle possess the long cuspidate teeth that suggested this generic name, while similar long setaceous teeth are found in *Mansoa, Tynanthus*, and several other genera. I have placed the *Bignonia glutinosa*, DC., and other kindred species, in the genus *Dolichandra*, notwithstanding that its calyx (as also its corolla) becomes nearly as much enlarged and coloured as in *Callichlamys*; but this feature is only due to the extreme increment of those parts, which may be traced in all its various gradations.

* This error has originated in copying the name from the lithographed plate of the 'Flora Fluminensis,' executed in Paris, in which work numerous similar misnomers occur. Had DeCandolle referred to the text of that work, he would have discovered the mistake, and have called the plant *Arrabidea Rego*: the latter is a Portuguese word signifying a rent or fissure, in allusion to the fissures I have described, and which are represented in the plate referred to, vol. vi. tab. 39.

One of the most important features that serve to mark the genera of the *Bignoniaceæ* exists in the form and development of the fruit; but unfortunately this is rarely available, as few cabinet specimens present this test; indeed, in some genera the fruit is quite unknown, and I am glad to be able to supply this desideratum in several cases.

The anther-lobes, in most instances, are divaricated to their utmost extent, when, from the mutual incurvature of the filaments, the lobes stand in a vertical position and at right angles with the filaments; the two lobes of each pair are thus brought into juxtaposition, as in the *Gesneraceæ*: sometimes, as in *Tynanthus*, the anther-lobes, fixed at right angles upon the apex of the filaments, are suddenly curved upwards. In several instances the filaments are nearly straight, and the anther-lobes, although free in their whole length, are parallel and pendent from the summit of the filament; this occurs in the genera *Pyrostegia, Dolichandra, Cybistax, Salpingophora, Astianthus, Calosanthes, Millingtonia, Catophractes,* and *Rhigozum*, and is a constant and valid generic character. In some few genera the anther-lobes are sagittately divergent. The glandular summit of the filament (connective), to which the anther-lobes are attached by their apex, is often excurrent and mucronate, sometimes extended into one or two membranaceous appendages, and at other times pilose; but these expansions are not always constant in the same group, and I have not considered their deficiency to be of any generic value. The anther-lobes, as a general rule, are glabrous, but in some instances they are ciliolate or pilose in the same group where others are glabrous; this feature, therefore, cannot be held to be of sufficient importance for purposes of generic distinction. An exception to this rule has been maintained in the extensive genus *Lundia*, which may always be recognized from all others by its densely pilose anthers; but this, notwithstanding, is an artificial character; for by its adoption we find a considerable deviation from one common form in the calyx, corolla, and stamens in several species which, but for this character, would be referable to other genera.

The anther-lobes are fleshy on the dorsal face, and formed in front of a very delicate membrane, where they open by a longitudinal suture, the two margins of which are greatly thickened. In cabinet specimens these margins often separate from the decaying membrane, and stand out like aristæ, for which they have been mistaken by some botanists.

There are several other points of structure in the *Bignoniaceæ* which merit attention; but enough has been said for the purpose here intended, of calling the attention of botanists to the study of this interesting family. I will now therefore proceed to particularize some of the features hitherto unnoticed or insufficiently explained in *Adenocalymna*, *Anemopægma*, *Dolichandra*, *Macfadyena*, and several other genera, notifying at the same time many new species collected by me. I have also brought together, in several new groups, a great number of species that have either fallen under my observation, or that (not having been seen by me) are recognizable from the ample descriptions of authors; they are scattered amongst the genera *Bignonia*, *Spathodea*, *Tabebuia*, *Tecoma*, &c. In the descriptions that follow, which are confined almost entirely to plants of the New World, I have endeavoured to detail the specific characters as laconically as possible compatible with the object in view, and to expose more amply the features that distinguish each genus or each peculiar group; for to the want of such details we must attribute the confusion now existing throughout the family.

In this early stage of the investigation, I have not attempted any arrangement of the genera; and though I recommend the system of distribution adopted by the illustrious DeCandolle, I have not thought it necessary to follow it here. The remarks now offered must be considered, as they are intended to be, rambling contributions of observed facts towards a better knowledge of the family; they are given as mere examples of the groups proposed, and are confined either to the plants of my own collection, which have enabled me to study their characters more fully, or to a portion of those, more especially typical specimens, in the herbarium of the British Museum, and to a very few in the rich and extensive Hookerian collection at Kew. There still remains a large amount of new plants to be described, or of known species to be better characterized. These I leave to abler hands, hoping to see the task elaborated by some careful botanist, who, after long and cautious study, may be enabled to schedule the species into sections by subdivisions, so as to avoid the necessity for frequent repetition of many essential features in the specific characters (now unavoidable), and thus render the determination of specimens more easy to the student.

[To be continued.]

XXXI.—*A Revision of the Synonymy of the Boat and Melon Volutes, 'Les Gondolières' of Lamarck.* By Lovell Reeve, F.L.S., F.G.S.

The Boats and Melons, as the large, boldly-convoluted shells of this tribe of Volutes have been aptly called, were known to authors before the time of Linnæus, more especially to Klein, Petiver, and Seba, by the term *Cymbium*; and the word has been used in a generic sense in later times by Schumacher and Menke. In the shells of the Boat Volutes the upper edge of the whorls is produced into a ledge stretching outwardly or inwardly; in the Melon Volutes, the upper edge of the whorls, with one exception, is coronated with erect or decumbent scales. Dr. Gray, in a paper on *Volutidæ* in the 'Proceedings' of the Zoological Society for March 1855, states that the animal of the Boat Volute is ovo-viviparous, "the young, when born, being of a large size, and covered with a shell with a large irregular callous apex," while the animal of the Melon Volute is oviparous, "the eggs being deposited in cartilaginous egg-cases like those of the other zoophagous mollusks." These observations are doubtless well founded; and the shells show obviously enough that the mantle of the animal is more developed and expanded in the Boats than in the Melons. The correctness of this subdivision of 'Les Gondolières' of Lamarck, as introduced by Mr. Broderip, is thus supported by observations of the animal; and it remains to consider the synonymy of the species, in which some errors need to be amended. Mr. Broderip restricted the term *Cymbium* (altered to *Cymba*) to the Boat Volutes, eight in number, and founded a new genus, *Melo*, for the reception of the Melons, of which there are nine species. Dr. Gray, instead of following the nomenclature of Broderip, transferred the name *Cymbium* to the Melon Volutes, and introduced a new appellation, *Yetus*, for the Boats, coined from the specific French name of Adanson, *Le Yét*. In the midst of this *imbroglio* of terms, I propose, in adopting the trinomial form of nomenclature, to use the names *Yetus* and *Melo* in a subgeneric sense, under *Cymbium* of the old conchologists taken generically.

Genus Cymbium, Klein.

Subgenus 1. Yetus, Gray.

1. *Cymbium* (*Yetus*) *Neptuni*, Gmelin, Syst. Nat. p. 3467; Conch. Icon. pls. 22 & 23.

Voluta Neptuni, Gmelin.
—— *Neptuni* (pars), Lamarck.
Le Yét, Adanson.
Cymba Neptuni, Broderip.
—— *Tritonis*, Broderip.
Yetus Neptuni, Gray.
Cymbium olla, Lowe, fide Hanley.

Hab. West Africa.

Two species, well distinguished by Gmelin, with the names *Voluta Neptuni* and *navicula*, were confounded together by Lamarck, and, excepting Dr. Gray, by all subsequent writers.

Cymbium Neptuni has an orange-fulvous shell, covered with a thick olive-black epidermis. The shell of *C. navicula* is of a white-mottled purple-red colour, with only a slight epidermis. But a much more serious error has been committed by Mr. Hanley (Ips. Linn. Conch. p. 237), and adopted by Mr. Lowe (Proc. Linn. Soc. 1860, p. 190), in assigning these combined species to the *Voluta olla* of Linnæus. The result of my examination of this question will be found under *C. olla*. Dr. Gray considers Mr. Broderip's *C. patula* to be the young of *C. Neptuni*, but I have not been able to satisfy myself on this point.

2. *Cymbium* (*Yetus*) *navicula*, Gmelin, Syst. Nat. p. 3467; Conch. Icon. pl. 24. f. 15 *a, b, c, d*.

Voluta navicula, Gmelin.
Cymbium Persicum maculatum, Martini.
Voluta Pepo, Solander.
—— *Neptuni* (pars), Lamarck.
Cymba Neptuni (pars), Broderip.

Hab. West Africa.

Martini was the first to recognize the distinction between this and the preceding species, but the irregularity of his nomenclature requires that a preference should be given to the name of Gmelin. The shell of *C. Neptuni* is of a uniform fulvous colour, covered with a thick, dark, fibrous epidermis; while that of *C. navicula* is of a characteristic red-brown mahogany colour, mottled throughout in all stages of growth with whitish spots.

3. *Cymbium* (*Yetus*) *proboscidale*, Lamarck, Anim. sans Vert. vol. x. p. 382; Conch. Icon. pl. 19. f. 11.

Voluta cymbium (pars), Linnæus.
—— *proboscidalis*, Lamarck.
Cymba proboscidalis, Broderip.
Yetus proboscidalis (pars), Gray.

Hab. West Africa.

In this species, the animal envelopes its shell entirely with the mantle, secreting a vitrified glazing over the surface, which is generally roughened here and there with pimples, arising from the intervention of particles of sand. The upper ledge of the whorls is so produced as to form an unusually broad hollow channel around the spire.

4. *Cymbium* (*Yetus*) *porcinum*, Lamarck, Anim. sans Vert. vol. x. p. 383.

Voluta cymbium (pars), Linnæus.
Cymbium excavatum (pars), Martini.
Voluta porcina, Lamarck.
Cymba porcina, Broderip.

Cymbium porcinum, Menke.
Yetus proboscidalis (pars), Gray.

Hab. West Africa.

Conchologists are divided in opinion as to whether this is a distinct species, or merely a variety or young of the preceding. Mr. Lowe, the latest authority on the subject, says (Proc. Linn. Soc. 1860, p. 193), "Dr. Gray unites *C. proboscidale* with *C. porcinum*, of which it may possibly prove, indeed, to be only a large, mature or full-developed state or form ; but further observations of the shells and animals conjointly seem still requisite to justify such combinations." In the face of this remark, coming from so experienced an observer as Mr. Lowe, I have kept the species distinct; but I must confess my inability to make out more than one, in an early stage of growth. All the very young and moderately advanced specimens, of which there are many in collections, have the straight form and more dilated corona-ledge of *C. porcinum*, and it is not improbable, therefore, that the attenuated contraction of the ends of the shell of *C. proboscidale*, like the callous overlaying and immersion of the apex, may be the result of age. Still, specimens of *C. proboscidale* are known in a state which is apparently scarcely mature; and all have an additional winding plait at the base of the columella. Dr. Gray calls in question a remark made by Mr. Adams in his 'Genera,' that this section of the *Cymbia* have a deciduous nucleus. Mr. Cuming certainly possesses specimens of *C. porcinum* in which the nucleus, of a rude, swollen growth, has been cast, still leaving a mammillary apex; and he possesses also a specimen of a cast nucleus, with the base almost walled-in, as it would be prior to being cast off.

5. *Cymbium* (*Yetus*) *cisium*, Lamarck, Anim. sans Vert. vol. x. p. 380.

Voluta cymbium, Lamarck (not of Linnæus).
Cymbium excavatum (pars), Martini.
—— *cisium*, Menke.
Cymba cymbium, Broderip.
Cymbium cymbium, Adams.
Yetus cymbium, Gray.
Cymba gracilis, Broderip.
Cymbium gracile, Adams.

Hab. West Africa.

It is to be regretted that Mr. Broderip, Mr. Adams, and Dr. Gray have followed Lamarck in assigning Linnæus's *Voluta cymbium* to this species, notwithstanding the testimony to the contrary given by Deshayes in a note to the species in his edition of the 'Animaux sans Vertèbres.' It was the practice of Linnæus to put numbers on his specimens in ink, corresponding with numbers written by him in ink against the descriptions in his private copy of the 'Systema Naturæ.' The original type of Linnæus's *Voluta cymbium* is in the possession of the Linnæan Society, and I find it upon examination to be a young *Cymbium porcinum*, or *proboscidale*, which are probably one and the same species. The number on this specimen agrees with the number in Linnæus's private copy of the 'Systema.' Linnæus's synonymy was, however, very confusing on this point. The shell of *C. cisium* was not known to him, and he referred to a figure of it in Gualtieri (Test. pl. 29. f. B) in illustration of his *Voluta cymbium*. On looking to this figure in Linnæus's own copy of Gualtieri, I find the name *V. cymbium* in the margin in Linnæus's handwriting; but he appears subsequently to have discovered his error, for in his latest synonymy of the species in the 'Museum Ulricæ' the reference to this figure is suppressed.

6. *Cymbium* (*Yetus*) *patulum*, Broderip, Spec. Conch. f. 4, 4 *b*; Conch. Icon. pl. 25. f. 16 *a*, *b*.

Cymbium Neptuni (young), Gray.

Hab. West Africa.

Is this the young of *C. Neptuni*, or a distinct species? It is not uncommon. There are several specimens in the British Museum, and Dr. Gray fancies that they show a passage of growth into *C. Neptuni*. The evidence of their relationship is by no means complete, and the columella of *C. patulum* is only two-plaited.

7. *Cymbium* (*Yetus*) *rubiginosum*, Swainson, Exotic Conch. pl. 28; Conch. Icon. pl. 26. f. 18 *a*, *b*.

Voluta rubiginosa, Swainson.
Le Philin, Adanson.
Cymba rubiginosa, Broderip.
Yetus cymbium (pars), Gray.

Hab. North-west Africa.

The Rev. R. T. Lowe has given a full and most interesting account of this species in the notes to his "List of Shells observed or collected at Mogador during a few days' visit in April 1859" (Proc. Linn. Soc. 1860, p. 169). He considers *C. rubiginosum*, and not *C. porcinum* or *proboscidale*, as quoted by Dr. Gray, to be *Le Philin* of Adanson. Dr. Gray gives *C. rubiginosum* as a synonym of his *Yetus cymbium*, which is not the Linnæan *Voluta cymbium*, but *C. cisium*, Menke. Mr. Lowe collected two well-defined varieties of *C. rubiginosum*, which he designates *a. angulata* and *β. incurva.* In one, the shoulder or upper edge of the whorls is angular, inclining outwardly; in the other it is inflected inwardly.

8. *Cymbium* (*Yetus*) *Olla*, Linnæus, Syst. Nat. p. 1196; Conch. Icon. pl. 25. f. 17 *a*, and pl. 26. f. 17 *b, c*.

Voluta Olla, Linnæus.
Cymbium mamillare, Klein.
—— *Philippinum*, Martini.
Voluta papillaris, Gmelin.
Cymbium papillatum, Schumacher.
—— *Olla*, Menke.
Cymba Olla, Broderip.
Yetus Olla, Gray.
Cymbium productum, Lowe.

Hab. Mediterranean.

It will be seen by the foregoing synonymy, that authors have not always agreed, either upon the natural habitat of this species, or upon the question of its identity with the *Voluta Olla* of Linnæus; but this want of agreement is the result of error rather than of a difference of opinion. Martini named the shell as coming from the Philippine Islands, and Lamarck gives the Indian Ocean as its native locality; but it is now well known that *C. Olla* is a Lusitanian shell, belonging strictly to the Western Mediterranean, on the shores of Spain. There is no evidence of its having been collected within the tropics.

The error of dissociating this shell from the Linnæan *Voluta Olla* needs also to be removed. In a recent paper by the Rev. R. T. Lowe on the shells of Mogador (Proc. Linn. Soc. 1860, p. 191), the author, relying upon an opinion of Mr. Hanley (Ips. Linn. Conch. p. 237) that this is not the *Voluta Olla* of the 'Systema Naturæ,' has given it the new name of *Cymbium productum*. Mr. Hanley says, "Assuredly the *Cymba Olla* of authors cannot be termed the *Voluta Olla* of Linnæus." Having carefully examined the evidences on both sides, I am able to state that the only evidence of any value against this species being the Linnæan *V. Olla* is, that the columella is two-plaited, whereas it is described in the 'Systema' as being four-plaited. The evidence *in favour* of its being the *Voluta Olla* is as follows:—All the best figures referred to in the Linnæan synonymy, namely those of Klein, Lister, Argenville, Adanson, and Gualtieri, represent unquestionably the species under consideration. The figure of Gualtieri is a particularly characteristic one; and in Linnæus's own copy of that work, in the library of the Linnæan Society, the name *Voluta Olla* is written against that figure, in Linnæus's handwriting. In some specimens of *C. Olla* there is a rudiment of a third columellar plait, and there is also a winding ridge of enamel with almost the appearance of a fourth. In the specimen figured by Gualtieri, these appear to be exaggerated in the drawing, and may have suggested to Linnæus the notion of the species being four-plaited. Another circumstance in favour of this shell being the Linnæan *Voluta Olla* is, that the only specimen among the Linnæan types in the possession of the Linnæan Society that can be referred to it is the species before us; and upon examining Linnæus's own working copy of the 'Systema,' I find against *V. Olla* the ink-score corresponding with that on the specimen—both in Linnæus's hand-writing.

Subgenus 2. Melo, Broderip.

9. *Cymbium* (*Melo*) *æthiopicum,* Linnæus, Syst. Nat. p. 1195; Conch. Icon. pl. 1. f. 1 *a,* and pl. 2. f. 1 *b, c.*

Voluta æthiopica, Linnæus.
—— *nautica,* Linnæus.
Cymbium coronatum, Klein.
—— *ceramicum,* Petiver.
—— *æthiopicum,* Schumacher.
Melo æthiopica, Broderip.
—— *nautica,* Broderip.

Hab. Eastern Seas.

Two Linnæan and Lamarckian species, *Voluta æthiopica* and *V. nautica,* are included under this head, the latter being merely a variety of the former in which the scales are decumbent. Dr. Gray appears to have been the first to unite them.

10. *Cymbium* (*Melo*) *regium,* Schubert and Wagner, Conch. Cab. vol. xii. p. 13, pl. 218. f. 3038, 3039; Conch. Icon. pl. 3. f. 2 *a, b,* and pl. 4. f. 2 *c, d.*

Voluta regia, Schubert and Wagner.

Hab. Eastern Seas.

In the fine collection of *Cymbia* in the British Museum, which includes the Broderipian collection, may be readily separated a series of very characteristic specimens mixed with specimens of *C. æthiopicum,* which appear to me to be distinct; and I have no hesitation in assigning them to the *Voluta regia* of Schubert and Wagner, described and figured in their Supplement to the 'Conchylien Cabinet.' Broderip gave the name of *regius* to the *C. Broderipii* described by Gray in Griffith's 'Cuvier's Animal Kingdom,' thinking probably that Schubert and Wagner's figure represented that species; but no light has been thrown on it by subsequent monographers of the genus. Dr. Gray gives a copious and tolerably accurate list of synomyms in his monograph of *Volutidæ* in the Museum Catalogue, but no mention is made of Schubert and Wagner's *Voluta regia*. It may be argued that *V. regia* is described by those authors as being four-plaited, whereas the species under consideration is three-plaited; but they have regarded, like some others, as a plait what is merely a thickened margin of the columellar enamel. The shells of *C. regium* are characterized by a peculiar bold mottling of white blotches; and in the young state the two species are even more distinct. *C. æthiopicum* is of a more ventricose, constrictedly convoluted form, the striæ of growth being gathered in by a broader and more contorted development of the columella and its plaits; the banded painting consists of interrupted dark blotches; and the scales of the corona are more numerous. In *C. regium* these peculiarities are replaced by others of good specific value—a shorter and less constricted columella, more distant scales, a more obtusely square form, with the painting of white blotches disposed longitudinally; and the differences are plainly discernible in a state modified only by age in the adults of the two species.

11. *Cymbium* (*Melo*) *Broderipii*, Gray, in Griffith's Cuvier's Animal Kingdom, Moll. pl. 26; Conch. Icon. pl. 5. f. 3 *a*, and pl. 6. f. 3 *b, c, d*.

Hab. Philippine Islands; *Cuming*.

This well-known species is the largest of the genus. Mr. Cuming possesses a specimen measuring 14 inches in length and 30 inches in girth. In a young state the shell is profusely reticulated and obliquely streaked with olive- or chestnut-brown upon a yellowish ground: in a more advanced state the ground-colour of the shell is of a deeper orange hue, and the olive-brown assumes a banded form stretching into freckles; soon the freckled painting disappears, and the large adult specimens are simply obscurely banded.

12. *Cymbium* (*Melo*) *ducale*, Lamarck, Anim. sans Vert. vol. x. p. 377; Conch. Icon. pls. 7–10.

Voluta ducalis, Lamarck.
Melo umbilicatus, Broderip.

Hab. Moreton Bay, Australia.

Writers on *Volutidæ* appear to have overlooked the fact that this excellent species, of which there is a magnificent series of specimens in the British Museum, is the *Voluta ducalis* of Lamarck, well described in the 'Animaux sans Vert.' and figured by Schubert and Wagner in their Supplement to the 'Conchylien Cabinet.' Some specimens are broadly oval, others elongately oblong, and the corona of scales is very conspicuously and boldly developed. The painting consists of an elaborate network of fine reddish or burnt-orange veins, crossed by two rather distant bands of chestnut blotches. Swainson has figured a small *C. ducale* in his 'Exotic Conchology' with the name *Voluta diadema*, Lamarck.

13. *Cymbium* (*Melo*) *Georginæ*, Gray, in Griffith's Cuvier's Animal Kingdom, pl. 34; Conch. Icon. pls. 11–13.

Melo mucronatus, Sowerby.

Hab. Moreton Bay. Port Essington.

Dr. Gray, whose politeness in giving shells the christian-names of ladies is unrivalled, well distinguished this species in 1833; but in his monograph of *Volutidæ* in the Museum Catalogue, published more than twenty years later, he remarked of this and the preceding species, that they appear to be varieties of *C. diadema*. "If we select certain specimens of each," says Dr. Gray, "they appear very distinct; but if a large number of specimens of different ages, from various localities, are arranged together, the differences gradually merge into each other, and it is difficult, if not impossible, to separate them from one another." Of the Lamarckian *V. diadema* and *armata* this may be said truly enough, for they are one species; but of *C. ducale* and *C. Georginæ*, I have found no difficulty in separating at a glance the largest number of specimens that were probably ever brought together. The painting of *C. Georginæ* is seldom seen, except in young specimens, beyond the pillar surface of the body-whorl. It consists of irregularly conglomerated linear streaks of red-brown, mingled with a partial network of veins of the same colour; and the shell has always a general foxy-red hue. The spines are rather decumbent, and more or less blotched with chestnut. In the young state this peculiarity of painting is more conspicuous.

14. *Cymbium* (*Melo*) *diadema*, Lamarck, Anim. sans Vert. vol. vi. p. 375; Conch. Icon. pls. 14, 15.

Voluta diadema, Lamarck.
—— *armata*, Lamarck.

Hab. Eastern Seas.

This is the most variable of all the *Cymbia*; and the more slender forms with longer scales have been separated, under the name of *armata*, from the more square-built and stoutly ventricose species with shorter scales. These variations, depending on the laws of correlation of growth, are not accompanied by a separate system of specific characters, as in *C. ducale* and *C. Georginæ*.

15. *Cymbium* (*Melo*) *Miltonis*, Gray, in Griffith's Cuvier's Animal Kingdom, pl. 29; Conch. Icon. pl. 16.

Melo cylindratus, Broderip.

Hab. Swan River.

A well-marked species both in form and colour. The upper part of the whorls is attenuately appressed from their manner of dropping more than usual in coiling, and it follows that the scales have an arched decumbent growth, leaving the spire produced and comparatively erect. The painting is an elaborate network shaded into bands, and of a uniform purple-chestnut or chocolate colour, the columella being bright orange.

16. *Cymbium* (*Melo*) *indicum*, Gmelin, Syst. Nat. p. 3467; Conch. Icon. pl. 17. f. 9 *a* and pl. 18. f. 9 *b*.

Voluta indica, Gmelin.
Melo indica, Broderip.
Voluta melo, Ann. du Mus.
Cymbium melo, Menke.

Hab. Eastern Seas.

The principal characteristic of this well-known species is that the shell is neither coronated nor channelled, the upper portion of the whorls being so closely slopingly contracted as almost or altogether to cover the spire.

17. *Cymbium* (*Melo*) *tessellatum*, Lamarck, Anim. sans Vert. vol. x. p. 377; Conch. Icon. pl. 18. f. *a, b, c*.

Voluta tessellata, Lamarck.
Melo tessellatus, Broderip.

Hab. Eastern Seas.

In colour and marking, this species resembles *C. indicum*, but it is distinguished from it by a very characteristic corona of decumbent scales.

Geographical Distribution.

The geographical distribution of the *Cymbia* is peculiar. Of the Boats, seven belong exclusively to the shores of West Africa, opposite the Canary Islands; and the remaining one, *C. Olla*, borders on that locality in the Western Mediterranean, with a more northerly range, reaching the coast of Spain. Of the Melons, six are natives of the Indian Ocean and Eastern Seas, ranging probably to North Australia; and three are truly Australian. There are no *Cymbia* in the waters of the Western Hemisphere.

XXXII.—*On the Caudal Spine of the Lion.* By Franz Leydig*.

The author took the opportunity of the death of a fine Lion in the Zoological Garden of Stuttgart to investigate the structure of the so-called "spine" in the end of its tail, which he found to be of more composite structure and of higher signification than has hitherto been supposed. In the specimen examined it formed a perfectly smooth and naked wart, $2\frac{1}{2}$ lines in length and $1\frac{1}{2}$ line in its broadest diameter. Its form was like that of the papillæ at the roots of human hair. Its colour was lead-grey, partially tinged with red from blood shining through it. The latter phenomenon, together with a certain elastic softness, indicated at once that it could not be a simple horny structure, which was confirmed by the microscopic examination of longitudinal seetions. The latter showed clearly that the so-called spine was in reality a papilla of the corium, covered by a comparatively thin epidermis; its horny layer was colourless; and the cells of the *rete Malpighii* contained a few pigment-granules. The ligamentous portion of the papilla, which appeared very rich in blood even to the naked eye, showed under the microscope, between the various columns and partitions of the ligamentous substance and fine elastic fibres, arteries 0·0875 line in diameter with a thick muscular coat, and also the corresponding veins. A nervous stem, 0·1 line in thickness, was also very distinctly observed: this, in advancing, diffuses itself like a trellis-work, and sends out its fibrillæ towards the periphery of the papilla. Just as elsewhere in the Mammalia the larger papillar elevations, both of the mucous membrane and of the external integument, are beset with secondary papillæ, so also in this case. The entire free surface runs out into papillæ a little larger than those on the tips of the fingers; the margin is also, as it were, finely denticulated. Each of these microscopic papillæ contains a beautiful capillary ramification, but no nervous threads can be traced into them. The skin of the extremity of the tail, which bears the long hairs, is destitute of papillæ; the hairs stand several together in one follicle; the sebaceous glands exhibited the ordinary form; the sudorific glands formed elongated coils.

From the foregoing statements, as the author remarks, it is evident that the so-called caudal spine of the Lion is not, morphologically, what it has hitherto been taken for. He sums up his observations as follows:—"The organ in question is a papilla of the corium, furnished with vessels and nerves, and therefore,

* Müller's Archiv, 1860, p. 820; abstract by W. S. Dallas, F.L.S.

physiologically, will be endowed with a delicate sense of touch: one might even say that, like the tip of a finger, it forms a sort of organ of touch."

The Lion is not the only animal that possesses a "spine" in the extremity of his tail. The Puma also has one; but it has not been found in any other Cat.

The Aurochs (*Bos urus*) has a papilla, of the size and form of half a pea, in the midst of its enormous caudal tuft; in other Ruminants nothing of the kind has been found. In *Macropus unguifer*, Gould found, at the extreme tip of the tail, a broad, flat, blackish nail, closely resembling that of the human finger: *Macropus frænatus* had only traces of something similar. The "spine" has also been found in the tails of various long-haired Monkeys—sometimes small, sometimes very large, and of a horny nature. Its form is three-sided, with the highest (somewhat arched) edge turned upwards, and the largest face downwards; it projects completely from the skin. The mass is hard, the angle worn away, but distinctly marked, and scaly like the tail of the Beaver. The Monkeys in which this structure was observed are *Semnopithecus melalophus* (in which the nail almost projects beyond the hairs), *S. nasalis*, *S. pyrrhus*, *Colobus Temminckii*, and *C. Guereza* (the latter with the smallest nail). The observations on the occurrence of this appendage in the Monkeys, the Puma, and the Aurochs are contained in an anonymous work published in 1855 at Darmstadt, and entitled 'Der Stachel des Löwen an dessen Schweifende. Nach genauer Untersuchung unter wörtlicher Beifügung älterer und neuerer Angaben, mit naturgetreuen Abbildungen und einem Anhange neuerer Entdeckungen.'

XXXIII.—*On new Australian* Hydrozoa.

By the Rev. Thomas Hincks, B.A.

[Plates XII. & XIII.]

I am indebted to the kindness of my friend George Norman, Esq., of Hull, for a parcel of sea-weed, collected in the neighbourhood of Melbourne and Geelong, which has yielded many species of Hydrozoa and Polyzoa. Several of these are new, and constitute an interesting addition to the Invertebrate fauna of Australia. I propose at present to describe two forms belonging to the order Sertularidæ—one of them a member of the well-known genus *Campanularia*, the other representing a new generic type.

Subkingdom *CŒLENTERATA.*

Class HYDROZOA.

Order **SERTULARIDÆ.** Family **Campanulariadæ.**

Genus Campanularia.

C. tincta, Hincks, n. sp. (Pl. XII.)

Creeping stem plain, forming a coarse network. Cells caliculate, elongate, slightly expanded above, with nine or ten pointed crenations on the margin: pedicles with a single small spherule at the top, immediately beneath which they widen, and usually exhibit one or two somewhat square segments; throughout the remainder of their length they are either smooth or very obscurely annulated. Gonothecæ large, of a dark horn-colour, recumbent, subcordate, attached by a short stalk, which springs from a notch at the base; upper surface ribbed transversely, flattened and smooth beneath; orifice terminal.

Hab. Australia; Laminarian zone, on *Cymodocea antarctica*, Hooker.

The pedicles in *C. tincta* are of variable length, but generally short. The lower portion of the cell is contracted; and within it there is, I believe, a spherical ring, as in *C. Hincksii.* The large and recumbent capsules constitute a marked and distinctive feature of this species.

Lineolaria, Hincks, nov. gen.

Polypary corneous, adherent, filiform, branching; branches given off at right angles (or nearly so) to the main stems. Cells adnate, attached to the stem at the base; orifice terminal. Gonothecæ very large, adherent, originating at the base of a cell.

L. spinulosa, Hincks, n. sp. (Pl. XIII.)

Creeping stem running in straight lines, with occasional branches. Cells oblong, alternate; orifice subtriangular, with an ear-like projection on each side; a curved spine at the lower extremity of the cell. Gonothecæ about three times the size of the cells, ovate, tapering towards the point of attachment,—a row of strong spines running down each side and meeting below, enclosing an area which is flattened and transversely furrowed and supplied with a few scattered spines; orifice terminal, subcircular, slightly marginate.

Hab. Australia; Laminarian zone, on *Cymodocea antarctica*, Hooker.

Both the species now described are parasitical on the leaves of

Cymodocea antarctica. This plant, Professor Harvey informs me, "occupies the same *region* of depth in Australia that *Zostera marina* does here," and is "very common everywhere in the Laminarian zone, from just below low-water mark to *perhaps* 3–5 fathoms." He adds, "It harbours a number of Algæ on its stems—seldom on its leaves." The leaves afford a favourite habitat to several of the Hydrozoa and Polyzoa, besides the species which form the subject of this paper.

EXPLANATION OF THE PLATES.

Plate XII.

Campanularia tincta, natural size and magnified.

Plate XIII.

Lineolaria spinulosa, natural size and magnified.

XXXIV.—*Notes on Cambridge Palæontology.* By Harry Seeley.

[Plate XI.]

II. *Some new Gasteropods from the Upper Greensand.*

In the Cambridge Greensand, Gasteropods are rare—so rare, that if one unaided were to search for a week, he would probably gather nothing but a few specimens of one or two of the commoner species; but, from the artificial abundance produced by the numerous workings (extracting as they do every fossil from whole miles of country), I have been able to examine nearly 2000 specimens. It is an extreme rarity to find the shell preserved, the specimens all occurring as internal moulds in phosphate of lime. I have not seen more than twenty specimens having any trace of the shell, and in some of these it is converted into the same substance as the cast. Many new species besides those here described occur; but, from the casts yet obtained giving no indications of external characters, mention of them is deferred for a future paper.

For the figures, which have been made under my direction, and chiefly from outline-sketches of my own, I am indebted to my friend Mr. R. Farren.

To the friends who assisted me in producing the paper on Bivalves, and especially Prof. Sedgwick, I have again to offer thanks for much kind help.

Pteroceras globulatum. Pl. XI. fig. 1.

Shell ventricose, ovately fusiform. Spire about one-third the length of the shell, composed of four whorls, which rapidly increase in size, and are rounded, inflated, and striated. Body-whorl very large, ornamented on its most tumid part with two keels, which, as they approach the aperture, become more elevated; the lower one then diverges rapidly anteriorly, and the upper one is turned a little towards the spire: a part of the cast of the last whorl is directed up the spire, and appears to have been produced into a canal; so that the shell was probably digitated like *P. Fittoni* (Forbes). Between the keels are four striæ, of which the outer ones are least elevated. Posterior to the keels the casts show but two striæ, and those near to the rib. Anteriorly the striæ were more numerous; but, from the canal being always broken, the number is not evident: there appear to have been five, with two beyond them less distinct. Mouth crescentic, oblique. Height $\frac{5}{16}$ inch, width $\frac{4}{16}$ inch.

This small species approaches most closely to *P. marginatum* (D'Orb.), but is distinguished by the more elevated spire, somewhat different ornamentation, and small size.

Not uncommon*. Cambridge and Ashwell. Coll. University; J. Carter, Esq.; Mr. W. Farren.

The figure of *Pyrula Smithii*, in Trans. Geol. Soc. 2 ser. vol. iv. t. 11. fig. 15 *a*, may possibly belong to this species.

Pterodonta marginata. Pl. XI. fig. 2.

Shell elongated, finely striated. Whorls elevated, nearly two-thirds as high as wide, somewhat inflated and round; each ornamented round the middle with about a dozen prominent tubercles. The body-whorl is small, and has on its upper part a prominent angle, above which is a space flat and oblique, and more than half the width of the whorl above. The space below has indications of a keel, which, however, is very faint, and becomes quite obsolete on the last fourth of the whorl, which is flat. The last whorl is gradually heightened towards its mouth, up to the middle of the whorl above. The tooth is placed immediately below the keel (and, in my specimen, at the edge of the mouth); it is large, elevated, and round, and reduces the mouth to a narrow elongated slit widened at the top, as in *Pteroceras*. The columellar lip, too, as in that genus, is enormously thickened.

This species is most nearly related to *P. carinella* (P. & R.), but differs in the tuberculated whorls, small body-whorl, &c. But it much more closely resembles *Rostellaria marginata* (Sow.), so closely that, where the mouth is wanting, it will be difficult

* These remarks refer in all cases to relative, not actual, rarity.

to distinguish between them. The chief differences are, that the angle is placed much higher up on the body-whorl, that there is an obscure keel below it, that the columellar lip is enormously thickened, and the aperture in consequence narrowed, and, finally, the labial tooth. This and the following are, I believe, the first tuberculated species which have been observed.

Rare. Coll. J. Carter, Esq.

Pterodonta longispira. Pl. XI. fig. 3.

Shell elongated, spirally striated. Spire formed of six or seven whorls, which are twice as wide as high, round, and ornamented with about ten longitudinally elongated tubercles. Body-whorl of moderate size, with a sharp angular keel on the upper part, and on the lower part a wide elevated obtuse keel or inflation; between these the shell is very concave; and near the mouth, on this intermediate space, is placed the transversely oval tooth; this space is considerably wider than that above, which is flat and oblique. Columellar lip moderately thickened. Mouth elongated, rather narrow.

This species is easily distinguished from every other by its keel and the inflated ridge of the body-whorl. It almost as closely resembles *Rostellaria Orbignyana* (P. & R.) as the preceding shell does *R. marginata*. The principal distinctions are the keels not nodulated, the columellar lip thickened, and the labial tooth. The spire also is more elongated than in English specimens of *R. Orbignyana*.

Not common. Coll. J. Carter, Esq.; University.

Pyrula (*Myristica*) *Sowerbii.*

Inflated, ovately fusiform, striated; spire one-third the length of the shell. Whorls rounded, with two obtuse angles, between which is the line of suture; crossed on the most tumid part with numerous longitudinal ridges. Mouth half as wide as high.

This is the *Pyrula Smithii*, described by J. Sowerby in Dr. Fitton's paper (Trans. Geol. Soc. 2 ser. vol. iv. t. 11. fig. 15 *b*). That name having been previously applied to another species, I have proposed for it one commemorative of its describer.

Very rare. Coll. University; Mr. W. Farren.

Fusus tricostatus. Pl. XI. fig. 4.

Ovately fusiform; composed of few whorls, apparently four. Spire about one-fourth the length of the shell, exclusive of the canal. Whorls rapidly enlarging, about twice as wide as high, inflated; ornamented on the most inflated part with two keels, between which the shell is concave; the upper one is most prominent; they are about as widely separated as the whorl above is high: on the space between the upper one and the suture, which is wider than that between the keels, there is a third rib, wide and obtuse. Anterior to the lowest one is a fourth, much less elevated than the others. These ribs are crossed longitudinally by numerous costæ moderately elevated. Mouth ovate. Canal?

This species is intermediate in form between the *F. trunculus* (P. & R.) and *F. bilineatus* (P. & R., not Partsch): from the former it is distinguished by the more elongated form, from the latter by being more inflated, and from both by the keels.

Coll. J. Carter, Esq.; University Museum.

Fusus quinquecostatus. Pl. XI. fig. 5.

Shell fusiform; spire elevated, about one-third the length of the shell exclusive of the canal, composed of three whorls, which regularly enlarge, are round, and twice as wide as high. The body-whorl is gently inflated, elongated, and ornamented with five strong keels, which are equally wide apart and separated by spaces half as broad as the whorl above is high; the second, on the widest part of the shell, is most prominent. Between the keels the shell is concave. Mouth somewhat elongated. Canal?

The species is easily distinguished from every other Cretaceous form by its elongated shape, rounded whorls, and five costæ.

Very rare. Coll. University and J. Carter, Esq.

MESOCHILOTOMA.

Regularly spiral, turreted, with a short canal (?) *. Outer lip with a notch, which forms a keel round the middle of the whorl, as in *Pleurotomaria*, &c.

This genus belongs to the Conidæ, and should be placed immediately after *Pleurotoma*.

Mesochilotoma striata.

Small, greatly elongated. Whorls enlarging rather gradually, twice as wide as high, convex, impressed at the sutures. The keel is rather narrow, but elevated; it is crossed by the lines

* I have not yet seen the canal, and predict its being short only from an examination of the broken uppermost whorl.

of growth. Both above and below it are several somewhat close and slightly elevated striæ.

This shell was found in the interior of a *Pleurotomaria*. Coll. J. Carter, Esq.

Cerithium tenuistriatum. Pl. XI. fig. 6.

Shell very elongated, subcylindrical. Whorls about half as high as wide, nearly flat. Each whorl is ornamented with about fourteen straight longitudinal ribs, which are very moderately elevated, obtuse, and separated by wide spaces. Near their termination the ribs expand, and on the bend of the base with the side become obliterated. These are crossed by numerous fine, closely-placed striæ, which wind spirally up the shell, and also ornament the base, which is rather convex. Aperture four-sided.

This species is most nearly related to *C. Clementinum* (D'Orb.), but differs in the greater elevation of the whorls, vastly greater number of striations, and rounded base. In the specimen figured the shell has been converted into phosphate of lime: the striæ are as perfectly preserved as in a recent specimen.

Very rare. University Museum. Collected by W. Bloomfield, Esq. (M.A. Clare Coll.).

FUNIS.

Shell thin, spiral, many-whorled, elongated. Columella straight, scarcely thicker than the shell of the whorls. Edge of the columella inflected and sharp; base truncated as in *Achatina*. Mouth ovate. [Shell cancellated ?]. Columellar lip reflected.

There is no trace of an internal nacreous deposit.

Its place appears to be in the Melaniadæ, between *Melania* and *Melanopsis*.

Funis elongatus. Pl. XI. fig. 7.

Shell greatly elongated, sides straight. Whorls narrowed at the sutures like a tightly twisted rope, very round, two-thirds as high as wide; ornamented with eight or ten spiral ribs moderately elevated, round, and separated by intervals of their own width, or spaces rather wider. Between each of the ribs there is generally a secondary striation, and there are always a few beyond them near to the suture. The space between the lowest rib and the base of the columella is occupied by numerous closely placed striæ. All these striæ and ribs are crossed by very narrow elevated fringes, the number of which increases with age: on a young specimen a quarter of an inch in diameter there are fifteen; in a large individual more than half an inch across, there are twenty-five. They are connected at the suture with those of the whorl above, like the fringes of *Scalaria*.

The whorls are often more elevated than in the specimen figured. It is remarkable that, whereas the shell is very rarely preserved on other Gasteropods, an internal cast of this species has never been found. The cast is cancellated. From the thinness of the shell it is seldom found in specimens of more than one whorl and a half long.

Not rare. Coll. Dr. Cookson; University; J. Carter, Esq., &c.

? *Funis brevis*. Pl. XI. fig. 8.

Shell an elongated cone. Whorls depressed, moderately inflated, each ornamented with 16 obtuse, wide, elevated longitudinal ridges, which become obscure on the base, and are separated by spaces scarcely so wide. They are crossed by five slightly elevated spiral ribs separated by rather narrower sulcations. The lowest rib is very wide. The base appears to be smooth. Width of specimen 1 line, length 2 lines.

Unique. In the collection of G. D. Liveing, Esq.

Scalaria angularis. Pl. XI. fig. 9.

Shell elongated, conical, composed of about six elevated whorls, which in the upper part of the spire are nearly flat, but gradually become very moderately convex. Each of the lower whorls is ornamented with about ten or twelve straight longitudinal folds, which are wide, prominent, and rounded, with comparatively flat intervening spaces. The upper whorls have very few ribs. The last whorl is more inflated than the spire; the ribs on the upper third of it are indistinct. The base makes a sharp rounded bend with the side. The mouth is not visible, but must have been nearly oval.

Very nearly related to *Scalaria Rouxii* (Pict. et Renv.), but well distinguished by the angular base, flatter whorls, fewer ribs, &c.

Coll. J. Carter, Esq.; University.

Solarium Sedgwickii. Pl. XI. fig. 10.

Shell suborbicular, very depressed, composed of about four whorls. Whorls thick, convex above and below, with a sharp medial angle forming the outline of the shell: this angle is itself angulated or dentated; with age it gets nearer the base. The most tumid part of both the upper and under surfaces is ribbed with transversely elongated elevated tubercles, separated by spaces as wide: the tubercles of the under side are very oblique, those above very slightly so. Umbilicus not small. Mouth angular above, twice as wide as high, half the width of the shell. The whorls being convex, there is a hollow round the suture, which in the last whorl gradually becomes effaced, producing a flat upper surface, nearly horizontal. The outer convex part of the upper whorl also becomes flat and oblique, and is much wider than the inner part. The ribs are on the angle between these areas of the shell. The base becomes more gently round; and in the cast the tubercles are obliterated on the last half-whorl. With age the shell thickened; so that in the cast the markings are only visible on the last whorl.

A specimen in the University Museum, collected by Mr. Archer (Trin. Coll.), measures $1\frac{3}{4}$ inch across. This fine species (the largest our bed has produced) is distinguished rather by its combining the characters of other forms than by anything peculiar. It has the inflated shell and tubercles of *S. cirroide* and the angular margin of *S. dentatum*.

Very rare. University Museum.

Solarium planum. Pl. XI. fig. 11.

Shell discoidal, composed of about six whorls, which are flat on the upper side, and separated by a deep suture. Under side slightly hollow; all the whorls exposed and separated by a suture. The outer edge of the dorsal surface has a row of prominent tubercles, about twenty-seven on a whorl. On the inner edge of the whorl, bordering the suture, is a row of less prominent tubercles, about thirty on a whorl. From the spaces between the tubercles extend on to the whorl little furrows which make its surface undulating. Between the rows of tubercles are five little ribs. The side of the whorl is also marked with striæ, and has in the middle a prominent keel, which is granulated. The outer edge of the base is marked with a row of tubercles more prominent than that of the top, about twenty on a whorl; on the inner edge above the suture is a row of more than forty small granules, from which branch out numerous little plicæ. Outside of the mouth pentagonal; inside round. Diameter rather less than $\frac{1}{2}$ inch.

The cast is round.

This elegant species is most nearly related to *S. Martinianum* (D'Orb.), but differs in the pentagonal mouth, plain ungranulated ribs, keel, &c.

Specimens in the cabinet of Mr. Carter exhibit external casts of the entire shell. Very rare.

Solarium Carteri. Pl. XI. fig. 12.

Shell thick, composed of about six angulated whorls, which very gradually increase in size. Spire somewhat elevated. Whorls flat above. The side is angular, the upper part of it narrow and perpendicular, the lower part twice as wide; it has on its lower part four obscure little grooves, which are crossed by numerous close longitudinal striæ. Umbilicus conical, twice as wide as deep, exhibiting all the whorls; whorls separated by a wide deep suture. The angle which the umbilicus makes with the base of the side is coronated with a row of large tubercles, about sixteen on a whorl; and the edge of the suture has a numerous row of little granules; between the rows are six or eight striæ. Aperture externally 5-sided. Cast round and smooth.

This species is distinguished from every other by its tuberculated angles and striæ. It is most nearly related to *Trochus Leymeriei* (D'Arch.), but differs in having a flat side, &c.

This little shell is far from uncommon in the form of casts and impressions of the umbilicus; but hitherto I have not seen the upper shell. Diameter half an inch.

Coll. J. Carter, Esq.; G. D. Liveing, Esq.; University.

Nerita (*Neritopsis*) *scalaris.* Pl. XI. fig. 13.

Shell thin, as wide as high. Spire very small, scarcely elevated, consisting apparently of two whorls. Body-whorl very large, moderately inflated, and expanding very rapidly; it is ornamented with twenty-two longitudinal ribs, which are greatly elevated, and separated by spaces as wide as their bases. The ribs are rounded on the side towards the mouth, and a little hollowed posteriorly. Mouth semicircular, thin. Columella apparently very deeply cupped.

This beautiful little Nerite (the first from our English Cretaceous beds) has a thinness of shell very unusual in the genus. The cast is ribbed like the shell. This species is very nearly related to *N. costatula*, Roemer, but differs in the relatively larger size of the less inflated body-whorl, wider ribs, and semicircular mouth.

Loc. Coldhams Common, near Cambridge. Coll. Univ. Mus. Collected by H. C. Raban, Esq., B.A. Trin. Coll.

TURBOÏDEA.

Shell turbinated, slightly round beneath. Whorls convex, tuberculated (or spinous?). Aperture round. Peristome continuous. Under part of the aperture retreating, as in *Phorus*. Base rugosely laminated. Umbilicus open.

This genus is exactly intermediate between *Turbo* and *Imperator*.

Turboïdea nodosa. Pl. XI. fig. 14.

Shell considerably wider than high, composed of four whorls, which regularly increase in size, and are rather inflated; they are flattened on the upper part, obliquely sloping, and (but for the lines of growth) smooth. Below the middle of the whorl is a row of large prominent tubercles, which on the last whorl are eight in number; each of them produces a slight inflation of the shell up to the suture, so that there are low obtuse longitudinal ridges separating wide intervening spaces. Below the tubercles is a narrow space, and then the base. The base is convex, and marked with curved folds radiating from the umbilicus. These rugose folds appear to be produced by thin oblique laminæ. Upper part of the mouth nearly straight, and parallel to a plane passing through the axis; but on the base it retreats in a curve. Aperture somewhat oval. Umbilicus longitudinally ridged, of moderate size.

The cast is smooth, round, and has but slight indications of the tubercles *.

A specimen, with a portion of the shell preserved and converted into phosphate of lime, is contained in the cabinet of Mr. Carter.

A second species occurs which is nearly twice as wide as high. The whorls are rather narrow, and the last is greatly expanded. Its upper part is a nearly flat ledge. The tubercles (about seven) are very large, and are placed in the middle of the side, or rather above. Below the tubercles the mouth retreats, as in *T. nodosa*. I only know this species from casts. Its shell was probably thin, and had the tubercles prolonged into spines. It might be named *T. expansa*.

Trochodon, n. subg.

Shell conical, imperforate. Aperture quadrate. Columella toothed.

This little group of shells will perhaps be best placed as a subgenus of *Trochus*, to which genus the species are at present referred.

* *Turbo Delafossii* (D'Arch.) is a nodulated shell, but in no other way resembles this, differing generically.

Trochus (*Trochodon*) *cancellatus*. Pl. XI. fig. 15.

Shell thin (?), conical, elongated, not umbilicated, commonly composed of four or five slightly convex whorls. Each whorl is about twice as wide as high, and ornamented with five or more spiral striæ, which are moderately elevated, and have wide spaces between; the lowest of them is very prominent. These are crossed by numerous close, rather oblique, longitudinal striæ (about forty on a whorl), which terminate in as many little tubercles crenating the lowest rib of the whorl. The base, which is somewhat convex, is separated from the upper part of the shell by a narrow, flat, oblique band, bordered by the bottom striation of the whorl, and a prominent one surrounding the base. The base is marked with about the same number of striæ as the whorl; they are finely granulated. Mouth quadrilateral. At a cessation of growth, little teeth are formed on the inside, which correspond with the external spiral ribs. The columella is banded with two prominent teeth.

Most specimens have varices, or else internal thickenings of the lip formed at irregular intervals; there are sometimes as many as four on a whorl, and sometimes but one on a shell.

This is the most variable Gasteropod our Greensand contains. In the casts the whorls are sometimes so rounded as to appear like the cast of a *Turbo*; sometimes they are perfectly flat, and have the upper one projecting over that below. The spiral angle is not constant. In the casts the longitudinal markings on the whorls are sometimes so faint as to be scarcely perceptible.

This species is most nearly related to *T. Guyotianus* (P. & R.), but differs from it in having a cancellated shell and less elevated whorls.

Not uncommon. University and all other Collections.

Trochus (*Gibbula*) *levistriatus*. Pl. XI. fig. 16.

Shell elevated, somewhat wider than high, formed of four whorls which regularly enlarge. Whorls angular, with flat sides, a flat space above, and a flat base. The shell is noticeably narrower across the upper angle of the whorl than across the lower. The lower is the line of suture. The space on the top of each whorl is narrow, and, excepting a single central striation which is scarcely perceptible, quite smooth. The side has six striæ, including that on each of the two angles; these are narrow, with wide spaces between. The base has (in the only perfect specimen I have seen) nine striæ, which are not similar: on its outer part are three prominent striæ, with spaces as wide as those on the side; in the middle are four close small striæ, and on the inner part two wider. A strong elevated keel, having about twenty small tubercles on the last whorl, forms the margin of the umbilicus. Umbilicus large, as wide as the base, marked on each whorl with several (about six or eight) prominent striæ. Mouth externally five-sided, internally round.

In another state of preservation, this species would be referred to a different genus. It commonly happens that the outer shell is removed, and the nacreous layer exhibited; this is round, smooth, marked with lines of growth, yellowish in colour, and has every appearance of being external.

The general affinity of this shell with *Solarium neocomiense* (D'Orb.) is very great; but it is less depressed, differently striated, has no keels, a striated umbilicus, &c.

Not uncommon. Specimens with the shell preserved are contained in the Univ. Mus. and that of Mr. Carter. Casts in all Collections.

This shell is only provisionally referred to *Gibbula*: the genus to which it belongs is not yet constituted.

Pleurotomaria semiconcava. Pl. XI. fig. 17.

Shell conical, wider than high, formed of whorls (five) which regularly increase in size. The whorls are concave, with a projecting sutural angle. The last whorl is high, and divided by the strongly elevated keel of the sinus into an upper concave part and a lower flat side, which rounds off into the slightly convex base. The sinus forms the line of suture. The concave part has about six narrow striæ; a similar number marks the space below. The base is striated. Aperture rhomboidal. Umbilicus as wide as the base. In the cast the hollow part of the whorl is flat and oblique, with a narrow flattened space above.

The spiral concavity and angular body-whorl fully distinguish this species from every other.

Rare. Woodwardian Museum.

Crepidula Cooksoniæ. Pl. XI. fig. 18.

Shell small, nearly as high as long, and three-fourths as high as wide, regularly inflated, nearly symmetrical, thin. Base transversely ellipsoid, not flat. Apex small, mesial, and above the middle of the posterior side. Outline of the anterior side of the shell oblique, rounding, top rounded; posterior outline nearly perpendicular. Attachment of the lamina narrow, about a third the width of the shell, consisting of upright sides, and a top which is twice as long as the sides, thus being shovel-shaped. The cast is marked with fine concentric lines of growth.

This interesting little shell removes the genus back in time from the Eocene to the Greensand age. It appears quite destitute of the apical obliquity usual in the genus. Specimens have been seen which possibly indicate a second species; in them the shell is longitudinally oval and more elevated.

Rare. Coll. University.

Galericulus.

[Symmetrical], conical, like *Emarginula*, with a thin shelly septum immediately behind the apex, as in *Crepidula*; below this is another septum, which is directed upwards towards that above. The basal margin is thickened.

This genus should be placed in the Calyptræidæ, near to *Crepidula*.

Galericulus altus. Pl. XI. fig. 19.

A small, regularly inflated, obliquely conical shell, with a circular base. The apex slightly overhangs the posterior side, which is straight and oblique. The outline from the base of the sides to the apex is lanceolate, and that from the apex to the anterior basal margin a curve of more than a quarter of a circle. The attachment of the upper septum is, on each side of the apex, a slight curve, which extends midway and halfway into the shell. The attachment of the lower septum is only half the length of the upper one, but much thicker; it is inclined to the right side rather than central. Lat. $\frac{3}{16}$ inch, alt. $\frac{3}{16}$ inch.

Loc. Coton. Coll. University Museum.

Acmæa tenuistriata. Pl. XI. fig. 20.

Shell thin, suboval, inclining to circular, moderately elevated, nearly as high as wide; ornamented with straight, regular, equal, extremely fine radiating striæ, which are crossed by fine concentric lines of growth. Apex a fifth the length of the shell from the anterior border.

This little shell is distinguished from *A. gaultina* (P. & R.) and *A. tenuicostata* (Mich.) by being less depressed, and having fainter, finer striæ. I found it on breaking the mouth of an Ammonite. It was not attached.

Coll. University.

Tornatella pyrostoma. Pl. XI. fig. 21.

Shell elongated, subconical, thick, spirally sulcated; sulcations numerous, narrow, and wide apart. Spire elevated, rather more than half the length of the shell, composed of four whorls. Whorls a little rounded; body-whorl slightly inflated. Mouth an elongated ellipse, not unlike the outline of a grain of wheat. Columella marked on its lower portion with two very prominent angular folds, which are wide apart; the upper one is near the middle of the columellar lip.

This species is most closely related to *T. affinis* (Sow.), but differs from it in the folds on the columella, and more elongated form. The sulcations also appear to be more numerous.

Rare. Coll. J. Carter, Esq.; University; Mr. W. Farren.

Cinulia ventricosa.

Shell thin, subglobular, as wide as high, consisting of four whorls. Spire nearly one-third the length of the shell. Whorls rapidly enlarging, ventricose, slightly flattened on the upper part from the suture outwards. Body-whorl ornamented with about twenty-five faint longitudinal striæ, which are crossed by more than twenty wide sulcations. Base round. Mouth large, suboval, angular posteriorly, more than half as wide as long. Lip greatly thickened by an internal varix, which is marked with numerous (about twenty-five) little teeth. The columella has on its anterior end two very prominent teeth, of which the more anterior is the longer. On the left-hand side of the mouth the body-whorl is a little flattened on its middle part, as though by internal thickening, and on the lower part near to the teeth it is slightly inflated.

This species is nearly related to *C. Hugardiana* (D'Orb.), but is distinguished by the two columellar teeth, wider mouth, longitudinal striæ, fewer spiral striæ, &c. It more closely approaches *C. Prevosti* (D'Arch.), but is distinguished by the more globular form, wider mouth, and longitudinal striæ.

Not rare. Coll. University; Mr. W. Farren; J. Carter, Esq.

STOMATODON.

Shell smooth, few-whorled, moderately elongated, inflated, not umbilicated. Aperture entire, semicircular, rounded anteriorly. Outer lip periodically thickened internally. Columella with prominent tooth-like folds.

This genus belongs to the Tornatellidæ, and should be placed near to *Cinulia.*

Stomatodon politus. Pl. XI. fig. 22.

Shell smooth, polished, elongated, inflated; not umbilicated. Spire half the length of the shell, consisting of four whorls, which are convex and twice as wide as high. Body-whorl very convex and (in the cast) less than twice the height of the whorl above, and considerably wider than high. The last whorl of the spire is exactly twice the height of the whorl above it*. Mouth semicircular, rounded anteriorly. Columella ornamented in the middle part with two teeth, of which the anterior is extremely large, fully a line wide, and as high, and angular. On each side of the whorl in the cast are wide spaces, slightly hollow, like the fringes of *Ranella*, indicating periodic mouths.

In shape this shell is very like *Phasianella neocomiensis* (D'Orb.). It is more inflated than any species of *Ringinella*, and is easily distinguished by the periodic mouths, by being smooth, and by the large teeth in the middle of the columella.

Extremely rare. University Museum. Collected by Mr. W. Farren.

The following species are new to the Upper Greensand of England:—

Rostellaria Orbignyana (*P.* & *R.*).
—— carinata (*Mant.*).
Pteroceras Fittoni (*Forbes*).
—— retusum (*Sow.*).
Natica Matheroniana (*D'Orb.*).
—— gaultina (*D'Orb.*).
—— Rhodani (*Pict.* & *Roux*).
—— Ervyna (*D'Orb.*).
Solarium dentatum (*D'Orb.*).
—— granosum (*D'Orb.*).
Solarium Rochatianum (*P.* & *R.*).
Pleurotomaria allobrogensis (*P.* & *R.*).
—— Brongniartiana ? (*D'Orb.*).
—— neocomiensis (*D'Orb.*).
Dentalium ellipticum (*Sow.*).
Cinulia incrassata (*Mant.*).
—— Hugardiana (*D'Orb.*), var.
Nerinæa, sp.
Hipponyx, sp.

EXPLANATION OF PLATE XI.

Fig. 1. *Pteroceras globulatum*, back and front views of a very fine specimen, nat. size. Univ. Mus.
Fig. 2. *Pterodonta marginata*, ventral and dorsal views, nat. size; the tooth on the outer lip is only partially formed. Mus. Carter.
Fig. 3. *Pterodonta longispira*, dorsal view, slightly restored, from specimens in Mus. Carter.
Fig. 4. *Fusus tricostatus*, under side. Mus. Carter. The longitudinal ribs restored from a younger specimen in Univ. Mus.
Fig. 5. *Fusus quinquecostatus*, under side. Univ. Mus.
Fig. 6. *Cerithium tenuistriatum*, slightly restored. Univ. Mus.
Fig. 7. *Funis elongatus*, in Mus. Cookson (the whorls should have been more oblique), and section showing the columella.
Fig. 8. ? *Funis brevis*, greatly enlarged.
Fig. 9. *Scalaria angularis*, upper whorls restored. Mus. Carter.
Fig. 10. *Solarium Sedgwickii* (upper and under views of a partially grown specimen).

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* Width 5 lines, height 7 lines. It was probably 1½ line higher. The upper whorls of the specimen are broken away.

Fig. 11. *Solarium planum,* enlarged twice, from wax impressions.
Fig. 12. *Solarium Carteri,* ventral view, enlarged twice, from a wax impression; dorsal view from a specimen with the nacreous layer phosphatized.
Fig. 13. *Nerita scalaris,* dorsal and spiral views. Univ. Mus.
Fig. 14. *Turboïdea nodosa,* dorsal and basal views. Mus. Carter.
Fig. 15. *Trochodon cancellatus,* two varieties.
Fig. 16. *Gibbula levistriata.*
Fig. 17. *Pleurotomaria semiconcava,* last whorl with the shell partially preserved.
Fig. 18. *Crepidula Cooksoniæ,* lateral and posterior views.
Fig. 19. *Galericulus altus,* front, back, and side views.
Fig. 20. *Acmæa tenuistriata* [the striæ are much too strong].
Fig. 21. *Tornatella pyrostoma* [the mouth should have been wider].
Fig. 22. *Stomatodon politus* [the anterior tooth should have been larger].

XXXV.—*On a new Genus and some new Species of* Pyramidellidæ *from the North of China.* By Arthur Adams, F.L.S. &c.

Every additional observation I make on the animals of the genera of *Pyramidellidæ* induces me to believe that there is a very intimate relationship between the families *Pyramidellidæ, Actæonidæ,* and *Bullidæ.* The other day, when observing a lively animal of my little group *Syrnola,* I was pleased to see the ear-shaped folded tentacles laid flat back and expanded, resembling very much Philippi's figure of *Actæon.* Although I have met with the shell of *Monoptygma striata* several times in the Gulf of Pe-chili, I have never yet succeeded in procuring the animal alive or dead. A mollusk closely allied, however, and which I believe to be a new species of *Menestho,* has an animal which very nearly agrees with Möller's description of *M. albula.* My beautiful, smooth, white species of *Myonia* (*M. virgo*) is a third species of *Menestho.*

Genus Monoptygma, J. Lea.

1. *Monoptygma vittata,* A. Adams.

M. testa turrito-subulata, gracili, solidiuscula, flavidula; anfractibus $8\frac{1}{2}$, planatis, transversim crebre striatis, fasciis duabus rufis spiralibus eleganter vittatis; apertura oblonga; plica parietali obliqua, inconspicua.

Hab. Hulu-Shan Bay; 3 fathoms.

2. *Monoptygma metula,* A. Adams.

M. testa subulato-conica, solidiuscula, carneo-fusca, apice obtuso; anfractibus 5, convexiusculis, transversim sulcatis, sulcis distantibus, interstitiis simplicibus; anfractu ultimo magno; apertura elongato-ovata, postice acuminata, antice producta; plica parietali obliqua, vix celata.

Hab. Hulu-Shan Bay; 4 fathoms.

3. *Monoptygma punctigera*, A. Adams.

M. testa subulata, sordide alba, tenuicula; anfractibus 6, planis, transversim sulcatis, sulcis subconfertis, interstitiis valde punctatis; apertura ovato-oblonga, postice acuminata, antice latiore et rotundata; plica parietali obliqua, conspicua.

Hab. Gulf of Pe-chili; 5 fathoms (sandy mud).

4. *Monoptygma sulcifera*, A. Adams.

M. testa pyramidali-ovata, alba, opaca, solidula; anfractibus 5, planis, transversim sulcatis, sulcis profundis, confertis, interstitiis simplicibus; anfractu ultimo elongato, magno, antice angustato; apertura oblonga, antice producta et acuminata; plica parietali obliqua, superiore, vix celata.

Hab. Gulf of Pe-chili; 5 fathoms (sandy mud).

5. *Monoptygma cingulata*, A. Adams.

M. testa turrito-subulata, solida, alba; anfractibus $7\frac{1}{2}$, planis, cingulis transversis elevatis subdistantibus ornatis; apertura subquadrato-oblonga; plica parietali valida, mediana, transversa, conspicua; labro rectiusculo, intus lirato.

Hab. Hulu-Shan Bay; 3 fathoms.

This species is by no means typical, and should form a subgenus under the name of *Oscilla*.

Genus Menestho, Möller.

Menestho subula, A. Adams.

M. testa acuminato-subulata, alba, lævi, opaca, nitida; anfractibus $7\frac{1}{2}$, planis; apertura ovata, antice dilatata, postice acuminata; plica parietali obliqua, superiore, conspicua.

Hab. Hulu-Shan Bay; 3 fathoms.

The animal agrees with Möller's account of *M. albula*, having a narrow elongated foot, and very small eyes at the inner bases of the tentacles; but the tentacles are longitudinally folded, which may be implied in his expression "crassiusculis." The part termed the mentum by Lovén is very long, and extends from the head as far as the front of the protruded foot. The operculum is small, thin, horny, and subspiral.

Genus Syrnola, A. Adams.

Syrnola unilineata, A. Adams.

S. testa parva, subulato-pyramidali, fulva; anfractibus normalibus 4, planatis, ultimo magno, ventricoso, ad peripheriam rotundato, et linea unica rufo-fusca circumcincto; apertura late ovata; plica parietali mediana, conspicua; labro simplici, acuto.

Hab. Lo-Shan-kow, Shan-tung.

Genus Elusa, A. Adams.

Testa subulata, turrita; anfractibus multis, longitudinaliter plicatis. Apertura ovata, antice integra; labio plica parietali unica instructo; labro tenui, simplici.

This little genus of Pyramidellidæ may be likened to a *Terebra* with the aperture entire in front, with a single plait in the inner lip, and with plicate whorls.

Elusa teres, A. Adams.

E. testa rufo-fusca, subulata, nitida; anfractibus $8\frac{1}{2}$, planis, longitudinaliter plicatis; apertura elongatim ovata, postice acuminata, antice dilatata et rotundata; plica parietali valida, obliqua, conspicua; labro tenui, intus lævi.

Hab. Hulu-Shan Bay, Gulf of Lian-tung; 3 fathoms.

Genus Turbonilla, Risso.

1. *Turbonilla terebra*, A. Adams.

T. testa subulato-pyramidali, turrita, solida, alba, nitida; anfractibus normalibus 10, planis, longitudinaliter plicatis, plicis haud prominentibus, subdistantibus, interstitiis lineis elevatis decussatis, quasi valde punctatis; anfractu ultimo rotundato, plicis ad peripheriam evanidis, basi seriebus spiralibus punctorum ornata; apertura subquadrato-ovata; regione umbilicali impressa; labio recto, subreflexo.

Hab. Hulu-Shan Bay, Gulf of Lian-tung; 4 fathoms.

2. *Turbonilla cerina*, A. Adams.

T. testa subulato-pyramidali, turrita, solidiuscula, pallide fusca, nitida, quasi cerea; anfractibus normalibus 8, planis, longitudinaliter plicatis, plicis obliquis, subprominentibus, distantibus, interstitiis simplicibus; anfractu ultimo subangulato, plicis ad peripheriam desinentibus, basi lævi; apertura ovato-quadrata; labio recto, antice vix reflexo.

Hab. Gulf of Pe-chili; 5 fathoms (eight miles from the Pei-ho).

3. *Turbonilla scitula*, A. Adams.

T. testa subulato-turrita, alba, solida; anfractibus normalibus 7, planiusculis, longitudinaliter plicatis, plicis angustis, undulatis, confertis, interstitiis lævibus, plicis in anfractu ultimo ad peripheriam abrupte desinentibus, basi lævi; apertura subquadrata; labio recto, brevi, subincrassato.

Hab. Gulf of Pe-chili; 5 fathoms (eight miles from the Pei-ho).

4. *Turbonilla albella*, A. Adams.

T. testa subulato-turrita, tenuicula, albida; anfractibus normalibus 7, planiusculis, longitudinaliter plicatis, plicis angustis, obliquis, subdistantibus, interstitiis lævibus, plicis in anfractu ultimo ad peripheriam abrupte terminantibus, basi lævi; apertura subquadrata; labio recto, antice subangulato et expanso.

Hab. Ka-la-Hai, Shan-tung (in shell-sand): Hulu-Shan Bay, Gulf of Lian-tung; 4 fathoms.

5. *Turbonilla compta,* A. Adams.

T. testa subulato-turrita, tenuicula, pallide fusca; anfractibus normalibus 9, convexis, longitudinaliter plicatis, plicis angustis, undatis, confertis, interstitiis concinne punctatis, suturis profundis; anfractu ultimo rotundato, plicis ad basin extendentibus; apertura subcirculari; labio tenui, arcuato.

Hab. Hulu-Shan Bay; 4 fathoms.

6. *Turbonilla bifasciata,* A. Adams.

T. testa subulato-turrita, alba, tenuicula, opaca; anfractibus normalibus 8, convexiusculis, longitudinaliter plicatis, fasciis angustis pallide rufescentibus circumcinctis, plicis obliquis, regularibus, æquidistantibus, interstitiis simplicibus; anfractu ultimo rotundato, plicis ad peripheriam desinentibus, basi lævi, convexa; apertura subquadrata; labio reflexo et antice subexpanso.

Hab. Hulu-Shan Bay; 4 fathoms.

Genus Odostomia, Fleming.

1. *Odostomia pumila,* A. Adams.

O. testa ovata, tenuicula, rimata, alba, opaca; anfractibus normalibus 4, convexiusculis, ultimo magno, ad peripheriam rotundato; apertura ovata, antice producta; plica parietali superiore, parva, transversa.

Hab. Shan-tung (Lo-Shan-kow).

2. *Odostomia biconica,* A. Adams.

O. testa ovata, tenuicula, rimata, alba, opaca; spira conica; anfractibus normalibus 3, planis, ultimo conico, ad basin producto, ad peripheriam subangulato; apertura ovata, antice effusa; plica parietali superiore, parva, transversa.

Hab. Shan-tung (Lo-Shan-kow).

3. *Odostomia porcellana,* A. Adams.

O. testa ovato-conica, alba, semiopaca, solidula; anfractibus normalibus 3, convexiusculis; anfractu ultimo magno, ad peripheriam rotundato; apertura ovata, postice acuminata, antice angulata et producta; plica parietali parva, mediana, obliqua.

Hab. Shan-tung (Lo-Shan-kow).

4. *Odostomia bulimella*, A. Adams.

O. testa oblonga, profunde rimata, alba, solida; anfractibus normalibus 4, planis, suturis impressis; anfractu ultimo elongato, ad peripheriam rotundato; apertura oblonga, antice effusa et producta; labio recto; plica parietali superiore; labro margine rectiusculo.

Hab. Gulf of Pe-chili; 3 fathoms (mud).

5. *Odostomia brevicula*, A. Adams.

O. testa ovato-conoidali, alba, opaca, solidiuscula, vix rimata; spira brevi; anfractibus normalibus 2, ultimo ventricoso, ad peripheriam rotundato; apertura acuminato-ovata; plica parietali parva, transversa, mediana.

Hab. Shan-tung (Kala-hai).

6. *Odostomia lepidula*, A. Adams.

O. testa oblonga, alba, vix opaca; anfractibus normalibus 3, planis, ultimo magno, elongato, ad peripheriam rotundato, antice producto; apertura acuminato-ovata; plica parietali parva, obliqua.

Hab. Lian-tung (Hulu-Shan); 3 fathoms.

7. *Odostomia pyramidalis*, A. Adams.

O. testa pyramidali-conica, alba, vix opaca, solidiuscula; anfractibus normalibus 5, planis, suturis impressis; anfractu ultimo ad peripheriam vix angulato; apertura ovata, postice acuminata; plica parietali mediana, transversa, conspicua.

Hab. Shan-tung (Kala-hai); Lian-tung (Hulu-Shan).

Ta-Lien-Whan, China,
August 1, 1860.

XXXVI.—*On certain Coleopterous Insects from the Island of Ascension.* By T. Vernon Wollaston, M.A., F.L.S.

There is probably no spot in the world more utterly hopeless to a naturalist than the island of Ascension. My friend Mr. Bewicke of Madeira, who spent a week there in April last (*en route* to the Cape of Good Hope), says, "Ascension is, I think, nearly barren of interest to an entomologist—indeed, to any one;" and after having been only a couple of days on shore, he wrote as follows: "We landed on this heap of dust and cinders on Friday, and I never saw a place I was so anxious to leave. How men and women sustain life here is to me inconceivable: everything, except the shrubs on the 'green mountain,' is indescribably dreary: the thermometer stands high (from 80° to 90°), but the heat is nevertheless very endurable." He then referred to the house in which he was staying as "distinguished by one tree about 6 feet high, and three aloes of very doubtful vitality," adding, "I do not believe there is another shrub or weed of any sort within two miles, except the few flowers grown in officers' verandahs." In such a locality, therefore, it is not surprising that insect-life (like all other life) should be at its lowest ebb, and that, during his week's sojourn there, and in spite of much perseverance, only *eleven* species of Coleoptera should have rewarded Mr. Bewicke's careful research.

In the present paper I propose to enumerate these eleven exponents of the beetle tribe which so signally crowned the labours of Mr. Bewicke. Inasmuch as, however, we may be almost certain, from their general character and modes of subsistence, that nearly the whole of them (if not, indeed, *absolutely all*) must have been recently naturalized, I may add that they would be totally unworthy of notice were it not as a voucher for the utter sterility of this miserable spot, and to warn naturalists from ever attempting to go there again for the purpose of collecting. Even the "green mountain," as it is called, which rises 2800 feet above the sea, and is covered in parts with introduced shrubs, appears almost destitute of insect-life; for Mr. Bewicke assures me that three specimens of the common European *Philonthus scybalarius* (now in my possession) were positively "the only species" he "found during a long day, amongst imported plantations, on the summit of the island"! Indeed, judging from his account, the species which would seem to have established themselves more completely, and have become really abundant, are the *Dermestes cadaverinus*, which swarms in the houses and under stones (particularly during the turtle season), and the two universally distributed *Alphitobii*, which, however (I conclude from the entire absence of their proper food), Mr. Bewicke captured in profusion "out of the dung of sea-birds, miles from habitable parts."

The only Coleoptera of any interest in the following list are the *Attagenus Gloriosæ*, *Oxyomus Heinckeni*, *Xyletinus ferrugineus*, *Cryphalus aspericollis*, and the (new) *Pentarthrum cylindricum*; but since it is pretty evident, in Mr. Bewicke's opinion, that the last, at any rate, has been introduced ("perhaps from the Cape of Good Hope or the Mauritius"), and since it is highly probable that (wherever it came from) the preceding one must have come with it, whilst the first three belong to groups which are readily disseminated through the medium of commerce, there remains *nothing whatever* for Ascension to boast of except the six other, *more or less mundane*, forms! In fact, of the eleven species enumerated below, we may safely say that seven of them are *certainly*, and the remaining four (*Oxyomus*, *Xyletinus*, *Cry-*

phalus, and *Pentarthrum*) *almost* certainly, imported. But let us take them *seriatim*.

Fam. Dermestidæ.

Genus Dermestes.

Linnæus, Syst. Nat. ii. 561 (1767).

1. *Dermestes cadaverinus*, Fab.

Dermestes cadaverinus, Fab., Syst. Ent. 55 (1775).
—— ——, Oliv., Ent. ii. 9. 3 (1790).
—— *domesticus*, Gebl., Germ. Spec. 85. 143 (1824).
—— *cadaverinus*, Erichs., Nat. der Ins. Deutsch. iii. 430 (1848).

Many examples of this *Dermestes* were brought to England by Mr. Bewicke. It seems, from his account, to be a most abundant insect at Ascension, "swarming in houses and under stones," and being "pretty generally distributed over the island." According to Mr. Bewicke, "the people call them '*hardbacks*,' and say that they only appear in the turtle season." After a careful examination of them, I cannot see that they differ in any respect from the *D. cadaverinus* of Fabricius—a species which was originally described by him, in 1775, from *St. Helena* specimens in the Banksian collection, and which has been recorded, also, from Europe, South America, Mexico, Otaheite, the East Indies, and Arabia. It belongs to the second of Erichson's Sections, in which the *third and fourth* abdominal segments of the males (instead of the fourth only) are furnished beneath with a little circular *fossette* armed with a cone (or convergent fasciculus) of powerful bristles. In specific details, it may be known from its several allies by its (black) upper-surface being uniformly and rather densely clothed with a coarse yellowish-cinereous pile, by its rather elongate (and slightly narrow) outline, and by its abdominal under-segments having, each of them, two somewhat rounded patches of darker pile in their centre (gradually *diminishing* and *approximating* in each successive segment towards the apex), and a sublunate one at either lateral edge.

Genus Attagenus.

Latreille, Gen. Crust. et Ins. ii. 32 (1802).

2. *Attagenus Gloriosæ*, Fab.

Anthrenus Gloriosæ, Fab., Syst. Eleuth. i. 107 (1801).

Five specimens of this prettily fasciated *Attagenus* were taken by Mr. Bewicke at Ascension. It is an almost cosmopolitan insect, being easily diffused through the medium of commerce. It occurs principally in India and Eastern Africa; but I am informed by my friend Dr. Schaum of Berlin that it has also been found in America.

Fam. Aphodiadæ.

Genus Oxyomus.

(Eschsch.) De Casteln., Hist. ii. 98 (1840).

3. *Oxyomus Heinekeni*, Woll.

Oxyomus Heinekeni, Woll., Ins. Mad. 228 (1854).
—— ——, Woll., Cat. Mad. Col. 79 (1857).

Two males of the present *Oxyomus* were amongst Mr. Bewicke's captures at Ascension; and, not having until now observed the sexual characters of the species, I had at first imagined them to be distinct from the ordinary Madeiran one; but having just looked more closely into specimens of the latter, I perceive in them also small structural differences pertaining to the male sex which are not noticed in the 'Insecta Maderensia.' Thus, the males are not only more shining than the females, but the external edge of their front tibiæ is much more powerfully tridentate, whilst their four hinder ones have their spurs more elongate and subflexuose, and their outer apical angle produced into a much longer and acuter spine. The elytra of the two examples from Ascension have the appearance of being a trifle more convex and shortened posteriorly than those of the Madeiran ones (so as scarcely to conceal the pygidium); but I think this is perhaps more apparent than real, their abdomen having probably been inflated in the spirits of wine, and not having completely collapsed in drying.

Fam. Cleridæ.

Genus Necrobia.

Olivier, Entom. iv. 76 *bis* (1795).

4. *Necrobia rufipes*, Thunb.

Anobium rufipes, Thunb., Nov. Ins. Spec. i. 10 (1781).
Dermestes rufipes, Fab., Ent. Syst. i. 230 (1792).
Corynetes rufipes, Klug, Abh. der Wissensch. Akad. zu Berl. 340 (1840).

This widely distributed insect appears to have established itself at Ascension, from whence I have many examples collected by Mr. Bewicke. I have taken it abundantly in the Canary Islands, and at Mogador, on the opposite coast of Morocco; and it was likewise found by Mr. Bewicke at the Cape of Good Hope. The Ascension specimens are, on the average, of rather a small size, and the subclaval joints of their antennæ are not so distinctly dark as in the ordinary individuals—occasionally only the club itself being black, whereas in general the *three* articulations preceding it are as much darkened as the clava.

Fam. Anobiadæ.

Genus Xyletinus.

Latreille, Règne Anim. (éd. 2) iv. 483 (1829).

5. *Xyletinus ferrugineus*, n. sp.

X. oblongus, rufo-ferrugineus, nitidus, dense flavo-cinereo-sericeus et ubique (oculo fortiter armato) subtilissime punctulatus; prothorace antice subtruncato, postice rotundato (angulis postice valde rotundatis); elytris haud striatis; antennis gracilibus, testaceis.

Long. corp. lin. vix $1\frac{1}{2}$.

Owing to the imperfect state of the three specimens of this insect which were amongst Mr. Bewicke's captures at Ascension, I have been unable to examine their palpi and feet, and cannot therefore pronounce for certain whether they are typical *Xyletini*, or whether they should not rather be referred (as their posteriorly rounded prothorax, subcylindric densely pubescent bodies, unstriated elytra, and general aspect would lead me to suspect) to that aberrant section of the group of which I have recorded * four exponents from the Canary Islands. At any rate, whether true *Xyletini* or not, I cannot identify them with any described *species*, though it is far from impossible they may have been elsewhere characterized, and were merely an accidental importation into Ascension. In external contour and hue they have very much the appearance of my *X. desectus* from Grand Canary, but are rather smaller, and more finely and closely punctulated than that insect.

Fam. Tomicidæ.

Genus Cryphalus.

Erichson, in Wiegm. Archiv, ii. 61 (1836).

6. *Cryphalus aspericollis*, Woll.

Cryphalus aspericollis, Woll., Ann. Nat. Hist. (ser. 3) v. 365 (1860).

A single example of this very minute insect, which agrees precisely † with the Madeiran and Canarian specimens, was found by Mr. Bewicke at Ascension. I have no note relative to its capture; but since Mr. Bewicke did not mention having searched

* *Vide* pp. 13–15 of this volume.

† The three minute joints (following the enlarged basal one) of the funiculus of this species are so excessively small, that with my ordinary microscope (although I had mounted carefully one of the antennæ in balsam) I could not detect more than two of them; and therefore, despite the exact outward resemblance of the insect with examples from Madeira and the Canaries, I somewhat hesitated in identifying it absolutely with them. But on placing the object, lately, beneath the highest power of the admirable instrument at the British Museum, these three infinitesimal articulations came out at once clear and well-defined.

any other piece of rotten wood except the "decayed box" in which *Pentarthrum cylindricum* was found (but, on the contrary, implied rather the absence of any opportunity for so doing), I have but little doubt that it must have been taken in company with the *Pentarthrum,* and is therefore not only (like it) an imported species, but one which was introduced from the *same country,* wherever that may be. The fact, however, of its being conspecific with the Madeiran and Canarian insect, whilst the other one is congeneric with the *P. Huttoni* from the west of England, would go far to render it, at any rate, *improbable* that the "box" in question could have come from either the Mauritius or the Cape of Good Hope.

Fam. **Curculionidæ.**

Genus Pentarthrum.

Woll., Ann. Nat. Hist. (ser. 2) xiv. 129 (1854).

7. *Pentarthrum cylindricum,* Woll.

Pentarthrum cylindricum, Woll., Trans. Ent. Soc. Lond. (1861).

A full description of this insect (the only new species amongst Mr. Bewicke's *collectanea* at Ascension) has been given in my paper on "the Atlantic *Cossonides,*" lately published in the 'Transactions of the Entomological Society of London;' and I will therefore merely quote from that memoir the following observations concerning its capture:—"Many specimens of it were detected by Mr. Bewicke in the decayed wood at the bottom of some boxes which he *suspects* had been used for importing plants into the island—*probably* either from the Cape of Good Hope or the Mauritius. It follows therefore that the insect is but a doubtful native of Ascension, and that its presence there may have been only accidental. Still, its close affinity with the British species, and its near relationship with the two *Mesoxeni* from Madeira and Teneriffe, would make it at least unlikely that so remote a spot as the Mauritius should be its proper *habitat*—a conclusion which its admixture (at Ascension) with a single example of the minute *Cryphalus aspericollis,* which also occurs in both the Madeiran and Canarian groups, would not tend to invalidate."

Fam. **Tenebrionidæ.**

Genus Gnathocerus.

Thunberg, Act. Holmiens. 47 (1814).

8. *Gnathocerus cornutus,* Fab.

Trogosita cornuta, Fab., Ent. Syst. Suppl. 51 (1798).

Cerandria cornuta, Lucas, Col. de l'Algérie, 345 (1849).
—— ——, Woll., Ins. Mad. 490 (1854).

One specimen of this universally imported insect was amongst Mr. Bewicke's captures at Ascension. It is perfectly unimportant, being of course naturalized (if indeed truly naturalized at all) through the medium of commerce.

Genus Alphitobius.

Stephens, Ill. Brit. Ent. v. 11 (1832).

9. *Alphitobius diaperinus*, Kugel.

Tenebrio diaperinus, Kugel., in Panz. Fna Ins. Germ. 37. 16 (1797).
Alphitobius mauritanicus, Steph. [nec Fab.], Ill. Brit. Ent. v. 11 (1832).
—— *diaperinus*, Woll., Ins. Mad. 498 (1854).
—— ——, Woll., Cat. Mad. Col. 154 (1857).

The present insect and the following one are likewise, of course, importations into Ascension, being both of them species universally diffused through the medium of commerce. They have a slight interest, however, attached to them in this instance, on account of the singular fact communicated by Mr. Bewicke, that they were "taken abundantly [not, as we should have expected, in houses and amongst merchandise, but] in the dung of sea-birds, *miles from habitable parts*,"—which is certainly a very remarkable *habitat* for these common *Alphitobii*!

10. *Alphitobius mauritanicus*, Fab.

Tenebrio mauritanicus, Fab. [nec Linn. 1767], Ent. Syst. i. 113 (1792).
—— *Fagi*, Panz., Fna Ins. Germ. 61. 3 (1799).
Alphitobius picipes, Steph., Ill. Brit. Ent. v. 11 (1833).
Heterophaga mauritanica, Lucas, Col. de l'Algérie, 341 (1849).

At Madeira both of these widely-imported *Alphitobii* have become tolerably common; but, as yet, I have observed only the *A. diaperinus* at the Canaries. M. Lucas states that the present insect is abundant in Algeria *under stones*; so that it is possible that it may be more easily naturalized in the open country than its ally,—though it would appear, from Mr. Bewicke's account, that both species indicate at Ascension this capability for *self-establishment in aperto*.

Fam. **Staphylinidæ.**

Genus Philonthus.

(Leach) Steph., Ill. Brit. Ent. v. 226 (1832).

11. *Philonthus scybalarius*, Nordm.

Philonthus scybalarius, Nordm., Symbol. 94 (1838).
—— *varians*, var. *b*, Erichs., Gen. et Spec. Staph. 470 (1839).
—— ——, Woll., Ins. Mad. 583 (1854).
—— *scybalarius*, Kraatz, Nat. der Ins. Deutsch. ii. 601 (1857).

As already stated, three individuals of the common European

P. scybalarius were captured by Mr. Bewicke, amongst imported shrubs, on the "green mountain,"—being, moreover, the only *species* which he obtained during a long day's research in what would seem to be the most promising collecting-ground of Ascension! There can be no doubt that it is a naturalized species, being an insect easy of transportation, and one which has established itself at the Cape of Good Hope, the West Indies, and in other distant localities. It agrees sufficiently well with examples which I have taken at Madeira and the Canaries; and Mr. Janson, to whom I submitted it for comparison, remarked that it was slightly larger than any of his British specimens, and that the punctures on the elytra were perhaps a trifle deeper, and the femora somewhat paler in hue, but that in all other respects it agreed exactly with its more northern representatives.

Such are the eleven Coleoptera captured by Mr. Bewicke in this miserable island. The only other *insect* which he took is one of which Ascension may be proud—the original *Cimex lectularius*!

XXXVII.—*On the Genus* Cornuspira, *belonging to the* Monothalamia; *with Remarks on the Organization and Reproduction of the* Polythalamia. By Professor MAX SCHULTZE*.

THE memoir of Williamson "On the Recent Foraminifera of Great Britain," published by the Ray Society in 1858, induces me to make some observations on the Rhizopod genus *Cornuspira* established by me.

I have given this name to some previously unknown calcareous-shelled Rhizopods which appear to be very widely diffused in many seas, and of which the shells exactly resemble that of a small *Planorbis*. In my book "Ueber den Organismus der Polythalamien" (Leipzig, 1854), at p. 40, I characterized the new genus as follows:—

"Shell calcareous, wound like a *Planorbis*-shell, solid or finely porous, disciform, similar on both sides, enclosing a *simple, undivided* cavity." From the absence of any division into chambers, therefore, the genus belongs to the Monothalamia, which is the name that I give, in opposition to that of Polythalamia, to those of the shelled Rhizopods (Foraminifera) in which internal partitions, or indications thereof, are wanting. I also described two species of this genus, *Cornuspira planorbis* and *C. perforata*, and figured them in plate 4. figs. 21 and 22.

* Translated by W. S. Dallas, F.L.S., from Wiegmann's Archiv, 1860, p. 287.

At that time I was only acquainted with specimens from Mozambique, Trieste, and the West Indies. I had not seen living examples; but specimens preserved in spirit allowed the animal contents of the shell (the body of the Rhizopod) to be distinctly recognized.

Further inquiries, made as opportunities offered, brought me examples of the same genus from many other places; and I have subsequently, at Trieste, observed many living individuals which crept about briskly. They may be obtained from almost any sponge freshly taken from the sea, during the pulling to pieces of which, quantities of small shelled and shell-less Rhizopods always make their appearance. It is by no means necessary to take sponges brought from the bottom of the sea, in which contamination by sand and mud might be the cause of the simultaneous occurrence of Rhizopoda; but even the species growing close beneath the surface of the sea—such, for example, as the *Grantia* (*Sycon ciliatum*, Risso) which abounds upon the woodwork of the baths in the harbour of Trieste—furnish, when pulled to pieces, great numbers of Mono- and Polythalamia, especially in a young state.

Cornuspiræ have also been discovered in a fossil state, and described by Reuss*.

Williamson found several species on the English coast. He, however, rejects the name *Cornuspira*, and replaces it by *Spirillina*, giving as the author Ehrenberg. The place in which Ehrenberg first describes his *Spirillina*, and which indeed is cited by Williamson, is in the 'Abhandlungen der Akademie der Wissenschaften zu Berlin' for the year 1841. In the memoir on the "Distribution and Influence of Microscopic Life in South and North America," p. 402, the genus "*Spirillina*, Kieselspirale," arranged under the Polygastrica, is thus characterized:—"Genus e familia Arcellinorum? Lorica tubulosa spiralis *silicea*, Planorbem referens (=Difflugia lorica silicea);" and further on is added, "Acid had no action on the shell." From this, and from the figure given by Ehrenberg (pl. 3. fig. 41) of the only species, "*Spirillina vivipara*," described by him in the place cited, we have to do with a shell similar in form to our *Cornuspira*, but, according to Ehrenberg's repeated assertion, of *silicious* and not *calcareous* nature. As, however, my genus *Cornuspira* was founded for animals with a calcareous shell, and also, according to Ehrenberg's nomenclature, belongs, not to the Polygastrica, but to the Polythalamia (or rather Monothalamia), it cannot possibly be regarded as identical with *Spirillina*, Ehrbg.; and as Williamson's *Spirillinæ* are Foraminifera, and therefore cal-

* Sitzungsber. der Wiener Akad. der Wiss. 1860, "Die Foraminiferen der westphälischen Kreideformation."

careous-shelled, they must be called *Cornuspiræ*, and not *Spirillinæ*.

If the figure given by Ehrenberg of his *Spirillina vivipara* be such that Williamson was to a certain extent justified in putting it with my figures of *Cornuspiræ*, and supposing that Ehrenberg might have deceived himself with regard to the presence of silica (in which case I should likewise have had no doubt as to the identity of the two forms), still the separation of the two genera must be most decidedly retained since Ehrenberg has recently described several new species of his genus *Spirillina*, and now arranges them among the Polycystinæ, therefore again with organisms possessing a silicious lorica*. These descriptions are of far later date than my book on the Polythalamia; and as Ehrenberg on this occasion does not mention my genus *Cornuspira* (although, as we shall soon see, it was well known to him), there can be no doubt that he maintains the genus *Spirillina* as perfectly distinct from *Cornuspira*, and that Williamson therefore cannot reckon upon Ehrenberg's acquiescence when he places the two generic names together as synonyma. There are, in the sea, Planorbiform Rhizopodous shells of calcareous nature; these are to be separated, as *Cornuspira*, mihi, from similar shells of silica, the *Spirillinæ* of Ehrenberg.

Ehrenberg, indeed, has also found something to urge against my genus *Cornuspira*†. He says that it is upon young states of larger Polythalamia, which are abundant everywhere, that I have founded a new genus, to which all title to stand is denied; and the indiscretion with which I have fallen into this error is the greater, as I myself have admitted that the Agathistegia in their earliest stages are not distinguishable from my *Cornuspiræ*.

It is indeed difficult to believe that Ehrenberg can have been serious in making this assertion, which, as we shall see, is quite untenable. It is clear that we have here to do, not with interpretations or opinions upon organic structure—not with the organization of the Rhizopoda or the like (upon which, as is well known, my opinions and Ehrenberg's are very wide apart, and to dispute about which with Ehrenberg is the less my design, as he has never adduced any new observations upon the soft parts of the Rhizopoda in confutation of my statements)—we have here to do only with shell-formation. Here Ehrenberg moves in a domain in which he has been actually and continuously active, and in which he may lay claim to the reputation of a weighty judge.

* Monatsber. der Akad. der Wiss. zu Berlin, 1857, pp. 574, 560; 1858, p. 35: see also p. 332.

† Monatsber. 1858, p. 332.

This causes the objection by which the genus *Cornuspira* is to be got rid of, to appear the more remarkable and incautious. It is literally as follows :—" The small calcareous-shelled *Planorbis*-like forms which occur in many species, and not unfrequently in the sea, I have recognized partly as small worm-shells of Annulate worms, such as *Serpula spirorbis*; but they were partly undoubted young states of Polythalamia of the most different kinds. Of these young states of the larger Polythalamia, which are abundant everywhere, Professor Max Schultze has recently formed the new genus *Cornuspira*, although the author himself says (p. 10) that the Agathistegia, in their earliest youth, are not to be distinguished from his *Cornuspiræ*, and he has had no opportunity of observing a living animal. They should therefore have been indicated with doubt as young Agathistegia, and not as a new genus. But—they increased his Monothalamia."

Ehrenberg therefore asserts that the *Cornuspiræ* are young states of larger Polythalamia of the most different kinds. The names of these kinds are not mentioned, with the exception of the Agathistegia, to which I had already directed attention, and therefore must have had reasons for maintaining the distinction, notwithstanding the affinity. As connected developmental series of Polythalamia, to which we might refer in testing Ehrenberg's assertion, are still very little known, we are driven, in investigating the question of the form of the young states of the larger Polythalamia, to deduce this from the forms of the shells in the mature animals, which may be effected with great certainty. My numerous observations of *living* young Polythalamia on the coasts of the Adriatic and in Heligoland, the study of their gradual growth, together with numerous comparative measurements of the shells of young and old individuals of the same species, have led to the result that the form and size, especially of the *internal space* of the youngest chambers, do not subsequently change essentially, and that therefore every Polythalamion at one time in its youth had the appearance which will be found subsequently in its oldest, first chamber, or the complex of several of them. This, indeed, does not require to be specially proved; but it follows of itself, from the processes of growth of the Polythalamia (for example, in a spiral Rotalide), that we need only look at the form of the innermost, oldest chambers, to know the form of the young state. In thick-shelled species we resort to cutting. It is exactly the same as with a chambered *Nautilus*-shell, or, not taking into consideration the dissepiments, with any spiral shell. If therefore the *Cornuspiræ* be the young of larger Polythalamia, the latter must exhibit a commencement of shell-formation like a *Cornuspira*; the centre of the spire of the larger Polythalamia (and, indeed, belonging to different genera according to Ehrenberg), must resemble a *Cornuspira*. As is stated in the passage above quoted of my book on the Polythalamia, the two species of the genus in question described by me occur with as many as six to seven whorls. They are *Planorbis*-like shells, without any division into chambers in the interior. Now, are there any chambered Rhizopod-shells, Polythalamia, of which the centre is such a *Cornuspira*? This Ehrenberg had to prove; at least, he ought to have adduced a single well-ascertained case of the kind, if he wished to combat successfully against the validity of the genus *Cornuspira*. Ehrenberg has adduced none, and could not adduce any; for, in fact, there are no Polythalamia with such a shell. This Ehrenberg knows as well as I do, and it must consequently be doubtful whether his assertions are only to be called "incautious."

But as regards the young Agathistegia (*i.e. Miliolidæ*), already compared by myself with young *Cornuspiræ*, Ehrenberg's mode of bringing these in to get rid of the genus *Cornuspira* is positively absurd. I am already accustomed to Ehrenberg's citing my book on the Polythalamia only when he attacks it, but not mentioning my name when his investigations furnish a confirmation of mine. Once already I have protested against this proceeding, at the same time publishing some examples of it*.

My statements upon the development of the *Miliolidæ* (*Agathistegia*, D'Orb.) are so complete and definite, that any possibility of confounding the young with *Cornuspiræ* after they have attained a certain age is prevented. In their earliest youth they are very similar, but as soon as more than a single complete whorl is formed, characteristic differences make their appearance. In the *Miliolidæ* at this age, the first or even the second division of the chambers shows itself; and the number of these divisions now increases by one with every half whorl, so that *Miliolidæ* with six to seven whorls already consist of twelve or more chambers. *Cornuspiræ* with the same number of whorls, on the contrary (and this is the distinguishing character), have not the smallest indication of partitions; nor do they acquire them with a still larger number of whorls, as appears from the *Cornuspira cretacea* described by Reuss from the Westphalian chalk, in which from ten to fifteen whorls have been counted.

From this, we see upon what principles Ehrenberg suppresses genera: somewhat as if the conchologist were to include the shells of *Planorbis* and *Spirula* in one genus on account of the similarity of their winding—or as if any one were to unite all the Entomostraca, of which the young cannot be distinguished from

* Müller's Archiv, 1856, p. 167.

each other, in one genus. I think it is clear from this that Ehrenberg's correction, that I should have indicated the *Cornuspiræ* questionably as young Agathistegia, and not as a new genus, is destitute of all foundation, and that the addition, "But—they increased his Monothalamia!" (which would lead the reader to suspect that, for the sake of a preconceived opinion, I would have forced nature) throws no very favourable light upon the love of truth of its originator.

The irritated frame of mind in which Ehrenberg evidently opposes the entire division of Monothalamia established by me is further distinctly expressed in a remark attached to a quotation from my book at p. 332 of the 'Monatsberichte' for the year 1858. It commences thus:—"I can only repeat my regret that in this work the *Difflugiæ* and *Arcellæ* of the Polygastrica are confounded with the Polythalamia; and every physiological base for a systematic arrangement of the allied forms is thereby set, not in progress but in contradiction (*sic*!). In it, moreover, the name *Miliolidæ* has again received a new application to which it has no right, as, with D'Orbigny, it only indicates one section of the Agathistegia in question: and as regards M. Schultze's Monothalamia, his representation leaves it wholly unproved that, after the deduction of the Polygastrica, they are not all young of the other Polythalamia—especially as the mode of reproduction of none of these forms is placed beyond doubt, and it is expressly stated that some are not to be distinguished from the young of others."

Although Ehrenberg will certainly not be able to establish his opinion of the necessity of a separation of the *Arcellæ* and *Difflugiæ*, as Polygastrica, from *Gromia, Lagynis, Euglypha,* and other Rhizopoda included by me in the family *Lagynidæ,* and even the *Cornuspiridæ* must be allowed to stand untouched, I may perhaps afford him a certain feeling of satisfaction by adducing the following interesting fact with regard to one family of Monothalamia. The *Orbulinidæ,* including the single genus *Orbulina,* will probably have to be suppressed,—not, however, because the *Orbulinæ* have been recognized, as Ehrenberg prophesied, as the young of Polythalamia. Recent observations prove that *Orbulina* is a separated and independently subsisting chamber of a *Globigerina*. The first observations relating to this were made by Pourtales, and published in 'Silliman's American Journal,' vol. xxvi. p. 96 (reprinted in the 'Annals and Magazine of Natural History,' 1858, vol. ii. p. 235). After calling attention to the great similarity (previously observed by others) in the structure of the shells of *Orbulina* and *Globigerina,* the above-mentioned naturalist reports that in deep-sea soundings (which, as is well known, contain Polythalamia of the two genera named in remarkable abundance) he frequently found *Orbulinæ*, each of which contained a *Globigerina* in its interior. And a confirmation of this occurrence was communicated to me by Dr. August Krohn, who, without knowing of the observations of Pourtales, saw exactly the same thing in Madeira, and, indeed, in living *Orbulinæ* captured at the surface of the sea in a muslin net.

Now as the one larger orifice of the *Orbulina*-shell, which both Ehrenberg and D'Orbigny regard as something constant, is scarcely large enough, even according to Ehrenberg, for a *Globigerina* with a whole lot of chambers and long spinous processes of the shell (which, according to Pourtales, reach to the inner surface of the *Orbulina*-shell) to walk into it, and immigration in a young state and development in the *Orbulina* in the manner of the Gall-flies is unheard of amongst the Polythalamia, and extremely improbable, considering the undoubted and, as proved by the structure of the shell, close relationship of the two genera, the *Globigerina*, as both Pourtales and Krohn believe, will have been produced within the *Orbulina*. Pourtales does not discuss any further developmental connexion between the two. To me the supposition appears most probable that the last chamber of the *Globigerina*, when it has attained a certain age and size, separates like the proglottis of a *Tænia*, and after living in a free state for a longer or shorter period, effects the reproduction. In this way the *Globigerina* is produced in its interior.

That Polythalamia bear living young which resemble the parent, I have proved from Gervais's first communications on a Miliolide*. I have recently observed the same mode of reproduction in several specimens of a Rotalide, as I will describe below. Ordinarily, it appears, the reproduction of the Polythalamia—the birth of living young—takes place without the individual chambers becoming independent. In the *Globigerinæ*, however, whose globular chambers can only touch each other by a small part of the surface of the sphere, and in which, no doubt, a separation may very readily occur even by mechanical causes, the isolation of one or more chambers appears to precede the reproduction. Considering the perfectly similar structure of the shells of *Orbulina* and *Globigerina*, I regard this explanation of the singular discovery of Pourtales and Krohn to be the simplest and most natural.

On the supposition of a derivation of the *Orbulinæ* from the *Globigerinæ*, Ehrenberg also is justified with regard to the larger opening of the *Orbulina*-shell. As the chambers of the *Globigerinæ*, as of the *Rotalidæ*, communicate by a large orifice, the

* Müller's Archiv, 1856, p. 165.

separated chamber must also exhibit a similar one. But if I could not find a large opening in many *Orbulinæ*, at which Ehrenberg is so much astonished, especially as D'Orbigny had already recognized and figured it (which, I may say in passing, is not of the least importance in my eyes), I will only indicate that possibly, after the *Orbulina* has been long swimming freely about, the orifice may diminish, or become obliterated, and, secondly, that perhaps a commencing obliteration of the orifice of communication may be connected with the separation of the last chamber of the *Globigerina*. In any case, as I must remark in opposition to Ehrenberg, this orifice, which moreover has also been missed by others*, is not of much importance, because the whole surface of the *Orbulina* is permeated by innumerable large and small pores, from which the protoplasmic filaments issue; and these, as is shown by *Polystomella strigilata*, can collect nutriment even without the reception of larger morsels into the interior of the body of the Rhizopod.

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I have recently incorporated some observations upon the nature of the Rhizopod-body, in a memoir treating of cells and protoplasm in the animal body, which will shortly appear in the 'Archiv für Anatomie und Physiologie' of Reichert and Du Bois-Reymond, under the title of "On Muscular Corpuscles, and what is to be called a Cell." I believe that in this I have materially simplified the difficult question as to the nature of the so-called *sarcode* of the body of the Rhizopods, by proving that this substance is to be regarded as identical with the protoplasm of cells, with which it must then also share the name. This may be the place to give some indications of the relationship of the substances mentioned.

Protoplasm is cell-substance, or, as the botanists say, cell-contents-substance, but not always the whole substance of the cell-contents. It is a thickly gelatinous mass, consisting of a homogeneous, limpid basement substance and imbedded granules, and is albuminous in its chemical nature. In many vegetable cells, especially of large size, the protoplasm of the cell separates itself sharply from another, aqueous part of the cell-contents. The aqueous part first makes its appearance in so-called vacuoles of the protoplasm, until, by the further growth of the cell, during which the protoplasm does not increase in proportion, it fills the greater part of the internal space. The protoplasm then forms only a thin stratum on the inner surface of the cellulose-wall, envelopes the nucleus, and stretches, usually in separate threads, through

* Williamson says, at p. 2 of his work already referred to, that the orifice is often not visible.

the cavity of the cell. The protoplasm is the most important substance of the cell; in it the functions of the latter are concentrated; in it exclusively are manifested all the chemical and morphological changes which characterize the various phases of cell-life. At the same time, inasmuch as it can produce on and from its surface membranous and other matters of many kinds, protoplasm is apparently quite exclusively the tissue-forming substance. Protoplasm is also contractile.

It is only by such suppositions that the movements in the interior of cells (for example, the well-known cells of *Tradescantia*, and, I believe, even of the *Charæ*) can be explained. The nature of the movement, the stream of granules, the anastomosis of the threads (when a net of protoplasm-fibres exists in the cell), all are in favour of the belief that the origin of the movement lies in the protoplasm itself, and not exterior to it. It is only by the assumption of a contractility of the protoplasm that the changes of form of individual cells, the *Amœba*-like movements of the *Gregarinæ*, of the lymph-corpuscles in the blood, of individual ligament-cells, of the cells in the hearts of embryos, &c., can be understood.

With this contractility of the protoplasm, changes of form of entire cells are, of course, hindered, or rendered quite impossible, by the presence of a rigid membrane. But the less perfectly the surface of the protoplasm is solidified into a membrane—the nearer the cell remains to its original membraneless condition, in which it only forms a naked mass of protoplasm with a nucleus, the more freely and unobstructedly can the movements be manifested. If such a cell be an independent organism, the protean changes of form—the variation of the external form caused by the contractility of the mass of protoplasm—manifest themselves to us most strikingly. Thus we come to the *Amœbæ*, of which the unicellular nature is at least very probable, as transitions to the *Gregarinæ* may be traced. It has been attempted to adduce the contractile vesicle as an obstacle to this view, and to the explanation of the *Amœbæ* as unicellular organisms. I cannot see in this an essential obstacle; for if protoplasm be contractile, as can hardly now be doubted, the possibility of the formation of a specially contractile space (a cavity contracting rhythmically) is given*.

* With this view we may very well bring into connexion the fact that there are *Amœbæ* which receive nourishment only at a determinate spot on the body. The cortical layer of the protoplasm need only condense a little, in its tendency to the formation of membrane; and the reception of foreign bodies, in external juxtaposition, into the interior will at once take place with less facility. But if, as in such cases will happen, one spot in the cortical layer of the protoplasm remains in its original soft state, this becomes the "mouth." Nay, it may come to the formation of a firm membrane, and

Now, I regard the contractile substance of all the larger Rhizopoda as such naked, free, contractile protoplasm. Whether it has been produced from one or several cells is a matter of indifference at present; it is *protoplasm*, and thus its nature and origin are characterized. It is by no means improbable that in individual cases it may have been produced by the coalescence of several naked masses of protoplasm with nuclei—that is, from several cells; but this coalescence is at any rate so complete, that only the number of the nuclei, which would probably be persistent in this case, could indicate that of the previously existing separate cells; in the protoplasm itself no division into cells is to be perceived. For as the coalescence of the processes outside the shell is complete (as is shown by the observation of any *Gromia*, and has been confirmed repeatedly since my first detailed statements), and as this coalescence exactly resembles that of the protoplasm-threads in vegetable cells, of course, if several originally distinct masses of protoplasm contribute to the formation of the contractile mass of the body of a Rhizopod, these will become completely amalgamated to form a homogeneous mass. For whenever protoplasm coalesces—whenever the individuality which a mass or thread of this substance possesses during life, and endeavours to preserve externally with a certain degree of obstinacy, is overcome, we can no longer speak of an individuality in the coalesced protoplasm-masses.

To give a well-ascertained example of such coalescence of membraneless cells, I may refer to *Æthalium septicum* among the Myxomycetes. According to De Bary's statements*, which I can confirm, the structures of this name occurring in tanners' bark consist of a substance like the *Amœbæ*; to express their nature with perfect clearness, they are naked protoplasm-masses, of course with the proper nuclei. They are sometimes large, sometimes small; they divide and coalesce as is required by the soil upon which they move, and internal circumstances of the substance, which are beyond the sphere of observation. The *Amœba*-like movements are perceptible under the microscope at every free margin; and if we succeed in isolating very lively substance in a capsule with water, it presents the most remarkable

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the cell retain its "mouth:" there remains an orifice in the cell-membrane through which the protoplasm communicates with the external world. The *Difflugiæ*, *Euglyphæ*, and all Monothalamia may be explained as cells of this kind, with a membrane, and an opening in the latter. Such cells also occur in higher organisms. E. Brücke, and, after him, Brettaner and Steinach have regarded the epithelial cells of the intestine in this light, and, it appears to me, quite correctly.

* Siebold and Kölliker's Zeitschrift, Bd. x. p. 88; Ann. and Mag. Nat. Hist. vol. v. 3 ser. p. 233.

spectacle in the world. The mass of protoplasm, which we will suppose to be of the size of a pea, soon spreads over the glass in the form of a membrane, emits processes which unite like a net, and in the course of a short time covers a surface of several square inches with a network which forms coarse meshes in one place, in another a fine filigree, and fills the observer with astonishment as it slowly but constantly changes. In this way the mass of protoplasm creeps along spontaneously from the place assigned to it. Then particular parts of the network again coalesce to form thicker balls, and separate themselves entirely, to commence the spectacle again on their own account. Or if they be divided artificially, even this does not disturb the movements if the instrument be carefully managed and the substance lively.

As has already been stated by De Bary, distinct *Æthalia* often coalesce. This may be observed in small watch-glasses. At a certain period of life this coalescence occurs on a particularly large scale, namely when the formation of spores is about to take place, for which purpose very large masses of protoplasm are usually employed.

Now, although, as may be proved directly in *Æthalium*, such masses of protoplasm are not produced by the enlargement of a single cell, but by the coalescence of many, I assert that we must not say they consist of cells. They have been produced from cells, but they now consist only of protoplasm. *Potentiâ* the mass contains cells, inasmuch as the nuclei, which persist in it, may at any time cause the division of the protoplasm into truly separate cells (as in *Æthalium* during slow desiccation); but *re verâ* no cells can be distinguished in the protoplasm, for its granules may wander from nucleus *a* to nucleus *b*, and, further, to nuclei *x*, *y*, and *z*, without being bound to any determinate nucleus, as, however, must be the case if we would speak of cells as constituent structures in the mass in question.

Such, in my opinion, is also the condition of the protoplasmic substance of the Rhizopoda. It has hitherto been denominated *sarcode*, and, in fact, the above statements show that it has much of what constituted Dujardin's notion of this substance. In proposing, however, to call it *protoplasm* in future, I believe I may reckon on the acquiescence of those acquainted with the subject. The word "sarcode" stood from the first so completely in opposition to the cell-theory, that, although we must regard it as characteristic, and not ill-chosen for the substance of the Rhizopoda, we shall nevertheless willingly exchange it for another, in which the triumph of the cell-theory even in these lowest organic structures is expressed. It is true that the name is of little consequence; but when we can select it so that it involves a deep inner sense corresponding with the object to be indicated, as I assert to be the case with the word "protoplasm," in which the mystery of an entire organism is intimated, we must prefer this to one which is less significant.

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Although, from what has been stated, the contractile cortical substance of the large Rhizopoda, as well as of the small ones, consists of a protoplasm not capable of resolution into cells (notwithstanding that, in regard to its development, it may be referable to one or several cells), this by no means implies that the whole inner part of the Rhizopod-body enclosed within the shell must necessarily consist of the same substance. In my work on the organization of the Polythalamia, I have already called attention to the fact that in all the larger Rhizopoda we have to distinguish an inner, usually coloured and more *quiescent* part, from the external, colourless, *motile* part which exclusively emits processes. The two parts pass gradually into each other; and definite data as to essential differences in the internal organization were not obtained by my observations. Vesicles of colouring matter, large granules, and nucleoli, which render the mass opake, distinguish the inner from the outer substance; but I was unable to detect any cellular composition, or any differentiation of definite systems of organs, even in this part of the body of the Rhizopoda. Ehrenberg assumes such a differentiation, and speaks, for example, of an intestinal canal permeating the body of the Rhizopod, which, of course, must have had a special wall, different from the surrounding substance. Evidence of the existence of anything of the kind is not adduced; and I must most positively dispute its existence from numerous observations, repeated down to the most recent time, upon living and, especially, transparent Polythalamia.

Of the fact that, as I previously asserted, young, transparent forms of *Cornuspira*, *Miliola*, and *Rotalia* are destitute of a contractile vesicle, I have also repeatedly (and, as I believe, positively) convinced myself.

Nevertheless, as I have stated, there exist in the freshwater Rhizopods, and even in *Amœba*, indications of a difference between the cortical and medullary substance. If the organisms have been produced from one cell, this might be referred to the difference between the cortical layer of the protoplasm and the internal parts, observable in many young, membraneless cells (I mean the difference which exists in the embryonal cells figured by Remak in pl. 11. fig. 17 of his work upon the development of the Vertebrata, consisting in the hyaline basal substance of the protoplasm here rising, at least in spots, above the portion enclosing the granules). Indeed the same thing is observed in many cells, especially young motile cells (I may recall the motile cells of the blood described by Lieberkühn). In the case cited, Remak has explained the projection of the hyaline substance as the casting of a membrane; but on this point I cannot agree with that respected observer.

But if several or many cells have come together for the formation of the body of a Rhizopod, as we have intimated to be by no means improbable (as would be the case if the body of the Rhizopod were produced from an egg-cell, dividing in the manner of an egg undergoing the process of segmentation), we should have, according to our new protoplasm-theory, to prove the following possibility with regard to the further behaviour of the cells. I again remind the reader that the definition of the cell given by me runs—"a naked mass of protoplasm with a nucleus," and that I regard the membrane as something quite unnecessary to the idea of a cell. There is consequently an aggregation of small cells given, from which a Rhizopod-body is to be formed. Then only the peripheral cells require to coalesce in order to form the so-called sarcode,—the protoplasm, no longer capable of resolution into cells, surrounding the internal part of the body like a stratum of fluid wax. But towards the centre the individuality of the cells may maintain itself in gradual transition; they may acquire a membrane, and form tissues of various kinds, as they are produced from the segmentation-cells of the egg of one of the higher animals; nay, the theory permits the assumption that a heart, blood-vessels, intestine, kidneys, brain and nerves—in short, whatever we please—may act in full development in the interior, whilst externally the simplest form of vitalizable substance persists, and therefore the whole organism, complicated as it is, rolls about like an *Æthalium* upon a heap of stinking tan. In order that a combination of the highest and lowest organization so horrible in its consequences may not occupy a place in nature, the limits of type have been established. We are still far from understanding the type of the Protozoa sufficiently to enable us to say, "so far, and no further, may the differentiation of the systems of organs advance in them;" but that they have a certain, and very definite, low limit may be concluded from the analogy of the other types.

Thus, therefore, within the Protozoan type there may easily be developed from the simplest animal forms, consisting only of the protoplasm of a single cell, other higher forms, in which a certain or tolerably perfect degree of independence of individual constituent cells exists, and indications of definite systems of organs occur. But in all Protozoa (and this I would regard as characteristic) there prevails in certain regions of the body, and for the purpose of fulfilling certain functions, the tendency of the cells to coalesce into a larger mass of protoplasm, in which then only the number of the persistent nuclei may perhaps indicate the origin of the mass from cells. In some forms it is in the cortical part of the body that such a mass occurs; these are Rhizopoda, among which, according to the important investigations of Johann Müller, and especially the recent ones of E. Haeckel, with which I am chiefly acquainted by oral communication, the *Radiolariæ*, *Acanthometræ*, and *Polycystinæ* must occupy the highest place, inasmuch as in them cells actually persist in the manner above indicated. In other Protozoa a stratified layer of more or less independent cells might exist externally, as in the Infusoria, whilst internally the body is filled with protoplasm not capable of being resolved into cells, and produced by the coalescence of cells. As such I indicate the soft central substance of the Infusoria into which the morsels of food are passed. It is the softest part of the body of the Infusorium, but belongs to it just as much as the cortical substance, and cannot bear the name of "chyme," which Lachmann has applied to it.

From this point of view I might proceed to the explanation of the organization of the Infusoria, and I am convinced that we may thus arrive at a satisfactory solution of this difficult matter; but I must call attention to one thing which is not unimportant, namely that the theory also admits the assumption of unicellular Infusoria. For one cell may acquire cilia on its surface; one cell may contain a harder cortical layer and a soft medullary substance, with vacuoles, nucleus, the most various corpuscles, pigment-vesicles, &c. In a single cell, as is shown by the young cells of muscular fibre, the periphery of the protoplasm may be converted into true muscle-substance, whilst the centre of the cell is still occupied by ordinary protoplasm. Whether a so-called contractile vesicle may be produced in the protoplasm of a single cell, certainly requires further investigation, but it does not appear improbable. Lastly, that a cell (therefore in this case a mass of protoplasm with a hardened and ciliated cortical layer) may be destitute of the hardened layer and cilia at one or two spots of its surface, or possess a "mouth" from which solid matters are pressed into the innermost, soft, protoplasmic mass, and an "anus" for the evacuation of the same, is a point of which I have already spoken above, and I believe that the possibility of such an occurrence must be admitted.

In conclusion, the new observation already mentioned, upon the reproduction of a Polythalamion of the family *Rotalidæ*, may here find a place.

In a bottle with sea-water and a little sand, which had been collected from a depth of about 20 feet off Heligoland and well washed, I had kept alive since the autumn of 1857 a small number of *Gromiæ* (*G. Dujardinii*), *Miliolidæ*, and *Rotalidæ*. In June 1859, after the bottle had been strongly agitated by my journey performed a little while before from Halle to Bonn, and then stood for some weeks closely stopped, I observed, amongst innumerable *Bacillariæ* which coated the inner surface of the bottle, some brownish-yellow bodies, which were recognized with the lens as small *Rotalidæ*. These had not previously occupied these spots, but now, as was shown by several days' continuous observation, either adhered quite immoveably, or changed their point of adhesion, which had been surrounded by a black ring on the outside of the glass, only by portions of a line. The size of the animals was about $\frac{1}{8}$th of a line. I detached one of the animals by means of a hair-pencil (which was not effected without considerable force), cleaned it, by repeated brushing, from the adherent small *Bacillariæ*, and could then distinctly recognize its form, especially by direct light. It was a Rotalide, and is best placed in the genus *Rotalia*. Threads were not emitted from its surface even after long watching. The yellowish-brown contents, especially of the larger chambers, exhibited a peculiar coarsely granular consistence, observable even with a strong lens: the true nature of this could not be ascertained, on account of the opacity of the shell. I then proceeded to break up the shell, in which I counted ten chambers, with needles, and was not a little astonished when, after detaching the first fragments of the shell, small three-chambered Polythalamia made their appearance, of which, after crushing and breaking up the mother as completely as possible, from twenty to thirty were brought to light. The whole of the small Polythalamia were of equal or nearly equal size, and consisted of three, mutually adherent, nearly globular chambers, of which the first and innermost was the largest and brownish-yellow, filled with large pigment-vesicles resembling fat-globules, and the other two were colourless. Their shell appeared very thin and brittle, containing calcareous matter: no special structure, such as regularly arranged pores, could be detected in it. The artificial birth appeared to have been too early for the young animals; for, although they were watched for hours, no emission of processes was observable in them.

Of course I waited with impatience to see what would happen with the other *Rotalidæ* which were left adhering to the glass. They were subjected to a strict check, and daily examined with the strong lens; and having been struck by the coarsely granular consistence of the contents of some, I had the satisfaction of observing in the neighbourhood of two of them the sudden appearance of an accumulation (at first dense, and then gradually dispersing) of small granules, which, when detached by the hair-pencil and placed under the microscope, proved to be likewise small three-chambered Polythalamia, of exactly the same form and size as those artificially freed from their parent, and only differing from the latter in that in all of them the second chamber already began to show a yellow colour.

Here, therefore, we have a new proof that Polythalamia bear living young, and that these at the time of their birth are in a comparatively high state of development. This increases our anxiety to know how the *Geoponi* may propagate, of which Ehrenberg asserts that they carry their eggs about with them in little baskets.

I have still to observe that I made comparative measurements of the chambers of the young animals and the innermost chambers of their parents, and found the measurements to agree perfectly. The first central chamber is perfectly globular, and has a diameter of 0·0112—0·0150 Par. line (it varies so much in different individuals); the two following chambers are no longer quite globular, and the third is a little larger than the second (the diameter varies between 0·0052 and 0·009 Par. line).

I have not named the species; it comes nearest to the *Rotalina nitida* of Williamson. Large approximated orifices of the shell are wanting. The shell is tolerably opake, and as if composed entirely of small irregular particles—not, indeed, so much as in the *Rotalina silicea* described by me: the shell also dissolves in acid; but it is deficient in the homogeneous, elegant appearance of most other *Rotalidæ*. Single large apertures, with jagged rather than sharp round margins, penetrate the somewhat thick shell.

It could not but be of great interest to examine the state of the mother after the birth. In one case I saw with the lens the shell as if burst in pieces, and on moving it with the pencil I obtained only fragments. In the other case I believed that I saw the shell entire and uninjured. I even transferred it to the object-slide; but whilst cleaning it from the innumerable little Diatomaceæ adhering to it, it was lost. Nevertheless I confidently believe that I recognized yellowish-brown contents in the inner chambers, from which it might be concluded that the whole body of the Rhizopod is not employed in the formation of the young. We shall leave unexpressed all further conjectures upon the mode in which the reproduction is effected, and conclude with the wish that others may seek the opportunity of making further observations on the propagation of the Polythalamia.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

January 17, 1861.—Major-General Sabine, R.A., Treasurer and V.P., in the Chair.

"On the Homologies of the Eye and of its Parts in the Invertebrata," by J. Braxton Hicks, M.D. Lond., F.L.S.

The author first remarks, that the great similarity which exists in the parts of the eye throughout all classes of the Vertebrata, coupled with the desire to find in the eyes of all animals the same component parts as in that great group, has militated much against a proper understanding of the different parts of the Invertebrate eye.

A different method has been followed in the observations upon which the present communication is founded; for, starting from the simplest condition in which the organ appears in the animal series, the necessary elements of a picture-seeing eye are first determined, and afterwards those parts which are superadded to it. A distinction is then drawn between the mere light-seeing eye and that which perceives a picture; the former requiring no lens, the latter having one. The elements of the picture-seeing eye are, in fact,—1st, a nerve-fibre, and bulb; 2ndly, a cell possessing more or less refractive power, and resting on the nerve-bulb; 3rdly, pigment; 4thly, the nerve-sheath, including the other structures. The homologies of these parts are then considered, and traced through the various classes. The cell resting on the nerve-bulb is the homologue of the crystalline lens. It has the power of secreting into its interior a highly refractive substance, which, in the Invertebrata generally, is semifluid, but sometimes, as in certain Insecta, solid. The bilateral tendency of the cell in *Asterias* and in some Entomostraca is pointed out, as also the tendency of the solid lens of Insects to split longitudinally into four portions. This is compared with the same condition in the more fluid lens of the Decapod Crustaceans, and referred to the mode of development as set forth by Dr. E. Claparède. Moreover, as in many cases these cells become so fused as to form an entirely homogeneous body, the author thinks that the single crystalline lens, possessing many nerve-bulbs (as in Mollusks), is formed really by the combination of their various lenses; the pigment in this case being confined to the nerve-bulb, which is its normal position.

It is then pointed out, for the first time, that in some insects, and in *Iulus*, the lens possesses a very slight refractive power, being filled with a fluid as little refractive as water. This is more particularly the case in the Diptera, where the dermal facets become so spherical as to usurp the function of the lens, while an example is furnished by the eye of *Aromia moschata* of the complete disappearance of the lens. In opposition to the opinion entertained by many naturalists, the author maintains that each bulb, provided with a refracting body, is capable of perceiving a picture independently of the assistance of other adjoining lenses.

The homology of the nerve-sheath is traced from its condition as a delicate membrane which passes over the simple eye, to that of the sclerotic and cornea; and it is shown to constitute the *true* cornea. After referring to the pigment and iris, the author discusses the parts added to the simple eye. The *anterior chamber*, or the space found anteriorly to the lens and iris (where the latter exists), first appears in the Leeches, but is a very variable element in the Invertebrata, existing in some aquatic animals, as Leeches and Cephalous Mollusks, while it is absent in others, as *Paludina*, *Limnæa*, &c.; and thus the opinion held by some, that an anterior chamber is of little use in aquatic animals, as in Fishes, is scarcely tenable, because they have a compensation in the globular lens. The author has never found an anterior chamber in the compound eyes of the Insecta, although a space has been described, and erroneously called a lens. Still the possibility of such a space is not thereby denied; only, should it exist, it would be homologous to the anterior chamber, and not to the lens; and the transparent body behind it is the true lens, and not a vitreous humour, as is often represented. There is such a chamber in the Decapods, in which it is well marked. In regard to a chamber posterior to the lens, the author is of opinion that none is to be found below the Mollusks, and points out that what has been so called in the ocelli and stemmata is not the homologue of the vitreous humour, but probably that of the lens, which otherwise is absent in these eyes, for the lens of the ocelli is shown below to be of dermal origin.

The next portion of the paper is occupied in pointing out the part which the integument plays in regard to the optical organs where it passes over them; and it is shown that in all of the Invertebrata the integument becomes more or less subservient to the functions of those organs. It is in animals with a dermo-skeleton that the greatest subjection of the integument to the eye is seen; and the change is reviewed *gradatim* from where the eye is independent of the integument, as in *Daphnia*, through *Gammarus*, where the integument is merely applied to it, till, in *Artemia salina*, we find the inner surface indented, but not yet facetted. In *Branchipus* the *inner* layer only becomes facetted, till in the Decapods both layers become so. But it is in the Insecta that the change is most marked, the form of the facets becoming more or less lens-like, till in Diptera they are nearly perfect spheres. Their power of refraction is very high; they are supplied with corrections for spherical and chromatic aberration, and they almost altogether supply the place of the true crystalline lens, as before pointed out. The ocelli in Insects and Arachnida show this condition carried to the extreme; and the author conceives that the so-called crystalline lens of these organs is derived entirely from the integument: this he endeavours to show by reference to their structure and intimate connexion with the other dermal layers, and by tracing them through the various tribes; and a more complicated structure is described, for the first time, in the median eye of one of the Scorpionidæ (*Buthus*), where the inner integumental layer is converted into a lens more distinct than in any other of the Arachnida. A chamber is also shown to exist in it, formed by the separation of the epidermis from the other layers, producing a plano-convex lens, similar in form to the anterior chamber of the higher animals, and analogous to it in function. The stemmata and ocelli, like the facets of the compound eye, have peculiarities in their structure for the correction of spherical and chromatic aberration.

The author concludes by pointing out the striking homology existing throughout the whole animal world in those parts which were mentioned at the commencement of the paper as forming the essentials of an eye, and considers that it affords a contradiction to the position of Agassiz, "That every great type is formed on a distinct plan,—so peculiar, indeed, that homologies cannot be extended from one type to the other, but are strictly limited to each of them." On the contrary, the eye of an *Asterias* is formed on the same plan as that of a *Planaria* and a *Daphnia*, and the eye of the Leech possesses the same parts as that of the *Helix*, while the similarity of the eye of the Cephalopod to that of the Vertebrata is obvious to all.

ZOOLOGICAL SOCIETY.

December 11, 1860.—Dr. J. E. Gray, V.P., in the Chair.

Description of Two New Species of Entomostracous Crustaceans from India. By W. Baird, M.D., F.L.S.

Order Phyllopoda.

1. Streptocephalus dichotomus (male).

The body of this little Phyllopod is elongate and of a dark brown colour (in spirits). In general form it resembles a good deal the *Branchipus torvicornis* of Waga, found in the neighbourhood of Warsaw. The peculiar twisted and elongated antennæ (characteristic of the male) are furnished with several filaments, and are divided at the extremity into two forks, one of the divisions of which (the longer) is again bifurcate at the extremity. This larger division of the fork is armed with several teeth on the outer edge. The tail is bifurcate, the divisions being, each of them, densely and strongly ciliated on the inner edges.

Length of body about three-fourths of an inch; length of antennæ about half an inch.

This curious creature was said to have been found alive in a pail of milk.

Hab. India.

Order Cladocera.

2. Daphnia Newportii.

Carapace-valves oval, terminating posteriorly in a rather long sharp spine directed a little backwards, and furnished on both sides with spines. The surface of the shell is reticulated and hirsute, being roughened all over with short spines. The margins of the carapace are beset with short spines also, the dorsal margin from the extremity to the base of the head, the ventral margin for nearly half its length. The head is very obtuse and rounded, terminating anteriorly in a short, sharp beak. The rami or inferior antennæ are of considerable size, and the setæ or filaments are finely plumose. The sixth segment of the body of the animal has five or six projections from it, two or three of which are small and rough, with very minute spines. The first is the longest, being prolonged and curved upwards ; the second is large and well marked ; and between the last and the hooks in which this segment terminates, the edge is beset with numerous small spines, the inferior six or seven being much the largest.

I have named this *Daphnia* after my late friend Mr. George Newport, to whom I am indebted for the specimens sent to me several years ago.

Hab. India.

On two new Reptiles from Guatemala. By Osbert Salvin, M.A., F.Z.S.

Thamnocenchris, n. g. (Crotalidæ.)

A pit on each side of the face. Posterior part of the body and tail much compressed, the latter ending in a horny spine. Subcaudals one-rowed. Tail prehensile. Head angular, anteriorly covered with irregular shields, and having small keeled scales posteriorly. No small scales between the superciliary and the orbit. The second upper labial forms the anterior part of the facial pit.

Thamnocenchris aurifer.

Scales keeled, in nineteen rows. Nine upper labial shields. Small shields between the fourth labial and the orbit. Green, with a dorsal series of orange spots edged with black. A black band from the orbit to the side of the occiput.

Hab. Coban, Vera Paz.

This new form is distinguished from *Teleuraspis* (Cope) by its peculiarly compressed body and tail, the latter being coiled as in some of the *Boidæ*, clearly indicating a habit of living in trees. It also differs from *Botriechis**, Peters, in having very large shields instead of very small scale-like ones on the upper surface of the snout. Nor does Prof. Peters mention in his description the peculiarly compressed tail, the most striking character of the present genus. The general form of the head is similar to that of *Cenchris*, which it moreover resembles in having the anterior portion of the upper surface of the head covered with irregular shields of moderate size. Nostril in the middle of a single plate. Upper labials nine, the third, fourth, and fifth of which are the largest. There are about seven small shields between the orbit and the fourth and fifth. From the superciliary backwards the head is covered with keeled scales. Scales of the body keeled in very oblique series. 154 ventral shields ; anal entire ; 53 caudal shields. The posterior ventral shields extend very far up the sides. Colour green, paler and yellower below. A series

* Monatsb. Akad. Wiss. Berlin, 1859, p. 278.

of about thirty-five small golden-yellow spots runs along the back to the tail, where they become more irregular; each spot has a black edge posteriorly. The upper surface of the head is uniform dull green, bordered on each side by a black stripe proceeding from the eye to the side of the occiput. Length of the head 1 inch 4 lines; of the trunk 2 feet 3 inches; of the tail 6 inches.

A single specimen only of this new species was preserved for me at Coban by Mr. Owen while I was away in the mountains of Lanquin. It had been brought to him by an Indian.

Hyla holochlora.

Vomerine teeth in two slightly oblique series, beginning from the anterior edge of the nostrils and converging posteriorly, more or less interrupted in the middle. Width of the tympanum two-thirds of that of the eye. Skin smooth. Disks of the toes very broad, as large as the tympanum; the three outer fingers almost entirely webbed. Uniform grass-green above, yellow below.

Hab. Coban in Guatemala.

Habit that of *H. arborea*. Head broad, with flat crown, rather short muzzle, and rounded canthus rostralis. Eye of moderate size, rather prominent. Tympanum two-thirds the width of the eye, with a small fold behind it. The legs of moderate size, with very large disks, and with the tubercles on the lower part of the feet very well developed. Toes entirely, and the three outer fingers almost entirely, webbed. No fold across the chest. Skin without any appendages. Tongue with a conspicuous notch posteriorly. Male with a single subgular sac. Sacral vertebra considerably dilated. Upper parts uniform grass-green, except the upper arms and thighs, which are colourless. Lower parts yellow. Length of the body of an adult female 3 inches; length of the fore leg 2 inches; length of the hind leg $4\frac{1}{2}$ inches.

Of this Tree Frog I obtained three examples at Coban, all of which were caught by the Indians. It was the only species I met with.

Note on the Balæniceps rex. By A. D. Bartlett.

The question of the affinities of the *Balæniceps* having been discussed by so many able ornithologists, it may be interesting to know that this bird does not possess the remarkable patches of down found on each side of the breast in all the Herons and Bitterns.

Having had the opportunity of ascertaining this fact by an examination of the living bird, now in the Society's Gardens, I am enabled to say that these patches (which are of a singular dense and close structure, and are found beneath the feathers on each side of the front and fore part of the pectoral muscles) do not exist in the *Balæniceps*. The absence of this structure may, I think, assist in indicating the true affinities of this bird, as pointed out by Dr. Reinhardt in his communication to the Society on this subject*.

* See *antea*, p. 144.

Characters of Eight New Species of American Birds. By Philip Lutley Sclater, Secretary to the Society.

1. Campylorhynchus nigriceps.

Supra fulvo-rufescens nigro transfasciatus: pileo toto nigro: superciliis elongatis rufescenti-albidis, striga post-oculari nigra subtus limbatis: alis nigris, harum tectricibus fulvo extus limbatis, remigibus autem in pogonio externo maculis ovalibus fulvis quater transfasciatis: cauda nigricante, rectricum pogoniis externis et harum extimarum pogoniis internis obsoletius fulvo transvittatis: subtus albidus, abdomine rufescente: rostro pedibusque corneis, illius culmine nigricante.

Long. tota 6·5, alæ 3·1, caudæ 3·2, rostri a rictu 1·0, tarsi 1·0.

Hab. In prov. Veræ Crucis Mexicana.

I possess two examples of this species of *Campylorhynchus*, one obtained by one of M. Sallé's correspondents at Orizaba, and the other from Señor de Oca's series collected at Jalapa. The latter is manifestly in immature plumage. I have until recently considered that they might perhaps be referable to an immature dress of *C. capistratus*, but such cannot be the case. The black head is distinctly marked in both of my examples; but there is no trace of the characteristic deep-rufous nape and upper back of *C. capistratus*, or of the white termination to the black rectrices. The body is quite unspotted below, traces of blackish edgings to the feathers being apparent only in the younger specimen; while in *C. capistratus*, junior, there are decided round black spots. Though I should wish to examine further examples of *C. nigriceps*, I can entertain no doubt of its distinctness from other known Mexican species of the genus.

2. Campylorhynchus gularis.

Supra brunneus, plumis omnibus nigro ocellatis, et medialiter albo striatis: pileo toto et nucha brunnescenti-rufis unicoloribus: superciliis latis et elongatis albis, striga post-oculari et altera rictali utrinque nigricantibus: alis pallide nigricantibus, harum tectricibus sicut in dorso maculatis, remigibus autem solum in pogonio externo maculis pallide brunneis regulariter transvittatis: cauda nigricante, margine lato apicali albo: rectricibus quatuor intermediis pallido brunneo et nigricante omnino tessellatis, proximis duabus in pogonio exteriore albido maculatis, duabus utrinque extimis in utroque pogonio maculis magnis albis notatis: subtus lactescenti-albus, ventre rufescente: gula immaculata; ventre præcipue laterali maculis rotundis nigris asperso: rostro brevi plumbeo: pedibus pallide corneis.

Long. tota 7·0, alæ 2·8, caudæ 2·8, rostri a rictu 0·8, tarsi 0·8.

Hab. In Mexico.

Mus. P. L. S.

I have a single specimen only of this *Campylorhynchus*, received from Mr. Gould. It belongs to the group with rufous and black heads, containing *C. brunneicapillus*, *C. affinis*, *C. capistratus*, *C. jocosus*, and *C. nigriceps*; but differs from all in its pure wood-brown head, unspotted throat, and very short beak and tarsi. Its nearest ally is *C. jocosus*, but its short bill will at once distinguish it from that species.

3. Vireo modestus.

Vireo noveboracensis, Gosse, B. of Jamaica, p. 192.

Supra olivaceus ; alis caudaque nigricanti-fuscis, illis albo bifasciatis : fronte et superciliis flavicante vix tinctis : subtus pallide flavicanti-albus : tectricibus subalaribus albis : rostro superiore pallide corneo, inferiore albescente : pedibus plumbeis.
Long. tota 4·5, alæ 2·3, caudæ 2·0.
Hab. In ins. Jamaica.
Obs. Similis *Vireoni noveboracensi,* sed fronte aureo caret.

This Greenlet appears to have been taken by Gosse for the *Vireo noveboracensis* of the United States and Mexico, from which it may be immediately distinguished by the absence of the golden-yellow colour of the front and lores. It is also not so brightly coloured on the sides of the belly. Mr. Gosse informs us that it is resident all the year round in the island. One example of this bird in my possession is from Mr. Gosse's original collection. A second has been recently presented to me by J. H. Gurney, Esq., M.P., who received it from Jamaica; and I have lately obtained a third.

I was at first suspicious that this bird might be identical with Cabanis's *Vireo Gundlachii* of the island of Cuba; but having forwarded one of my specimens to Dr. Hartlaub for comparison with examples of the Cuban species in the Museum at Bremen, I have ascertained through his kindness that such is not the case. In the size of the first spurious primary and the general conformation of the wings, *Vireo modestus* resembles *V. noveboracensis.*

4. Vireosylvia cobanensis.

Vireosylvia philadelphica, Sclat. Ibis, 1859, p. 12 (nec *Americanorum*).

Supra olivaceus, pileo vix cinerascente induto : fronte, superciliis, et regione oculari albicantibus, alis et cauda nigricantibus, olivaceo extus anguste limbatis ; tectricum majorum apicibus albescentioribus : subtus pallide flavus, unicolor, mento albicante ; hypochondriis olivacescentibus ; tectricibus subalaribus pallide flavis : rostro plumbeo, pedibus nigro-schistaceis.
Long. tota 5·0, alæ 2·5, caudæ 1·75, rostri a rictu ·55, tarsi ·7.
Hab. In Guatemala (*Salvin*).

This *Vireosylvia* belongs to the section of the genus in which the first primary is altogether absent. The second and third quills are equal in length and longest, the fourth is very little shorter, and the fifth nearly equals the first. The bill is smaller than in *Vireo gilvus*, and somewhat like that of *V. modestus* and *V. noveboracensis,* though more slender and more compressed.

This *Vireosylvia* is quite distinct from any species of the genus with which I am acquainted. I have hitherto referred it to *V. phi-*

ladelphica of North America—a bird which appeared to approach it in the absence of the first primary, and in the yellow colour of the under-body—but Professor Baird, to whom I have sent examples, informs me that I have been wrong in so doing.

Mr. O. Salvin obtained many specimens of this bird at Coban and Tactic, in the province of Vera Paz, Guatemala, and I therefore propose to call it *Vireosylvia cobanensis.*

5. Myiobius flavicans.

Flavicanti-olivaceus, pilei semi-cristati plumis infra rufescenti-aurantiacis; ciliis oculorum pallide flavidis: alis et cauda nigricanti-fuscis, remigum et tectricum alarium marginibus, harum latioribus, extus ochracescenti-rufis: subtus valde dilutior, gula albicantiore, ventre crisso et tectricibus alarum inferioribus pallide flavis: remigum marginibus interioribus subtus pallide rufescenti-ochraceis: rostro nigro, pedibus fuscis.

Long. tota 4·3, alæ 2·6, caudæ 1·9, tarsi 0·7.

Hab. In rep. Equatoriali et Nov. Grenad.

Mus. P. L. S.

This Tyrant-bird belongs to the crested section of the group which contains *M. ornatus* (Lafr.) and *M. phœnicurus*, though its bill is slightly more compressed and less well provided with rictal bristles than in those species. My collection contains two specimens of this bird, one from Pallatanga in Ecuador, collected by Mr. Fraser (no. 1088), and a second received from M. Verreaux, apparently a Bogotan skin. The latter is either a female or young bird, and wants the orange crest.

The wings of this *Myiobius* are rather long, reaching beyond half the length of the tail. The third, fourth, and fifth quills are nearly equal and longest, the second and sixth are of the same length, the first being equal to the eighth and ninth.

6. Myiobius pulcher.

Olivaceus, pilei semicristati plumis intus aurantiacis; loris albidis; alis nigris albo bifasciatis, tectricum majorum et minorum apicibus necnon secundariorum marginibus externis conspicue albis aut flavicanti-albis: cauda fusca, extus olivaceo limbata: subtus flavus, gutture magis aurantio: tectricibus alarum inferioribus pallide sulphureis: rostro et pedibus nigris, illius mandibula inferiore carnea.

Long. tota 3·5, alæ 1·9, caudæ 1·6, tarsi 0·55.

Hab. In rep. Equatoriali.

Mus. P. L. S.

This pretty and well-marked species is allied in structure to the preceding, but is immediately distinguishable by its diminutive size and double-banded wings. I have two examples of it, both out of a collection received by Mr. Gould from Ecuador, as it is believed, from the eastern slope of the watershed. The third, fourth, and fifth quills are equal and longest, slightly exceeding the second and sixth; the first is rather shorter than the longest secondaries.

7. Myiobius crypterythrus.

Fuliginoso-fuscus, uropygio brunnescentiore ; pilei plumis interne rubris ; loris albis ; alis nigricantibus albo bifasciatis, tectricum majorum et minorum necnon secundariorum marginibus externis fulvescenti-albis : cauda fusca, marginibus pallidioribus : subtus albus lateraliter cinerascens, pectore nigricanti-cinereo flammulato, tectricibus alarum inferioribus albis : rostro et pedibus nigris, mandibula inferiore carnea.

Long. tota 5·0, alæ 2·5, caudæ 2·3, tarsi 0·7.

Hab. In republ. Equator. reg. occidentalibus.

Mus. P. L. S.

This *Myiobius* is nearly allied to *M. nævius* (Bodd.) (Pl. Enl. 574, fig. 3) of Brazil, and of the same form and distribution of colours ; but it is easily distinguishable by its larger size, sooty colouring above, and red crest. It appears to be common on the western side of Ecuador, examples having been procured by Mr. Fraser at Pallatanga, Babahoyo, and Esmeraldas.

8. Myiobius cryptoxanthus.

Fuliginosus, uropygio magis olivaceo ; pilei plumis interne flavis : loris albis : alis nigris albo bifasciatis, tectricum majorum et minorum apicibus necnon secundariorum marginibus externis sordide albis : cauda fusco-nigricante, rectricum marginibus externis dilutioribus et harum ipsis apicibus anguste albis : subtus sordide cinereus, gutture albicantiore, abdomine flavido perfuso ; rostro et pedibus nigris illius mandibula inferiore carnea.

Long. tota 4·5, alæ 2·3, caudæ 2·1, tarsi 0·6.

Hab. In rep. Equator.

Mus. P. L. S.

This species is closely allied to the preceding, but may be distinguished by its smaller size, shorter bill, yellow hidden crest, and yellowish belly. Its discovery is also due to Mr. Fraser's researches, the only examples of it I have seen having been obtained by him at Gualaquiza and Zamora, in Ecuador. It is included in my list of Mr. Fraser's birds collected in those localities given in our 'Proceedings' for 1859*, but not named, as I was not then able to determine it satisfactorily.

January 8th, 1861.—Dr. Gray, V.P., in the Chair.

On Typical Selection, as a means of removing the difficulties attending the Doctrine of the Origin of Species by Natural Selection. By E. Vansittart Neale, F.Z.S.

The great interest excited in the scientific world by the theory of the origin of species proposed by Mr. Darwin, and the obscurity necessarily attached to many of the data employed in the arguments

* See P. Z. S. 1859, p. 458, sp. 59*.

adduced either in support of or in opposition to it, must be my apology for bringing before this Society the following considerations, resting upon admitted facts, but which appear to me both to elucidate the difficulties of that theory, and to suggest the means of overcoming them.

The strong points of Mr. Darwin's theory I apprehend to be, (1) the satisfactory explanation afforded by it of the analogies and differences observed in the various forms of living beings which have been, or actually are, the tenants of our globe; (2) the fact, experimentally ascertainable, that the element of variation whence his explanations are derived exists in active operation at the present day. Mr. Darwin can say of the modifications of form manifested in living organisms, as Sir I. Newton said of the attractive force of the earth, "*hypotheses non fingo*;"—I appeal to a power which can be shown to be at work in the present world; I ask only, is it capable of explaining the phenomena observable now, or ascertained by probable induction to have occurred formerly upon it?

These are great merits. But if these strong points of the theory are connected with the principle of diversity, whence the animal and vegetable creation derives the charm of its endless variety, it has, as I conceive, also its weak points connected with the opposite principle of *unity*: whence it attributes too large a share to death, and too small a share to life, in the formation of species.

In nature we find *two* powers at work, a principle of *change* producing varieties, and a principle of *permanence* producing species. Man is able, by making use of the principle of change, "adding up," as Mr. Darwin happily says, the successive minute differences of different generations in different directions, to bring about wonderful transformations in the original form whence he started,—from the Rock Pigeon, for example, educing Carriers, Tumblers, Runts, Fantails, &c., forms differing from each other more than do many undoubted natural species—more, for instance, than Fieldfares differ from Thrushes, or Wood Wrens from Willow Wrens. But, although man can do wonders through this principle of *change*, the principle of *permanence* slips through his fingers. He can preserve his varieties in their distinctness, only so long as he intervenes to prevent their interbreeding. Leave Carriers and Tumblers, Fantails and Runts together, without pairing them, and a race will soon arise neither Carrier, nor Tumbler, nor Fantail, nor Runt, but apparently in the process of reverting towards the Rock Pigeon. But Fieldfares and Thrushes, Wood Wrens and Willow Wrens live on for generation after generation, side by side, and remain Fieldfares and Thrushes, Wood Wrens and Willow Wrens still.

That this is the case, is unquestionable. It is equally clear why it is the case. Each distinct species in nature interbreeds by preference with those of its own kind; and if accidental unions do take place between nearly allied species, the offspring are either sterile or, at all events, much less fruitful than their parents. Here is the principle of *permanence* in nature, preventing the principle of *change* from producing *confusion*, as, again, the principle of *change* prevents the principle of *permanence* from producing *monotony*. Whence comes this principle of permanence? I look to Mr. Darwin for an answer, in vain. All that he says on this point amounts only to the position that the progeny of nearly allied species are not always sterile. That the preservatory tendency does not necessarily accompany a given amount of external difference is clear; for man can produce in living organisms external differences greater than those associated in nature with this principle of permanence, without calling that principle into action. To attribute it to the greater length of time occupied in the formation of natural species than in that of a variety, is to make an assumption wholly destitute of proof, and indeed inconsistent with a very beautiful and essential part of Mr. Darwin's hypothesis, namely, the doctrine that the living principle never loses its energy, and that the power of life now at work on our globe has been transmitted, unchanged in its essence, though infinitely richer in its manifestations, from the first inhabitants of the earth to the generations inhabiting it at the present day.

If then Mr. Darwin may appeal to the principle of *change* disclosed in living organisms, as a "true cause," capable of accounting for the mutual affinities of species by the supposition of descent from a common origin, those who are opposed to his views are no less entitled to appeal to the principle of *permanence*, disclosed in these organisms, as a real force, not to be explained away, but requiring to be reconciled with the principle of change in any theory which shall satisfactorily account for the origin of species.

It appears to me that this reconciliation may be effected through the intervention of a conception proposed by one of whose labours and reputation we are justly proud, as an explanation of the "homologies" of structure, which he has profoundly illustrated. I mean the conception of the typical character pervading all organic life. But to make this apparent, I must premise some remarks on the characteristics of natural types. The types of nature must be carefully distinguished from the types of art. The types of art are forms realized in their perfection in some particular individual. A Phidias may produce a Jupiter, a Minerva, or a Venus, as the perfect outward embodiment of the ideal of Majesty, or Wisdom, or Grace. A Danecker may toil for years, in labour with his conception of the head of Christ. But in each case, the type, when realized, is a fixed, individualized object, expressing some one predominant characteristic, to which all others, though not necessarily lost, are subordinate. The types of nature are, as I conceive, ideals not of external form, but of internal relations, each realized in countless modifications of forms differing from one another in infinitely varied particulars, but balanced around central points common to them all. But the preservation of this balance depends upon the aptness of each variety of the type for interbreeding with all the rest, and thus perpetually recombining its own peculiarities with theirs. If any of the varieties by the action and reaction of which a type is preserved become locally distinct from the others, subtypes will arise; as we find to be the case in mankind. The original type becomes the centre of a circle including many lesser circles, where we find the same tendency repeated. Now this character of natural types offers a mode of passage from one type to another. Assume a subtypical variety to acquire a special aptness for interbreeding with itself, to the exclusion of other varieties, and it would become an independent type. But how is this special aptness to be acquired? That it does not accompany the formation of subtypes we see in numerous instances; and it would clearly be inconsistent with the idea of a natural type that it should do so, if, as has been suggested, it is the characteristic of such a type to preserve itself by the mutual actions of its varieties. That it should belong to some one variety and not to others, in virtue of the general principle of variation, is a supposition inconsistent with itself: a general principle must apply to every individual case. There remains only the hypothesis of a special selection, by which particular varieties are internally modified, so as to acquire this special aptitude. Now such a special selection appears to me to involve the transition, which must take place at some point in all physical research, from conditioned, to self-conditioning power, from will working by upholding laws, to will working by constituting the laws to be upheld; in other words, we must resort to the hypothesis of an intelligent action as the only intelligible one. Accordingly it is to an intelligent choice, exercised upon the infinity of possible variations capable of arising in different organisms, through the laws belonging to their natures, that I would attribute the formation of species by what I venture to call Typical selection.

When that Power, of whose ordering will I conceive nature to be the expression, purposes to produce a new race, I suppose It to select from some existing race those individuals which show a disposition to vary in the desired direction, so modifying their constitutions as to render their unions with each other more prolific than their unions with other individuals differently formed, and if they are conscious agents, so modifying their instincts as to give them a preference for each other. How this internal modification is produced, I no more attempt to explain than Mr. Darwin attempts to explain how life was originally produced and is continued. The one act is not more difficult to conceive than the other. But there is no necessity for supposing the modification to be considerable in any one case. Divine providence need not be in a hurry. The amount of change at any step of the process of forming a new species may be very small, and the completion of that process may require many generations.

The modification of the sexual instinct and fertility of sexual unions may be gradually introduced, and at first be scarcely perceptible. But if the alteration be brought about by an internal action tending always in the same direction, each generation will approximate more closely to the character of a new type; and by the time that the external change has become considerable, a corresponding amount of internal change will have been produced. A new phase of the principle of permanence will have taken its place in creation, amongst the many phases of the principle of change; the variety will be transformed into a species.

By this conception of the origin of species, we escape from another serious difficulty, which appears to me to lie in the way of the conception of their formation by such a process of external selection as Mr. Darwin assumes. When we are asked to suppose that differences so considerable as we observe between different organisms, past or present, have been brought about by a process precisely analogous to that by which man can change the shape of a sheep or a pigeon, we naturally ask whether there are no limits to the amount of change producible by man? Could he, by any degree of watchfulness however long continued, expand a race of sparrows to the size of condors, or condense a race of turkeys to the size of humming-birds, or lengthen out a pig's snout, and thicken his legs and body into a trunk and frame similar in size to the elephant? Mr. Darwin must contend that this would be possible, if man continued to act uninterruptedly for a sufficient length of time in the same direction. Perhaps future experiments may enable us to speak with certainty upon this point. At present I conceive the general feeling of the most experienced breeders would be against him. It may be true that they "habitually speak of an animal's organization as something quite plastic, which they can mould almost as they please" by the principle of selection (Darwin, p. 31). Yet Mr. Darwin also tells us that "all the breeders of the various domestic animals, and cultivators of plants, with whom he has ever conversed, or whose treatises he has read, are firmly convinced that the several breeds to which they have attended are descended from so many aboriginally distinct species" (*id.* p. 28). Now they are no doubt mistaken in this notion; and it is easy to see whence the mistake has arisen,—namely, from each one having attended only to one out of many possible kinds of variation producible in the particular animal or plant forming the object of his care. But it is difficult to conceive whence the general notion could be derived, if each breeder found no limit, no stop, to the amount of variation which he can produce in the particular direction selected by him for experiment.

But this difficulty disappears, like that first stated, if the process of selection be transferred from the external action of circumstance, to the internal action of the living Power gradually modifying the constitution of the individual. It is a supposition agreeable to common experience, that to each particular constitution certain limits of change are assigned, within which the possible varieties of the creature possessing it fluctuate. But if the constitution changes, these limits must be presumed to change also. Each fresh species, then, may be regarded as a resting-place in the advance of life,—the development of the possible varieties inherent in it being left to the external action of circumstances; while among these the Power manifested in life selects the forms most suitable to be converted into other species, and thus carries on the differentiation of living beings a step further in its proposed course.

Other grave difficulties disappear if we accept the idea of "typical" in place of "natural" selection. One very serious one, in my judgment, is the difficulty of seeing how natural varieties could perpetuate themselves at all, if they retained that mutual prolificness characteristic of all the varieties upon which we can experimentalize.

Able and ingenious as is Mr. Darwin's argument to show that selection, by the "struggle for existence," is possible, he seems to me, throughout the whole of it, to confuse two distinct conceptions, namely, the *effect* of peculiarities of structure in giving one plant or animal an advantage over another, and the *preservation* of those peculiarities. His reasoning would be conclusive if applied to a state of things where each different variety was distinguished by an exclusive disposition to produce its own kind, as we actually find to be the case with species; but he applies it to a state of things where, by his own hypothesis, he has swept away the ground of his argument. If one variety of wading birds possessed longer bills than another, this "advantage" might lead to the ultimate annihilation of the short-bills, through the more rapid multiplication of the long, if a long-billed parent always produced a long-billed offspring. But if the long-bills and the short live side by side, as they must do if they are to struggle for existence, and possess that aptness and disposition for interbreeding which all known varieties are experimentally found to possess, and the laws of interbreeding be supposed to be what they now are, long-bills and short would soon merge into one race of medium-billed birds, between whom the struggle for existence would be reduced to one of individual strength. In connexion with this topic, the fact insisted upon by Mr. Darwin must be borne in mind, that intercrossing between varieties is conducive to fertility, as on the other hand breeding in and in is well known to cause unhealthiness, if not sterility. On the whole, then, I conclude that the permanent distinction of type which Mr. Darwin assumes to result as a *consequence* from the struggle for existence, is really a necessary *condition*, in order that this struggle may assume the form of a contest of races.

Illustrations of this position might be endlessly multiplied. I will adduce one only, drawn from the instance of the humble-bee and the honey-bee, the origin of whose architectural powers is the subject of a most interesting and ingenious discussion in Mr. Darwin's work. He adduces, as the "advantage" of the honey-bee, and therefore the constitutive principle of its peculiarities, the economy of wax in the construction of its cells when compared with the round, imperfectly connected cells of the humble-bee; for thus, in seasons when honey was scarce, a saving in food might result. But the humble-bee still raises her lowly dwellings along side of the palatial storehouses of her insect neighbour. Whatever the vicissitudes of the seasons may have been since she first appeared on the earth, Death has not swept her away; she survives now. What probable ground, then, is there for assuming that she was not present when Mr. Darwin's incipient honey-bee began its work, to destroy by intercrosses the peculiarities of her rival, and bring down its "advantages" to the common level?

It is unnecessary to dwell upon the complete removal of this difficulty by the supposition of "typical selection." But more notice is requisite of the bearing of this supposition upon another subject, whereon Mr. Darwin's hypothesis of selection by means of the struggle for existence has produced much controversy, namely, the evidence of the "stone-book." That, if a new species can be formed at all by "natural selection," it can be only as the ultimate result of a long balancing of rival tendencies, ending in the preponderance of one side, Mr. Darwin admits. It follows, as he also admits, that each new species, if thus formed, must have left behind it a long trail of intermediate forms between itself and the species whence it arises. Now, we do not find this "trail;" the links are wanting in many cases; and Mr. Darwin's explanation of their failure is, that they once existed, but that the evidence of their existence has either not yet turned up, or has been altogether swept away.

Other eminent geologists have questioned the probability, if not the possibility, of this total sweeping away of the links wanted to bind together, upon Mr. Darwin's supposition, the forms known to have existed. I do not propose to enter into this controversy, but only to remark that, whatever difficulty may arise from the absence of intermediate forms in tracing connected lines of descent of the different forms whose existence has been ascertained, it is most materially diminished on the hypothesis of typical selection,—(1) because the advance in each case will be always in the same direction, and therefore the interval between one marked form and another will be indicated by much fewer steps than are required on Mr. Darwin's supposition, even if each step be very gradual; (2) because it is consistent with our present experience, that a very considerable amount of change may take place in animal or vegetable organisms at once. I will refer only to General Tom Thumb, and the Giant whose skeleton is preserved in the College of Surgeons, in proof of the important departures from the ordinary human scale of proportion which may be produced at one birth, under the ascertained laws of life. Now, suppose individuals, male and female, characterized by the possession of forms thus departing from the general human standard, to be selected to constitute a new human species, forming the centre of variations extending on all sides of the type thus manifested, and the process to be repeated three or four times, by transitions of equal magnitude on each occasion, in both directions; we should arrive at forms almost as distinct from each other as Swift's men of Lilliput and Brobdingnag. And yet the intermediate variations might succeed each other at short intervals, and leave but scanty traces of their existence in any geological record. The Lilliputian and Brobdingnagian students of geology might thus find it as difficult to connect their own history with that of the present race of mankind, by geological evidence, as we find it to trace the descent of Teleostean fishes, or Saurian amphibians, by the same records.

The conception of "typical selection" seems also to elucidate another subject, not altogether unencumbered with difficulty on Mr. Darwin's hypothesis, namely, the disappearance of types. If one species is educed out of another by a modification of the sexual character of some particular variety of the first, whence it acquires a peculiar aptness and disposition for interbreeding, this variety would be withdrawn from the circle of varieties by whose mutual action the original type was preserved. Consequently the type would itself have a tendency to alter; and if several varieties were thus withdrawn from any type, it would seem that this type must change into some modification of itself, and take its place amid the circle of variously related types evolved out of its original unity. The process would be analogous to what appears to have happened in some cases, where, through local circumstances or human interference, many distinct varieties of the same plant or animal have been formed, as in the case of wheat, of horses, of dogs, and of man himself; and the result seems to accord with many ascertained facts in the relations of plants and animals, living and extinct.

If in the course of these observations I have been occupied in criticising rather than in defending Mr. Darwin's views, the object of this criticism has been to separate what I regard as a most valuable scientific conception, from association with a theory which, though highly ingenious, is entirely hypothetical,[1] and, in my judgment, untenable.

That there is a principle of variation at work around us in the living world, animal and vegetable, is certain. That by adding up successive changes effected by this principle, we can bring about a large sum of total change, is ascertained. The idea that the variety of living beings to be observed on the earth has arisen from the long-continued operation of this ascertained principle of variation during the countless ages when, as we learn from geology, a vast succession of creatures gradually tending to similarity with those existing now, have followed each other as its occupants—creation, to use the forcible language of Professor Owen, ever compensating for extinction—is an idea full of the promise of scientific results, because it seeks to explain the unknown by the known or knowable, and to substitute thought interpreting experiment, in place of thought dealing only with itself. This true scientific character forms the distinction between Mr. Darwin's fundamental hypothesis and the theories of those who like Lamarck, or the author of the 'Vestiges of Creation,' have previously attempted to embrace under one comprehensive thought the riches of the organic world. They presented only conjectures incapable of being tested; he has offered a conception respecting the past, which may be tested by the study of the present.

But this observation applies only to the conception that specific differences arise from selection. In referring the method of selection to the "struggle for existence," Mr. Darwin leaves the solid ground of experiment for the airy regions of ingenious hypothesis. The "struggle for existence" is perpetually going on around us; yet Mr. Darwin has not adduced a single case of even an approach to the formation of a new species as its ascertained result. All his instances of the effects produced by the addition of minute changes, in animal or vegetable organisms, are instances where the principle of variety is modified in its operation by the principle of intelligent choice. That the last principle has been concerned in producing the changes observed in nature, we cannot, indeed, show directly; but when we learn experimentally that, by this means, something very like natural species can be produced, surely it is more accordant with the sobriety of science to assume that by this means also natural species have been produced, than to refer their production to another principle, which cannot be shown to be in operation at all, and of which, if it is in operation, we cannot show how it could bring about the effects attributed to it.

I have said "something very like natural species;" for, as has been observed above, man cannot confer upon his varieties the self-preserving power characteristic of true species. But this is only accordant with the universal analogy of the distinction between man's work and the works of what we call Nature. Man always works from without, Nature from within. But otherwise their works are subject to similar conditions. The crystalline lens of the eye is formed of elementary particles, held together by molecular or chemical attraction, as is the lens of the eyeglass. The formation of the optical image, the prevention of diffraction, is brought about in each case by an observance of the same principles of construction. But the eyeglass is shaped and put together by a power operating from without, upon masses of elementary particles, already drawn to each other by their natural attractions. The lens of the eye is formed by a power working from within, which draws these elementary particles together, by secret processes, into positions where their natural attractions keep them in the required arrangement.

So is it, as I conceive, in the formation of species. Man and Nature both bring about changes of form in organized beings by the same process, namely, by directing into particular channels the tendency to vary inherent in all organisms, "adding up" in different directions the sum total of many changes, tending the same way. Both effect this addition by the same instrumentality, namely, by favouring sexual intercourse in the organisms which show a tendency to vary in the required direction, and impeding it in those which do not. But man, working in this case as in every other from *without*, can effect his "additions" only by bringing the suitable organisms together for the purpose of that intercourse, and keeping the unsuitable apart. Nature, working, in this case as in every other, from within, effects her additions by so modifying the wish for this intercourse, that the animals whom she desires to bring together shall prefer each other's society, and so modifying its consequences, that accidental unions of organisms, whether animal or vegetable, with other than the organisms suitable for her purposes, shall be incapable of seriously disturbing them. To seek an explanation of the natural process in an external action, seems to me as contrary to the whole analogy of our knowledge, as it would be to seek an explanation of the human process in an internal action.

And yet there is an external action in nature, bearing upon the constitution of species—an action admirably described by Mr. Darwin under the name of the struggle for existence, and having, as I apprehend, an effect analogous to that of external action on living organisms considered individually. The struggle with circumstances destroys the dead, but it developes and exercises the living individual; and so the struggle for existence developes the capacities of variation of each typical form, while it prevents those variations from injuring the type. For the order of the living creation depends upon the more or less perfect transmission of the distinctive peculiarities of each living being to its descendants; and since these peculiarities are subject to constant variation, there would be a tendency to a perpetual degradation of each natural type but for some counteracting influence. For the characters of a living being cannot be balanced like ciphers in arithmetic—so many good on the *plus* side, so many bad on the *minus*: they involve a mutual harmony, which cannot be departed from far in any direction without fatal injury to the whole: one vice spoils many virtues; and the union of great perfections with great defects can, at the best, be only grotesque.

Now the risk of degradation consequent on these circumstances appears to be prevented principally by two causes: first, that, in the general course of nature, more than one individual must concur in every act of generation; for since these individuals commonly differ in their accidental peculiarities, these peculiarities tend to efface each other, and thus to preserve in their offspring the typical character: secondly, that Death is, so to speak, ever on the watch to keep the individual up to the mark, sternly sweeping away the varieties afflicted with any serious imperfection, while he leaves the more perfect specimens to transmit their endowments to their posterity,—an operation probably aided by what Mr. Darwin has called "sexual selection."

In this conservative action, not in the creative operations ascribed to Death by Mr. Darwin, his true function appears to me to consist. Death throws away the worst of each *kind* to preserve the best; but he must have the *kind* given him to operate upon. So he sweeps away those types which change of circumstances have made unsuitable to the surrounding creation, to make room for others; but these are educed from the former, not by the unconscious action of death, but through an "ordained becoming," realized by the wise foresight of the ever-acting Power whose works we generalize into Nature.

Our greatest living poet has poured forth the dirge of existence:—

> Are God and Nature, then, at strife,
> That Nature lends such fearful dreams?
> So careful of the type she seems,
> So careless of the single life.
>
> So careful of the type! but no,
> From scarped cliff, and quarried stone,
> She cries, "A thousand types are gone,
> I care for nothing—all shall go."

But the history of organized being, considered as a succession of typical forms, assumes a more cheerful character; life appears everywhere triumphant over death. As in the order of nature the individual transmits to its successors its own peculiarities, modified, indeed, but not lost in the great stream of being, so each type, if it passes away when it has done its work, is yet not lost, but transmits to succeeding types the undying fire, tinted with its own characteristic hue. And this succession of typical forms, like the perpetuation of each particular type, is brought about by the action of the individual, following the laws and impulses of its own nature, and unwittingly contributing, by the performance of its own little part, to the gradual unfolding of the majestic drama of creation. But the arrangement of the scenes is due to foresight, not to chance, to the constructive power of thought adapting organization to circumstance, not to any power in circumstance to create by destroying. In the words of the same great master whose language I have already quoted—

> Nature also, cold and warm,
> And moist and dry, *devising* long,
> Through many agents, making strong,
> Matures the individual form.

MISCELLANEOUS.

Capture of the Long-finned Tunny on the Chesil Beach. By W. Thompson, Esq.

To the Editors of the Annals of Natural History.

Gentlemen,—On the 13th instant I had the gratification of receiving a specimen of the Germon, or Long-finned Tunny (*Thynnus alalonga* of Cuvier), from its captor, who had been kindly sent to me by my friend Capt. Manning, H.M. Lieutenant-Governor of Portland. The captor informed me that "*it run ashore like a whale*," on the Chesil Beach. It was evidently a sickly fish, although apparently very well fed. I purchased the fish and sent it to the British Museum; and as time presses, and I have little doubt that we shall have a description drawn up by our good friend Dr. Gray, I shall not now give the description, nor the measurements that I have taken.

I am, Gentlemen,
Yours truly,
William Thompson.

Gloucester Row, Weymouth,
March 19, 1861.

On Oxybeles gracilis, *Bleeker.* By Dr. C. L. Doleschall.

The remarkable observation made by Quoy and Gaimard, and confirmed by Bleeker, that certain fishes habitually reside in the stomachal cavities of Echinodermata, has been submitted to further examination by the author; and although he does not arrive at any very satisfactory results, a short notice of his observations may prove interesting to our readers.

Dr. Doleschall states that the fact of the connexion between the fish and the star-fish is well known to most of the fishermen in Amboyna, and that he was able to obtain a sufficiency of specimens for examination; but as the star-fishes (and with them the fishes) speedily died in confinement, he was unable to make continuous observations upon them in a living state. Of the results of his observations he gives the following summary:—

"The fish stands to the star-fish in a definite relation which cannot be the subject of observation. Why the little fish should always seek the stomachal cavity of one and the same species of star-fish, and not that of various species, is a mystery. It is well known that Crustaceans of the genus *Pagurus* inhabit the empty shells of Mollusca; but we find on the shore the same species of *Pagurus* in the shells of the most various genera and species. I have never met with *Oxybeles gracilis*, on the contrary, in any other species of star-fish than *Culcita discoidea* *." The fish was described by Bleeker under the above name in 'Natuurkundig Tijdschrift,' vii. p. 162. The author proceeds to state that neither he nor any one else in Amboyna has ever captured the fish under other circumstances, or while swimming freely in the sea; but upon this Dr. Bleeker remarks that many of his specimens of *Fierasfer Brandesii*, and all those of *Fierasfer* (*Oxybeles*) *gracilis* and *F. lumbricoides*, were obtained by him along with other fishes, and were probably taken while swimming freely in the sea.

Upon the habits of *Oxybeles gracilis* the author goes on to say that it is certain that this animal passes the greater part of its existence in the stomach of the star-fish, rarely showing itself outside of this, and then probably at night. That it does come out occasionally, appears from the fact that in two cases the author observed the fish with a portion of its body outside the cavity of the star-fish, and in the act of creeping in. The same observations showed that the fish, in returning to its concealment, passes along the furrow of the lower surface of one of the arms leading to the mouth of the star-fish, which is wide enough, when the tentacles are retracted, to leave room for the passage of the slender body of the *Oxybeles*. This fact likewise proves that the *Oxybeles* does not get into the stomach of the *Culcita* by accident.

If a living *Culcita* be cut in two, the fish is seen moving freely in the cavity of its body. If it be taken out, it immediately seeks the shade. If the two halves of the *Culcita* (still alive) be placed in the water, the fish will soon be seen to draw towards them, in order to get into the cavity of the star-fish. When exposed to the light, it is uneasy, and its iris contracts excessively. The author never found two fishes in the same star-fish.

In most of the fishes examined by him, the author found the stomach empty; it was full only in one. The contents of the stomach had the appearance of a lump of fat, and consisted of half-digested muscle. Under the microscope, striated muscular fibres could be detected; and the author thinks that they belonged to the muscles of a fish. This circumstance proves that *Oxybeles* does not feed upon the chyle of the star-fish, but that its nourishment is analogous to

* *Fierasfer Brandesii*, or *Oxybeles Brandesii*, Blkr., inhabits not only *Culcita discoidea*, but also several species of Trepang, such as *Tripang edulis* and *T. ananas*.—Note by Dr. Bleeker.

that of other fishes. Whether it seizes upon the fishes taken by the star-fish for its own nourishment must be determined by further investigations.

The author's observations establish:—

1. That *Oxybeles gracilis* is not a true parasite.

2. That it passes the greater part of its life in the stomach of *Culcita discoidea*, as is also indicated by the unusually pale colour of the fish.

3. That, however, it can come out, either to seek nourishment or for the purpose of reproduction.

4. That it then returns to the mouth along the furrow on the ventral surface of the arms.

5. That it is very sensitive to light.

6. That it feeds upon other animals.

In fresh water the animals live for about half an hour. The pigment upon the peritoneum exhibits under the microscope the most beautiful stellate forms. The fish possesses a swimming-bladder.—*Natuurkundig Tijdschrift voor Nederlandsch Indie,* Deel xv. p. 163; *Wiegmann's Archiv,* 1860, p. 319.

On some Naked-eyed Medusæ of *Charleston Harbour.* By Mr. M'Cready.

In a memoir on the "Gymnophthalmata of Charleston Harbour," published in the first volume of the 'Transactions of the Elliot Society,' the author describes many new forms of Hydroida, proposes a new systematic arrangement of those animals, and makes some interesting observations regarding their anatomy and development.

The author states that in several species he has succeeded in detecting an unmistakeable ganglion behind each tentacle and marginal corpuscle.

Cunina octonaria, like *Æginopsis,* to which it is nearly allied, is developed by simple metamorphosis,—not, however, swimming freely in the water, but in the cavity of the bell of another Medusa (*Turritopsis nutricula*). Not only does the latter furnish a shelter and dwelling-place for the larvæ during their development; it also serves as their nurse, by allowing the parasites, whilst adhering by their tentacles, to draw their nourishment out of its mouth by means of a large proboscis. In point of fact, the relation between them is of so unprecedented a nature, that the author may well be excused for having at first taken the impudent parasite for the gemmiparous progeny of the sheltering Medusa. The youngest state of this parasitic Medusa observed by the author formed a ciliated body of clavate form, adhering to the cavity of the bell by means of the slender stalk in which it terminated. Its first change consists in the emission, from the thick end, of two slender flexible tentacles, and in the formation of a central cavity by liquefaction. At this stage of development, the author frequently observed gemmation taking place at the thicker end, sometimes frequently repeated. Subsequently the number of tentacles becomes doubled. These bend together over the clavate extremity, and are then employed, instead of the thin end of the body, in adhering to the cavity of the sheltering Medusa. The thin extremity then acquires a mouth, and may be recognized as a stomachal peduncle, which is employed, as above indicated, in obtaining nourishment. The morphological nature of this proboscis becomes still more distinct when, after the lapse of some little time, an annular fold makes its appearance immediately under the tentacles, which is recognizable from its form, and from the formation in it of (eight) otolithic capsules, as the first indication of the future bell. Simultaneously with the otolithic capsules, four rudimentary tentacles make their appearance between the four tentacles. The Medusa remains in this stage of development for a long time. The bell gradually becomes more freely developed, and at last, by the reduction and entire disappearance of the stomachal peduncle, becomes the most essential part of the Medusa, after it has left its previous dwelling-place in the bell of the *Turritopsis*. The bell nevertheless retains for some time its earlier lobed form and unequal tentacles.

With regard to the general character of the Medusan fauna of Charleston, the author thinks that, besides its continental relations to that of Grand Manan, Boston, and Long Island Sound, it has also an unmistakeable (climatic) analogy with the Mediterranean forms, and a partial identity (perhaps caused by the Gulf Stream) with the species of the south of England.—*Wiegmann's Archiv*, 1860, *Bericht*, p. 169.

On Infusorial Animalcules living without free Oxygen gas and causing Fermentation.* By L. Pasteur.

The author commences by calling attention to the varied nature of the products of *lactic* fermentation. Lactic acid, a gum, mannite, butyric acid, alcohol, carbonic acid, and hydrogen make their appearance simultaneously or successively in very variable and perfectly capricious proportions. The author has found that the vegetable ferment which converts sugar into lactic acid is different from that or those (for there are two of them) which cause the production of the gummy matter, and that the latter do not produce lactic acid. He has also ascertained that these different vegetable ferments, if *very* pure, cannot give origin to butyric acid. There is consequently a peculiar butyric ferment; and the author's present memoir relates to the origin of butyric acid in the lactic fermentation.

Having observed what he calls Infusoria in the liquids, he directed his attention to the removal or prevention of their appearance, believing that they fed upon the butyric vegetable ferment. But being

* The author must be considered to use the term "Infusorial animalcules" in Ehrenberg's sense, as it is pretty evident that the organisms referred to are vegetable *Vibrionidæ*, and not of animal nature. This must be borne in mind in reading the following abstract of Pasteur's observations. Even with this deduction, they are still very important.—Ed. *Ann.*

unable to ascertain the cause of the production of butyric acid, he was at last struck by the coincidence shown, by his analyses, between this acid and the Infusoria, and between the latter and the acid—a circumstance which he had previously regarded as due to the favourable conditions afforded by the butyric acid for the life of the animalcules. He has since convinced himself that the conversion of sugar, mannite, and lactic acid into butyric acid is due exclusively to these Infusoria, and that they must be regarded as the true butyric ferment.

They are small cylindrical rods, rounded at the extremities, usually straight, isolated or united into chains of two, three, four, and sometimes more joints. Their average breadth is 0·002 mill. The length of the isolated joints varies from 0·002 to 0·015 or 0·02 mill. They advance by a gliding movement, during which their body remains rigid or undergoes slight undulations. They pirouette, balance themselves, and cause the anterior and posterior parts of their body to tremble rapidly. The undulations of their movements become very evident when they attain a length of 0·015 mill. They are often recurved at one of their extremities, sometimes at both: this peculiarity is rare at the commencement of their lives. They propagate by fissiparity, and it is evidently to this mode of reproduction that the formation of chains is due. The joint which drags others behind it often agitates itself briskly, as if to detach itself. Although the bodies of these Vibriones are cylindrical in appearance, they often appear to be formed of a series of granules, or very short indistinct joints, which are probably the first rudiments of new individuals.

These organisms may be sown as one would sow beer-yeast; they multiply if the medium be adapted for their nourishment. They may be sown in a liquid containing only sugar, ammonia, and phosphates—crystallizable and, as it were, mineral substances; and they reproduce in correlation with the butyric fermentation. The weight of them formed is notable, although always very small in comparison with the quantity of butyric acid produced. They live and multiply without the smallest quantity of air or free oxygen,—and not only this, but air kills them. If a current of pure carbonic acid be passed into the liquid containing them for some time, their life and reproduction are not at all affected; but if a current of atmospheric air be substituted for the carbonic acid, and passed for only one or two hours, they all perish, and the formation of butyric acid ceases.

Hence, the author thinks, we arrive at this double proposition:—

1. The butyric ferment is an Infusorium.

2. This Infusorium lives without free oxygen gas.—*Comptes Rendus*, Feb. 25, 1861.

[It seems to us that all the facts adduced by him go to support the opinion expressed in our note, that the organisms in question are not true Infusoria, but vegetable *Vibrionidæ*. This would remove everything wonderful from the circumstances; but the observations are nevertheless very interesting, as affording, we believe, the first evidence of the production of fermentation by a *Confervoid* plant.—Ed.]

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 41. MAY 1861.

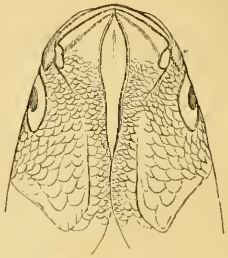
XXXVIII.—*On the British species of* Mugil, *or Grey Mullets.* By Dr. Albert Günther.

The species of *Mugil* are very numerous, and very similar to one another in general appearance, the genus resembling in this respect some of the Cyprinoids, as *Leuciscus*, *Abramis*, and others. They can be distinguished from one another only by close examination; the greater part of the difficulty of distinguishing them, however, is owing rather to the incompleteness of the descriptions in our ichthyological works, than to the absence of palpable characters. The latter (such as are hereafter indicated) are very constant in each species, but so little conspicuous, that we find very lengthened descriptions, giving minute details of the general appearance of a fish, but omitting the very character by which it differs from other species. The discovery of these characters is due to Cuvier and Bonaparte, who have carefully used them for the distinction of the Mediterranean species; and it is much to be regretted that, in the great ichthyological work of the former, equal attention has not been paid to the distinction and description of many foreign species, which, if the typical specimens are not re-examined and redescribed, are dead letters in science. It is nearly useless to go beyond Cuvier's period in order to recognize species described by ichthyologists; and when Cuvier, for instance, applies the Linnæan name of *M. cephalus* to a Mediterranean species which is not found on the more northern coasts of Europe, he has been led rather by his own taste (this species bearing the vernacular name of *Cefalo* in Southern Europe) than by an appearance of probability that this species was intended by Linné, who certainly has adopted Artedi as his guide. But Artedi has given us admirable description of *M. capito*.

This paper is devoted only to the British species of the genus, all of which are comprised under the common name of Grey Mullets.

1. *Mugil capito*, Cuv. (The Short-finned Grey Mullet.)

Nine soft rays in the anal fin; no adipose eyelid; upper lip membranaceous, thin. The depth of the body is one-fifth, or rather less than one-fifth, of the total length. A distinct portion of the maxillary bone is visible behind the angle of the mouth. There is a rather broad, elongate cuneiform space at the chin, which is not covered by the mandibularies and the interopercles. The pectoral fin extends only to the eighth or ninth of that series of scales which commences from the shoulder (lateral line), whilst the origin of the spinous dorsal is vertically above the twelfth or thirteenth. A short pointed scale in the axil of the pectoral. Root of the pectoral with a black spot superiorly*.



Mugil capito.

Cuvier was the first who stated that a species of *Mugil* occurring on the English coast, and probably the same which had been described by Willughby and figured by Pennant, is identical with that Mediterranean fish for which he had chosen the name of *Mugil capito*. One year later (1830) the species was examined by Hancock†, who, not being aware of the name given by Cuvier, calls it *M. britannicus*; he describes the lips as thin, mentions a callus at the corner of the mouth, and nine anal rays, so that we can scarcely doubt that specimens of the true *M. capito* served for his description. The species has been fully established for the British fauna by Couch and Yarrell, whilst Parnell was obliged to borrow his description from Jenyns, as the species appears to be scarce on the Scotch coasts.

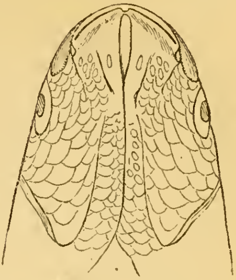
2. *Mugil auratus*, Risso. (The Long-finned Grey Mullet.)

Nine soft rays in the anal fin; circuit of the orbit adipose, but not forming an eyelid; upper lip thin. The depth of the body is less than one-fifth of the total length. Only the outermost

* Only those specific characters are given for this and the following species which serve to distinguish them from other European *Mugiles*.

† Lond. Quart. Journ. Sc. 1830, p. 129.

extremity of the maxillary bone is visible behind the angle of the mouth; the cleft of the mouth is more than twice as broad as it is deep. There is a short lanceolate portion at the chin not covered by the mandibularies. The pectoral fin extends to the thirteenth scale of the lateral line, that is, nearly to the origin of the spinous dorsal, which is vertically above the fourteenth scale. No pointed scale in the axil of the pectoral, and no black spot at its root.



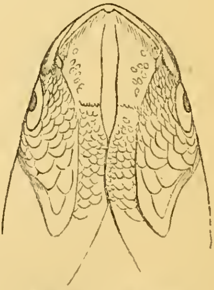
Mugil auratus.

This species is new to the British fauna; it had been previously known from the Mediterranean and from the Canary Islands. Considering its great similarity to *M. capito* in general appearance, it is not improbable that former ichthyologists have confounded it with that species.

I have not been able to find more than two specimens among numerous examples of the Thick-lipped Grey Mullet brought to the London market during the first half of the month of March. It could not be determined on which particular spot of the coast they had been caught; but it was ascertained, from the inquiries made, that all the Grey Mullets which were in the market at that time came either from the south or west coast. No Dutch vessel with fish had entered the Thames. All the specimens, besides, were remarkably fresh, and could not have been brought from any great distance; so that there is no doubt that those two specimens, as well as others purchased at the same time for the British Museum, were truly British specimens.

3. *Mugil octo-radiatus,* n. sp. (The Eight-rayed Grey Mullet.)

Eight soft rays in the anal fin; no adipose eyelid; upper lip thin. The depth of the body is less than one-fifth of the total length ($5\frac{1}{3}$). The outermost extremity of the maxillary is visible behind the angle of the mouth; the cleft of the mouth is nearly half as deep as it is broad. There is a narrow elongate space at the chin which is not covered by the mandibularies and extends between the interopercles. The pectoral fin extends to the twelfth scale of the lateral line; that is, it terminates at some distance from the origin of the spinous dorsal, which is vertically above the fourteenth scale. No



Mugil 8-radiatus.

pointed scale in the axil of the pectoral, and no black spot at its root.

This species is not only new to the British fauna, but also to science, and is founded on a single well-preserved specimen in the British Museum, presented by Mr. Gerrard. It resembles *M. auratus* in general appearance, from which, however, it differs in several characters so well marked, that it will be readily distinguished whenever it occurs. It has only eight soft rays in the anal fin, whilst all the other European species have nine, except *M. cephalus* and, perhaps, *M. curtus*. There is no possibility of its being confounded with the former, which has broad adipose eyelids, and is not found on the British coasts, whilst *M. curtus* is distinguished by an unusually short body, being only four times as long as deep. Variations in the number of the anal rays are of extremely rare occurrence in the Mullets; therefore we are not justified in considering the small number in the present specimen as such an exception, and in ranking the specimen as a variety of *M. auratus*. It differs in several other points besides: the cleft of the mouth is deeper than in *M. auratus*; the free space at the chin is twice as long, and extends between the interopercles; the pectoral is shorter. Nothing can be said of the occurrence of this species on any particular part of the coast; perhaps it is scarcer than its congeners. The attention of British naturalists being now directed to this species, we may hope soon to have better information on its natural history.

4. *Mugil curtus*, Yarr. (The Short Grey Mullet.)

Eight(?) soft rays in the anal fin; lips thin; no adipose eyelid. The height of the body equals the length of the head, and is one-fourth of the total length.

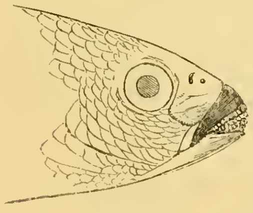
This is all that is known of this species, but quite sufficient to recognize it, if it should occur again on the British coast. Yarrell had a single very young specimen, 26 lines long, which, to judge from the figure, does not appear to have been in a good state of preservation; it has not been preserved in his collection, which was transferred to the British Museum. Valenciennes professes to have recognized the species in a Mullet from the Somme, eight inches long; he does not give a fuller description than Yarrell; and the figure added (Cuv. et Val. Hist. Poiss. pl. 311) distinctly shows nine anal rays, the last two being as distant from each other as the seventh is from the eighth. The pectoral appears to have a short pointed scale in its axil. Yet there can be no doubt that a Short-bodied Grey Mullet exists on the European coasts; but whether the specimen described by Valenciennes is of the same species as that found by Yarrell, is a question the solution of which must be left to further investigation.

5. *Mugil septentrionalis*, n. sp. (The Thick-lipped Grey Mullet.)

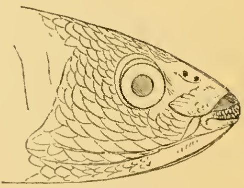
Nine (rarely ten) soft rays in the anal fin; upper lip thick, with two series of short and obtuse papillæ on its inferior third; the extremity of the maxillary is visible behind and below the angle of the mouth. The præorbital is very obliquely truncated, so that its posterior angle is pointed, whilst the anterior is very obtuse and rounded. Mandibles very broad, almost entirely covering the chin. The pectoral extends to the tenth scale of the lateral line; that is, it terminates at a considerable distance from the origin of the dorsal fin, which is above the fifteenth scale, and exactly on the middle between the snout and the base of the caudal.

Mr. Couch* has the merit of having shown that, besides *M. capito*, a second species of Grey Mullet exists on the British coasts; and finding that it has a similarly thick lip as *M. chelo* from the Mediterranean, he has considered it as identical with this southern species. Both the northern and the southern thick-lipped Mullets, indeed, are very similar to each other; and it has been nearly impossible to see, or to show, their specific differences otherwise than by comparison of actual specimens, as the descriptions and representations existing have taken little notice of the distinctive characters. Yarrell and Parnell have adopted Mr. Couch's determination, the latter giving an original description†, in which, however, some of the numbers of the fin-rays are erroneous (2. D. 10, A. 11, instead of 2. D. $\frac{1}{8}$, A. $\frac{3}{9}$); Hancock's *M. britannicus* is placed by him here as a synonym, whilst it is described by Hancock as having *thin lips*, &c.

The characters by which this species differs from the southern are the following:—



M. chelo.



M. septentrionalis.

1. The upper lip is considerably thicker in *M. chelo*, and provided with three series of papillæ.

2. The form of the præorbital is entirely different: in *M. chelo* its extremity is rounded, the anterior angle being not much

* Couch, MS. in Yarr. Brit. Fishes, 2nd edit. vol. i. p. 241.

† Fishes of the Frith of Forth, p. 68.

wider than the posterior (see figure, pl. 309, in Cuv. et Val., which is copied by Parnell, Fishes of the Frith of Forth, pl. 28); in *M. septentrionalis* the præorbital is very obliquely truncated, so that its posterior angle is pointed, whilst the anterior is very obtuse and rounded (see Yarr. Brit. Fishes, 2nd edit. i. p. 243, lateral view of the head).

3. The pectoral fin is much longer in *M. chelo*; it extends to the thirteenth scale of the lateral line—that is, nearly to the origin of the dorsal fin, which is above the fourteenth or fifteenth scale.

4. The whole of the caudal portion is shorter in *M. chelo*, so that the origin of the spinous dorsal fin is nearer to the root of the caudal than to the end of the snout.

These points will suffice to show that *M. chelo* and *M. septentrionalis* are two distinct species*; and we must therefore be careful in using for their determination figures which were executed when the species had not been distinguished.

a. Bonaparte's figure in the 'Fauna Italica' is taken from *M. chelo*; but the outlines of the præorbital are incorrect.

b. Cuv. et Val. Hist. Poiss. pl. 309 represents the head of the true *M. chelo*.

c. Yarrell, Brit. Fishes, 2nd edit. i. p. 241, figure of the entire fish, is a copy from Bonaparte's *Mugil chelo*, and does not represent the British species.

d. Yarrell, *l. c.* p. 243. The lateral view of the head is original, and taken from a British specimen of *M. septentrionalis*; whilst the view from below, again, is a copy of Bonaparte's *Mugil chelo*.

e. Parnell (*l. c.*) copies the head of *M. chelo* from the 'Hist. Nat. des Poissons.'

This species is not confined to the British coasts. Professor Nilsson, who also takes it for *M. chelo*, Cuv., has given an excellent description of it, from which it is evident that the thick-lipped Mullets of Scandinavia are identical with the British; so that *M. septentrionalis* appears to be common to the northern shores of Europe, whilst *M. chelo* frequents the southern.

I do not pretend to give this as a *complete* account of the British Grey Mullets. The present paper contains only the result of observations made on the materials which I have found in the British Museum, and on a collection which the Keeper of the Zoological Department, Dr. Gray, has enabled me to make during the first half of the month of March; and I feel fully convinced that, by continued *accurate* investigations, not

* A difference of minor importance is that *M. chelo* has seven, *M. septentrionalis* five pyloric appendages.

only the species mentioned will be recognized, and their distribution and natural history elucidated (as has been done already by Mr. Couch for *M. capito* and *M. septentrionalis*), but also that others will be discovered, either new to the British fauna or to science in general.

Finally, I cannot refrain from subjoining some remarks on a passage in Yarrell's work, by which I have been particularly struck, not only because it is one of the numerous proofs of Yarrell's admirable dexterity in embodying in his work everything by which ichthyology could be advanced *in a practical way*, but also because it deserves particular attention at a time when the acclimatization of animals and of fishes is so much discussed. I quote the passage in full (2nd edit. i. p. 239) :—

"Mr. Arnould put a number of the fry of the Grey Mullet about the size of his finger into his pond at Guernsey, which is of about three acres' area. After a few years, Mullets of four pounds' weight were caught, which proved to be fatter, deeper, and heavier, for their length, than others obtained from the sea. Of all the various salt-water fishes introduced, the Grey Mullet appeared to be the most improved. A slight change in the external colour is said to be visible."

It needs no comment to prove that the plan of Mr. Arnould, as stated by Yarrell, must give a return worthy of consideration, if systematically and more extensively carried out. The Grey Mullets belong to the better fishes for the table, especially the thick-lipped species, and at present fetch a price of 6*d*. to 9*d*. per pound in the London market. Besides, the ponds in which they are kept will afford constant opportunity for fly-fishing.

This is only one of the numerous examples from which it could be shown that, if the natural resources which this country possesses in its indigenous species of fishes are resorted to and developed, and if due attention is paid to improving the condition and the number of the individuals, the endeavours to increase the natural stock by the introduction of foreign species lose much of their *practical* value. And is it not quite clear that such foreign species, when their introduction has become an accomplished fact by long-continued efforts and by a great expense of money, will require at least the same care and attention as the indigenous species, if they are expected to yield an adequate return?

The possibility of transferring marine fishes into freshwater ponds was indicated by Mr. E. T. Bennett, formerly Secretary to the Zoological Society, as far back as the year 1828. After giving an account of an ichthyological collection made by Mr. Frembly in the Sandwich Islands (Zool. Journ. 1828, iv. p. 32), he adds—

"There is, however, another point of view in which the collection possesses a very peculiar attraction—the probability that the fishes composing it, though natives of the ocean, actually become naturalized in fresh or nearly fresh water, and are thus preserved and improved for the use of man. It is not a little extraordinary that a fact of so much importance to the comforts and even the necessities of life should have been brought but recently under the notice of the civilized people of Europe, while to the uncultivated inhabitants of the Sandwich Islands it has probably been long and practically known. It forms, indeed, a very important part of the employment of the common people to search among the pools left by the retiring tide for the smaller fry which may be there retained, and to convey them to ponds, in which in a short time they increase to a size fit for the table."

Yet, although I consider the acclimatization of foreign species of fishes as a matter of subordinate value from a *practical* point of view, it is a problem of high *scientific* importance, because it involves the solution of the question, how far the power of man is able to interfere with the original distribution of fishes? It would far exceed the limits of this paper if I were to enter into proposals or conjectures on the experiments by which we might hope to solve a portion of that problem. It may suffice if I venture to offer an opinion to those who are particularly interested in the subject, namely, that for the first experiment a species ought to be chosen from a climate similar to that of England; that no other species can be recommended with better right than the *Wels* of the Continent (*Silurus glanis*); that if the experiments should be extended to tropical species, fishes from the family of the *Labyrinthici* ought to be selected, because they are very tenacious of life and can live without water for days. The *Gorami* (*Osphromenus olfax*), one of the best freshwater fishes of the tropics, growing to the weight of ten to fifteen pounds, and already introduced in Mauritius and Cayenne, the Climbing Perch (*Anabas scandens*), and the *Pla Kat* of the Siamese (*Betta pugnax*), would deserve the first attention*.

* The two latter species would be fishes of luxury, like Gold-fish. The *Pla Kat*, which also occurs in the Malayan Peninsula, is, according to Dr. Cantor, a great favourite with the Siamese. They keep them like Gold-fish, and produce several varieties, one of which has great fighting propensities. "The Siamese are as infatuated with the combats of these fishes as the Malays are with their cock-fights, and stake considerable sums, and sometimes their own persons and their families. The license of exhibiting fish-fights is farmed, and affords a considerable annual revenue to the King of Siam."—Cant. Catal. p. 87.

XXXIX.—*Supplement to a Monograph on the British Species of* Phalangiidæ, *or Harvest-men.* By R. H. Meade, F.R.C.S.

In June 1855, I published, in the 'Annals and Magazine of Natural History' (vol. xv. p. 393), a short paper on the Phalangiidæ of this country, in which I described fifteen species. Since that period a few new facts have come to my knowledge, which will enable me to add somewhat to the natural history of this neglected tribe; and I have also one new species to record, the only one that has fallen under my notice since the appearance of my monograph.

I formerly remarked that no observations had been published as to whether the Harvest-men change their skins and undergo periodical moultings, like the true spiders; but soon after the appearance of my paper, my friend Mr. Blackwall wrote to me to the following effect:—"Many years ago, when engaged in investigating the changes of integument which various species of spiders undergo, I directed my attention to the Phalangiidæ also; and I can inform you, from my own observations, that they cast their integument several times before they arrive at maturity." In further confirmation of this fact, the Rev. Prof. Henslow, in a communication dated September 4, 1855, wrote to me, "I have just found two Harvest-men standing by what are manifestly their old clothes." These he kindly transmitted to me, together with the spiders themselves, which proved to be specimens of *Phalangium urnigerum.* Mr. Blackwall also sent me several exuviæ in proof of his observations; so no doubt can rest any longer upon this point.

With respect to the power possessed by the Phalangiidæ of reproducing lost limbs, Mr. Blackwall observes in the same letter, "I am inclined to think that they do possess the power, as I have frequently noticed one of the long legs of the second pair (though perfect in structure) to be much shorter and smaller than the other. Latreille's argument against the capability of animals of the order Phalangidea reproducing lost limbs, deduced from the supposed shortness of their lives, is of little or no weight, when it is borne in mind that the existence of numerous species of spiders which do reproduce lost limbs is limited to a few months."

I am here led to the correction of another error into which I had fallen, viz. with respect to the length of life to which the Phalangiidæ may attain; for while doubtless the individuals of most species die at the commencement of cold weather, some survive through the whole winter. Mr. Blackwall has found living specimens of *Nemastoma bimaculatum, Megabunus insignis, Megabunus corniger,* and *Opilio agrestis,* under stones in the woods, both in winter and early spring; and on several occasions I have found adult specimens of *Megabunus insignis* myself in March and April, and *Nemastoma bimaculatum* all through the winter in a torpid state.

In returning my thanks to those friends who had assisted me in preparing materials for my monograph, I omitted the name of the Rev. Hamlet Clark; and I now embrace the opportunity of supplying the omission. I am the more anxious to do this, as I found, after the publication of my memoir, that he had been so kind as to put up a large collection of specimens of British Harvest-men (the result of two years' collecting), together with a number of MS. notes upon them, and to transmit the whole to me through the post-office, by which they must have been lost, as they never reached me. Mr. Clark had promised to send them some time before I finished my paper; and as they did not arrive, I thought he had forgotten or neglected to do so; and I was exceedingly annoyed to hear, a short time after the appearance of my monograph, that they had been sent off and lost. From the well-known talents of the Rev. Hamlet Clark as an entomologist, it is probable that, had I received the parcel, this department of Arachnology would have been enriched by some additional species, as well as by a more extended knowledge of the habits of the family.

Genus Phalangium, Linn.

Phalangium cornutum.

In the male of this species the length of the horned processes of the falces is subject to great variation. I mentioned before, that they are always short in young specimens; but I have since found that adult individuals are often met with in which the horns are very short, and sometimes almost deficient. The size of these Harvest-men is generally small; and the palpi seem to bear a proportionate length to that of the horns of the falces. In the month of August 1859, I found numerous adult short-horned males together with females of this species, near Bicester, in Oxfordshire, in a dry stony place, which were smaller than usual in all their proportions, and very ferruginous in colour. At first I regarded them as a new species; but on finding that they agreed with ordinary specimens in all points of structure, except in the length of the falces and palpi of the males, I came to the conclusion that they were only stunted varieties, perhaps produced in some measure by the extraordinary dryness of the season. I have since received similar specimens from the Rev. O. Pickard-Cambridge, captured in the south of England.

Phalangium minutum.

When I published my monograph, the habitat of this minute species was unknown to me: I had then seen but two specimens. I have since found another, in a collection of Phalangiidæ made in the neighbourhood of Dublin.

Genus Opilio, Herbst.

Opilio histrix.

I am glad now to be able to give this fine Harvest-man (our largest native species) a clear title to a place among the British Phalangiidæ.

In November 1856, the Rev. A. M. Norman transmitted to me, alive, a fine adult female specimen, which he found under a mat "which lay before a window opening down to the ground into the garden," at Kibworth, near Market-Harborough, Leicestershire. In November of the following year I had also the pleasure of receiving a pair (male and female) of the same spiders from Mr. Norman, which were captured at Kibworth. In determining the name of these specimens from my description, it struck this naturalist that a slight alteration in the account would make it more correct: viz. that the row of minute teeth with which the posterior edge of each ring of the abdomen is said to be furnished should have been called a row of small tubercles.

Genus Leiobunus, Koch.

Leiobunus Blackwallii, n. sp.

L. forma et colore *Leiobuno rotundo* consimilis; sed differt cephalothoracis fronte pallida, corneis albo cinctis, macula abdominali ad extremum extensa, articulorum crurum juncturis albidis, tarsisque albido et fusco annulatis.

Long. fœm. 2, maris $1\frac{1}{4}$ lin.

In form this species closely resembles the common *Leiobunus rotundus*; but it is about one-fourth smaller, and has the legs proportionably rather shorter and weaker. The general colour is also very similar, the body of the female being testaceous marked with brown. A pale band extends up the front and middle of the cephalothorax from the anterior margin to the eye-eminence, enclosing two short dark lines placed close together in the centre towards the front edge. On each side of the pale band is an irregular dark-brown patch, somewhat semicircular in shape, the convexity being inwards, which terminates posteriorly and externally in a sinuous curved mark.

The eye-eminence is white, and the eyes black. The legs are marked with brown and white patches or rings. The distal extremities of the femora and tibiæ are white and glistening, while the ends of each joint of the tarsus are dark brown, the middle being light-coloured. The sides of each trochanter and the proximal ends of the femora are dark brown. The abdomen is marked with a wide and somewhat indistinct dorsal band of a brown colour, which extends along the anterior two-thirds of its length and dilates posteriorly into two lateral prolongations. Behind this band is a pale transverse space occupying the whole or part of two rings. The terminating rings towards the apex are marked with brown.

The male, like the same sex in *Leiobunus rotundus*, is almost hemispherical in shape, the upper surface being flattened. The colour is dull yellowish brown, and the body is nearly concolorous; still the cephalothorax is faintly marked as in the female, the front and central part being white, and the eye-eminence being crested by two pale projecting rings which surround the eyes. The legs are dark brown.

This species has been confounded with *L. rotundus*; and Mr. Blackwall first called my attention to the distinctions between them. The two species may readily be distinguished by the following characteristics, which I have embodied in the Latin specific character:—1st. The front of the cephalothorax is dark in the centre in *L. rotundus*, while the same part is pale in *L. Blackwallii*. 2nd. The eyes are surrounded by a black ring in the former and a white one in the latter. 3rd. The brown abdominal band has a well-defined quadrate extremity in *L. rotundus*, while it terminates in two lateral projections in *L. Blackwallii*. 4th. The legs are more distinctly variegated with white and brown rings and marks in the latter than in the former.

In naming this species (which is met with in woods in different parts of England) after Mr. Blackwall, I am only rendering a slight tribute of gratitude to that eminent naturalist for the many favours and uniform kindness which I have received from him. I may truly say that the little knowledge of arachnology which I have acquired has been mainly derived through his assistance; and I really think that the difficulties with which this branch of science was beset in England a few years since (owing to the defective state of our scientific literature on the subject) were so great that, had not Mr. Blackwall kindly and liberally afforded me every information on my first application to him as a perfect stranger, I should have given up the study in despair.

Genus Homalenotus, Koch.

Homalenotus quadridentatus.

I received a specimen of this species in 1857 from the Rev. A. M. Norman, which had been captured at Brighton; and the Rev. O. Pickard-Cambridge found several individuals among moss and herbage, near Winchester, last year. All of these, as well as the specimens which I myself obtained in Buckinghamshire, were inhabitants of a chalky soil.

XL.—*On Hermaphrodite Reproduction in* Chrysaora hyoscella. By T. Strethill Wright, M.D.

[Plate XVIII.]

Prof. Allan Thompson, in his Treatise on the Ovum *, states that "the Discophoræ (Medusæ) are of distinct sexes." I have found this to be the case in all the Steganophthalmata and Gymnophthalmata which I have examined, with the exception of the subject of this notice.

Large individuals of *C. hyoscella* are hermaphrodite; but smaller ones are found which are unisexual, the male or female element being suppressed, as in some diœcious plants.

The best method of examining the structure of the reproductive apparatus of this animal is to place the Medusa, in its natural position, in a large basin of sea-water. The umbrella, all but its margin, is then to be cut away. The cavity of the stomach is thus laid open, and we have a good view of the interior aspect of the sub-umbrella. We find that each lip of the mouth divides, at its insertion, into three pillars. The central pillar projects as a large rounded bulb into the stomach, while the lateral ones diverge, pass outwards towards the margin, and afterwards converge and unite together, so as to form, with the bulb of the central pillar, the thickened opening or framework of the ovarian pouch. This opening is closed by the ovarian membrane, which consists of three layers—1. the endoderm, or intestinal layer; 2. the gelatinous layer; and 3. the ectoderm, or dermal layer. The ovarian membrane appears as a flocculent mass, from its being corrugated into numerous folds. By injecting air beneath it, it becomes inflated, and the folds are opened out. It then presents the appearance of a large transparent bag traversed by flat convoluted bands. These bands are the ovaries, and contain, between their endoderm and gelatinous layer, countless ova and planuloid larvæ in various states of development.

* Cyclopædia of Anatomy and Physiology, vol. v. p. 129, "Acalephæ."

The ova of *C. hyoscella* do not present, at any stage, a trace of germinal vesicle or spot—objects which are so readily detected in the ova of other polypoid zoophytes.

The planuloid larvæ resemble those of *Medusa aurita*; but the polyps into which they become developed approach more closely to the Lucernarian type, in having a pedicle which is surrounded by a gelatinous covering, and at its foot by a horny corallum, which I have described and figured elsewhere *.

The structure and position of the male organs are remarkable. Attached to the inner surface of the ovarian membrane by delicate pedicles, and projecting into the stomach, are numerous large grape-like bodies of translucent "jelly," accompanied in many cases by fringes of tentacles of the same substance (Pl. XVIII. fig. 1). The surfaces of the first bodies are dotted with minute papillæ, and on the tentacles are found tubercles or thickenings covered with similar papillæ. These papillæ are sperm-sacs filled with spermatic cells and spermatozoa (fig. 4). Smaller bodies, about the size of a hemp-seed, and specked with sperm-sacs, also occur attached to various parts of the lining membrane of the stomach, and even to that of the lips or long oral tentacles, *down to the very tips of those organs.*

The small Chrysaoras (about 4 inches in diameter) have no ovarian bands in their pouches, which only contain masses of the grape-like bodies and tentacles before mentioned. These tentacles are not homologous with the minute, hollow, cnidophorous or sting-cell-bearing tentacles found on the inner surface of the ovarian membrane of *Medusa aurita* and *Lucernaria auricula*; they are simply, as are the grape-like bodies, prolongations of the endoderm and gelatinous layer of the ovarian membrane.

Although the *testicles* of *Chrysaora* are apparently not homologous with those of other zoophytes, yet in reality they differ but little from those of *Actinia* and *Lucernaria.* I have given, in Pl. XVIII. fig. 2, a section of the testicle of *Chrysaora,* and in fig. 3, of one of the same bodies in *Actinia mesembryanthemum.* In *Chrysaora,* the thin endoderm (*a*) forms the distant sperm-sacs which project from the surface. In *Actinia,* the thick endoderm (*a*) also forms the more closely aggregated sperm-sacs, and fills up the interstices between them. The testicle of *Lucernaria,* again, resembles in shape and structure fig. 3; but the sperm-sacs are so closely moulded together, that they form hexagonal prisms divided from each other by exceedingly delicate walls of endoderm.

The sperm-sac of *Chrysaora* (fig. 4), as well as of other Ste-

* Edinburgh New Phil. Journal for 1859.

ganophthalmatous Medusæ, Lucernarias, and Actinias, is thus always formed of the endoderm or lining membrane of the digestive system, while the sperm-sac of *Hydra* (fig. 5), the Hydroid Polyps, and the Gymnophthalmatous Medusæ is formed of the ectoderm. In the first class of animals the spermatic cells (fig. 4) become first matured into spermatozoa in the centre (*c*), or at the base of the sperm-sac, the part most distant from the endoderm (*a*). In the second class they ripen at the periphery, or at the summit of the sperm-sac (fig. 5), the part also most distant from the endoderm (*a*).

My friend Mr. Hincks, in his valuable paper on *Clavatella* contained in the February Number of this Journal, appears to consider that the ova of that creature may be developed from the ectoderm. But an examination of the embryology of a very large number of zoophytes forbids me to entertain this idea. The endoderm of the generative capsule in these creatures consists of two layers intimately connected with each other. The external layer, or that in contact with the generative elements, is transparent and structureless. The internal layer, communicating with the cavity of the digestive system, is loaded with brown granules. In *Coryne glandulosa*, the ova are at an early period observed attached to the transparent layer of the endoderm, and separated from the ectoderm by a wide space of fluid. In *Hydractinia*, the reproductive polyps of which possess a muscular coat, that coat intervenes between the ova and the ectoderm.

In the subject of this paper, the ectoderm does not enter at all into the constitution of the sperm-sac. We may therefore conclude that the ova and spermatic plasma are detached or secreted from the external surface of the endoderm, which continues to convey nutriment to the former until they are fully developed.

EXPLANATION OF PLATE XVIII.

Fig. 1. Male organs of *Chrysaora hyoscella*: *a*, grape-like bodies dotted with sperm-sacs and attached to the ovarian membrane, *b*; *c c*, tentacular processes bearing tubercles and sperm-sacs.

Fig. 2. Section of tubercle bearing sperm-sacs, from the extremity of long oral tentacles: *a*, endoderm; *b*, "jelly;" *c*, ectoderm.

Fig. 3. Section of similar tubercle from *Actinia mesembryanthemum*, showing sperm-sacs formed by and imbedded in endoderm, *a*; *b*, interstitial tissue.

Fig. 4. Single sperm-sac of *C. hyoscella*: *a*, endoderm; *b*, unripe spermatic cells; *c*, spermatozoa; *d*, "jelly."

Fig. 5. Sperm-sac of *Hydra viridis*: *a*, endoderm; *d*, ectoderm; *b*, unripe spermatic cells; *c*, spermatozoa bearing the same relations to the constituents of the sperm-sac as in fig. 4.

XLI.—*On the Reproductive Elements of the* Rhizopoda. By T. Strethill Wright, M.D.

[Plate XVIII.]

We have, as far as I am aware, no definite observations as to the reproductive elements of the Rhizopods. All who are accustomed to the observation of minute marine life know that these creatures increase with great rapidity; but *how* they increase is at present a mystery.

Prof. Carpenter* has recorded and figured a peculiar state of the *sarcode* as occurring in spirit specimens of *Orbitolite*, which appeared to be broken up into little spherules, though still retaining the structure of unchanged sarcode. He also states that similar spherules are figured by Ehrenberg in several of the cells of *Sorites orbiculus*, and by Schultze in the chambers of *Rotalia*. Dr. Carpenter is inclined to believe that these bodies are gemmules. I have repeatedly noticed bodies, apparently similar to those figured by Carpenter, in *Gromia*; but I have considered them to be of the same nature as the coloured spherules which are found within the endoderm of the Hydroid Zoophytes.

Besides these spherules, however, Dr. Carpenter has met with other bodies, apparently imbedded in the sarcode, which he considered might be gemmules in a later stage, or ova. These were of a deep-red colour, and exhibited various stages of binary division. He has also figured a third object, found in an imperfectly closed shell of *Orbitolite*, which, with his usual caution, he considered might possibly have been introduced from without.

It is under these circumstances that I bring forward the following observations.

With regard to the female element, it will be necessary first to ascertain the essential characters of an ovum. Prof. Allan Thompson† defines it as "a detached spheroidal mass of organized substance, of variable size, enclosed in a vesicular membrane, and containing, in the earlier periods of its existence, an internal cell or nucleus." But the presence of a nucleus is not essential to the constitution of an ovum; for in the ova of *Chrysaora hyoscella* and some of the Ctenophora (*Beroë*) it cannot be detected at any stage. The ova of these animals may be defined as "detached masses of highly refractive substance." Such appears to be the simplest definition of an ovum,—a definition which will apply also to the first stage of the ovum of *Rhizostoma* as figured by Prof. Thompson ‡, where he shows, first, the "primitive ovum" destitute of germinal vesicle and

* Phil. Trans. vol. cxlvi. p. 212.
† Cyclopædia of Anat. and Phys. vol. v. p. 128.
‡ *Op. cit.* p. 128.

spot; secondly, the appearance of the germinal vesicle; thirdly, the advent of the macula within the vesicle; and, lastly, the formation of the enclosing membrane.

On examining a great number of specimens of *Gromia, Miliolina, Rotalina,* and *Orbulina,* I have repeatedly discovered bodies which correspond in all respects with the "primitive ovum" defined above. They consist of transparent spheres or ovoids formed of a finely molecular substance, but in which the molecules are masked or rendered indistinct by the highly refractive matter in which they are imbedded. No germinal vesicle or spot appears in the living specimens. It may be masked in a similar manner to the molecular structure; but in a specimen of *Truncatulina* (Pl. XVIII. fig. 6), which has been hardened in spirit, decalcified by dilute nitric acid, and mounted with strong heat in Canada balsam, four of the segments or zooids contain each an ovum which shows a germinal vesicle and spot with the utmost distinctness, while the rest present the usual appearance of granular, low-refracting sarcode*.

I have not been able to trace the development of the ova of Rhizopods. Bodies similar to those I have considered ova in *Gromia* are found attached to Algæ in vessels where that animal abounds. The ova of *Gromia* are very small; and young Gromias slightly larger than the ova also occur. In *Gromia,* therefore, the ova may be at once transformed into young, and directly acquire an envelope. Such is the mode of development in the ova of most of the Hydroidæ, which are transformed into planuloid larvæ without undergoing fissure. In *Orbulina,* however, the ovum is of very large size, and consists of a colourless spherule of sarcode enclosed in a membranous test and covered by a thin glairy layer. Here the sarcode presents traces of fissure, though these are lost when it is pressed out of its envelope. In both this genus and *Truncatulina* it is impossible that the full-sized ova can obtain exit from the animal, except by the destruction of the chambers of solid shell in which they are enclosed. In the case of *Truncatulina,* moreover, the ova are at least ten times as large as the primordial segment or zooid of the adult. It is therefore probable that the ova of these genera undergo a "polymorphic" development of many months' duration, similar to that described by Carter as occurring in *Amœba verrucosa*†, and that each ovum becomes transformed into numerous Amœboid zooids, which escape through the openings of the shell and form the primordial segments of future Rhizopods.

* I shall be happy to lend this preparation to any gentleman who may take an interest in it.

† Ann. Nat. Hist. ser. 2. vol. xx. p. 37.

With regard to the male element, I have only one observation to record. Amongst a large number of dark-brown Gromias which I have possessed for many months, one appeared filled as to its upper part with a milky matter, which, when pressed out, proved to be a congeries of cells and large active molecules, such as are obtained from the sperm-sacs of *Hydra viridis*. I was not able to make out the tails of the spermatozoa; but there could be no mistaking the characteristic shape and movements of the cells and molecules. The sarcode of the body in Rhizopods is itself finely molecular in structure, and, when crushed, exhibits slight molecular movements; but these movements are altogether different from those of the objects which I am persuaded are the spermatozoa of *Gromia*.

Since the foregoing paper was sent to the press, I have received the April Number of the 'Annals,' in which Schultze's discovery of living young in the chambers of *Rotalia* is brought before the readers of this Journal. Prof. Williamson, in his 'Treatise on Recent Foraminifera' (Ray Soc. Publ.), states, in regard to his *Spirillina perforata*, "he (Prof. Ehrenberg) assigns to it the trivial name of *vivipara*, owing to the circumstance that just within the septal orifice of his specimen he found two small spiral shells, which had obviously found their way there by accident: from this unimportant circumstance, he concluded that the shell was viviparous." *S. perforata* is plentiful in the Firth of Forth, on *Fucus serratus*. Immediately after reading Schultze's paper, I examined a quantity of the sea-weed, and found two large specimens of *S. perforata* surrounded by a multitude of very small ones. In one of the large specimens three small living *Spirillinæ* existed. Ehrenberg was doubtless right in considering this animal viviparous; but it remains to be determined whether the young are produced by gemmation or ovulation. In *Spirillina foliacea* I have found the highly refractive bodies I have above described as "primitive ova."

55 Northumberland St., Edinburgh,
April 17, 1861.

EXPLANATION OF PLATE XVIII.

Fig. 6. Specimen of *Truncatulina*, decalcified: *a*, membranous basis of shell; *b*, sarcode; *c*, ovum with germinal vesicle and spot; *d*, segment or zooid destitute of ovum.

XLII.—*Further Observations on the Natural History of the Lac-Insect* (Coccus lacca). By H. J. Carter, Esq., F.R.S.

After my observations on the evolution of the larvæ of the Lac-insect, which took place at Bombay about the 1st of July, and their succeeding changes, were made*, I continued my visits to the colony on the Custard-apple tree in order to ascertain the truth of the statement that a second evolution took place during the year, and was fortunate enough to witness this also, as well as the succeeding changes in the larvæ, which, being somewhat different from those that took place after the first evolution, I will now relate, with the modification in the practical deductions that the second evolution necessitates.

On the 13th of December I visited the Custard-apple tree, and found the larvæ issuing from the lac formed by the evolution of July, besides many which had become fixed to the bark; so that we must date the commencement of this evolution a few days earlier, say the 7th of December. After this, the same changes took place in the incrustations that were observed in the evolution of July. On the 27th of February the males were coming out of their cocoons or incrustations; and on the 4th of March I found some of them creeping over the cocoons of the females, with others dead and entangled as before in the cotton-like substance, which during the last few days had become so exuberant from the females as to whiten all those parts of the branches covered with the new lac.

But the remarkable point here was, that, this time, all but a few of the males were provided respectively with two membranous, whitish, transparent, diploneurose wings, which, being a little longer than the whole length of the body, extended, when closed, considerably beyond the last segment of the body, and made the insect look very much like the male of *Coccus Cacti*, or the Cochineal-insect.

Thus, on comparing the dates of evolution and metamorphosis, we find that the first evolution of the larvæ takes place about the 1st of July, and the second about the 7th of December. Hence the summer-brood requires about five months and seven days, and the winter-brood six months and twenty-one days, to prepare their young respectively for independent existence. But the metamorphosis of the larvæ into the males and the impregnation of the females take place about the same time after each evolution. Thus, in the evolution of July it took place about the 20th of September, and in that of December about the 1st of March, giving eighty-two days to the former

* 'Annals,' ser. 3. vol. vii. p. 1.

and eighty-five for the latter; but in the latter instance almost all the males were provided with wings, as before stated, while in the former not a single winged male was observed.

The resinous secretion goes on more rapidly in the first than in the second evolution, owing probably to the greater quantity of sap which is present in the trees in the summer than in the winter or cool season; but the greatest amount of resin, comparing that produced by the brood of December 1859 with that of the brood of July 1860, appears to me to be produced by the December brood. In each instance the Lac-insect perishes, whether it gives forth a new brood or not; so that the old lac thus becomes entirely lifeless.

Having previously assumed that only one evolution takes place during the year, it is necessary to modify the practical deductions which I have made. Thus I have stated that, as the colouring-matter or "lac-dye" is contained in the young ones, the lac should be gathered just before their issue, that is, "towards the end of May or the beginning of June," so that at once the greatest amount of "lac" and "lac-dye" might be obtained; and now it is necessary to add that a second gathering should be made, viz. in the month of November.

Then, as regards the propagation, branches of the tree bearing the lac with the insect in it should be gathered just previous to the evolution of the young, and tied to the trees on which it is desired to grow it,—it being understood that, as their numbers increase by "*lakhs*" (100,000's) (from which the name of "lac," according to Sir W. Jones, would appear to be derived), the trees must be thus sacrificed. And as regards self-propagation, it would be difficult to conceive how this could take place with the early incarceration of the females, did we not know that the larvæ are so light and so numerous that they might be conveyed from tree to tree in a hundred ways; and as to impregnation, the females may be able to produce even more than one brood without this—as is notorious with the *Aphides*, which belong to the same order, and afford the oldest authenticated instance of parthenogenesis.

In the second volume of the 'Asiatic Researches,' p. 261 (ed. Lond.), there is a paper on the Lac-insect by Roxburgh, to which my attention has been directed; and it is interesting to find that his description was written from an evolution of the larvæ which was taking place in Bengal on the 4th of December. His figure of the male, and its appearance at the same time with the larvæ, is of course erroneous.

Bombay, March 12, 1861.

XLIII.—*Notes on Cambridge Palæontology.* By Harry Seeley.

III. *On a new Order of Echinoderms.*

Introduction.—For many years past there have been observed in the Upper Greensand, near Cambridge, certain forms of an anomalous organism which it seemed impossible to group in any known family or order of Invertebrata. As yet, no opinion has been expressed on their affinities; and as these are by no means evident at a glance, it has been thought desirable to give a sketch of the evidence which has led to the conclusions to be presently stated.

The bodies in question consist of carbonate of lime with a very slight animal basis; so that without much difficulty the cleavage-faces may be obtained. The form of the larger and more common type is an elongated sphere, with a longitudinal wedge-shaped slit, the margins of which are tuberculated; it is granulated, and has one end flattened and smooth. From these characters it is evident that the structure is Echinodermatous, though to what group of Echinoderms it belongs is far from clear.

Its shape and the tubercles would at first sight suggest its place to be in the Echinoidea; but the cause of the failure of our efforts to find apertures, or ambulacra, is soon explained by discovering it to be solid. Nor is there any probability of its being an Urchin-spine, since, besides the fact of its being channelled, the tuberculated character would be altogether unique. It clearly has nothing to do with the Echinoidea.

The slit and general form give it a resemblance to the joints of the arms of a Crinoid; but besides the fact that no Crinoid has yet been observed with the margin of the groove tuberculated, there is the more important one that it has but one end fitted for articulation, the other being convex and granulated. Among the Ophiuroidea there is no structure with which it has the slightest analogy. So we are reduced to placing it among the Star-fishes. But here, too, the same structural difficulties are met with. The single attachment at once excludes it from being a part of the skeleton of either that group of Star-fishes in which it consists of a network of membrane with the meshes of bone, or of that in which there is a network of bone with the meshes of membrane. To this, however, there is an exception, since in some species of *Goniodiscus* there is developed, at the extremity of each corner, a single plate, under which the eye is lodged. This plate, though attached to the two great oculars, has itself but a single articulation. In proportions it resembles the fossil in question, has a groove for holding the nervous cord, and there is a close analogy between all the parts. I am not acquainted with any form in which the margins are tuberculated; but it is by no means impossible to conceive that they should be so; on the contrary, if the plate were so placed as to have its under side exposed, it would be precisely what we should expect. This resemblance is certainly very close; but, among many other little differences, it will soon be observed that that pit in the groove is wanting in the fossil which exists in the small ocular plate, for lodging the enlargement of the nerve; and when inquiry is made for the plates of the star-fish to which these supposed oculars belong, the difficulty becomes insuperable. I have seen about one hundred and fifty of these structures, the largest a quarter of an inch long; so that there ought to have been collected with them several thousands of granulated plates of two or three species of *Goniodiscus*, of which each plate should have measured from one to two inches in diameter; whereas not a single granulated plate has been found, and the only plates met with are a few pitted ones belonging to an *Astrogonium*. This must demonstrate that it has nothing to do with the Star-fishes; and thus the Class Echinodermata is exhausted without our finding a place for it. We shall search in vain for a group with which it presents a nearer affinity. The tubercles for the attachment of spines constitute a character not met with in any other class of organisms; and the whole sum of the characters clearly indicates that there can be no doubt as to the class to which these singular bodies belong.

The structure may give some clue to their real nature. As already remarked, one end is fitted for attachment. If, then, it is no part of an Echinoderm, and yet is Echinodermatous, it would appear to be something *attached* to an Echinoderm. Now, certain anomalous bodies, known as Pedicellariæ, do occur attached to Echinoderms. In the Sea-urchin group they are pedunculated cups, with three moveable prongs. On Star-fishes they consist of two little valves, like Entomostraca. On Crinoids I believe both of these forms are met with. To neither do these fossils, in any way, approach; but they can scarcely be considered to differ more from the sessile form on Star-fishes than that does from the form occurring on Urchins; so the fact of their being distinct from any known type does not necessarily exclude them from the group. There arises, however, the question—if Pedicellariæ, on what creatures did they occur? Certainly not on Star-fishes; for Prof. Forbes noticed, on a species from the Greensand, structures of this kind apparently identical with the living form; and it would be impossible to conceive how so large a species could be attached to *Diadema*, which is the only genus of Echinoidea occurring in anything like a corresponding relative abundance. So, if they are omitted from these orders, they can only be referred to the Pentacrinite, which, however, is rare. The microscopic structure is identical with that of *Pentacrinus*; and the rather concave form of the base would agree with the rounded edge of a plate to which it might be supposed they were attached. But if they are thus disposed of, there will arise the question—what are Pedicellariæ? Are they organs of the animal, or independent parasitical existences? If the former, it would appear extremely improbable, first, that in the same genus the organs should so vary; and secondly, that in those beds where *Pentacrini* abound, similar structures should never have been met with. But then, on the other hand, supposing them to be parasites, it is impossible to understand how, in the recent state, specimens should never be found without them; and it also seems unlikely, as in the case of the *Goniaster* alluded to, that the same species should have lived on from the middle of the Cretaceous beds to the present day. By those who believe the Pedicellariæ to be a part of the animal on which they occur, they are regarded as delicate organs of touch, or as an apparatus for grasping. But it is very obvious that, in the fossils in question, there is no trace whatever of that nipping organization which distinguishes both the recent forms. In this important structure the fossils certainly differ from Pedicellariæ. And then, one of the circumstances which have rendered the determination of the nature of Pedicellariæ so difficult is the fact that there are in them no traces of vital organs; but it can scarcely be imagined that the deep slit in our specimens was not formed for protecting some important organs, which, moreover, are defended by the two rows of spines, and perhaps by the angle of attachment, which is oblique, so that, were the organism fixed, the slit would be turned somewhat downwards. It would therefore seem evident that with the Pedicellariæ they have no relation whatever. With Pedicellariæ the evidence is decidedly strong in favour of their being organs of the animals on which they occur; with these the anatomical characters seem to be unmistakeably those of independent existences; and therefore it cannot be necessary that they should occur on any animals in particular.

A further conclusion may now be deduced. It has been demonstrated that these fossils are not related to Pedicellariæ, and that they form no part of any member of the known orders of Echinodermata; and it has also been shown that they possess some of the most distinctive characters of Echinoderms; therefore it will be evident that they are Echinoderms of a new type. What that type is we will now endeavour to discover.

It has already been seen that there is a surface for attachment, towards which the visceral cavity enlarges; so that if the organism were attached, the viscera would only be separated from the surface beneath by the investing membrane—a character almost inconceivable in a bony Echinoderm, since the internal organs are always well protected. Then, there is no evidence of that important structure, the mouth, which in all Echinoderms is prominently developed; and finally, there is no appearance of the radiate plan, which is always self-evident in the bony structures of the class. These facts render it certain that each fossil is not an independent creature, but only a portion of something else. What this is, there will not be much difficulty in discovering, since it is a universal rule that Echinoderms are made up of similar parts. The number of these varies, the typical number being five; but it must not be forgotten that many of the Echinoidea (which our fossils externally so much resemble) present a very evident bilaterality. Now, if two of them are united by the attachment surface, a free creature is produced, in which there would be a large central cavity on one surface, where the mouth might well be placed; while the union produces, on the opposite surface, a much smaller opening, which might be the anus; moreover, there is thus obtained a symmetry which it would be impossible to suppose wanting in a creature of this kind. But it is obvious that while an animal would thus be produced presenting evident affinities to both the Asteroidea and Echinoidea, it would differ from the radiate plan in a way that those affinities would not induce us to think probable. All the parts and organs would be in twos instead of fives. According to this view of their structure, the groove already referred to would hold the ambulacra; and as these are confined to the ventral surface, the affinity to the Asteroidea would clearly be greater than that with the Echinoidea, so that there will be no reason for supposing them to be bilateral on account of any resemblance to the latter order; while the obvious resemblance of each specimen to the solidified ray of a bony star-fish is so great as scarcely to allow of a doubt that these lobes or rays were arranged in fives, as in the members of that group and the majority of Echinodermata*. But it will be asked—where is the disk? Before answering that ques-

* As the parts have but one articulating surface, and were grouped in fives, they clearly must have been placed round a centre, as in Star-fishes and Crinoids. The facts of there being no attachment for arms, there being tubercles, and the stem not having been discovered, will be conclusive evidence that their plan of structure was not that of the latter order. So, as analogy would have suggested, we must adopt the only alternative, and believe them to have been grouped round a disk as in Star-fishes.

tion, it will be well to find out what kind of disk it had. That it was not in one solid piece may be assumed, since it has never been discovered; and had it existed, it would have given a rigidity to the body which we should not be justified in presupposing without the most decided evidence to that effect. In many specimens, the dorsal margin of the articulating surface has an impressed border, as in some fossil Goniasters. On the attachment-end may be detected three articulating surfaces—one very narrow dorsal one, which is horizontal and curved in rather less than a fifth of a circle, and two lateral ones, which are vertical and do not generally extend quite to the base of the side. The dorsal articulation will suggest the probability of the dorsal surface being covered with minute triangular plates, resembling those of the Brittle-stars, as *Ophiothrix*. This will be further considered presently. The two lateral articulations were probably, as in all Star-fishes and Brittle-stars, connected with little bones which made the rays continuous with the bony ring which probably surrounded the mouth. Thus there will be no difficulty about the disk, since the minute size, rarity, and the almost impossible task of determining what they were will readily account for the circumstance of its elements not having been detected.

It would seem that a final conclusion may now be drawn. It was before seen that the fossils belonged to a new group of Echinoderms, and it has been shown that each was not a separate animal; that there is no reason for believing that the creature to which they did belong diverged from the radiate plan; and finally, and as the only explanation which was supported by anatomical structure, it has been shown that they must have formed part of an animal very closely resembling a star-fish. Hence it will be admitted that a place has been found for them which is the only one logically possible.

Structure and Affinities.—It will now be desirable to notice the relations of these fossil bodies with other Echinoderms; but before doing so, it will be necessary briefly to describe the parts which will have to be compared. It has been observed that each lobe or ray is a sphere, sometimes elongated and flattened at one end. The groove on the ventral side resembles that on the under side of the ray of a star-fish; and as, from the structural characters, it is clear that, in order to have moved, the creature must have been furnished with suctorial feet, it is evident that in these grooves only could the ambulacra have been placed; but they differ from those of the star-fish in the important feature that whereas in the latter only the outside of the ray is seen, in the former the whole cavity is exhibited, the ventral covering being gone. The depth which this visceral groove extends into the lobe varies greatly with the species. It is always wide near the attachment, and gradually narrows and becomes less deep; but it does not terminate in a point, there being a little ledge at the end, forming a notch, in which it is extremely probable that the little ganglion for the eye was placed. It is to be noticed that towards the end the groove curves upwards towards the dorsal surface, as do the ambulacra of many star-fishes. The object of this is evident; for, from the solidity of the rays, they were incapable of motion: so, had the feet been confined to the ventral surface, the animal could only have moved on flat ground; but by the beautiful arrangement of their reaching in a curve some distance up the anterior side, the want of motion is in a measure compensated for, since by it they could ascend any elevation that might be met with. The ambulacra appear to have differed from those of the star-fish in the remarkable character that the feet were not protruded through bony plates; for there was no trace of them in any of the specimens examined; and on microscopically examining the contents of the visceral groove in some very perfect specimens, the only structures visible were a few minute and thin square and rhomboidal bodies. It is possible that these may have been imbedded in the membrane through which the feet were protruded.

In many specimens the ambulacral groove is seen to be marked transversely throughout its length with little striæ, which, commencing in a puncture just inside of the margin, extend across from side to side. They are very much coarser and wider apart than the fine striæ observable on the jaws of Echinoidea; but it would appear very probable that, as in those structures, they indicate the attachment of muscles. Judging from analogy, it may be conjectured that this great muscle was a retractor, drawing the animal's body closer to that surface to which the feet were attached.

Margining the grooves on each side is a row of large tubercles, which are generally surrounded by pits, and have a fissure on the summit for the insertion of the ligament of the attached spine. Spines, generally minute, margin the ambulacra of Star-fishes, and gradually become large among the Sea-urchins. There can be no doubt that they were formed to protect the suctorial feet; and as it has already been seen that these were protruded through a membrane, the necessity for a more efficient protection than that usually given to star-fishes will be evident. If the large size of the articulation may be taken as an indication of the length of the spine, it may be presumed that the suctorial feet were capable of being protruded to a great length.

In some well-preserved examples, I have seen on the sides of the lobes, near to the articulation, fine and close oblique striæ, apparently indicating muscular attachments, and which, judging from their position, gave attachment to large muscles moving the rays, and rendering it improbable that they were thrown off as by the Brittle-stars. The fact of finding no young specimens would also support this view.

In describing the ornamentation, the different parts will be spoken of as regions; they will be the anterior, the dorsal, and right and left lateral.

Some remarks may now be made on the value of the group, and on its position in the Echinodermatous class. The general form of the creature has already been shown, with great probability, to have been pentalobular, so that it must have greatly resembled such a star-fish as a short-legged *Ophidiaster*. Now, the question to be determined is—are these fossils most closely related to the Asteroidea or Ophiuroidea? and also to see in what respects they differ from them. Unfortunately, almost the only structure that can be compared is the visceral groove. A remarkable feature about it, which will at once attract notice, is its relative smallness to the whole size of the ray; while, if the ventral covering of a star-fish were removed, the visceral cavity would be seen to be coextensive with it. The rays of Brittle-stars are very slender, however, and the internal cavities, in proportion to the size of the disk, very small. The cause of this difference in size is well known: there are in Brittle-stars no cæcal appendages to the stomach; and the ovaries being included within the disk, there is no necessity for the space which these bulky organs require. Hence, as the groove contains no space but such as would be required for accommodating the ambulatory organs, we shall be justified in supposing that the ovaries were included within the disk; and it will be very probable that there were no cæcal appendages. Thus the fossils are clearly to be excluded from the Asteroidea. There is, however, another argument for their exclusion, in the solidification of the rays: this alone could not be considered more than a generic difference, except that in a star-fish it would be only reasonable to suppose that all parts would be solidified alike, so that the suckers should have been protruded through pores in a solid plate; this would have indicated a transition to the Echinoidea, constituting at least a new suborder.

The whole sum of the characters is so entirely different, that they may with equal certainty be excluded from the Ophiuroidea.

Nor is it possible to suppose any relationship with the Echinoidea, since those forms to which they make the nearest approach have the ambulacra chiefly developed on the dorsal instead of on the ventral surface.

But though not to be included under any of these orders, they are by no means unrelated to them. The concentration of the viscera within the disk would indicate an affinity with the Brittle-stars, while the development of the ambulacral suckers would show their near relation with the true Star-fishes*.

It has already been shown that the dorsal surface of the disk was probably covered with large scutes; and now the affinity of the group to the Brittle-stars is evident, it cannot but be regarded as an interesting coincidence, that whereas the supposed large plates are associated with large spines on the rays of these animals, it also happens that the genus *Ophiothrix*, which has large plates on the disk, is likewise furnished with large spines on the rays.

The genital openings were in all probability placed on the ventral surface, much as in the Brittle-stars. Considering the whole of the affinities, it would seem improbable that there should have been either a vent or a madreporic tubercle; but this latter assumption is open to some slight doubt.

From the disk not being known, the distinction of genera will be difficult; and it is not impossible that generic characters may be passed over as specific. But we are not entirely without guidance. The width of the ambulacral groove at the point of attachment varies in the different forms; and this will indicate a relative difference in the size of the disk—a character which, from its general constancy, we shall be justified in regarding as generic.

But in order to get an idea of the relative size of the lobes to the disk, it will be necessary to assume some size for the mouth. The experience of its proportions in many existing forms would suggest that its diameter was at least equal to, if not *greater* than the width of the ray; and as in this order the rays did not touch each other, it will thus be easy, on observing the comparative width of the ambulacral groove, and the ratio in which

* But, though to some extent intermediate, and partially filling the gap between these orders, they cannot be regarded merely as a link for blending them. Its own peculiar characters require for the group an independent position, which will show that it connects the allied orders rather as a parallel than as a continuous chain. It will, however, introduce between the Asteroidea and Ophiuroidea much such a relation as in Crustacea is produced between the Macroura and Brachyura by the intervening Anomoura. Hence it will be impossible any longer to regard the Asteroidea, for instance, as an order of equal value with the Echinoidea, any more than the Brachyura can be compared in value with the Stomapoda. If great groups are to be considered natural, it will constitute a suborder of an order which will include the fossils under consideration and the Brittle-stars.

it increases, to determine with probable accuracy the distance they were placed apart, and also the proportion they bore to the central disk.

[To be continued.]

XLIV.—*Notices of British Fungi.* By the Rev. M. J. Berkeley, M.A., F.L.S., and C. E. Broome, Esq.

[Continued from vol. iii. 3rd Series, p. 377.]

[Plates XIV. to XVII.]

901. *Agaricus* (Lepiota) *hispidus*, Lasch. in Linn. 1829, no. 407.

Amongst pine-leaves. Apethorpe, Northampt., Aug. 20, 1860. Smell like that of *Lactarius theiogalus*, approaching that of *Ag. cristatus*.

902. *A.* (Tricholoma) *Ionides*, Bull. t. 533. f. 3.

In open pastures, King's Cliffe, Aug. 22, 1860. Smell not very decided, but pleasant; rather like that of *Lactarius theiogalus*.

Admitted formerly into the British list on the doubtful synonym of Bolton. Our plant is precisely that of Bulliard.

**A.* (Volvaria) *speciosus*, Fr. Syst. Myc. i. p. 278. *A. speciosus* and *A. gloiocephalus* are united in the 'Outlines of British Fungology.' The latter is figured there; and a good figure will be found in the 'Gardeners' Chronicle' for 1860. Both are united in Letellier's plate. Mr. Currey has lately sent a fine specimen of the former from Weybridge.

903. *A.* (Clitopilus) *cretatus*, n. sp. Pusillus; pileo membranaceo, demum umbilicato, dealbato nitido, margine involuto; stipite brevissimo tomentoso; lamellis decurrentibus angustis roseis.

On the naked soil in woods and pastures. Not uncommon.

Single or gregarious. Pileus $\frac{1}{4}$–$\frac{3}{4}$ inch across, at first convex, then umbilicate, of a dead-white, but shining, membranaceous, not striate; margin involute; stem a few lines high, 1 line thick, often curved at the base and sometimes thickened, tomentose especially below, white; gills pale pink, not broad, very decurrent. Mycelium white, floccose.

Closely allied to *A. prunulus*, but apparently constant. It does not seem to have been noticed by any author.

**A.* (Nolanea) *Babingtonii*, Blox. MS.

This rare species occurred in a wood at Colleyweston, Oct. 2, 1860.

904. *A.* (Eccilia) *rhodocalyx,* Lasch. in Linn. 1829, no. 567. On tops of walls at Lincoln, Sept. 1860.

This has just the habit of *A. umbelliferus.*

**A.* (Pholiota) *spectabilis,* Fr. El. p. 28, Ep. p. 166.

Fries informs us that *Ag. aureus* of the 'Introduction to British Fungology' is certainly *A. spectabilis* of the 'Epicrisis,' and not *A. aureus.* Fries, indeed, refers Sowerby's plant to his *A. aureus,* but that is clearly the same with our plant; therefore at present we must consider *A. aureus,* Fr., as a stranger to the British flora.

905. *A.* (Hebeloma) *fastibilis,* Fr. Ep. p. 178. Belvoir, on the borders of the Plantations, Sept. 1860.

The old *A. fastibilis* comprises several species. The present, which is the plant to which Fries attaches the name in the 'Epicrisis,' has a distinct veil.

906. *A.* (Hebeloma) *punctatus,* Fr. El. p. 30. In pine woods. Lea, near Gainsborough, Sept. 1860.

907. *A.* (Hebeloma) *versipellis,* Fr. Ep. p. 179.

Amongst fir-leaves. Mossburnford, A. Jerdon, Esq., Aug. 16, 1860. Smell like that of several species of *Hymenogaster*; not unpleasant.

908. *A.* (Hebeloma) *mesophæus,* Pers. Myc. Eur. iii. p. 173. In pine woods; common. Apethorpe; Lea, near Gainsborough; Mossburnford, &c.

909. *A.* (Flammula) *floccifer,* n. sp. Cæspitosus, subcarnosus; pileo convexo fulvo, fibrillis niveis adsperso; stipite deorsum attenuato, e squamis sericeis, albo, fistuloso, intus umbrino; lamellis latiusculis adnatis ferrugineis.

On stumps of lime. Colleyweston, Oct. 2, 1860.

Cæspitose. Pileus 2 inches across, convex, expanded, tawny, somewhat zoned in drying, sprinkled with white fibrils, rather fleshy; flesh tawny at the edge and beneath the cuticle, elsewhere white; stem $1\frac{1}{2}$ inch high, $\frac{1}{4}$ thick, attenuated downwards, furfuraceous within the pileus, white, with silky scales, hollow, umber within; gills moderately broad, rounded behind, adnate, scarcely ventricose, wrinkled transversely, ferruginous; edge white. Spores ferruginous; ring none.

The habit is that of *A. velutinus.* Its proper place seems to be next to *A. scambus.*

PLATE XIV. fig. 1. *A. floccifer,* nat. size and vertical section.

910. *A.* (Naucoria) *carpophilus,* Fr. Obs. i. p. 45.

On dead beech-mast and leaves. Colleyweston, Sept. 19, 1860.

911. *A.* (Naucoria) *conspersus,* Pers. Ic. et Descr. t. 12. f. 3. On the ground in woods. Colleyweston, Sept. 20, 1860.

912. *A.* (Naucoria) *sobrius,* Fr. Obs. ii. p. 25. On the ground. King's Cliffe, Sept. 20, 1860.

913. *A.* (Psalliota) *Jerdoni,* n. sp. Pileo campanulato obtuso umbonato carnoso ochraceo sicco, squamulis superficialibus niveis secedentibus ornato, epelliculoso; stipite sericeo-squamuloso cavo; annulo superiore; lamellis e pallido brunneis transversim lineatis.

On fir-stumps. Mossburnford, Nov. 2, 1860.

Pileus 2 inches across, ochraceous (brown when dry), campanulate, obtuse, with a broad umbo, fleshy, minutely rivulose, adorned with superficial evanescent snow-white scales; cuticle not peeling off; stem 3 inches high, 2–3 lines thick, cylindrical, snow-white, pulverulent above, brownish with silky transverse scales below; ring superior, deflexed; gills adnate, sending a line down the stem, but not truly decurrent, pallid, then brown, transversely striate. Spores dark brown.

This fine species is allied apparently to *A. Caput-Medusæ,* but is distinct, as far as I can find, from every published species. It has a close analogy with *A. Ægerita, luxurians,* &c.

Plate XIV. fig. 2. *A. Jerdoni,* nat. size and vertical section.

913*. *A.* (Hypholoma) *capnoides,* Fr. Ep. p. 222. In Fir-woods. Apethorpe, April 1861.

914. *A.* (Hypholoma) *epixanthus,* Fr. Ep. p. 222. On old fir-stumps. Mossburnford, A. Jerdon. Lea, near Gainsborough.

Easily known by the absence of the bitter taste and cinereous tint of the gills.

915. *A.* (Hypholoma) *egenulus,* n. sp. Solitarius; pileo hemisphærico expanso ex albido niveo umbonato appendiculato; stipite subtiliter adpresso-squamuloso fistuloso; lamellis dente adnatis purpureo-umbrinis.

On the ground amongst grass. Apethorpe, May 12, 1860.

Solitary. Pileus $1\frac{1}{2}$ inch across, hemispherical, expanded, umbonate, but not decidedly rugose or atomate, of a watery white, when dry snow-white, quite smooth as if delicately gummed, even, except towards the edge, margin finely striate, appendiculate; stem 2 inches high, $1\frac{1}{2}$ line thick, attenuated upwards or nearly equal, minutely adpresso-squamose, fistulose; gills purplish umber with a white edge, moderately distant, slightly ventricose, adnate, with a tooth. Spores brown-purple.

Has exactly the habit of Schæff. t. 205 (*A. cernuus*); but that belongs to a different section. The nearest ally is *A. appendiculatus.*

916. *A.* (Psilocybe) *clivensis,* n. sp. Pileo subhemisphærico e pallido-fusco albido-ochraceo lævi atomato, margine striato;

stipite æquali subsericeo; lamellis adnatis late emarginatis horizontalibus umbrinis.

On the ground. King's Cliffe, Oct. 2, 1860.

Pileus 1 inch across, subhemispherical, at first pallid brown, then pallid ochre inclining to white, even, sprinkled with shining particles; margin striated, not straight; stem $1\frac{1}{2}$ inch high, 1 line thick, fistulose, nearly equal, except at the very base, where it is slightly clavate, somewhat silky; gills broad, adnate, widely emarginate, ventricose in front, rather distant, umber; margin white. Spores umber.

Intermediate between *A. hebes* and *A. Fœnisecii*, with the habit of the former.

Plate XIV. fig. 3. *A. clivensis*, nat. size and vertical section.

917. *A.* (Psilocybe) *comptulus*, n. sp. Pileo subconico-campanulato demum expanso e pallido ochraceo-pallido striato; margine subcrenulato; stipite flexuoso nitido sericeo glabro; lamellis distantibus ventricosis adnatis carneo-umbrinis.

In woods, amongst grass. Colleyweston, Oct. 2, 1860.

Pileus $1–1\frac{1}{4}$ inch across, between conical and campanulate, at length expanded, pallid, acquiring a pallid ochraceous tint as it loses its moisture, sprinkled with shining particles, scarcely rugulose, striate; margin somewhat crenulate, at first inflexed; stem 2 inches high, $1–1\frac{1}{2}$ line thick, flexuose, undulate, smooth, but with a shining silky aspect, not striate above, below acquiring a very pale rufous tinge; gills distant, ventricose, broad, adnate, umber with a rosy tinge. Spores purple-brown.

A very distinct species.

Plate XIV. fig. 4. *A. comptulus*, nat. size and vertical section.

918. *A.* (Psathyra) *obtusatus*, Fr. Ep. p. 232. On the ground in a garden. King's Cliffe, Aug. 26, 1860. Stem rooting.

919. *A.* (Psathyra) *urticæcola*, n. sp. Pileo campanulato, margine striato, stipiteque sursum attenuato fistuloso insititio flocculentis albis; lamellis antice ventricosis postice attenuatis ex albo spadiceis.

On nettle-roots. King's Cliffe, Aug. 8, 1858.

Pileus 2 lines across, campanulate, flocculent, white; margin at length straight, striate; stem short, slender, attenuated upwards, flocculent, fistulose, springing immediately from the matrix; gills ventricose in front, attenuated behind, adnexed, at first white, then of a rich chocolate.

Allied to *A. pennatus*.

920. *A.* (Psathyra) *semivestitus*, n. sp. Pileo ovato obtuso brunneo pallescente lævi, fibrillis niveis brevibus notato; stipite fibrilloso-sericeo niveo; lamellis adscendentibus adnatis umbrinis.

Amongst grass in rich pastures. King's Cliffe, Oct. 2, 1860.

Pileus about half an inch across, ovate, obtuse, dark brown, turning pale, sprinkled with little fibrils more than half-way up, not striate; stem nearly straight, 2 inches high, $1\frac{1}{2}$ line thick, fibrilloso-silky, rather strong, white with a pale under-tinge of brown, fistulose, the walls within white with down; gills ascending, broad behind, adnate, umber-brown, tinged with the dark spores.

Allied to *A. noli-tangere*, but distinct in character from all the neighbouring species.

Plate XIV. fig. 5. *A. semivestitus*, nat. size and vertical section.

921. *A.* (Psathyra) *mastiger*, n. sp. Pileo conico-campanulato repando e spadiceo alutaceo; stipite stricto sursum attenuato; lamellis adscendentibus affixis umbrinis.

On the roadside amongst grass. Apethorpe, Sept. 20, 1860.

Pileus about an inch across, at first nearly cylindrical, obtuse, then conico-campanulate, with a strong mammiform umbo, repand, dark rich brown when moist, umber-tan when dry, somewhat fleshy, not striate; margin straight; stem 3 inches or more high, $1\frac{1}{2}$–2 lines thick, attenuated upwards, white, smooth or fibrillose and furfuraceous, fistulose, pale umber within, and as the plant dries acquiring the tint of the pileus, but pale; veil none; gills umber, paler on the edge, rather narrow, affixed, ascending.

This fine species is allied to *A. conopilus*, but differs in many respects. The dark colour and mammiform apex are very striking.

Plate XIV. fig. 6. *A. mastiger*, nat. size and vertical section.

922. *A.* (Psathyra) *Gordoni*, n. sp. Cæspitosus; pileo campanulato pallide cinereo demum albescente plus minus flocoso-squamuloso sulcato-striato; stipite flexuoso floccoso glabrescente sursum albo pruinoso; lamellis adscendentibus anguste adnatis distantibus cinereis.

On old stumps. Overton Longueville, Oct. 10, 1860. The Marchioness of Huntley.

Densely cæspitose. Pileus $1\frac{1}{2}$ inch across, campanulate, membranaceous, at first pale cinereous, then white, sprinkled with white floccose scales, sulcato-striate; stem 2 inches high, $1\frac{1}{2}$ line thick, transversely undulated, pruinose above, floccose below, but becoming at length smooth and shining, brittle, fistulose; gills ascending, narrowly adnate, distant, moderately broad, scarcely ventricose, cinereous. Smell faint, nauseous. When young, the whole plant is covered with copious white flocci.

A very distinct species.

Plate XV. fig. 7. *A. Gordoni*, nat. size and vertical section.

923. *A.* (Panæolus) *sub-balteatus*, n. sp. Pileo convexo carnoso hygrophano cervino, sicco pallescente, zonato, ruguloso; stipite subconcolori fragili albo-fibrilloso; lamellis brunneolis adnatis subventricosis.

In a tare-field. Apethorpe, Sept. 24, 1860.

Cæspitose. Pileus 1½–2 inches across, at first convex, with the margin slightly incurved, then expanded, obtuse or slightly umbonate, irregular, rather fleshy, hygrophanous, of a dull deep fawn-colour, pallid when dry, slightly rugose, and marked near the margin with a dark narrow zone; veil none; stem 2–2½ inches high, 2 lines thick, fistulose, red-brown, brittle, stringy, splitting longitudinally, marked with short white fibrils; gills brownish, slightly ventricose, adnate; margin white, slightly toothed. Spores black.

Closely allied to *A. cinctulus*, Bolt., but differing in habit and in many essential characters.

924. *A.* (Psathyrella) *pronus*, Fr. Ep. p. 239. In grassy pastures. Apethorpe, Sept. 24, 1860.

925. *Coprinus ovatus*, Fr. Ep. p. 242. In pastures. Woodnewton.

926. *C. flocculosus*, Fr. Ep. p. 245. In pastures. King's Cliffe, Aug. 1860.

Pileus 2½ inches across, ovate, at length expanded, dirty white, striate, splitting in the direction of the gills, covered with innate scales, thus resembling *C. picaceus*; stem 3 inches high, attenuated upwards, white, slightly swollen at the base, smooth, or rather finely silky under a lens; gills free.

As this species has not been seen by Fries, it is thought better to give a description. It is not uncommon in the early part of the autumn, but generally solitary.

927. *C. aratus*, n. sp. Solitarius, elatus; pileo campanulato umbrino profunde sulcato micaceo; disco rugoso; stipite sursum attenuato basi subbulboso subtiliter sericeo niveo; lamellis angustis spadiceis liberis.

In a hollow tree. King's Cliffe, May 13, 1860.

Pileus campanulate, 3 inches across, umber, deeply sulcate up to the darker wrinkled disk, sprinkled with large micaceous particles, revolute in decay; stem 5 inches high, 2½ lines thick, attenuated upwards, slightly bulbous at the base, straight, smooth, or, rather, minutely silky, snow-white, fistulose, umber within; gills narrow, attenuated at either end, free, deep rich brown, then black.

A magnificent species, allied to *C. micaceus*. Grooved like *Agaricus hiascens*.

**C. Hendersoni*, Berk. Outl. p. 180.

This beautiful species occurred abundantly on horse-dung at

King's Cliffe, in the open fields, in 1860, mixed with *C. radiatus*, from which it is different in every stage of growth.

928. *C. filiformis*, n. sp. Minimus; pileo cylindrico striato griseo albo micacco; stipite capillaceo albo pilosiusculo.

On the ground in a wood. Colleyweston, Sept. 19, 1860.

Pileus not a line high, cylindrical, striate, grey, shining with white mealy particles; stem half an inch high, extremely fine, white, sprinkled with a few short delicate hairs.

This minute species is not larger than *Mucor caninus*, and is certainly distinct from any which has been described.

Plate XV. fig. 8. *a*. Nat. size; *b*. slightly magnified.

929. *Cortinarius* (Telamonia) *Helvelloides*, Fr. Ep. p. 299. In woods. Not uncommon.

930. *C.* (Telamonia) *hemitrichus*, Fr. Ep. p. 302. In woods. Lea, near Gainsborough, Sept. 1860.

931. *C.* (Hygrocybe) *rigens*, Fr. Ep. p. 311. In woods. Mossburnford, A. Jerdon, Esq.

932. *Hygrophorus arbustivus*, Fr. Ep. p. 323. In woods. Colleyweston, Dec. 1860, C. E. Broome.

933. *H. chlorophanus*, Fr. Ep. p. 332. In pastures. Abundant at King's Cliffe in the autumn of 1860.

934. *Lactarius trivialis*, Fr. Ep. p. 337. In woods. Colleyweston, Sept. 19, 1860. Coed Coch, 1859.

935. *Cyphella Curreyi*, n. sp. Gregaria, minuta, nivea, pezizæformis, extus villosa.

On twigs of broom, furze, elm, &c. Not uncommon.

Gregarious, sometimes slightly crowded, pezizæform, white, externally villose.

This resembles very closely *Peziza albo-violascens*, but has the true fruit of a *Cyphella*. Mr. Currey was, we believe, the first to observe it; and the structure has been repeatedly brought under our notice by Mr. Jerdon.

936. *C. fulva*, Berk. & Rav. Membranacea, cupulæformis, subdependens, fulva; sporis ovatis.

On dead bark; F. Currey, Esq.

Membranaceous, cup-shaped, the mouth more or less directed downwards, tawny, externally tomentose. Spores ovate, ·0006 inch long.

This seems to be the same species with what Mr. Ravenel has gathered in South Carolina, and which has also occurred in other parts of the United States, though the American specimens are generally fasciculate. The species is very near to *Cantharellus fasciculatus*, Schw.

937. *Polyporus* (Resupinatus) *viridans*, n. sp. Resupinatus, effusus, primum albus, exsiccatus pallide viridans; ambitu tenu-

issimo pulverulento-tomentoso; poris minutis angulatis; dissepimentis tenuibus.

On very rotten wood. Staunton, Notts., Sept. 1860.

Effused, forming patches a few inches long, perfectly white at first, but in drying assuming a delicate pale green, with a honey-like tinge in parts; border pulverulento-tomentose, very thin; pores minute, angular; dissepiments thin.

This pretty species has the habit of *P. vulgaris*, but differs in character from anything with which we are acquainted.

**Hymenogaster tener*, B., Ann. Nat. Hist. ser. 1. vol. xiii. p. 349. Colleyweston, C. E. Broome, Dec. 1860.

The spores are sometimes surrounded by a hyaline sac, as in one or two other species.

**Hysterangium nephriticum*, B., Ann. Nat. Hist. ser. 1. vol. xiii. p. 350. Colleyweston, C. E. Broome, Dec. 1860.

938. *Diderma lucidum*, n. sp. Subglobosum, sessile, substellatim fissum, lateritio-luteum, intus luteum; gleba globosa atra; floccis fuscis areolis triangularibus; sporis atris minutissime echinulatis.

On *Jungermanniæ*. Trefriw, C. E. Broome; on *Hypnum cupressiforme*, Cumberland.

Scattered or crowded, stemless; peridium subglobose, splitting in an irregular stellate manner, bright reddish-yellow, yellow within; mass of fruit globose, black; flocci brown, triangular at the points of ramification and yellowish; spores globose, black, very minutely echinulate, ·0005 inch in diameter.

A smaller plant than *Diderma vernicosum*, in which the spores are inclined to be angular, and much paler under the microscope.

Plate XV. fig. 9. *a*. Plant, nat. size; *b*. the same, magnified; *c*. plant ruptured; *d*. the same, showing the obscure columella; *e*. flocci; *f*. spores. (All but *a* more or less magnified.)

939. *Prosthemium stellare*, Riess, Bot. Zeit. 1853, p. 130, t. 3. f. 28–31. On alder. West of England, C. E. Broome.

Plate XV. fig. 10. A vertical section, highly magnified, showing the wall of the perithecium, the sporophores, and spores.

940. *Septoria princeps*, n. sp. Peritheciis magnis depressis papillatis epidermide tectis; sporis cylindricis oblongis 5–6-septatis hyalinis.

On beech-sticks. Batheaston, C. E. B.

Perithecia large, depressed, covered with the cuticle, which they pierce with their papilliform orifice; spores ·002 inch long, cylindrical, oblong, with about seven or eight endochromes, hyaline, oozing out in an irregular mass.

Plate XV. fig. 11. *a*. Perithecium; *b*. sporophores with spores; c. spores. (All more or less magnified.)

941. *Coryneum macrospermum*, n. sp. Stromate minuto pulvinato; floccis sursum furcatis; sporis subcylindricis 4–5-septatis, articulis extremis hyalinis.

Didymosporium macrospermum, Corda, Fasc. 6. f. 17.

On elm-poles. Batheaston, Jan. 1852.

Forming little scattered spots on the surface of the wood. Stroma cellular; thread cylindrical, equal, forked above.

This is clearly the plant of Corda, though more highly developed.

PLATE XV. fig. 12. Plant, nat. size; *a*, the same, slightly magnified; *b*. vertical slice, showing spores and sporophores; *c*. the same, showing the branching of the sporophores; *d*. mycelium; *e*. spores. (All more or less magnified.)

942. *Septonema irregulare*, n. sp. Effusum, tenue, nigrum, irregulare; sporis oblongis.

On living apple-twigs. Apethorpe, Northamptonshire.

Forming a very thin, cloud-like, black stratum; very irregular, sometimes exhibiting continuous threads under the microscope, sometimes distinct spores ·0007–·001 inch long.

PLATE XV. fig. 13. Spores magnified.

943. *Arthrobotryum stilboideum*, Cesati in Hedwigia, tab. 4. fig. 1. On a pollard willow. Langridge, Som., April 1859. Spores ·0005 inch long.

**Monotospora megalospora*, B. & Br. no. 759. A form has occurred, on an old stump, with broadly fusiform spores ·0012 inch in diameter. We do not consider this distinct, because other spores occur which are precisely of the same form as those we have figured in the place indicated above.

944. *Helminthosporium oosporum*, Corda, Fasc. 1. f. 200. On sticks. East Bergholt, Rev. C. D. Badham, Feb. 2, 1852.

945. *H. apiculatum*, Corda, Fasc. 1. f. 191. On dead wood. Twycross, Rev. A. Bloxam.

946. *H. dendroideum*, n. sp. Floccis erectis sursum attenuatis articulatis, ramulis brevibus, sporis apicalibus oblongo-subfusiformibus multiarticulatis.

On maple. Batheaston, C. E. Broome, Feb. 12, 1857. Also in South Carolina.

Threads attenuated upwards, articulated; each joint above giving off one or two short branchlets terminated by an oblong, subfusiform, slightly curved, multiarticulate spore ·0024 inch long, each joint containing a globose nucleus.

Distinct from all other species except *H. arbuscula*, Berk. & Curt., which differs in the peculiar branchlets and shorter spores. The characters of *H. arbuscula* are as follows:—

Floccis erectis subæqualibus sursum ramulosis; ramulis brevibus lagenæformibus inarticulatis; sporis fusiformibus.

On *Rhus copallina*. Spores, when full-grown, ·0023 inch long.

Plate XVI. fig. 14. *H. dendroideum*, with spores magnified.

947. *H. apicale*, n. sp. Floccis simplicibus lævibus sursum attenuatis; sporis apicalibus ellipticis 3-septatis utrinque hyalinis.

On rotten sticks. Langley, Wilts., April 1859.

Threads simple, even, attenuated upwards, articulated, the ultimate joint having two or three little inequalities, to each of which is attached an elliptic spore ·0007 inch long, triseptate, dark in the centre and hyaline at either extremity.

A singular and very distinct species.

Plate XVI. fig. 15. Threads and spores magnified.

948. *H. altum*, Preuss in Deutsch. Fl. Fasc. 26. t. 17. On dead sticks. Twycross, Rev. A. Bloxam.

949. *Mystrosporium stemphylium*, Corda, Fasc. 2. f. 61. On dead wood. Bury St. Edmunds, Mr. E. Skepper. Spores ·0015 inch in diameter.

950. *Acrothecium simplex*, n. sp. Floccis simplicibus flexuosis irregularibus septatis fuscis; sporis paucis apicalibus 4–5-septatis oblongis subclavatis hyalinis leviter coloratis.

On nettle-stems, with *Arthrobotryum*, &c. Batheaston, Dec. 1858.

Threads simple, flexuose, irregular, septate, brown; spores terminal, about three together, oblong, subclavate, with from four to five septa, hyaline, slightly coloured.

Differs from *A. multisporum*, Preuss, in the simple stem without any creeping threads, and the small number of spores.

Plate XVI. fig. 16. Threads and spores magnified.

951. *Helicocoryne viridis*, Corda, Fasc. 6. f. 38. On dead wood, with *Mystrosporium stemphylium*. Bury St. Edmunds, Mr. E. Skepper.

[To be continued.]

XLV.—*On the Recent* Terebratulæ. By Prof. Suess, of Vienna.

To the Editors of the Annals of Natural History.

Gentlemen,

In the March Number of your excellent periodical, Mr. Lovell Reeve has inserted "A Revision of the History, Synonymy, and Geographical Distribution of the recent *Terebratulæ*," and has had the politeness to communicate to me an abstract of his paper, enumerating certain errors said to be contained in the memoir on the geographical distribution of recent

Brachiopoda, which I published, in 1859, in vol. xxxvii. of the 'Proceedings' of our Academy. Although I have explicitly said (p. 191 of my paper) "that my results must claim even a greater degree of indulgence than is generally bestowed on every paper relating to zoological geography, because many and different sources were recurred to, and it was not always possible to ascertain how far they were to be relied on," I still believe that the "inconvenience of my philosophical dissertations" is not quite so great as Mr. Reeve fears; and I feel it a duty to myself to beg you to insert the following notes in one of your next Numbers. They will clearly show that these few erroneous statements are mainly due to English authors (some of great and well-deserved reputation, and of whose publications I had no right to entertain even the least distrust), that Mr. Reeve himself is involved in one of them, and that I am therefore somewhat surprised to find my paper blamed on the same page on which the catalogues from which the greater part of my statements are taken are termed "*excellent.*"

1. Mr. Reeve states that *Waltonia Valenciennesii*, Dav., is identical with *Terebratella Evansii*, Dav., "and Prof. Suess might have detected this, even without any examination of the specimen, from Mr. Davidson's excellent figures of it." Now, I do not understand how I ought to have recognized this identity from figures, which was not recognized by Mr. Davidson, who had the specimens before him. Nay, a glance at Mr. Davidson's fig. 1, in Ann. Nat. Hist. ser. 2. vol. v. pl. 15, and then in Proc. Zool. Soc. 1852, pl. 1. figs. 7–9, shows that they are *widely different*, and their identity is only possible if the suppositions are made—1. that the specimen figured as *W. Valenciennesii* was an abnormal one, the plaits of which did not reach the umbo; 2. that all the ascending branches and horizontal bars of the loop were broken away. Either Mr. Davidson's first figure is *not* excellent, or the two species are widely different and belong to different genera. According to the figures, I was obliged to range *Waltonia* among *Argiope*; and *if the specimen is not mutilated*, I maintain my opinion, although Mr. Reeve may term it "obviously a blunder." Every one familiar with the fossil type of the genus *Magas* must see that the generic position assigned to the shells under consideration by Dr. Gray and Mr. Reeve is erroneous, because the ascending processes are not united at all in *Magas*, and are broad, triangular, and anchor-shaped in that cretaceous genus. The loop of *T. Evansii*, as figured by Mr. Davidson, is that of a true *Terebratella*: in this genus it has also been placed by Mr. Davidson, and I have not the least cause to dissent from this opinion of my learned and indefatigable friend.

2. "Again," says Mr. Reeve, "Prof. Suess gives *Terebratella* as one of the types of the South African province of geographical distribution; but this conclusion is drawn from a statement that a shell in the British Museum, named by Sowerby *T. algoensis,* from Algoa Bay, is a *Terebratella.* Upon examining this shell, I find it to be a bleached fragmentary odd valve of the South African *Kraussia rubra.*" If Mr. Reeve will re-peruse my paper, he will find the following passage (p. 205): "*T. algoensis,* Sow. sp. (ranged among *Terebratella* by Mr. Davidson in Ann. Nat. Hist. 1852, p. 368), is only known by one single greater valve; the generic position is therefore rather doubtful."

3. "Prof. Suess gives *Kraussia* as one of the types of the Corean waters, on the authority of Mr. Davidson, adding that the original habitat given by Mr. Adams and myself, in the 'Mollusca of the Voyage of the Samarang,' for *T. capensis* (now *Kraussia Deshayesii*), is probably erroneous. The Cape of Good Hope is especially the home of the *Kraussiæ*; the only species out of that locality is an abnormal one, *K. Lamarckiana,* a native of South Australia and New Zealand. Mr. Davidson's mistake in giving Corea as the habitat of *Kraussia Deshayesii* arose from a displacement of tickets in Mr. Cuming's cabinet." I have remarked (p. 197), in speaking of *Terebratulina abyssicola,* "I was surprised to see that this species was said to have been dredged together with *T. capensis*; now *T. capensis,* Ad. & Reeve, is not *Kr. capensis* of other authors, but *Kr. Deshayesii,* Dav., which is cited from Corea. Some confusion may exist here, &c." I was, indeed, obliged to indicate some doubt as to the statements made on the habitat of these two species in the 'Voyage of the Samarang;' and Mr. Reeve himself says now, "One important error needs to be corrected. In the original description of *T. abyssicola* in 'Moll. Voy. Sam.,' the habitat of *Kr. Deshayesii* was accidentally repeated;" and in speaking of *Kr. Deshayesii,* he states again that the labels were confounded. You see that my doubts with reference to Messrs. Adams and Reeve's statements were justified; but I had not the least right to doubt the simple statement given by Mr. Davidson, and I was indeed far from believing that here likewise a fault had occurred.

4. In speaking of *Terebratella spitzbergensis,* Mr. Reeve observes, "Prof. Suess remarks that a figure of a species of Middendorf, which is unknown to me (*T. frontalis*), is like it. Can they be one and the same species? But Prof. Suess goes on to ask, is *T. frontalis* the same as *T. transversa*?—which has no relation whatever, as a comparison of our figures of that species in 'Conch. Icon.' with *T. spitzbergensis* will show." This does not, however, convey my meaning; and I will therefore translate

the whole of my passage (p. 204): "*T. frontalis* (Midd. sp., Beitr. Malac. Ross. ii. in Mém. Acad. Imp. de St. Pétersbourg, vi. p. 518, and Reise i. d. ausserst. Nord. u. Ost. Sibirien's, 1851, ii. p. 241. t. 18. f. 9–14), *quasi the representative* of *T. spitzbergensis* in the North Pacific, *has, on the contrary,* a broader shape, with a thick shell, and, as Middendorf's excellent figures show, with a remarkable anterior position of the transverse portion of the apophysis, seems to have united cardinal plates, as the unpublished *Terebratula Hoernesi* of the Vienna tertiary beds has. This species inhabits the south coast of the Sea of Ochotsk. It is possible that this species is identical with *T. transversa*, Sow., a species belonging to *Terebratella* according to Mr. Davidson, but the habitat of which is as yet unknown."

As I am no friend of critics, I do not intend to enter into further objections against Mr. Reeve's paper, beyond mentioning that the author was himself mistaken in citing Japan instead of Java (in speaking of *Terebratella rubella*), and in counting *Terebratella labradorensis* (only known from Labrador) among the North European, and not among the American species. Nor do I approve the altered generic position of several species, or the uniting of *T. minor* with *T. vitrea*. *T. euthyra*, Phil., a species also united with *T. vitrea* by Mr. Reeve, is no *Terebratula* at all, but a true *Waldheimia*, as Mr. Reeve will see by a glance at the figure of its loop in my German edition of Mr. Davidson's 'Classification of Brachiopoda,' pl. 1. fig. 5.

I do not hesitate a moment to acknowledge the value of the interesting new facts brought forward by Mr. Reeve, but I hope that, after having re-perused my paper, he will admit that all these new facts do not show the "inconvenience of my philosophical dissertations." They, indeed, only touch the chapter regarding the distribution of species and genera; and although if, *e. gr.*, *Waltonia Valenciennesii* be indeed identical with *Terebratella Evansii*, *Argiope* must be regarded as an endemic, and not as a sporadic genus, still the conclusion remains wholly unshaken, "that the geologically old genera are sporadic, and the younger ones endemic,"—a conclusion already arrived at by a great number of naturalists from the study of very different divisions of the animal kingdom. All the other chapters are wholly without reference to anything brought forward by Mr. Reeve; and I believe I have shown that the present bathymetrical distribution of Brachiopoda leads to some palæontological reflections which are not quite devoid of interest, and that it is important to aim at those great general laws which govern the multifarious crowd of forms and facts.

The rapid progress of natural history depends materially on the existence of sincere and true harmony between naturalists;

and so I venture to hope that Mr. Reeve will allow this discussion to come to an end, and that our united efforts may tend to the advancement of science.

I am, Gentlemen,
Yours most respectfully,
Edw. Suess.

Imperial Museum, Vienna,
March 17, 1861.

XLVI.—*Observations on the* Bignoniaceæ.
By John Miers, F.R.S., F.L.S. &c.

[Continued from p. 268.]

Adenocalymna.

This genus was first proposed by Prof. Von Martius, for a group of climbing plants, mostly from intertropical Brazil, which are distinguished by the presence of peculiar greenish glands, almost constantly upon the calyx, and more rarely upon the corolla, whence its generic name. Its branching stems are generally rugose, and spotted all over with hollow lenticels, and often pitted at the nodes with crowded porous dots. The opposite leaves are 3-foliolate when the terminal leaflet is somewhat larger, or they are conjugate with an intermediate cirrhus, both conditions often existing in the same plant. The inflorescence is either axillary in short racemes, or it is terminal, when sometimes, by the abortion of the superior axillary leaves, it forms a pyramidal or elongated panicle. At the axils, within the base of each petiole, there is constantly seen a pair of simple stipuloid leaflets, generally reduced to the size of bracts, which are furnished with glands similar to those of the calyx. The flowers are large and showy, covered with velvety down, and are of a dull-yellow colour, or sometimes purple. The fruit has been hitherto unknown; but I was fortunate enough to find it: it is very different from that of any other Bignoniaceous genus, both in its form and the structure of its seeds. The capsule in the two species I met with is quite cylindrical, about 6 inches long, and 1½ inch in diameter, formed of two thick coriaceous valves, which split open along the edges of the flat dissepiment, as in all *Eubignonieæ*. The seeds, so remarkable in their form and structure, have been described in a preceding page (p. 156).

I have not seen any of the plants referred by DeCandolle to his genus *Pachyptera*, with the floral structure of which he was unacquainted; the genus was established merely on the peculiar development of the seed, the expanded margins of which are thick and coriaceous, like the central discoid portion. This structure, among the *Monostictides*, occurs only in *Adenocalymna*, the seed of which was not then known; so that it is more than probable that the two genera are identical. This opinion is confirmed by some of the specific characters given in the 'Prodromus,'—for instance, in the punctate hollows mentioned in the axillary nodes of his *P. foveolata*, which exist in many species of *Adenocalymna*, and which I have not observed in any other genus. DeCandolle, however, describes the capsule as being somewhat flatly compressed and smooth: the flattening of the valves in the dried specimens may probably arise from their warping in desiccation, as I have observed in those of *Adenocalymna*; and the tubercular rugosities, as described in my plants, may be only a specific character; but it is impossible to determine these points without comparative examination. *Adenocalymna* must be placed in the division *Monostictides* of DeCandolle, not among the *Pleiostictides*, where he arranged it.

The following is an emended diagnosis of the genus:—

Adenocalymna, Mart.—*Calyx* tubuloso-campanulatus, coriaceus, sæpius 5-dentatus, rarius fissus, versus apicem glandulis grossis disciformibus viridibus semi-immersis instructus. *Corolla* tubulosa, imo coarctata, hinc inde subcampanulata, extus sæpius pulverulento-velutina, limbo 5-lobo, lobis subæqualibus, rotundatis, quorum 3 erectioribus. *Stamina* 4, didynama, inclusa, cum 5to sterili inter 2 breviora; *filamenta* filiformia, glabra, apice incurva; *antheræ* per paria conniventes, singulæ 2-lobæ, lobis oblongis, apice affixis, segregatis et divaricatissimis, flexione filamentorum axi parallelis. *Ovarium* oblongum, rugulosum, 2-loculare, pluriovulatum, *disco* pulvinato suffultum: *stylus* filiformis, glaber, longitudine staminum: *stigma* bilamellatum. *Capsula* cylindrica, botuliformis, sæpe tuberculis elevatis poriferis subserialibus rugosa, 2-locularis, 2-valvis, *valvis* coriaceis dissepimento crasso parallelis, *replo* bipartibili utrinque subtenui a valvis solubili. *Semina* plura, in utroque margine dissepimenti 1-seriata, transversa, magna, crassa, aptera, crebre coarctata, vix imbricata, compresse suborbicularia, dorso convexiuscula, ventre subangulata, *hilo* pergrandi ovali versus basin notata: *testa* dura, crustacea, nitida, longitudinaliter 2-locularis, *septo* integro coriaceo foramine centrali pro radiculæ receptione fenestrato: *integumentum internum* conforme: *embryo* exalbuminosus, testa configuratus, *lobis cotyledonaribus* 4, crassis, carnosis, plano-convexis, per paria adpressis et in locellis integumentorum nidulantibus, *radicula* perparva, tereti, loborum quarta parte longitudinis, centro inter eos prorsum adnata, et in foramine septi recondita, oblique et horizontaliter centrifuga. Frutices *scandentes Americæ meridionalis intertropicæ, plerumque*

Brasiliæ; rami *poroso-rugosi:* folia *opposita, nunc 3-foliolata, foliolo mediano longius petiolulato, nunc cirrhoso-conjugata,* cirrho *simplici:* foliola stipuloidea *sub-bracteiformia ad basin ramulorum novellorum utrinque bina glandulifera:* racemi *axillares, terminalesve, sæpius pulverulento-velutini,* flores *breviter pedicellati,* pedicelli *bracteis glanduliferis donati;* corollæ *flavæ, aurantiacæ, vel purpureæ.*

Species novæ, aliæque plantæ cognitæ, nunc ad hoc genus relatæ:

1. *Adenocalymna scansile,* n. sp.;—ramis glaberrimis, striatis, pallidis, teretibus, lenticellis porosis præsertim circa axillas subnodosas ruguloso-punctatis: foliis conjugatis, cum cirrho sublaterali simplici cito deciduo; foliolis oblongis, imo cordatis, inæquilateris, hinc gradatim acutis, apice mucronatis, pallidis, superne lævissimis, opacis, nervis immersis, inferne nervis venisque tenuiter reticulatis prominulis, nervo marginali pellucido, glabris, granulis porosis punctatis, rachi subtus prominente cum petiolo petiolulisque puberulis; foliolis stipuloideis bracteiformibus, intrapetiolaribus, linearibus, acutis, rigidis, concavis, extus glandulis immersis signatis: racemo terminali, folio sub-breviore: capsula botelloidea, tuberculis majusculis in lineis nunc interruptis notata, seminibus magnis pallide brunneis.—Brasilia in Prov. Rio de Janeiro, *v. s.*

Ab *A. marginato,* DC., differt foliolis cordatis, et pro ratione latioribus. Internodia 5 poll. remota; petiolus 6 lin., petioluli 3 lin. long.; foliola 3 poll. long., 1–1½ poll. lat.; foliola stipuloidea 3 lin. long., 1 lin. lat.; racemus fructifer rachi incrassata 2 poll. long., 2 lin. crassa; flores ignoti; capsula pallida, 4½ poll. long., 1½ poll. diam.; valvæ crasso-coriaceæ; semina in 2 loculis circiter 50, creberrime congesta, utrinque ad margines dissepimenti uniserialia, exalata, crassa, crustacea, 9 lin. diam., hilo magno 8 lin. long. et 3 lin. lat.

2. *Adenocalymna prehensile,* n. sp.;—ramis subteretibus, striatellis, ad nodos dilatatis, lenticellis porosis inconspicuis rugulosis; foliis conjugatis, cirrhosis, omnino glaberrimis; foliolis oblongo-lanceolatis, imo subobtusis, 5-nerviis, inæquilateris, hinc gradatim attenuatis, apice mucronatis, coriaceis, utrinque reticulato-venosis et ruguloso-punctatis, supra pallide viridibus, nitidis, subtus opacis, pallidioribus, nervis venisque prominentibus, margine cartilagineo pellucido; petiolulis petiolo paulo brevioribus, omnibus transversim corrugato-rugosis, teretibus, apice tumidulis; foliolis stipuloideis linearibus, bracteiformibus, glanduliferis; racemis axillaribus folio brevioribus, rachi in fructu valde incrassata, apice ampliata;

capsula subcylindrica, tuberculis majusculis elevatis seriatis interdum in lineis interruptis confluentibus.—In montibus circa Tejuco, Prov. Rio de Janeiro, *v. v.*

Species distincta: internodia $2\frac{1}{2}$–$4\frac{1}{2}$ poll. remota; rami ad nodos linea transversali signati; folia in articulationibus sæpe luxata; petiolus 9–12 lin., petioluli 6–7 lin., cirrhus simplex 6 poll. long.; foliola 5 poll. long., 16 lin. lat., mucrone apicali calloso glandulifero; foliola stipuloidea iis præcedentis similia; racemus fructifer 2 poll. long., pedunculus 3 lin. crassus, apice ad 5 lin. diam., ampliatus; capsula botelliformis, 6 poll. long., $1\frac{1}{2}$ poll. diam.; semina iis speciei prioris similia *.

3. *Adenocalymna flavidum*, n. sp.;—ramis flavescentibus, striatis, lenticellis parvis porosis angulosis, patentim hirsutulis, nodis remotis tumidulis; foliis conjugatis, cirrhosis, cirrho cito caduco, superioribus minoribus et sæpe 3-foliolatis, foliolis oblongis, imo subæqualibus, subrotundis, hinc gradatim acutis, apice callosis, supra lævibus, planis, opacis, pallide viridibus, minute reticulatis, subtus petiolisque flavido-pilosis, hinc nervis venisque reticulatis prominulis, margine cartilagineo, reflexo, petiolo petiolulisque subæqualibus rugulosis et angulato-striatis; racemis axillaribus, brevibus, petiolo paulo longioribus, e foliolis stipuloideis binis linearibus intrapetiolaribus glanduliferis enatis; floribus congestis, cano-velutinis, flavis, calyce 5-dentato, piloso, glandulis majusculis glabris fusco-viridibus concavis signato.—In montibus circa Tejuco, Prov. Rio de Janeiro, *v. v.*

Species insigniter ab *A. bracteato*, DC., diversa, e cirrho sæpius caduco, foliolis majoribus, flavido-pilosis, racemis axillaribus multo brevioribus et paucifloris, calyce minore dense flavo-tomentoso glandulis majusculis viridibus irregulariter 2-seriatis, et corollæ tubo magis cylindraceo. Rami valde tomentosi, ad nodos tumiduli et hinc poroso-punctati. Internodia 7 poll. dist., superiora breviora 3–4 poll. remota. Folia inferiora majuscula, petiolus 7 lin., petioluli 9 lin. long., foliola 5–6 poll. long., 2–$2\frac{1}{2}$ poll. lat., superiorum petiolus 7 lin., petioluli 5 lin., cirrhus 5 poll. long., foliola $2\frac{1}{2}$–$3\frac{1}{4}$ poll. long., 1–$1\frac{1}{4}$ poll. lat.; foliola stipuloidea linearia, interpetiolaria, rigida, erecta, glandulifera, 4 lin. long., 1 lin. lat.; racemi flavido-velutini; pedunculus 1 poll. long., circiter 8-florus, pedicelli oppositi, 2 lin. long., bracteæ velutinæ, lineares, acutæ, 3 lin. long.; calyx tubulosus, late et breviter 5-dentatus, 4 lin. long., $2\frac{1}{2}$ lin. diam.; corollæ flavæ tubus late cylindricus, imo repente angus-

* A drawing of this species, with details of its fruit and seeds, will be given in the 'Contributions,' plate 53.

tatus, $1\frac{3}{4}$ poll. long., ore 5 lin. diam. (constrictione basali 8 lin. long., 1 lin. diam.); limbi lacinia 5, oblonga, obtusa, inæqualia, 4–6 lin. long., 2–3 lin. lat.; filamenta 2 antica breviora; antheræ inclusæ.

4. *Adenocalymna lanceolatum*, n. sp.;—glaberrimum, ramulis teretibus vix striatis, lenticellis porosis sparsis punctatis, strictis, nodis remotis, compressis et dilatatis; foliis 3-foliolatis, aut terminali caduco conjugatis, foliolis oblongo-lanceolatis, ab imo obtuso gradatim acutis, terminali ad basin subacuto, apice longe mucronatis, supra nitidis, subtus pallidioribus, nervis tenuibus venisque delicatulis reticulatis vix prominulis, petiolulo mediano petiolo æquilongo, et lateralibus duplo longiore, vel interdum quasi in cirrhum apice foliiferum longius producto, omnibus apice tumidulis; foliolis stipuloideis intrapetiolaribus, lanceolato-linearibus, concavis, extus glandulosis; racemis axillaribus, folio tertia parte brevioribus, pedicellis medio bracteis 2 linearibus parvis donatis; calyce tomentoso, 5-dentato, 2-seriatim glandulifero; corolla flava, glandulis plurimis viridibus in lineis 5 dispositis notata.—Rio de Janeiro, *v. v.*

Species valde perspicua. Internodia $4\frac{1}{2}$–5 poll. remota; ramuli quasi virgati, axillis nodosis dilatatis utrinque linea transversa elevata notatis; petiolus 6–9 lin., petiolulus medius 8 lin., interdum $2\frac{1}{2}$ poll. et quasi cirrhiformis apice foliolifero, laterales 4 lin. long.; foliola lateralia 3–$4\frac{1}{2}$ poll. long., 14–16 lin. lat., intermedium paulo longius et latius, omnia subtus nervis divaricatis prominulis sub lente puberula; foliola stipuloidea sub-bracteiformia, rigida, erecta, glandulifera, 3 lin. long.; racemi axillares, 2 poll. long.; flores circiter 24, pedicelli oppositi, 2 lin. long.; bracteæ filiformes, cito caducæ, 1 lin. long.; calyx 4 lin. long., $2\frac{1}{2}$ lin. diam.; corolla pollicaris et ultra, in alabastro 7 lin. longa.

5. *Adenocalymna divaricatum*, n. sp.;—glaberrimum, ramulis fusco-rubris, teretibus, striatis, lenticellis parvis albidis punctatis, ad axillas nodosis et dilatatis; foliis conjugatis, patentibus, cirrho simplici, petiolulis petiolo brevioribus, foliolis ellipticis, fere æquilateris, imo subobtusis, e medio longe acuminatis, apice mucronatis, subcoriaceis, utrinque nitidis, glaberrimis, nervis venisque valde reticulatis rufulis prominulis, subtus flavido-pallidioribus; foliolis stipuloideis intrapetiolaribus, linearibus, acutis, divergentibus, glanduliferis; racemis axillaribus, pedunculo glabro, rufo, petiolo 3-plo longiore; floribus speciosis, circiter 12; pedicellis oppositis, medio 2-bracteatis; calyce extus fusco-velutino, fere integro,

mucronibus 5 denticulato, glandulis concavis plurimis 3-serialibus immersis notato; corolla flava, longe infundibuliformi-campanulata, pulverulento-velutina.—Ad montem Corcovado, Rio de Janeiro, *v. v.*

Species evidenter *A. Salzmanni* proxima, sed differt foliis valde divaricatis, foliolis longe acuminatis, et nervis rufescentibus. Internodia $3\frac{1}{2}$–4 poll. remota; foliola 3–$3\frac{3}{4}$ poll. long., $1\frac{1}{2}$–$1\frac{3}{4}$ poll. lat.; petiolus superne sulcatus, $\frac{3}{4}$–1 poll., petioluli 5–6 lin. long., omnes striati et divaricati; cirrhus simplex, 4 poll. long.; foliola stipuloidea 2 lin. long.; racemi pedunculus divaricatus, 2 poll. long.; pedicelli oppositi, basi bracteola unica, medio duabus muniti (hinc normaliter 3-flori, abortu 1-flori), cunctis linearibus, glanduliferis, $1\frac{1}{2}$ lin. long., caducissimis; calyx fusco-velutinus, glandulis porosis 2-seriatis infra dentes signatus, 4 lin. long.; corollæ tubus basi coarctatus, $1\frac{1}{2}$ poll. long., limbi ampliati lobi late obrotundi, $\frac{3}{4}$ poll. long., quorum 3 erectiores; stamina tubo dimidio breviora; antherarum loculi lineares, omnino segregati, divaricatissimi, e filamentis incurvis hinc verticaliter positi et per paria approximati, connectivo apice excurrente; ovarium oblongum, 4-carinatum, disco pulvinato suffultum; stylus filiformis, elongatus.

6. *Adenocalymna bracteatum*, DC. Prodr. ix. 200;—Bignonia bracteata, *Cham. Linn.* vii. 692.—Rio de Janeiro, *v. v.*

Species *A. flavido* proxima; rami ad nodos compressi et dilatati, lenticellis parvis rugosi, molliter puberuli; folia inferiora 3-foliolata, superiora conjugata et cirrhifera; foliola supra nitida, subtus molliter pilosa, 3–$3\frac{1}{2}$ poll. long., 14–18 lin. lat.; petiolus striatus, lenticellis rugosus, sub 1-pollicaris, petioluli laterales 4 lin., medius 7–9 lin. long., cunctis puberulis; folia stipuloidea intra petiolum linearia, glandulis immersis notata, 2 lin. long.; racemi pedunculus $3\frac{1}{2}$ poll. long.; pedicelli tomentosi 3 lin. long., imo bractea singula medio binis tomentosis 3 lin. long. donati, hinc abortione 1-flori; calyx coriaceus, tubulosus, velutinus, 5-carinatus, breviter 5-dentatus, sub-5-gonus, summo glandulis inconspicuis 3-serialibus immersis signatus, 5 lin. long.; corolla campanulata, extus tomentosa; ovarium oblongum, glabrum, glandulis favosis rugosum.

7. *Adenocalymna nitidum*, Mart., DC. Prodr. ix. 200.—Ad montem Corcovado, Rio de Janeiro, *v. v.*

Species, ut bene dixit cl. DeCandolle (loc. cit.), cum nonnullis aliis confusa: certe a *Bignonia unguiculata*, Flor. Flum. vi. tab. 33, valde diversa, ut posterius demonstretur; *Cuspidaria pauciflora* DC. identicam credit cl. Sonder (Linn. xxii. 560), sed clare diversissima. Ad diagnosin in Prodr. cit. annotabitur:—rami teretes, nitidi, lenticellati, ad nodos compressi et dilatati, hinc linea elevata transversali notati; internodia $3\frac{1}{2}$–$4\frac{1}{2}$ poll. dist.; folia glaberrima, inferiora 3-foliolata, superiora cirrhoso-conjugata, foliola crasso-coriacea, utrinque pallida, supra nitida, subtus opaca et poroso-punctata, inferiora 4 poll. long., 2 poll. lat., petiolo patentissimo, angulato, rugoso, $1\frac{3}{4}$ poll., petiolulo med. 1 poll., lateral. 5 lin. long.; foliola superiora $2\frac{1}{2}$–3 poll. long., 1–$1\frac{1}{2}$ poll. lat., petiolo 9 lin., petiolulis 4 lin. long.; cirrhus simplex, $2\frac{3}{4}$ poll. long.; foliola stipuloidea prioris, 3 lin. long.; racemi axillares et terminales, nutantes, inter foliola stipuloidea enati, 3–4 poll. long., circiter 24-flori; pedunculi oppositi, abortione 1-flori, 3 lin. long., bracteis 1 basali foliacea glandulifera 5 lin. long., binis in medio caducis muniti; calyx 5 lin. long., fere integer, e nervis excurrentibus 5-denticulatus, tomentosus, glandulis viridibus circa 10 infra dentes signatus; corolla flava, velutina, late infundibuliformis, tubo $1\frac{1}{2}$ poll. long., limbi lobis 5 rotundis, 6 lin. long. et lat.

8. *Adenocalymna stridula*;—Bignonia Kerere, *Aubl. Pl. Guian.* ii. 644. tab. 260 (non *Lindl.*); *DC. loc. cit.* 154;—B. heterophylla, *Willd. Sp. Plant.* iii. 298;—ramulis gracilibus, glabriusculis, angulato-striatis, ad nodos compressis et dilatatis, et hinc utrinque punctis favosis crebris notatis; foliis inferioribus 3-foliolatis, superioribus conjugatis, cum cirrho simplici; foliolis oblongis, basi ovatis et subcordatis, apice acuminatis, glaberrimis, firmulis, supra lucidis, subtus nervis venisque prominentibus, petiolo favoso-punctato, basi apiceque incrassato, petiolulis summo tumidulis duplo longiore; racemis brevissimis, axillaribus, paucifloris; calyce urceolato, imo coriaceo, glandulis disciformibus sub os truncatum 5-denticulatum immersis; corolla ampla, lutea, infundibuliformi-campanulata, tubo curvulo, limbo 5-lobo, sub-bilabiato, lobis 2 superioribus erectioribus, paulo majoribus, genitalibus inclusis; capsula lanceolato-ovata, subcompressa, coriacea, glanduloso-rugosa.—Guiana Gallica, *v. s. in herb. Mus. Brit.*

Ad *Adenocalymna brachybotryn*, DC., et *A. lanceolatum*, nob., proxime accedit; differt tamen a priore foliis basi non acutis, nervo mediano striato et prominente, sed non acute carinato, racemis axillaribus brevissimis, paucifloris, nec terminalibus et multifloris, glandulis calycinis majoribus et paucioribus. Nomen *Kerere* vel *Terere* inter Indos usitatum, *stridulans* significat, quia rami, quum flectantur, sonum crepitantem emittunt: hoc vocamen barbarum ab incolis pariter datum est ad plantas Aubletianas *B. Kerere*, *B. incarnatam*, et *B. echinatam*, qua ratione hæc species Latine *stridula* melius dicitur. Diagnosis in Prodr. DC.

ad plantam cultam Lindleyanam refert, quare palam specim. typic. citat. char. hic reformavi. Internodia 3½–4½ poll. dist.; in axillis superioribus floriferis petiolus 6 lin. long., petioluli 4 lin. long., cirrhus 5 poll. long., foliola 3 poll. long., 15–17 lin. lat. Foliorum inferiorum petiolus 14 lin. long., petioluli laterales 4 lin., terminalis 12 lin. long.; foliola 5½ poll. long., 2 poll. lat.; racemi rachis 6–12 lin. long., 3–6-flora, pedicelli imo breviter bracteolati 3 lin. long.; calyx 4 lin. long.; corolla (in specim. deficiens) sec. Aubl. flava, tubus 2 poll. long., limbi lobi rotundati 6 lin. diam. Ovarium adauctum vidi, 12 lin. long., 4 lin. lat., oblongum, compressum, fuscum, glabrum, glandulis carnosis porosis crebris notatum. Capsula oblonga, compresso-teres, poroso-rugosa, valvis dissepimento plano parallelis coriaceis deciduis; sec. Aubl. (icon. 263) 3 poll. long., 15 lin. lat., et 9 lin. diam. transverso; sec. Splitzb. 3 poll. long., 8 lin. solummodo lata; tunc forma propior capsulæ *Adenocalymnatis scansilis* nuper descriptæ. Semina, sec. icon. cit., utrinque 1-serialia, compressa, margine angusto cincta, 8 lin. long., 11 lin. lat.

9. *Adenocalymna verruciferum*; — Bignonia verrucifera, *Schl. Linn.* xxvi. 655;—ramulis glabris, lenticellis crebris porosis verrucosis; foliis cirrhoso-conjugatis, foliolis late vel ovato-ellipticis, basi obtusis, subcordatis, sub-3-nerviis, apice acutiusculis, subcoriaceis, supra glabris, nitidis, subtus pallidioribus, opacis, nervis venisque prominulis et obsolete puberibus: inflorescentia e racemulis in ramulis novellis terminalibus, 1–3-floris, lenticellis instructis et puberulis, axillis approximatis, hinc pseudo-corymbosa; calyce campanulato, tuberculis irregulariter verrucoso, margine breviter 5-dentato et mucronato; corolla purpurea, infundibuliformi, glabra, limbo irregulariter 5-lobo.—Columbia ad Curucati (Wagener, no. 307).

Species mihi invisa, sec. el. Schlecht. ad *Bignoniam glabratam*, H. B. K. accedens; ad altit. 30 ped. scandens; foliola 4–6 poll. long., 2½ usque fere 4 poll. lat.; petiolus 1 poll., petioluli 6 lin. long., supra canaliculati; calyx 3 lin. long.; corolla 1½ poll. long. (parte constricta basali 2 lin. long.), superne elongato-campanulata.

10. *Adenocalymna paniculatum*, Bth. MSS., n. sp.;—ramis glabris, foliis 3-foliolatis, foliolis obovatis, lateralibus, imo subinæquilateris, rotundatis, impari majore, longius petiolulato, basi obtuso, 5-nerviis, apice attenuato-acuminatis, mucronatis, glaberrimis, supra nitentibus, reticulato-venosis, subtus pallidis, nervis tenuibus in axillis barbatis, et sæpe glanduliferis; panicula terminali pyramidali, e basi longe ramosa, ramis oppositis, 3-chotome divisis, multifloris; calyce turbinato,

fulvo-velutino, 5-denticulato, infra marginem glandulis paucis immersis signato; corolla infundibuliformi-campanulata, extus velutina.—Prov. Para, *v. s. in herb. meo* (ad cataractas fluv. Aripecurù, Spruce).

Planta facies *Arrabideæ,* sed propter folia, calycem, corollamque glandulifera ad *Adenocalymnam* referenda: species *A. divaricato* proxima: rami fusculi, striatelli, teretes, ad nodos compressi et dilatati; internodia 3–4 poll. dist.; foliola lateralia 4 poll. long., 2 poll. lat., terminale 4½ poll. long., 2½ poll. lat.; glandulæ immersæ crebræ in axillis nervorum pellucidæ; petiolus 2 poll. long.; petioluli laterales 5 lin., terminalis 9 lin. long., striati et canaliculati; foliola stipuloidea caduca, loco insertionis cicatriculis notata; panicula 12 poll. long. et ultra, ramis basalibus subdivaricatis 7 poll. long., aliis superioribus oppositis gradatim brevioribus; ramulis secundariis 6 lin. long., sensim brevioribus; pedicelli velutini, 2 lin. long.; bracteæ setaceæ, 2 lin. long., divaricatæ; calyx 2–2½ lin. long., glandulis 10 immersis parvis signatus; corolla (sicca) flavida, velutina, tubo 9 lin. long., intra calycem coarctato, lobis 5 inæqualibus, quorum 3 superioribus erectioribus, tenuiter membranaceis, 6 lin. long., 4 lin. lat., 2 inferioribus reflexis, minoribus, crassioribus; stamina longiora faucem fere attingentia; antheræ divaricatissimæ; ovarium cylindricum, lepidotum, tenuiter 4-sulcatum, disco majusculo carnoso pulvinato insitum.

11. *Adenocalymna alliaceum*;—Bignonia alliacea, *Lam. Dict.* i. 421; *Swartz, Fl. Ind. Occid.* ii. 1039; *Aubl. Pl. Guian.* ii. 659; *DC. l. c.* 148; *Splitzb. Pl. Surin.* p. 1;—glaberrimum, ramulis teretibus aut subangulosis, late ellipticis, utrinque acutis, subcoriaceis, supra pallide viridibus, nitidis, nervis immersis, subtus pallidioribus, nervis venisque transversis prominulis, minutissime favoso-punctatis, margine reflexo, petiolulis petiolo brevi subæquilongis aut longioribus, apice basique tumidulis; paniculis axillaribus aut terminalibus, folio multo brevioribus, 5–6-floris; calyce truncato, integro, subtomentoso; corolla majuscula, infundibuliformi-campanulata, glabra, alba, limbi ampliati lobis subæqualibus, oblongis, rotundatis; capsula fere cylindrica, obtusa, oblonga; seminibus suborbicularibus, compressis, marginibus subalatis, coriaceis.—Cayenne et Peruvia, *v. s. in herb. Mus. Brit.* (Cayenne, Aublet); *in herb. meo* (Tarapota, Spruce, 4475).

Planta alte scandens, quæ de longinquo odorem alliaceum spirat: internodia 6 poll. dist.; ramuli infra nodos, ut in plerisque speciebus, crebriter favoso-punctati; foliola 7–8 poll. long., 3–3½ poll. lat.; petiolus petiolulique crassiusculi, 6 lin. long.; paniculæ rachis ½–2 poll. long., ramique 3-chotomi aut 3-flori, valde compressi; calyx coriaceus, enervius, infra marginem integrum glandulis omnino immersis et hac causa facile prætermissis notatus, 3 lin. long.; corollæ tubus ultra calycem coarctatus, 2–2½ poll. long.; limbi lobi 8 lin. long., imo 6 lin., medio 9 lin. lat.; filamenta glabra, per paria incurva, longiora vix ultra medium tubi pertingentia; stylus filiformis, staminibus longior; ovarium oblongum; ovula ad extremos margines dissepimenti utrinque uniseriata. Capsula sec. cl. Splitzb. fere cylindrica, 2½–3 poll. long., 1 poll. diam. aut paulo latior; valvis crassis, lignosis, extus fulvo-tomentosis, dissepimento coriaceo parallelis; semina angulato-orbicularia, marginibus subcoriaceis; conditiones, quæ cum illis *Aden. prehensilis* supra descriptis, omnino congruunt.

12. *Adenocalymna prasinum*;—Bignonia grandifolia, *Vell.* (non *Mart.*) *Flor. Flum.* 247. vi. tab. 28;—glaberrimum, ramulis teretibus striatis punctato-rugosis; foliis ecirrhoso-conjugatis aut 3-foliolatis, foliolis oblongo-ellipticis, imo angustiore obtusis, apice subacuminatis, obtusiusculis, submembranaceis, supra læte prasinis, reticulatis, subtus valde pallidis, nervis tenuibus secum arcuatis venisque reticulatis prominulis; petiolo petiolulis breviusculis æquilongis; racemis axillaribus et terminalibus, folio brevioribus, tomentosis; calyce 5-dentato, conspicue 2-seriatim glandulifero; corolla speciosa.—Brasilia, *v. s. in herb. Lindl.* (Manneville); *in herb. Mus. Brit.* (A. Cunningham).

Species primo aspectu præcedenti valde similis, sed differt nodis non favoso-punctatis, foliis angustioribus, nervis aliter dispositis, floribus racemosis nec paniculatis, rachi longiore, tereti, nec compressissima, floribus numerosioribus, per paria oppositis, calyce majore, glaberrimo, 5-carinato, nec lævi et tomentello, corolla minore, pulverulenta, nec glabra, &c. Internodia remota; foliola 8–10½ poll. long., 2¾–3½ poll. lat.; petiolus 5–8 lin. long.; petioluli laterales 5–9 lin. long., terminalis 1–2¼ poll. long.; racemi rachis teres aut sub-4-gona, 2–4 poll. long., circiter 20-flora; pedicelli oppositi 3 lin. long., medio bibracteati; bracteæ 5 lin. long., 1 lin. lat.; calyx 4–5 lin. long., 4 lin. lat., glandulis majusculis prominulis instructus, 5-carinatus, nervis extus infra marginem in mucrones protensis; corollæ tubus 18 lin. long., intra calycem coarctatus, medio ventricosus, extus rufescente pruinosus; lobi rotundi, 4 lin. diam.

13. *Adenocalymna acutissimum*;—Bignonia acutissima, *Cham. Linn.* vii. 691; *DC. l. c.* 153;—scandens, præter inflorescentiam tomentosam glaberrimum; ramulis teretiusculis; foliis cirrhoso-conjugatis (interdum 3-foliolatis), foliolis firmulis, ellip-

ticis, basi obtusis, apice acuminatis et longe cuspidatis, lucidis, prominenter reticulatis, margine cartilagineo subreflexo, subtus pallidioribus, nervis venisque prominulis; racemis terminalibus, longiusculis, densifloris, tomentosis.—Brasilia, *v. s. in herb. Lindl.* (Forrest, 26).

Species valde peculiaris, *A. marginato*, DC., proxima: internodia 4 poll. dist.; foliola firma, obscure viridia, nitentia, $3\frac{1}{4}$–4 poll. long., $1\frac{1}{4}$–$1\frac{1}{2}$ poll. lat. (sec. cl. Cham. folia inferiora multo majora, 9 poll. long., $3\frac{1}{4}$ poll. lat.); petiolus 6–7 lin., petioluli tenuiores, 5 lin. long., superne canaliculati; cirrhus simplex, tenuiculus, 6 poll. long.; racemi rachis pulverulenta, 4 poll. long., fere e basi florifera, circiter 30-flora; pedicelli oppositi, 4 lin. long. (plerique delapsi), imo bractea 4 lin. long. donati; calyx tubulosus, fulvido-pulverulentus, 5-dentatus, infra dentes glandulis 20 biseriatim dispositis instructus, 4 lin. long.; corolla in alabastro fulvo-tomentosa; maturæ in specim. desunt, sed sec. cl. Cham. 2-pollicares, extus (lobis utrinque) dense farinoso-tomentosæ, intus glabræ.

[To be continued.]

XLVII.—*On the Existence of Animal Life at great Depths in the Sea.* By G. C. Wallich, M.D., F.L.S.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

Any communication emanating from so distinguished an authority on matters connected with the natural history of the sea as Mr. Gwyn Jeffreys, must at all times command the notice of the scientific world. To quote that gentleman's words, "Public attention having been of late attracted to the subject of submarine telegraphy, and especially to the causes of failure in several of these undertakings," the article "On a presumed Cause of Failure in Oceanic Telegraphy, and on the Existence of Animal Life at Great Depths in the Sea," which appeared in the 'Annals' for the present month (April), must have been hailed with even more than ordinary interest, inasmuch as the writer intimated his intention of making known "some facts" which had fallen under his own immediate observation.

Mr. Jeffreys having done me the honour to allude to certain statements of mine in connexion with the subject, I beg leave to offer a few comments in reply, and request attention to the connexion that exists between "the facts" actually recorded and the "inferences" drawn from them.

Mr. Jeffreys states that "during the recent expedition to survey the North Atlantic Telegraph line, there was only one piece * of *drift-wood* met with in the Arctic Sea which showed any marks of having been perforated by marine animals;" and that this piece of wood, which "was picked up by the 'Fox,' on the 13th Sept. 1860, off the east *coast* of Greenland, in lat. 60° 54′ N., long. 41° 58′ W.," had, through the intervention of the commander of H.M.S. 'Bulldog,' been submitted to his (Mr. Jeffreys's) examination. On making sections of this piece of wood, which "appeared to have been much rubbed and frayed, probably by attrition against *loose or floating* ice," Mr. Jeffreys says he found "that the perforations had been caused by *a kind* of *Annelid,* and that they extended to a considerable depth, although they were of a different nature from the tunnels made by *any kind* of *Teredo,*"—the paragraph from which these extracts are quoted concluding with the statement that, reference having been made by Mr. Jeffreys "to the account given by the late Sir John Ross of his 'Voyage of Discovery to the Arctic Regions,' which was published in 1819," he found "that in many of the deep-sea soundings" which are so accurately described by that navigator, "living 'sea-worms' (or *Annelids*) occurred at depths varying from 192 to 1000 fathoms."

I confess myself at no slight loss to trace the bearing of the "fact" adduced by Mr. Jeffreys upon deep-sea soundings, or oceanic telegraphy, and still more at a loss to establish any rational connexion between it and the "inference" which is made to follow—an inference long since universally recognized as deducible from a very different series of observations—namely, "that proper precautions ought to be taken to prevent the cable being injured, and the telegraphic action affected, by marine animals of perforating habits. *No* vegetable substance," Mr. Jeffreys goes on to say, "is free from their attacks;" and, as

* Mr. Jeffreys labours under a misconception on this point. At page 28 of my "Notes on the Presence of Animal Life at vast Depths in the Sea," I state that "on two occasions only, during the cruise of the expedition on the coast of Greenland, was drift-timber fallen in with. Both specimens were of pine, completely sodden by long immersion, and exhibiting no trace of epiphytic growths or parasitic animalcules, from which some clue might possibly have been obtained as to their source." This remark having reference solely to the peculiar nature of the Arctic current of the season in question, I made no mention of fragments of drift-timber, which I repeatedly came across whilst dredging in the ship's dingy amongst the fiords. Several of the pieces picked up by me in these channels were more or less pierced; but I failed to detect any remarkable telegraphic significance in these tempest-worn but still *floating* derelicts. It is to be presumed, I suppose, that the piece of drift-wood picked up by the 'Fox' did not *grow* at the bottom of the sea.

N.B. The italics in the quotation are mine.—G. C. W.

shown by him "in the case of the Mediterranean line, the cable, as well as its enclosure of gutta percha, was pierced, at a depth of between 60 and 70 fathoms, by the *Xylophaga dorsalis.*" And here follows the very remarkable and startling opinion that "a sheathing of copper, or of *any other* metal which is *not* liable to oxidation, would effectually prevent any such injury, and not interfere with the flexibility of the cable!"

No doubt Mr. Jeffreys is fortified with evidence in support of his view that copper is not liable to oxidation when immersed in sea-water. He must pardon me, however, if I venture to impugn the assertion, and, further, if I impugn the fitness of copper, on electrical grounds, to be employed as a sheathing for submarine cables, at any depth whatever, even admitting it to possess the necessary degree of flexibility.

In the concluding portion of Mr. Jeffreys's communication, he takes the "opportunity of remarking, in justice to the memory of the gallant officer to whose explorations he had above referred, that by means of his 'deep-sea clamm' he (Sir J. Ross) succeeded in taking up and bringing to the surface considerable quantities of stones and mud (as much as 6 lbs. at a time) from the sea-bottom at great depths," *worms* being obtained on one occasion at 1000 fathoms; whilst "entangled on the sounding-line, at the depth of 800 fathoms, was found a beautiful *Caput-Medusæ*, which appears to have measured no less than 2 feet in length when fully expanded." And again, according to Sir J. Ross (vol. ii. p. 5), "When the line came up, a small *Star-fish* was found attached to it, below the point marking 800 fathoms. Animals of a higher degree of organization (such as *Mollusca* and *Crustacea*) were also procured, at *rather less* depths, in Baffin's Bay."

Had Mr. Jeffreys confined himself to the performance of what he considered an act of justice to the memory of Sir John Ross, I, for one, should have been the last person to place in competition with the discoveries of that distinguished Arctic commander any trifling additional light I may have been fortunate enough to cast on the question of animal life at great depths in the sea. But when, in order to make it appear that my "supposed discovery," as Mr. Jeffreys is pleased to designate it, "was anticipated more than forty years ago," such meagre and unconnected "facts" are dragged forward, I cannot help thinking that the chivalry of the "supposed" act of justice dwindles into a shadow.

I freely admit that, until Mr. Jeffreys drew attention to the circumstance, I was unaware that animals had been *proved to exist* at anything like the depths alluded to by Sir J. Ross. Having spent twenty years of my life in India, this ignorance on my part might perhaps be held to be excusable. But I am content to avow that I humbly followed in the wake of those high authorities whose works I had now and then the opportunities of consulting, as, for instance, Edward Forbes, Huxley, Ansted, Phillips, and many other illustrious writers whose published opinions are far too well known to render it necessary for me to show that *they*, at all events, demanded *everything* in the way of confirmatory evidence, before yielding that credence which must all along have been accorded by Mr. Jeffreys, if founded, as it would appear to be, on the bare statements to which he is so anxious to do "justice."

I have expressly stated, in my published "Notes," that my chief aim, in tendering my services when the North Atlantic Expeditions were projected last season, was to "*determine* the depths to which animal life extends in the sea, together with the limits and conditions essential to its maintenance." How far I have been successful in my labours, it is not for me to decide. I would only remark, in conclusion, that the mere hauling up a creature from the sea-bottom, apart from the elucidation of the attendant biological phenomena, is too purely a mechanical feat to elicit any higher credit than will some day attach to the first observer of the "great sea-serpent," should such a monster prove, after all that has been said *pro* and *con.*, to be something more than a myth.

I remain, Gentlemen,

Your very obedient Servant,

G. C. Wallich.

17 Campden Hill Road, Kensington,
April 15, 1861.

BIBLIOGRAPHICAL NOTICES.

Life on the Earth; its Origin and Succession. By John Phillips, M.A., LL.D., F.R.S. &c. Cambridge: M'Millan, 1860. 12mo.

One of the most astonishing circumstances in the present day is the acceptance which the theory put forward by Mr. Darwin in his work on the 'Origin of Species' has met with from several of the leading naturalists of this country. That a book having the name of Charles Darwin on its title-page would be extensively read, is a matter of course; but that, without containing the smallest tittle of new evidence on the subject of the evolution of one species from another, it should have been regarded as establishing that theory, may well excite our surprise.

When we compare Mr. Darwin's hypothesis with those of his predecessors, which have been sometimes treated as irreligious, sometimes as simply ridiculous, we find that its main difference from them (looking at both in a broad light) consists in the exclusion by

Mr. Darwin of anything like plan or design in nature. As far as one can judge from his statements, all the diversities of form and structure that we meet with in organized beings are to be deduced from a series of indefinite variations in the organism, accumulated through countless ages, but subject to certain limits in consequence of the greater or less degree of adaptation exhibited by the successive races for the conditions to which they are exposed. Unity of type, according to Mr. Darwin, is subordinate to the law of conditions of existence; and in another place he remarks on the ease with which we "hide our ignorance under such expressions as the 'plan of creation,' 'unity of design,' &c., and think that we give an explanation when we only re-state a fact." How many of Mr. Darwin's "laws" may fairly come under the denomination of "re-statements of facts" we will not stop to inquire; but there can be no doubt that to one of them at least, that of "correlation of growth," as stated by him, this term will apply most fully.

The "law" of correlation of growth appears, in fact, to have been introduced into his theory by Mr. Darwin for the express purpose of accounting for any phenomena which it might be difficult to explain by any other means; it is every bit as arbitrary and as completely a "hiding of ignorance" as any law of type or design that has ever been laid down by naturalists; it introduces into the hypothesis an element both arbitrary and extraneous, independent of all chance variations, impressed upon the organism by some superior power, and consequently superior, and not subordinate, to all the other elements in Mr. Darwin's theory.

We find from Mr. Darwin's own statements that he regards correlation of growth as the origin of what is commonly called "type" in some instances; but if in some, why not in all? May we not assume (taking the Darwinian hypothesis generally to be correct) that this law, by which, as we understand it, changes produced in the organism by *variations* in the conditions of life are accompanied by other changes not attributable directly to that cause, must have been in operation from the very earliest appearance of life upon the earth? that during the very first variations of the progeny of that "primordial germ," which is not only the analogical, but the logical starting-point of every system of evolution, this law must have been in action? and that by its means the variations of that progeny were guided in definite directions until the production of those phenomena to which we usually give the name of type? But if this be so, it implies the impression upon the "primordial germ" of the power of evolution under certain conditions of existence in certain directions, and in no other; in other words, that germ must have been endowed with the potentialities of all the variations through which its progeny could pass*; which, however, involves the notion of a "plan in creation," treated by Mr. Darwin as a mere expression

* Even in the Darwinian sense, "correlation of growth" is clearly the expression of a quality or force inherent in the organism, the action of which under any given circumstances must have been predetermined at the first creation of the primordial germ.

used "to hide our ignorance." Under any circumstances, we come back to a theory very analogous to that of Lamarck—that of variability, with gradually increasing perfection of organization, within certain definite limits laid down by a higher power; and it appears to us that Mr. Darwin's theory must be regarded in the same light as those of his predecessors, namely as an attempt (perhaps a better one than any that have gone before) to account for phenomena which are not proved to occur. For, after all, before we can regard any theory of evolution as deserving notice, we must look for some little evidence that such a thing as the production of one species from another pre-existing one has taken place.

In seeking this evidence, it is clear that we must not expect to find it unequivocally expressed among existing plants and animals. Nevertheless, if species be, as Mr. Darwin's theory would make them, nothing else than more strongly-marked varieties, or, at least, forms in which the divergences from the last specific type have been accumulated to such an extent as to give rise to what we regard as distinct species, it would appear that we ought to be able to find some traces of such changes taking place within historical periods. But when we come to investigate the facts of the case, we find that the balance of probability is in favour of species being liable to definite degrees of variation dependent on the external conditions of life*; and although some varieties of the same species may differ sufficiently from each other, or even from the specific type, to have induced naturalists to describe them as distinct species, such errors have generally been due either to imperfect information, or to the augmentation of the importance of differences into which the close study of a limited group of objects is liable to lead the student, especially of a local fauna or flora. That there may be differences of opinion among good naturalists as to the limits of a species, every one will admit; but whether this fact is to be used, as has been done by Darwin, as an argument in the discussion of a theory in natural history is quite another question.

It is, however, to geology that we must turn to seek anything like reliable evidence of the evolution of species. In the successive strata of the earth's crust, if anywhere, we must find the traces of that "interminable number of intermediate forms" necessary to conduct us step by step from the primordial germ of the evolutionists to the most highly organized members of the animal and vegetable kingdoms. But Mr. Darwin himself admits that we do not find them—that "we meet with no such evidence" of "the gradation and mutation of the forms of life;" and he can only get over this difficulty by assuming "that the geological record is far more imperfect than most

* It appears to us that even the celebrated pigeon-experiments of Mr. Darwin are confirmatory of this view: hardly any evidence of the permanence of species can be stronger than that a bird, after many ages of variation under domestication and the production of varieties so widely different as those of pigeons, should still retain the impress of the original type so strongly as to revert to it by the simple intermixture of two extreme forms.

geologists believe." It is upon this assumption, which has been by no means generally accepted by geologists, that Professor Phillips, one of the most accomplished of their number, joins issue with Mr. Darwin in the little work before us. "With the exceptions of the two great breaks at the close of the Palæozoic and Mesozoic periods," says Professor Phillips, "the series of strata is nearly, if not quite, complete, the series of life almost equally so. Not, indeed, in one small tract or in one section, but on a comparison of different tracts and several sections. For example, the marine series of Devonian life cannot be found in the districts of Wales or Scotland, but must be collected in Devonshire, Bohemia, Russia, and America. When so gathered, it fills very nearly, if not entirely, the whole interval between the Upper Silurian and the Carboniferous fauna. So, in England, the marine intermediaries of the Oolitic and Cretaceous ages are not given; but the Neocomian strata supply the want. We have no Meiocene strata in England, but their place is marked in France and America.

"Even the great breaks alluded to are bridged. The Permian series of life contains some Mesozoic interpolations; and the Lias contains *reliquiæ* of some Palæozoic genera. The Upper Chalk of Maestricht and the South of France extends towards the Tertiaries the reign of the Upper Mesozoic beds. On the whole, it appears that there exist ample materials for testing any hypothesis of the sequence of life which includes the marine races."

After reviewing the steps by which we might suppose that the lower forms of animal life had been derived from a simple primordial germ, and showing that, as far as our knowledge of animal forms goes (and there is nothing else to which we can appeal), even "in what seem to be the first and easiest steps we can imagine, nothing but postulate upon postulate will bring us on our way," Professor Phillips proceeds to examine the evidence afforded, either for or against the doctrine of evolution, by the Mollusca, "the least incomplete series of forms, and undoubtedly the most favourable of all the marine groups for the application of hypothesis."

"The earliest known mollusk," he says, "is the Brachiopod *Lingula*, which recurs in all the systems of strata, and is still living. It gives no generic branches. The next earliest are the Dimyarian genera *Ctenodonta* and *Cucullella*, which cannot be regarded as descended from any conceivable Brachiopod, or accepted as progenitors of *Modiola*, *Orthonota*, *Cardiola*, or *Pleurorhynchus*—still less of their Monomyarian companions, *Ambonychia*, *Avicula*, and *Pterinea*. It is inconceivable that from these, or anything like them, could be derived the Gasteropod *Euomphali*, *Loxonemæ*, &c., or that the Heteropod *Bellerophon*, the Pteropod *Theca*, or the Cephalopod *Orthoceras* are consanguineous any one of them with any other. All these great classes, then, are, *according to the evidence*, equally aboriginal, though not of equal antiquity." From these and similar considerations, Professor Phillips affirms "that the later series of Cambro-Silurian life cannot possibly be derived from the earlier series, according to the evidence preserved to us, but, on the contrary, requires absolutely the admission of separate stemmata, certainly for every principal group, apparently and probably so for every genus or natural assemblage of much-resembling forms with similar structures." In the ordinary view, these stemmata, however circumscribed, are regarded as the products of separate creations: in the evolution hypothesis, these forms, "which appear to be, and are really, distinct," are not aboriginal, but the modified progeny of far earlier forms, which, with all the intermediate forms, are utterly unknown to us. "Now," to use Professor Phillips's words, "they are not unknown to us by any impossibility of being preserved; for the strata of the Cambro-Silurian series are of a kind in which organic remains of great delicacy are often preserved; and, indeed, such are preserved in these very strata; and, by the hypothesis, the life-structures which are lost must have only gradually differed in their nature from those which are preserved. It follows therefore that the earlier living progenitors of the Cambro-Silurian series not only lived long before, but must have lived somewhere else. But as in all the known examples of this series of strata, wherever found, we have everywhere animals of the same general type, and nowhere the traces of earlier progenitors, it is clear that everywhere we are required by the hypothesis to look somewhere else; which may fairly be interpreted to signify that the hypothesis everywhere fails in the first and most important step." It may also be urged, to give additional force to the above argument, that the necessity for "looking somewhere else" for the transition-forms is of itself fatal to the hypothesis of evolution: it is quite clear that when new forms make their appearance at a given point, they are (according to the hypothesis) either the modified descendants of immigrants from some other point, or of forms previously residing in the same locality; in either case, the modifications they have undergone must have been intended to adapt them for new conditions of existence at the spot where they are found; and the intermediate forms should occur, if anywhere, at the same spot. Moreover, when we consider the individual case of *Lingula*, that it is one of the very first known fossils to which we can with certainty assign a definite place in the classification of animals, and that it has continued to make its appearance, from the earliest periods down to the present time, with no change except of a specific nature, we may justly ask why, if descent with modification under varying conditions of life were sufficient to produce the type of *Lingula* in the progeny of the primordial germ as early as the period of deposition of the beds which bear its name, the further influence of at least equal (and most probably far greater) changes in the conditions of existence during the long period of time which has elapsed since the appearance of the type of *Lingula* upon the stage of life should have had so little effect upon it, whilst other types, exposed, as far as we can judge, to precisely the same influences, have been almost infinitely modified? It appears to us that it is rather too much to expect us, without some evidence or explanation, to assume the occurrence of such phenomena as these; and the same will apply to the analogous case of the genus *Nautilus*, and more or less to many other forms.

That we have devoted so much space to the consideration of the portion of Professor Phillips's work from which the above extracts are taken, is due to the fact that, although the immediate consideration of the doctrine of evolution of species occupies but a small space in the book, the section devoted to it really contains the sum and point of the whole volume; and considering that the Darwinian chariot has been accompanied on its course by such shouts of triumph from the supporters of the theory contained in it, it may be some consolation to the more sober-minded of our readers to learn that one at least of our naturalists, and that one not less conspicuous for his extensive and accurate knowledge of the various subjects bearing on this theory, than for the care with which he has always avoided committing himself by the emission of crude opinions, does not hesitate to come forward in support of those old-established views which it is the object of the evolutionists to cast down. He does not profess to put forward any novel theories, but simply endeavours to illustrate, by means of carefully prepared tables, what has been the real sequence of the appearance of different animal forms, and to show the bearing of the facts thus established upon the various theories of the origin and succession of life upon the earth. He adopts the notion of type in its ordinary signification and in the fullest sense; he maintains the theory of independent centres of creation; and discusses, with a clearness scarcely to be expected in a work of such brevity, those important questions in physical geology connected with the change of climate which must have taken place during the lapse of ages. The section treating of the latter subject, and that in which various calculations as to the antiquity of the earth are brought together, will well repay the attention of the reader.

Illustrations of the Genus Carex. By Francis Boott, M.D. London, Pamplin, 1858–60.

We have too long delayed noticing this very valuable work. Our excuse may perhaps be found in the difficulty of doing justice to it.

Botanists have long been hoping to receive some account of the difficult and extensive genus *Carex* from the pen of that botanist who was known to be the most intimately acquainted with it; but no one, unless he had the good fortune to be admitted into the secret, as we were not, had any idea that the result would be so magnificent and elaborate as it has proved.

The book is published in two parts, in folio, and consists of 103 pages of type and 310 plates, representing 250 species. The author informs us that his original design was limited to the illustration of the *Carices* of North America, but that the extensive and beautiful collection of specimens subsequently brought from the East Indies by Dr. Hooker and placed in his hands caused him to extend his plan and to endeavour to illustrate the genus at large. The natural result of this is that the great majority of the species here discussed and figured are either Indian or American. Occasionally a European *Carex* is noticed, and to these our remarks will be confined, as those species interest more persons in this quarter of the world than do the others, although the examination of them is not perhaps of so much value to the general botanist as the illustration of the less-known American and Indian species.

C. cæspitosa (Linn.).—The opinion of Fries is confirmed, that the Linnæan plant is that which was called *C. pacifica* by Drejer; not the *C. vulgaris* as long supposed by British botanists, nor *C. stricta* (Good.) as suspected by Gay. Although this species is extensively spread throughout the North of Europe, it has not as yet been detected in Britain. Scottish botanists should look for it in peat mosses. Indeed Fries states that he has received a specimen from Scotland; but Dr. Boott has been unable to discover one in any British herbarium. We may add that our rather extensive searches after it in nature and in herbaria have not led to any better result. It is said to be very constant in form. *C. vulgaris* is known to be exceedingly variable.

C. tenella (Schkr.).—Good figures of this plant and its ally *C. loliacea* (Linn.) are most valuable. The former has long passed by the name of *C. disperma* in America, where it is abundant. In Europe it seems to be confined to Scandinavia, and to be rare even there. The name of *C. tenella* is found in Smith's 'English Flora' as given by Mr. G. Don to a plant gathered by the river Esk in Forfarshire. No other botanist seems to have found it; nor is it even mentioned in Gardiner's 'Flora of Forfar.' Dr. Boott does not notice it; and Hooker referred it to *C. remota*, but gives no reasons.

C. evoluta (Hartm.) is thought to be a probable hybrid between *C. riparia* or *C. paludosa* and *C. filiformis*. The Swedish plant has certainly very much that appearance. We have not seen the plant from Mennecy, which is supposed by Cosson and Germain to be the *C. evoluta* (Hartm.), but referred by them as a variety to *C. filiformis*, where also Dr. Boott seems to place it.

In the second part there is a most interesting and valuable series of descriptions and plates of some rather difficult European species, viz. *C. fuliginosa*, *C. laxa*, *C. livida*, *C. limosa*, *C. rariflora*, and *C. magellanica* (*C. irrigua*). We cannot make extracts, but commend the original to the careful study of those who feel an inclination to adopt Bentham's views and would with him combine *C. irrigua* and *C. rariflora* with *C. limosa*. Bentham does not even condescend to say a word about the former (which Boott considers to be essentially separate from *C. limosa*), and calls the latter simply a high northern variety. Here we see the difference between the careful observer of species and he who would reduce their number at any cost. Let Mr. Bentham follow the example of Dr. Boott and tell us the reasons upon which he founds his opinions, and we shall gladly examine into their cogency, and, if possible, adopt his views. In the case before us we believe that he is totally wrong in running counter to the opinions of all the botanists who have really studied the plants. But we must apologize to our readers for going out of our way on this occasion. That we dislike autocracy and arbitrary decrees as much in botanical as in political life must be our excuse.

Dr. Boott has adopted the name of *C. magellanica* (Lam.) for the plant which has usually been called *C. irrigua* in Europe because the Antarctic American plant so named by Lamarck is not specifically different from the Arctic *C. irrigua.* Such being the case, there can be no doubt that a strict application of the laws regulating nomenclature would require this change of name. As long as the plant was supposed to be confined to the southern end of America, Lamarck's name was applicable and appropriate; but when it is found to abound in the northern parts of Europe and America, the Linnæan rule may be applied and the erroneous name allowed to drop. Linnæus says, in his 'Philosophia Botanica,'—"Locum non debere nomen specificum intrare, multæ rationes suadent . . . . . non unicus est locus ejusdem speciei."

There is also another curious question relative to nomenclature raised by *C. irrigua.* Who first used that term as the name of a species? By Wahlenberg and early botanists it is applied to a variety—a use which confers no claim of priority upon it. In common with Dr. Boott, we have failed in tracing its specific use to any work preceding Hoppe's 'Caricologia Germanica' (1826). He says, "von Smith als eigene Art bestimmt, und *C. irrigua* genannt worden ist," but gives no idea of the place of publication. Koch quotes "Smith. secund. Hartm. Scand. Fl. ed. 2. 255." We have not that work at hand, and cannot therefore confirm his statement; but it is worthy of remark that the "Smith" is followed by a full stop (.), which, if intentional (and it is so printed in both editions of his 'Synopsis'), shows that it is an abbreviated name, and therefore does not refer to Sir J. E. Smith. Ledebour, in the 'Flora Rossica,' gives Smith as the authority for the name, and adds as a reference "Addit. Spec.," whatever that may mean.

Unfortunately such works as this before us are necessarily placed beyond the reach of most botanists by their cost. In the present case, the author has most liberally and extensively given his book to those institutions and individuals to whom it seemed likely to be useful; and when we remember at how great an expense to him it has been produced, we cannot too much admire his munificence.

We have already expressed the high value that we place upon the descriptive and critical part of this book, but have to add that the plates, although uncoloured and only slightly shaded, are of the kind most useful to the botanist. They usually represent one or more complete specimens of the natural size, and an abundance of magnified figures of the essential parts.

In short, it is a book that all opulent botanists (we fear that they are few), and libraries which possess works relative to natural science, ought to obtain, so as in some slight degree to repay the expense incurred by the author.

We may perhaps venture to hope that Dr. Boott will not conclude his labours upon this genus of plants without publishing a complete synopsis of the species included in it. It is what we have long looked for from him, and for the production of which no living botanist has the same qualifications.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

February 21, 1861.—Major-General Sabine, Treasurer and Vice-President, in the Chair.

"Notes on the Generative Organs, and on the Formation of the Egg, in the Annulosa" (Part I.), by John Lubbock, Esq., F.R.S.

In the present paper I have communicated some observations on the Myriapoda, on *Petrobius*, and on certain Arachnida. Among the former I have examined species belonging to the genera *Glomeris*, *Iulus*, *Polydesmus*, *Lithobius*, *Cryptops*, *Geophilus*, and *Arthronomalus*. Through the labours of Brandt, Fabre, Newport, Stein, Treviranus, and other eminent naturalists, we are tolerably well acquainted with the anatomy of the generative organs in the Myriapods; but these observers have occupied themselves principally with the arrangement and forms of the organs, and have not paid much attention to the different stages of egg-development, nor to the relation in which the young egg stands to the surrounding tissues. This relation is indeed very curious, and seems to have been generally misunderstood. It is well known that there are in the Myriapods no long egg-tubes, as in most insects, but that each egg arises in a separate follicle. It was, however, natural to suppose that this follicle held the same position with reference to the ovary as the very similar egg-follicles of certain insects, as, for instance, of *Coccus*. This, however, is by no means the case. If we compare the ovary and egg-follicle of *Coccus* with the ovary and egg-follicle in *Glomeris*, we shall see that the egg-follicle is very much alike in both cases,—the shape of the follicle, the Purkinjean vesicle, and the vitelligenous cells being very similar; but whereas in *Coccus* and in all insects the egg-follicle projects *from* the ovary, in *Glomeris* and the other Myriapods, so far as my observations go, the follicle projects *into* the ovary. If, therefore, we consider the ovary as consisting of an outer membrane and an inner epithelial layer, it would appear that while the egg in the Myriapods arises between these two layers, in the insects it originates on the inner side of both.

This difference appears to me to be very important, and, as will be mentioned under the head of Iulus, escaped the attention of our great anatomist Newport, whereby he was led to give an erroneous description of the ovary of that genus. I have chosen to compare *Glomeris* with *Coccus*, because the vitelligenous cells make the resemblance, and, at the same time, the difference between these two genera more striking. If we, however, compare with them the ovary of *Phalangium*, we shall see not only that the vitelligenous cells are absent, but that the egg-follicle differs equally from that of the insect on the one hand, and that of the Myriapod on the other. The egg-follicle projects *from* the ovary as in *Coccus*, &c.; but, on the other hand, the Purkinjean vesicle lies on the outer side of the epithelial layer, as in *Glomeris*, and in consequence the egg-follicle, which in *Coccus* consists of both the ovarian membranes (so far as the epithelial layer can be called a membrane), and in *Glomeris* of the epithelial layer only, is in the Phalangidæ, and perhaps all the Arachnida, formed only by the outer membrane. Consequently, while in the insects the mature ovum passes into the ovary through the neck of the follicle, in Myriapods and the Arachnida it bursts through the epithelial layer, in the former at its free, and in the latter at its attached end.

If these characteristics are found eventually to hold good throughout the Myriapods and Arachnida, the differences thus shown to exist between these groups will be of great interest; but it is too early to generalize on the subject with much confidence. Moreover, it often happens that one or a few epithelial cells *are* attached in Arachnida to the inner side of the follicle-wall. This happens, however (as far as my observations go), without any regularity, and the cells thus present fulfil perhaps no important function in the formation of the egg. The Crustacea appear to differ from the three preceding groups in the fact that their eggs do not possess separate follicles.

In the more advanced eggs of *Glomeris*, the macula of Wagner is double, one being much smaller than the other.

The ovary of *Iulus* has been described by Newport; the specimens which he examined had, however, been submitted to the action of spirits of wine, and were therefore altogether unsuitable for histological examination. The egg-follicle did not contain any large vitelligenous bodies like those of *Glomeris*, nor could I see in it a vitelline vesicle like that of *Arthronomalus*; but it very generally contained, when the yelk was beginning to darken, a patch resembling that which appears to result from the small vitelline vesicle of *Lithobius*. In both these genera the eggs in all stages of development are mixed together without any regular arrangement. The macula appears to be generally double, as in *Glomeris*. In the genus *Polydesmus*, however, where, as in all Chilognaths, the eggs are arranged on a double stroma, situated at the lower side of the ovary, the smaller eggs are on the central parts of the stroma, and the more developed ones lie towards the sides. In appearance the ova offer a great contrast to those of *Iulus*, and particularly of *Glomeris*, since the margin of the yelk has all the appearance of being bounded by a distinct membrane, though I am not convinced that this is really the case. I have not yet made out in *Polydesmus* anything corresponding to the "patch" of *Iulus*. The macula appears to be always single. It often contains vacuoles.

The yelk of mature eggs consists, 1st, of globules about $\frac{6}{8000}$ths of an inch in diameter; 2ndly, of greenish bodies about $\frac{1}{4000}$th in diameter; and 3rdly, of a clear, more or less viscid substance. By the month of October most of the females have laid their first lot of eggs; after which another set immediately begin to be developed. M. Fabre does not appear to have seen the spermatozoa of *Polydesmus*. They are small elliptical bodies about $\frac{1}{8000}$th of an inch in length, and containing a bright nucleus. M. Stein appears to be the only naturalist who has hitherto described them from personal observation, but he does not allude to the nucleus.

In *Lithobius, Cryptops, Geophilus*, and *Arthronomalus*, the eggs form a single series; large ones and small ones lie next to one another without any arrangement. In the youngest Purkinjean vesicles of *Lithobius* there are about seven nuclei, each $\frac{1}{3500}$th of an inch, or thereabouts, in diameter. As the eggs increase in size these maculæ appear to subdivide, at any rate they become continually smaller and more numerous. This is very remarkable, nothing like it taking place in the other genera. When the egg has attained a certain size, but before it has begun to darken, a small vesicle, about one-third of the size of the Purkinjean vesicle, may generally be seen in it. This vesicle is probably homologous with the vitelline vesicle of *Arthronomalus*, &c. It soon disappears, and is replaced by a "patch" resembling that of *Iulus**. The eggs of *Cryptops* are narrow. The macula differs from that of *Lithobius*, and agrees rather with that of *Glomeris*, in consisting of two unequal separate bodies. To the description of the spermatophores given by M. Fabre, I have nothing of importance to add. The spermathecæ of the females examined by me contained only filiform spermatozoa. The form of the eggs in *Arthronomalus* is spherical. The yelk-nucleus is very apparent, and has at first all the appearance of a vesicle. Globules gradually appear in it, and it loses its distinct outline.

The development of the eggs in *Geophilus* is much like that of *Arthronomalus*. The principal peculiarity observed was in the structure of the Purkinjean vesicle, which appeared to consist of two different substances, one surrounding the other. The inner substance was generally produced, in the form of a peninsula, at one or two places, almost through the outer substance. This latter was of more regular outline, but sometimes partially followed the same outline. Occasionally even the macula was thus produced. It appeared that the projecting parts gradually became pinched off from the main portion, and thus formed certain irregularly rounded bodies, which could in most eggs be indistinctly discerned in the homogeneous yelk, and were probably homologous with the vitelline vesicle of *Arthronomalus*. A somewhat similar phenomenon has been described by Leuckart as occurring in the eggs of *Aphis rosæ*.

In the Phalangidæ I examined the genera *Phalangium*, *Nemastoma*, *Opilio*, and *Leiobunus*, in all of which the process of egg-development was similar, and resembled that already described as occurring in *Polydesmus*. The structure of the male generative organs has, however, been entirely misunderstood by all preceding writers. Tulk states that the "testes are formed by a cluster of elongated . . . cæcal tubes;" and this opinion has been generally adopted, though from the structure and contents of these tubes it is evident that they are rather to be regarded as accessory glands. Leydig found among these tubes one longer than the rest, and described this, which is in fact the ductus ejaculatorius, as the true testis. The true testis, however, had been misunderstood, but not overlooked. It is described by Treviranus, Tulk, Leydig, and others, and being present only in the male sex,

* The number of labial teeth, which is a point generally used as a specific character, varies in many individuals; out of twenty-eight specimens examined, nine were unsymmetrical in this respect.

was supposed by all to be a portion of the generative organs, though they were not able to trace its connexion with the penis. It is a large V-shaped tube, which lies transversely across the abdomen; at each end it dwindles into a very fine tube, which passes, on each side, round the tracheal trunks close to the spiracles, and then the two, approaching one another, unite in the centre of the body and fall into the long winding *ductus ejaculatorius*. Thus it will be seen that the generative organs of the male Phalangidæ are formed on exactly the same type as those of the females.

In *Chelifer* and *Obisium* the ovary is a simple tube, on each side of which the egg-follicles are produced. In each specimen there are two sets of eggs in very different stages of development; and it would appear that thirty or forty come to maturity at once. In the early part of the autumn I found four or five specimens with an egg-capsule attached to the underside of the abdomen. These egg-capsules, however, only contained seventeen or eighteen eggs. Moreover, in these specimens I found neither a testis nor an ordinary ovary, but a large body consisting of about thirty follicles opening into a common cavity, and full of oil-globules. The eggs in the egg-capsule were in several cases undergoing segmentation.

The males of *Chelifer* appear to be about as numerous as the females. The testis consists of a median and two lateral tubes, which are united together by three transverse branches. It is therefore much like that of the true Scorpions. The spermatozoa in *Obisium* have a small head and a long tail, while those of *Chelifer* are oval bodies. These oval bodies may be immature forms only, but I never found any further stage of development in the spermatheca of the female.

The ovary of *Petrobius* consists of seven short egg-tubes; each of which in September contained three eggs, with more or less darkened yelk, and about fifteen or twenty egg-germs in earlier stages. The development of the eggs reminded me much of that which takes place in the Orthoptera.

It appears to be a pretty well established fact that, at least in many animals, the Purkinjean vesicle is a modified ovarian cell, round which the yelk is deposited. On the other hand, according to some eminent naturalists, there are certain animals in which the ovarian cell becomes the *egg*, and its *nucleus* the Purkinjean vesicle. In this case we should have two distinct classes of eggs, the Purkinjean vesicle in one of which would be homologous with the whole egg in the other. I have, however, given in my paper the reasons which induce me to doubt whether these last observations are altogether correct. But even if we may admit that no essential difference has as yet been proved to exist in the eggs of animals, as far as regards the relations existing between the Purkinjean vesicle and the original ovarian cell, it would still seem that in the relations between the former and the yelk, two very different types of development must be recognized.

In describing the so-called "winter-ova" of *Lacinularia socialis*, Prof. Huxley says (Micr. Journal, vol. i. p. 14), "It will be observed that all these authors consider the winter-ova or ephippial ova and the ordinary ova to be essentially identical, only that the former have an outer case. The truth is that they are essentially different structures. The true ova are single cells which have undergone a special development. The ephippial ova are aggregations of cells (in fact, larger or smaller portions, sometimes the whole of the ovary), which become enveloped in a shell, and simulate true ova." This aggregation of several cells (one of them putting on the appearance and fulfilling the functions of a Purkinjean vesicle), and the whole becoming enveloped in a shell, is, however, the ordinary and only method of egg-development in many lower animals. In the Trematoda and Cestoid worms, and the greater number of the Turbellaria, the yelk and the Purkinjean vesicle are formed in two separate organs.

In *Piscicola*, according to Leydig, the mature egg contains, besides the Purkinjean vesicle and the ordinary yelk, a number of nucleated cells (Zeit. f. Wiss. Zool. 1849, part 1. pl. 10. fig. 56).

In the Mites and Spiders, in *Chelifer*, *Obisium*, the Phalangidæ, and, so far as I know, all the Arachnida, the egg arises from the metamorphosis of a single cell.

On the other hand, we find that complex eggs alone are present in vast numbers of insects, namely, in all the Lepidoptera, Diptera, Neuroptera (excluding the Libellulidæ and allied genera), Hymenoptera, Hemiptera, Homoptera, and Coleoptera. We are as yet ignorant of the mode of egg-development in the Thripsida and the Strepsiptera; nor does it seem quite clear whether the development of the pseudovum in *Aphis* can be referred to the complex type. It would, however, appear from the statements of Leydig, Huxley, and Leuckart, that, in the opinion of these three eminent naturalists, the pseudovum is a derivation of a single ovarian cell, and differs therefore in this respect from the ovum of the impregnated female.

We know little as yet about the early stages of egg-formation in the Crustacea; but it would appear that the simple mode prevails generally throughout this class, with the exception of the Daphnidæ.

As regards the Rotatoria, the so-called winter eggs have been observed in *Hydatina*, *Brachionus*, and *Notommata*, as well as in *Lacinularia*; and we may probably conclude that in these and other allied genera the development of these eggs is on the same type; while "summer eggs" are formed from one cell. Among the Myriapoda, the eggs of *Lithobius*, *Cryptops*, *Geophilus*, *Arthronomalus*, *Polydesmus*, and *Iulus* are simple, the vitelline vesicles occurring in some of them being probably homologous with the yelk-nucleus of Spiders.

Glomeris, however, offers apparently an exception to the rule so general among the Myriapods, as the large rounded bodies present in the egg-capsule are probably homologous with the vitelligenous cells of insects.

In excluding the ephippial ova of *Lacinularia* from the category of true eggs, Prof. Huxley was influenced to a certain extent by the supposition that they are fertile without impregnation, and are therefore "not ova at all in the proper sense, but peculiar buds." According to Stein, however, the reverse is probably the case, and the summer eggs are agamic, while the winter eggs require to be fertilized. This is also in accordance with the case of *Daphnia*. In this genus, as in Rotatoria, the "summer eggs" are agamic; but it has not yet been conclusively proved that the "winter eggs" of either require impregnation. However this may be, the development of the eggs of insects sufficiently proves that eggs composed of several ovarian cells, like those which are unicellular, are generally incapable of development without impregnation. But no one can deny the name of true eggs to the ova of Butterflies, &c.; and we therefore cannot class as "false eggs" those which arise from more than one cell. Perhaps it would be better to distinguish the two classes as "compound," and "simple" or unicellular. The names we may adopt are, however, of less importance than the establishment of the fact that throughout the Annulosa there are two sorts of eggs, which are of an essentially different structure, and therefore cannot, strictly speaking, be regarded as homologous with one another.

ZOOLOGICAL SOCIETY.

January 8, 1861.—Dr. J. E. Gray, V.P., in the Chair.

Account of the Reptiles sent by Dr. Wucherer from Bahia. By Dr. A. Günther.

Of the living specimens of Reptiles sent by Dr. Otto Wucherer from Bahia, only a few have survived the transport. Most of them perished during the voyage; and several arrived in so exhausted a condition that they died very shortly afterwards. It became evident, from the emaciated state of the latter, that those animals had been killed, not by the change of the temperature, but by want of food and water. Those tropical animals naturally require a greater supply of the latter than our European species do; and perhaps it would be better to place them during the transport in a cool place on board the steamer, in order to subdue the natural functions and to lessen the desire for food. Once every week, on a bright day, they ought to be brought on deck and exposed to the sun; then some water might be poured into the cage or box in which they are kept. I have no doubt that the failures hitherto experienced in bringing over the beautiful *Hylæ* of the Tropics, and other reptiles living in damp places, might be avoided by the adoption of the measures recommended.

As it is, however, only three of Dr. Wucherer's specimens survive—a beautiful specimen of the South American Rat-Snake, *Spilotes variabilis*, about 6 feet long, one *Polychrus marmoratus*, and one *Philodryas viridissimus*. The two former are exhibited for the first time, and apparently are doing very well. The Rat-Snake feeds regularly on birds and small mammals; Dr. Wucherer has observed that this species has the power of setting its tail in a trembling motion, like the Rattle-Snake, if made angry. I have once seen the same in the specimen living in the Gardens, and several times in the North

American *Coluber quadrivittatus*, whenever it was attacked by a dog: in the latter case, it was not fear which produced the trembling motion of the tail; for it was immediately followed by the snake striking at the dog*.

The specimens of *Polychrus marmoratus* show the remarkable peculiarity, that their femoral pores are not visible; this has been observed also by Bibron, who says that they are often very indistinct in this species. It changes its colours, like the Chamæleon, the name of which has been conferred on it by the inhabitants of Bahia. Its ground-colour is brown when it is cold or asleep, bright green when it feels comfortable, and yellowish-green when exposed to great heat. Also the great capacity of the lungs and the lively motion of the eyes (which, however, act in concert with each other) remind one of its representative of the Old World. Since it has been removed to a warmer place than the cages in the Reptile-house are, it has recovered its full strength, feeds regularly on meal-worms, and is very fond of milk. Being a Tree-Lizard, its favourite place is on the branches of a large geranium, near the fire-place; but even that place is sometimes too cold for it; and then it will approach nearer to the fire than it is possible to keep the hand for any length of time. Nevertheless it lies there basking for hours, extending the neck towards the fire, and stretching the hind limbs in a line with the tail. These animals will drink much; and the quantity of water swallowed on a single day by this specimen, the body of which does not exceed 5 inches in length, cannot be less than half an ounce.

The researches of Dr. Wucherer, continued for a considerable space of time and confined chiefly to Snakes, prove that the environs of Bahia are by no means so poor in species of this tribe as has been represented by Castelnau. On the contrary, the following list, containing chiefly the species common in the immediate vicinity of Bahia, will be considerably increased, if Dr. Wucherer carries out his intention of extending his researches beyond those limits; and it is to be hoped that, with the assistance of this gentleman and of his friends†, we shall produce one of those local faunas which are so valuable as contributing to our knowledge of geographical distribution, and to the distinction of the local variation of species.

The following list of Snakes has been made up from the notes of Dr. Wucherer, and from actual specimens sent in spirits to the British Museum:—

1. *Geophis*, n. sp.‡ From Canavieras, a small town south of Bahia.
2. *Elapomorphus Wuchereri*, Gthr. From Ilhéos.
3. *Liophis cobella*, L.

* The young of *Cenchris piscivorus*, born alive in the Gardens about the middle of February, show this peculiar motion more frequently than any other of the species mentioned.—March 5.

† Dr. Wucherer has been assisted in collecting by Consul C. A. Gültzow, Dr. Heller, Dr. Tölsner, Herr v. Steiger, H. Föppel, and other gentlemen. Mr. Bennett has kindly taken charge of the reptiles during the transport.

‡ Dr. Wucherer has reserved to himself the description of this species.

4. *Liophis Merremii*, Wied. Very frequent.
5. —— *reginæ*, L. Very frequent.
6. —— *conirostris*, Gthr.
7. *Xenodon severus*, L.
8. —— *rhabdocephalus*, Wied. Very frequent.
9. —— *colubrinus*, Gthr. The validity of this species has been fully acknowledged by Dr. Wucherer. He has sent two specimens in spirits, one of which measures 3 feet 8 inches in length; another, sent off alive, perished on the voyage. Dr. Wucherer has observed that the scales of all the species of *Xenodon* have a small colourless spot near the tip; it is especially distinct in *X. colubrinus*. The West Indian species of *Dromicus* have this spot yet more distinct. All the species of this genus are very savage and apt to bite; they frequent dry places; their food, however, consists in frogs.
10. *Spilotes corais*, Cuv. Frequent; called *Pupapinta*. Scales in fifteen or seventeen series.
11. *Spilotes variabilis*, Wied. Frequent; called *Cainana*. Dr. Wucherer found the loreal always absent in old specimens.
12. *Spilotes pœcilostoma*, Wied.
13. *Coryphodon pantherinus*, Merr. The form of the head and the colours of this species vary much according to age.
14. *Herpetodryas fuscus*, L. Frequent.
15. —— *carinatus*, L. Less frequent.
16. *Philodryas viridissimus*, L. Very frequent.
17. ? —— *serra*, Schleg. A single specimen from Ilhéos.
18. *Dryiophis acuminata*, Wied. Very frequent; called *Cipó*.
19. —— *argentea*, Daud. Less frequent,
20. *Thamnodynastes Nattereri*, Mikan. Frequent.
21. —— *punctatissimus*, Wagl. One specimen from Canavieras.
22. *Leptodeira annulata*, L. Very frequent.
23. *Eudipsas leucocephalus*, Mikan. Frequent.
24. *Leptognathus Catesbyi*, Weig. Two specimens from Canavieras.
25. *Scytale coronatum*, Schneid.
26. *Oxyrhopus Clœlia*, Daud.
27. —— *petolarius*, L.
28. —— *trigeminus*, D. & B. Frequent.
29. *Uranops angulatus*, L. Frequent near rivers.
30. *Elaps lemniscatus*, L. Very frequent.
31. —— *corallinus*, L.
32. *Epicrates cenchria*, L. Rare; called *Giboia*.
33. *Xiphosoma caninum*, L.
34. *Boa constrictor*, L. Frequent; called *Giboia*.
35. *Eunectes murinus*, L. Very frequent; called *Sucurujuba*.
36. *Craspedocephalus atrox*, L. Called *Caisaeca*; frequent, especially near Nazareth on the river Jaquaripa.
37. *Craspedocephalus bilineatus*, Wied. This is a venomous Tree-Snake; it is called *Surucúcú patyoba*, from the palm on which it is usually found; it renders the cutting of the leaves of this palm

very dangerous. Another similar snake lives on the Uricana pam, from which its name of *Surucúcú uricana* is derived.

38. *Lachesis mutus*, L. Called *Surucúcú*; it lives in holes together with *Cœlogenys paca*, and is very dangerous to the dogs used in shooting the latter.

39. *Crotalus horridus*, L.

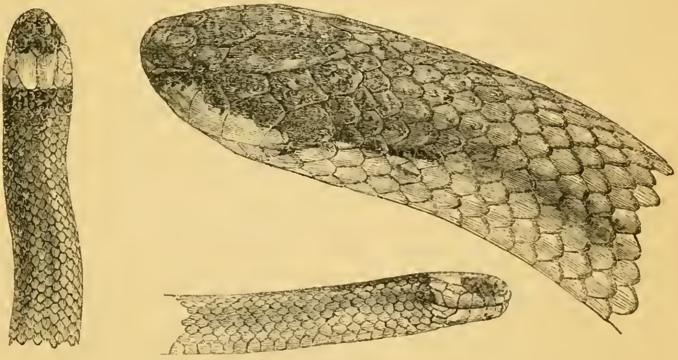
I add the description of the new species of Snakes, and of a new Lizard, sent by Dr. Wucherer to the British Museum.

Elapomorphus Wuchereri.

Six upper labial shields, the second and third of which enter the orbit; two posterior oculars. Scales in fifteen rows; ventral shields 181–208. Reddish-olive (in spirits); head black, with a yellow band across the occipitals; sometimes with three dark longitudinal lines. Very old specimens uniformly coloured, the head being dirty light brown.

Hab. Bahia.

Description.—This species has a very slender body, whilst the tail is comparatively short. The head is depressed and obtuse, like that of an *Elaps*. Rostral shield of moderate extent, not reaching to the upper surface of the head. Anterior frontals one-third only of the size of the posterior ones; vertical subhexagonal, somewhat longer than broad; occipitals large. Nasal shield oblong, occupying the place of a loreal; one anterior, two posterior oculars. Two temporal shields, one behind the other, the anterior in contact with the



oculars. Six upper labial shields, the second produced upwards and backwards so as to enter the orbit, the third immediately below the eye. Lower labials seven or eight, the fourth and fifth being very large. Two pairs of chin-shields; two or three pairs of scale-like shields between the chin-shields and the ventral plates. Scales smooth, polished, rhombic, in fifteen rows. Ventral shields 206–208; anal bifid; subcaudals 33–47. Dr. Wucherer has found in a very large specimen 181 ventral and 32 subcaudal shields.

Specimens of 19 inches in length are reddish-olive in spirits, with a darker line along the vertebral series of scales. In a specimen in which this line is very distinct, another similar line is to be seen along each side of the body, between the fourth and fifth outer series of scales. Smaller specimens have those lines still more distinct. The head and the anterior portion of the nape are brownish-black, with a broad yellow band across the occipitals and temporals to the side of the mouth. The lower parts are yellowish. Very large specimens are of a uniform bright gamboge-yellow, the head being dirty light brown, gradually becoming lighter posteriorly ; there are some greyish-ash irregular spots on the side of the head and under the chin, and some minute irregular grey spots on the sides of the belly and on the outermost rows of scales.

The posterior maxillary tooth is grooved.

Two specimens were taken at Ilhéos ; one is 18 and one 19 inches long. Another large specimen, of which a sketch has kindly been communicated to me by Dr. Wucherer, is from the same place ; it was captured on an open piece of ground before the house of a Cacao-planter, situated some 60 feet above the level of the river and perfectly dry ; its total length is 4 feet 5 inches, and the length of the tail $4\frac{1}{2}$ inches. Its habit is stouter than that of the younger specimen, and it appears to me to be a female.

TRACHYCYCLUS SUPERCILIARIS. (IGUANIDÆ.)

? ? *Proctotretus Tœlsneri*, Berthold, Gött. Nachr. 1859, p. 179.

Occipital plate of moderate size, as large as the eye. Above uniform brownish-olive (in spirits), yellowish below, a brown band along the lower side of the thigh and before the vent.

Hab. Bahia.

Description.—The head is slightly depressed, of moderate width, the snout is as broad as long. The whole of the upper surface is covered with small, irregular shields, that in the middle of the occiput being the largest, about as large as the eye. The superciliary margin is sharply prominent, continued into the canthus rostralis, and formed by imbricate pointed scales, the point of which is directed backwards. The eyelids are entirely covered with small granular scales. The nostril is situated near the extremity of the snout, before the canthus rostralis, and separated from it by a shallow groove ; it is in a single convex shield. The upper and lower labial shields are narrow, and there are two or three other series of small shields, running above, and parallel to, the upper labials, and covering the loreal region. The lower of those series extends to below the eye. The neck and the temporal region are covered with small keeled scales. The opening of the ear is large, subtriangular, and its anterior margin is provided with six or seven tooth-like plates. The scales on the lower side of the head are small, smooth, and become smaller on the throat, where they form a very indistinct collar. There are two oblique deep folds on the side of the neck, between the tympanum and the shoulder.

The back is covered with keeled scales of moderate size, the keels terminating in small spines, and forming lines which converge from both sides towards the vertebral line. There are seventeen longitudinal lines of keels across the back between the shoulder-joints and fifteen between the hip-joints. The scales on the upper parts of the limbs are more sharply keeled and more spiny than those on the back. The tail is of moderate length, depressed on its base, and slightly compressed on its middle ; it is surrounded by rings of scales, which are much larger than those of the body, each terminating in a prominent spine.

The scales on the belly are rather small and smooth, disposed in transverse series ; there are about twenty longitudinal series across the breast between the front limbs ; the scales on the lower parts of the limbs are smooth, except those on the soles of the feet and toes, which again are strongly keeled. There are no femoral or anal pores. Palatine teeth none.

All the upper parts are brownish-olive ; the lower dull yellowish, with indistinct greyish reticulated lines ; the region before the vent is deep brown, and a band of the same colour runs along the lower side of the thigh.

	in.	lin.
Length of the snout (to the anterior angle of the orbit)	0	4
Length of the head (to the anterior margin of the tympanum)	0	10
Greatest width of the head	0	$8\frac{1}{2}$
Distance of the anterior angles of the orbits	0	$4\frac{1}{2}$
Length of the trunk (from tympanum to vent)	2	6
——— of the tail	5	0
——— of the fore limb	1	9
——— of the hind limb	2	6
——— of the fourth finger (from the base of the fifth)	0	7
——— of the fourth toe (from the base of the fifth)	1	0
Total length	8	4

Description of a New Species of Water-Hen (Gallinula) from the Island of Mauritius. By Alfred Newton, M.A., F.L.S., F.Z.S.

A small collection of birds recently sent from Mauritius by my brother, Mr. Edward Newton, Assistant Colonial Secretary in that island, and a Corresponding Member of this Society, contains a single specimen of a Water-hen which I am led to consider as distinct from the common *Gallinula chloropus*, with which it has hitherto been confounded. To this conclusion I am chiefly induced by the weight I attach to my brother's opinion, which is decidedly in favour of regarding it as different from our own familiar bird ; for, though it must be confessed that the differences observable in the dried skin are but slight, they are perhaps not more so than are to be found in other generally recognized species of the restricted genus *Gallinula* —as, for instance, *Gallinula galeata* of the New World and *G. tenebrosa* of Australia. The peculiarities, however, of the Mauritian bird seem to be constant; and I may perhaps be excused for stating my belief that in cases where we find an animal from any certain locality always presenting an appearance easily to be recognized, we are justified in distinguishing it by a specific name.

In addition to the characters of the Mauritian Water-hen, which I shall presently describe, I may add that my brother informs me that its cry is altogether different from that of our own bird, with which he is well acquainted; and I must remark that this is also the case with respect to the American species (*G. galeata*).

Mr. Gould has kindly enabled me to exhibit an example of this new species, which he received through Mr. Barclay from the Mauritius many years ago; and, as may be seen, it exactly resembles my brother's specimen in the peculiarities I have to point out. At the same time I am indebted to Mr. J. H. Gurney for the opportunity of showing that these peculiarities are not shared by the Water-hen of South Africa, as the bird on the table, from the collection recently sent to that gentleman by Mr. C. J. Andersson from Damara Land, does not differ, that I can see, from our own *G. chloropus*.

In an admirable series of articles on the ornithology of Madagascar, lately contributed by Dr. Hartlaub to the 'Journal für Ornithologie,' mention is made of a *Gallinula* in the collection at Vienna, killed by Bojer on the east coast of that island, which is stated to have "ocherfarbenen Unterschwanzdecken." Hence I should be disposed to presume that the Mauritian form is found in the neighbouring and larger island, and perhaps indeed is common and peculiar to the whole Mascarene group, as Dr. Hartlaub, quoting the authority of M. Victor Sganzin (whose paper, by the by, in the 'Mémoires de la Société d'Histoire Naturelle de Strasbourg,' I have not been able to examine), states that it is common in Bourbon (Réunion) as well as in Mauritius.

I now proceed to designate the new species in proper form :—

GALLINULA PYRRHORRHOA, sp. nov.

Fulica chloropus, Julien Desjardins, P. Z. S. 1831, p. 45.

"*Gallinula chloropus*, V. Sganzin, Mém. Soc. d'Hist. Nat. Strasb. 1831–2, p. 45;" G. Hartlaub, Journ. für Orn. 1860, p. 173.

Gallinule or Moor-hen, auct. anon. in 'Mauritius Register,' 1859, p. lxxxv.

Gallinula —— (?), 'Ibis,' 1861, p. 116.

Statura et aspectu Gallinulæ chloropodi *admodum similis, sed membrana frontali majore, caudæ tectricibus inferioribus cervinis, pedibusque flavis.*

Hab. In insulis Mascarenis, Mauritiana, Borbonica (teste Sganzin) atque Madagascariensi (teste Bojer); differt voce a *G. chloropode*.

Mus. Vindobon., Joh. Gould necnon A. et E. Newton.

Notice of the Occurrence of the Pink-footed Goose, Anser phœnicopus. By A. D. Bartlett.

On the 8th of January 1839 I had the pleasure of introducing this species for the first time to the notice of the Society as a new British bird; and although since that period many examples have been from time to time obtained, I am not aware that they have ever appeared in such large numbers as at present. Since the 3rd of this month upwards of a hundred specimens have been seen and examined by me, most of them having been killed in the Eastern Counties. The old males weigh about 6 lbs., the females 5 lbs., and young birds $4\frac{3}{4}$ lbs. The length of the males is about 2 feet 6 inches, the females 2 feet 3 inches, measuring from tip of bill to end of tail. The length of the bill varies from $2\frac{1}{4}$ to $1\frac{5}{8}$ inches in length. I mention this, as too much importance has been attached to this character (in the Geese), which has led Mr. A. Strickland to regard and describe the old male Bean-Goose as a new and distinct species*. Of this latter bird I here exhibit an *old male* whose bill is upwards of $2\frac{3}{4}$ inches long. I also exhibit a female Bean Goose, bill $2\frac{1}{4}$ inches long; this latter is an adult female, having been kept in the Gardens of this Society nearly two years.

January 22, 1861.—Dr. J. E. Gray, V.P., in the Chair.

Dr. P. L. Sclater called the attention of the meeting to an important addition lately made to the Society's Menagerie. On the 18th instant Her Majesty the Queen had transferred to the Society's care a female of the Ælian's Wart-Hog (*Phacochœrus Æliani*, Rüpp. Atlas, i. pl. 25), which had been lately received from Bathurst in Western Africa by the steamer 'Armenian,' as a present to Her Majesty from the King of Ashantee, through the Governor of the Gold-coast. This species was stated to be distinguishable from the Wart-Hog of Southern Africa (*P. æthiopicus*), of which the Society already possessed a specimen, by the presence of two upper incisor teeth (which are wanting in *P. æthiopicus* when adult), as well as by other very noticeable external characters.

Dr. Sclater also exhibited a specimen of the American Meadow-Starling (*Sturnella ludoviciana*), shot in Suffolk a short time since, and lent to him by the Rev. Henry Temple Frere, of Burston Rectory, for examination. This was the first instance of the occurrence of this bird in Europe.

A letter was read, addressed to Dr. Sclater by Dr. G. Bennett, F.Z.S., relative to a singular Grallatorial bird living in an aviary in Sydney in November 1860, which had been brought from New Caledonia by M. Des Planches. A drawing of the bird was also exhibited, which was stated by Dr. Sclater to represent the same species as that lately described in France as *Rhinochetus jubatus*,

* See Ann. and Mag. N. H. ser. 3, vol. iii. p. 121, where the old male Bean-Goose (*Anser segetum*) is described as a new species under the name of the Long-billed Goose (*Anser paludosus*).

and referred by its describers (MM. DesMurs and J. Verreaux) to the family *Ardeïdæ*.

The Secretary read the following extract from a letter addressed to him by Captain John M. Dow, Corr. Memb., dated "U.S. Mail-steamer 'Guatemala,' Panama Bay, December 7th, 1860:"—

"Some time since, while in the Bay of La Union, State of San Salvador, I caught, or rather should say shot with my gun, having no other means at hand, a couple of what I supposed was *Anableps tetrophthalmus*; but upon sending them to my friend Professor Baird of the Smithsonian Institution at Washington, was somewhat surprised and gratified to hear they were of an entirely new species,—gratified because honoured with having my name given to this singular fish, which has been called *A. Dowii*.

"On our voyage just ended, at the request of Professor Baird, who desires to distribute them to different Museums, I captured a half-dozen or so more of these fishes, one of which I left out for dissection; fortunately this proved to be a female. With the assistance of Dr. J. Taylor Crook, the Surgeon of the steamer, a sufficiently satisfactory dissection was made to justify me in announcing a most remarkable peculiarity, which I have never before seen noticed in any work, in the reproduction of this species. It is well known that this genus of fishes give birth to their young alive. An incision made in the abdomen of the one under consideration established the fact; for three young ones were found within it, and all of them in different stages of development. The first we removed was fully developed in all its parts, but still had the placenta attached to its belly, but altogether detached from the parent, and evidently in condition to be discharged from the parent in a couple of days. The second was intermediate in its development to the one just described and the third. In the latter the abdominal suture was not yet closed, neither was the black transverse band which divides into two parts the cornea and iris of the eyes of this genus (which band was perfect in the first-mentioned young one, and not entirely perfect in the second) at all developed. I think this observation fully establishes the entirely viviparous (not ovo-viviparous as most writers have it) nature of the genus. Does not also the singular fact of the young being found in intermediate stages of development within the parent present a strange anomaly in the history of viviparous reproduction—an undeniable argument against the generally accepted opinion of the laws which are supposed to govern the reproduction of species in animal life? Of the above fact I desire no further evidence. Whether it is of that importance to the scientific world which my imperfect relation above would imply, I leave for others, more deeply versed in such investigations, to decide."

Additional Note on the Black-footed Rabbit. By A. D. Bartlett.

On the 23rd of June 1857, at the evening meeting of this Society, I called the attention of the meeting to some Rabbits, known as the

Himalayan Rabbits, and proposed provisionally to call the species *Lepus nigripes**.

Soon after my paper was published, I received a letter from a gentleman at St. Ives, informing me that this kind of rabbit could be produced by crossing the dark *wild silver-grey* rabbit with a breed known as the *Chinchilla* or light silver-grey. This at the time appeared to me strange and unlikely; nevertheless I determined to make the trial; and having during the last two or three years produced by these means a large number and fully established the fact, I beg leave to bring them before your notice.

I have here a light *silver-grey male,* a dark *silver-grey female,* and *two young* of a litter of *five,—two* of the number being of the Himalayan variety, the other *three* silver-greys; I have many other examples of the same thing.

Now, if the white or Himalayan varieties are removed and kept together, the result will be all Himalayan, thus showing a tendency to increase this variety at the expense of the silver-greys, because, although you may remove and destroy all the white specimens, still the silver-greys from which they originated will continue to produce white young ones, while, on the other hand, the white variety never produces silver-greys.

I mentioned in my former paper that large numbers of the skins of the white variety were imported to Europe annually, and these are probably bred in Asia. I now beg leave also to mention that for many years a large trade has been carried on by two or three merchants, who buy all the skins of the silver-grey rabbits, and export them to *Russia* and *China*; these skins realize a very high price, some of them 36*s*. per dozen, in this country.

With reference to the origin of the light-coloured silver-grey or Chinchilla rabbit, I am only able to say they came from the Continent to this country, being met with in the South of France and Belgium, but, as far as I am aware, always in a state of domestication. Observing that we receive large quantities of the skins of these white rabbits, and that the skins of the silver-grey rabbits are sold to the Russians and Chinese at a large price, I am led to think it highly probable (from the experiments that I have tried) that at some period the silver-grey rabbit existed in *Russia* or *Asia* (and hence the taste or fashion for their skins), and that this breed has been lost and replaced by the white variety whose skins we now receive in such abundance—finding, as I have before remarked, that these have a strong tendency to out-number the *greys*.

In conclusion, it is deserving of remark that, in all instances, the young of the silver-greys are quite black for the first five or six weeks, at about this age the grey hairs beginning to make their appearance on the breast and sides; while the young of the Himalayan or black-footed kind are always perfectly white until they are five or six weeks old, at which time the black hairs begin to appear on their noses, feet, ears, and tails.

* P. Z. S. 1857, p. 159.

Description of a Soft Tortoise from Camboja. By Dr. J. E. Gray, F.R.S., V.P.Z.S.

I have only been able to observe this *Trionyx* in its young state; but I make no apology for describing it as a distinct kind, as I find from experience that the colouring of the young animal of this family of Tortoises affords one of the best characters for the distinction of the species; and I believe it is from their not having been studied in that state that the species have been hitherto confounded together. The character thus afforded has the advantage of not being liable to variation from development, as is the case with the comparative length of the free part of the ribs and with the form of the sternal callosities, which have been hitherto chiefly depended on for specific characters.

Trionyx ornatus.

Back of the young animal, in spirits, brown, with large, unequal-sized, irregularly disposed black circular spots. Head olive, with symmetrical small black spots on the chin, forehead, and nose. Throat and sides of neck with large, unequal-sized, irregular-shaped and nearly symmetrically disposed yellow spots. Legs olive, yellow-spotted in front. Sternum and under side of margin yellow. Sternal callosities not developed.

Hab. Camboja (*M. Mouhot*).

This species is most like the young of *T. gangeticus*; but the dorsal spots are solid, not annular; and the head is olive, dotted with black.

It has some affinity to *Trionyx tuberculatus* of Dr. Cantor from Chusan, which appears, from a drawing by Dr. Cantor in the Indian Museum at Fifehouse, to be distinct from any of the other Asiatic species that have occurred to me. That species has eight large and four small white-edged black spots, placed in pairs, on the dorsal disk, the throat with a dark streak on the middle of each side, the chin yellow, black-dotted. The lateral sternal callosities are large, oblong, and the posterior one round.

MISCELLANEOUS.

On the Anemone nemorosa purpurea. By Dr. J. E. Gray, F.R.S., V.P.Z.S. &c.

In the 'Annals' for May 1858 (3rd ser. vol. i. p. 397) I mentioned a purple variety of the Wood Anemone as found at Pinner. I observed it again the other day in the woods near Chislehurst. This variety or race is not dependent on any local or other external circumstance, as it is found in the same woods as the more common pale or white kind, and generally in patches intermixed with it. This probably arises from all the plants in each patch being flowering plants of the same root, or of fragments of the root, accidentally broken off. These patches are scattered in various parts of the woods.

There is considerable difference between the two varieties, and I have not been able to discover any intermediate gradations between them.

The more common pale states of the species have a large flower, usually consisting of six ovate, whitish petals, the three outer ones having a more or less deep-purple tinge on the outer surface. The purple-flowered variety or race has a rather smaller flower, generally of eight (rarely of six) narrow ovate petals, which are all of a uniform more or less deep-purple colour. The leaves of this variety are mostly of a darker hue.

I do not find the variety noticed in Hooker, Duby, or any other work that I have at hand.

On the Raphides of Lemnaceæ. By George Gulliver, F.R.S.

1. *Lemna minor.* Fronds abounding in bundles of acicular crystals and starch-granules. The crystals are longer than the cells of the frond.

2. *L. trisulca.* Bundles of the same raphides plentiful in the frond, and often clearly distinguishable within its cells.

3. *L. polyrrhiza.* Raphides scanty. Pigment-cells smooth and highly refracting

4. *L. gibba.* Raphides scanty.

The above extract from my notes of July 1859 shows that these raphides occur in all the British species of *Lemna*, and that they and starch are especially abundant in the most common one.

The valuable observations of Prof. Quekett having shown that in some other plants these raphides are phosphate of lime, Dr. Davy kindly examined a few of them for me in *Epilobium montanum*, and came to the same conclusion as to their composition. All the species of *Epilobium* that I have examined abound more or less in these raphides.

As to the common and prolific Duckweed, it appears to be a very laboratory of starch and phosphate of lime; so that it is now obvious how useful even this abject and despised plant may be, both as a manure and as food for aquatic animals, especially when they are young and the osseous system growing.

It may be added, for the information of London botanists, that all the British Lemnaceæ are common about Walthamstow; and that *Lemna polyrrhiza* may be distinguished at once simply by its singularly sharp-pointed root-sheath, the same part in the other species being much more blunt and rounded.

On the Habits and Larva of Mormolyce.

Mr. John Bowring, in a letter from Penang, observes, "Among other good things I fell in with was the *Mormolyce phyllodes*, of which I have also the pupa, and two specimens of what I have good reason to suppose is its larva, found in the cavities of the woody fungus on which the perfect insects live. These last are very active, and, notwithstanding their large size, are not very readily to be found, although their peculiar scent betrays their presence. They lie so close to the fungus, that, in feeling the under side of it, the hand is very apt to slip over them. To *see* them *in situ* is rarely possible; at least I should think so from the fact of its being only on fallen trunks of trees (and on the under side of these) that we found the particular fungus they frequent. Of the dozen specimens we fell in with, none are of large size, the largest being about 3 inches in length. Great injury is being done to the nutmeg-trees here (Penang) by a species of *Monohammus*, the larva of which may be taken by scores when the trees affected are cut down. I have the beetle, larva, and pupa."

A New Canadian Dye.

Prof. Lawson exhibited specimens of a new dye of great richness, prepared in the laboratory of Queen's College, Kingston (Canada), from an insect, a species of *Coccus*, found for the first time last summer on a tree of the common Black Spruce (*Abies nigra*, Poir.), in the neighbourhood of Kingston. This new dye closely resembles true cochineal, a most expensive colouring matter, capable of being produced in warm countries only, and which is used to give a fine and permanent dye, in red, crimson, and scarlets, to wool and silk. Unlike cochineal, the new dye discovered at Kingston is a native Canadian product, and capable of being produced in temperate countries. Having been but recently observed, a sufficient quantity has not yet been obtained for a complete series of experiments as to its nature and uses; but the habits of the insect, as well as the properties of the dye, seem to indicate that it may become of practical importance. In colour it closely resembles ordinary cochineal, having rather more the scarlet hue of the flowers of *Adonis autumnalis*; and no doubt other shades will be obtained. The true Mexican cochineal is now being cultivated in Teneriffe and other vine-growing countries of Europe and Africa with such success as to displace the culture of the grape-vine; yet the Directors of the East India Company offered in vain £2000 for its introduction into India.—*Proceedings of the Botanical Society of Canada*, Feb. 15, 1861.

On the Development of Doliolum. By MM. Keferstein and Ehlers.

According to the authors, the polymorphism of the *Doliola* is effected in the following manner:—The ova of one generation, A, produce individuals furnished during their youth with a tail similar to that of the larvæ of the Ascidia. They are asexual, and bear a large blastogene on the back. This is the generation B; it possesses a rosette-like organ on its pericardium. In its blastogene is formed the generation C, which is also asexual. This consists of two kinds of individuals. Some, C^1, resembling the generation A, have a ventral blastogene, in which sexual individuals, closing the cycle, are formed; they are identical with the generation A. The others, C^2, are individuals of singular form; they have been described by Gegenbaur. They have neither sexual organs nor blastogene, and it is not known whether they are capable of reproduction.—*Nachr. Gött.* No. 19, 1860; *Bibl. Univ.* 1861; *Bull. Sci.* p. 273.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 42. JUNE 1861.

XLVIII.—*On the Ophidian genus* Helicops.

By Dr. ALBERT GÜNTHER.

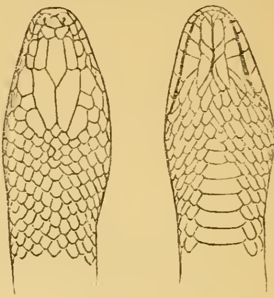
THE genus *Helicops*, as defined by Duméril and Bibron, is a very natural group of Snakes; it comprises those freshwater snakes from Tropical America which have the scales keeled, the anterior frontals united into a single triangular shield, and the posterior maxillary tooth longest, smooth, and at some distance from the others. At the time of the publication of the Catalogue of Hydroid Snakes, Dr. Gray was only acquainted with two species, which he referred to two genera, *Uranops* and *Helicops*, the former being distinguished by very strongly-keeled scales, the latter by having the scales smooth on the anterior part of the body. Since that time, a third species (*H. Leprieurii*) has been discovered, intermediate between those extreme forms, and proving their close affinity. This is confirmed by numerous examples since procured by Dr. Gray for the British Museum; and among these there are two other species which have not yet been described:—

1. *Helicops modestus.*

Diagnosis.—Three pairs of chin-shields; occipitals narrow, elongate. Scales in nineteen rows; those on the sides smooth, on the anterior parts of the back with feeble keels. Blackish above, with two indistinct darker longitudinal bands; lower parts uniform dull yellowish.

Hab. Tropical America?

Description.—Head depressed, triangular, not very distinct from neck; rostral shield pentagonal, much broader than high; anterior frontal single, triangular, with the posterior side longest; one pair of posterior frontals, each being not much larger than the prefrontal; vertical elongate, with the lateral margins slightly convergent anteriorly; occipitals elongate, thrice as long as broad. The nostril is on the upper side of the head, small, at the end of a groove which incompletely divides a quadrangular shield into an anterior and posterior portion. Loreal shield large, covering the central part of the antorbital; the upper and lower ends of the antorbital are broader than the middle, which is overlapped by the loreal. Two posterior oculars, in contact with a large temporal shield, which has a small shield beneath; the other temporal shields are scale-like, except one on the side of the extremity of the occipital, which is larger than the rest. Eight upper labial shields, the eye being above the fourth; the third enters the orbit only with a point. The first pair of lower labials form a suture together behind the central labial; and there are three other pairs of chin-shields besides, the middle one being the smallest. The scales on the sides are smooth, those along the middle of the back provided with feeble keels, the keels becoming stronger on the posterior parts of the body. Ventral shields 125; anal 1/1; subcaudals 43.



Helicops modestus.

The posterior maxillary tooth is somewhat distant from, but not much longer than, the rest.

The dark longitudinal bands are very indistinct, and run along the sides of the back.

Length of the cleft of the mouth ⅗rds of an inch, of trunk 16 inches, of tail 4 inches.

The specimen on which I have founded this species was procured from the Leyden Museum, and was marked as coming from North America. It is, however, very doubtful whether species of this genus go so far northwards, and it is probable that this very distinct species comes from Tropical America as well as its congeners.

2. *Helicops polylepis.*

Diagnosis.—Two pairs of chin-shields; occipitals rounded, as long as the vertical. Scales in twenty-six rows, strongly keeled. Brown above, with three series of indistinct dark spots; the black colour is predominant on the lower parts, and nearly entirely suppresses the whitish ground-colour.

Hab. Upper Amazon.

Description.—Head broad, obtuse, short, not very distinct from neck; eyes rather prominent; rostral shield pentagonal, broader than high; anterior frontal single, triangular, with the posterior side rather longer than the anterior ones; one pair of posterior frontals, each being not much larger than the prefrontal; vertical elongate, with the lateral margins slightly convex; occipitals short, obtuse, and rounded posteriorly, nearly as long as the vertical. Nostril and nasal plate as in *H. modestus*; one loreal, one anterior and two posterior oculars, the latter being in contact with a temporal shield; the other temporals scale-like. Eight upper labial shields, the eye being above the fourth. There are only two pairs of chin-shields behind the anterior pair of lower labials. Ventral shields 133; anal 1/1; subcaudals 82 (three of the anterior subcaudals are undivided).

The posterior maxillary tooth is not grooved, distant from, and longer than, the rest.

Length of the cleft of the mouth $\frac{1}{2}$ inch, of trunk 12 inches, of the tail $5\frac{1}{2}$ inches.

As the British Museum possesses examples of all the species, it will be useful to make a synoptical survey of them.

1. *Helicops carinicauda.*

Coluber carinicaudus, Neuwied, Abbild. taf. 3.
Helicops carinicaudus, Wagler, Ic. tab. 7.

Scales in nineteen rows; those on the anterior half of the body smooth, on the hinder part of the back and tail keeled. Two pairs of chin-shields. Belly with three longitudinal series of black spots, each ventral plate having three spots. (Two very young specimens in the British Museum have only two series.)

Hab. Southern parts of Brazil; Cayenne.

2. *Helicops modestus.*

Scales in nineteen rows; those on the sides smooth, on the anterior parts of the back with feeble keels. Occipitals narrow, elongate; three pairs of chin-shields. Blackish above, with two indistinct darker longitudinal bands; lower parts uniform dull yellowish.

Hab. Tropical America?

3. *Helicops Leprieurii.*

Helicops Leprieurii, Dum. et Bibr. vol. vii. p. 750. pl. 68.

Scales in nineteen rows; those on the sides smooth, on the anterior parts of the back with feeble keels. Occipitals narrow, elongate; two pairs of chin-shields. Brownish or blackish above, with longitudinal series of more or less distinct darker spots; belly checkered with black.

Hab. Bahia*; Cayenne.

4. *Helicops angulatus.*

Coluber angulatus, L. Mus. Ad. Fried. p. 23, pl. 15.
Natrix aspera, Wagl. Serp. Bras. tab. 13.
Helicops angulatus, Wagl. Syst. Amph. p. 171.
Uranops angulatus, Gray, Catal. p. 68.

Scales in nineteen rows, strongly keeled anteriorly and posteriorly. Occipitals short, as long as the vertical; two pairs of chin-shields. Brownish or brown, generally with a series of large rhombic spots extending on the sides and on the belly.

Hab. From Venezuela to the southern parts of Brazil.

5. *Helicops polylepis.*

Scales strongly keeled anteriorly and posteriorly, in twenty-six rows. Occipitals short; two pairs of chin-shields. Brown, with series of indistinct darker spots.

Hab. Upper Amazon.

XLIX.—*Descriptions of ten new Species of Spiders lately discovered in England.* By the Rev. O. P. Cambridge, B.A.

Tribe Octonoculina.

Family Drassidæ. Genus Drassus.

Drassus prælongipes.

Size small; general colours olive-brown and yellow; abdomen with several transverse angulated yellow lines on the hinder half; actual length of legs very great, especially of the first and fourth pairs; shape of legs, particularly of the femoral joint, flattened or strap-shaped; digital joint of palpi small; palpal organs simple; eyes nearly uniform in size; maxillæ without any inward curvature.

Adult male.—Length $\frac{1}{8}$ of an inch; length of cephalothorax $\frac{1}{16}$, breadth $\frac{1}{20}$; relative lengths of legs 4, 1, 2, 3; actual length of longest (or fourth pair) $\frac{1}{4}$ of an inch.

Cephalothorax oval; front part squared off, and slightly compressed on the sides; hinder part, near the abdomen, considerably wider and rather more elevated than the front part. Some slight furrows or indentations correspond with the insertions of the legs, and converge towards the most elevated part. Its

* Several fine specimens have been sent from that province by Dr. O. Wucherer.

colour is a coppery yellow, bounded by a blackish line, and suffused, especially on the sides and in the furrows, with olive-brown.

Eyes eight, in two almost concentric curved rows on the front of the cephalothorax, the curve directed backwards; they are *nearly equal in size,* the two middle ones of the foremost row *rather* the smallest, and nearer together than the middle ones of the hinder row, which last two are further from each other than from the one at the end of the row nearest to each; the front row is immediately above the frontal margin.

Legs very long and strap-like, i. e. deeper than *broad;* this is very observable in the femoral joint. Colour clear coppery yellow; the first and second pairs have the genual, tibial, and tarsal joints, and the third and fourth pairs the tibial and metatarsal joints, suffused with greenish brown. They are furnished with longish hairs and spines; these spines are in two parallel rows on the under side of the tibial and metatarsal joints of the first and second pairs, but are longest on the third and fourth pairs, though not placed regularly as on the other legs.

Palpi same colour as the legs, *slightly* suffused with brown; radial joint larger than the cubital, and having a short black spiny projection at its extremity on the outer side; digital joint small, oval, convex, and hairy outside; palpal organs simple in structure and moderately developed, with a small black spine at their extremity.

Falces conical, vertical, with a few minute teeth on the inner surface.

Maxillæ convex at the base, rounded at the extremity, and inclined towards the labium, *but not curved inwardly.*

Labium nearly quadrate, dark brownish yellow, slightly paler at the top.

Sternum oval, and, with the maxillæ and falces, of a yellow-brown colour, but not so dark as the labium.

Abdomen slightly hairy, oblong, squarish at the end nearest the cephalothorax, over which it projects a little, but rounder at the other end. Colour of the upper part dark olive-brown with a greenish tinge; several clear yellow angulated lines or chevrons (the points of the angles directed forwards) begin at the spinners and extend about halfway to the cephalothorax, increasing in span as they approach it; under side rather paler than the upper; branchial opercula yellowish white.

The adult female resembles the male, though slightly *smaller,* and the actual length of her legs is less; the sexual organs are of a reddish colour; when immature, her legs are blotched and annulated with dark brown.

Three adult males and an adult female of this species were found by myself, towards the end of the summer of 1860, on Bloxworth Heath, Dorsetshire, at the roots of heath, and running under the rooty ledges where gravel had been dug out. An immature female was also received, about the same time, from Mr. C. H. Brown, of Southport, Lancashire, where it was captured by himself on the sand-hills. It is a very active spider, and the great length of its legs gives it, when running rapidly, a very peculiar appearance.

Drassus subniger.

Size very small; general colour plain dark brown; cephalothorax large, and but slightly compressed on the sides forwards; sternum very large and strong; eyes nearly uniform in size, those of the lateral pairs very near to each other; maxillæ with no inward curvature; digital joint of palpi large; palpal organs prominent and highly developed.

Adult male.—Length $\frac{1}{12}$ of an inch; length of cephalothorax $\frac{1}{20}$, breadth $\frac{1}{24}$; relative length of legs 1, 4, 2, 3.

Cephalothorax large, oval, and but *slightly compressed on the sides forwards*; medial line slightly arched longitudinally, and sloping from it to the margins on either side and towards the abdomen. It has a very few pale-coloured hairs, distributed in a single row in the medial line, and in a curved row on each side of the medial line, and a few others near and among the eyes. Colour deepest bistre-brown.

Eyes eight, in two *nearly straight parallel rows* on the front of the cephalothorax,—if anything, slightly curved from each other, and so bringing the eyes of the lateral pairs nearer together than those in the centre. The lateral pairs are seated obliquely on a tubercle, and the eyes of each pair are near to each other. The outer eyes of the front row are *rather* the largest, and the inner ones *rather* the smallest of the eight; the front row is the shortest of the two, but the eyes in it are equidistant from each other.

Legs robust, hairy, and furnished with a few spines. Colour brown, with a yellowish-drab tinge, palest at the joints; relative length 1, 4, 2, 3.

Palpi short, hairy; hairs longest and most regular on the outer side of the third joint. Colour rather darker than the legs; radial joint smaller than the cubital, and with a blunt projection at its extremity on the upper side; digital joint large, oval, convex and hairy outside; palpal organs very prominent, highly developed, and with a projection at their base, from the outer side of which issues a black spine, which is curved across their middle to the inner side. Colour of palpal organs dark yellow-brown.

Falces conical, vertical; colour dark brown.

Maxillæ inclined towards the labium, but without any inward curvature, convex at the base and obliquely truncated at the extremity.

Labium oval, rounded at the top; its colour and that of the maxillæ are both dark brown.

Sternum very broad, convex, heart-shaped, and covered with yellowish hairs.

Abdomen small, oviform, hairy, some hairs of a pale whitish colour; it projects considerably over the cephalothorax. Colour very deep brown, approaching black.

An adult male of this very small, plainly coloured, but yet very distinct species of *Drassus* was discovered by myself among the decayed rubbish of an old hedge on Hursley Down, near Winchester, in May 1860.

Family Agelenidæ. Genus Agelena.

Agelena subfusca.

Colour plain dark brown; no pattern on the abdomen; digital joint of palpi large; eyes of lateral pairs very closely contiguous to each other.

Adult male.—Length $\frac{1}{12}$ of an inch; length of cephalothorax $\frac{1}{24}$; breadth of abdomen $\frac{1}{32}$; relative length of legs 4, 1, 2, 3.

Cephalothorax oval, slightly compressed before and on the sides, which have some slight furrows converging towards an indentation in the medial line. Colour darkish brown, deepest at the lateral margins.

Eyes eight, in two curved rows across the front of the cephalothorax; the eyes of each lateral pair are on a small tubercle, and *almost touch each other*; these are the largest of the eight, and the two centre ones of the front row are the smallest.

Legs robust and hairy; relative length 4, 1, 2, 3. Each tarsus ends with three claws. Colour yellowish brown, darker on the femora and tibiæ of the first and second pairs.

Palpi same colour as the legs; cubital and radial joints short; the radial joint has a strong bluntish projection at its end on the under side; digital joint *large*, oval, convex, and hairy outside: palpal organs not very prominent nor complicated in structure; they have a black filiform spine issuing from their lower side in a curve round the base and outer side to their extremity; their colour is reddish brown.

Falces strong, conical, and vertical.

Maxillæ short, projecting at the base, rounded at the ends, and slightly inclined towards the labium.

Labium nearly square; base rather broader and darker in colour than the top.

Sternum broad and heart-shaped, and, with the labium, maxillæ, and falces, of a yellowish-brown colour.

Abdomen oviform, hairy, and projecting slightly over the base of the cephalothorax; upper part and sides very dark brown; under part and spinners much paler; spinners pale yellowish brown, and placed in a slightly curved row at the end of the abdomen; the outer ones are longest, and three-jointed, the spinning tubes being placed on the lower surface of the last joint.

An adult male of this small, plainly-coloured *Agelena* was captured by myself, among copse-wood, at Lyndhurst in the New Forest, at the end of May 1860.

Family Theridiidæ. Genus Theridion.

Theridion stictum.

General colour rusty yellow, with the cephalothorax and several patches on the abdomen deep red-brown; two of these patches are forwards on the upper side, and one on each side: abdomen with four or six red-brown spots on the upper side in the form of a square or oblong; it is extremely globular in shape, and projects greatly over the base of the cephalothorax, which, with the sternum, is peculiarly covered with small punctures; legs short and moderately stout.

Nearly adult female.—Length $\frac{1}{9}$ of an inch; length of cephalothorax $\frac{1}{20}$, breadth $\frac{1}{24}$; breadth of abdomen $\frac{1}{12}$; relative length of legs 1, 4, 2, 3.

Cephalothorax oval, prominent, and compressed on the sides near the eyes; it has the appearance of roughness from numerous small punctures, especially along the medial line, hinder part, and towards the lateral margins; its colour is deep mahogany-brown (nearly black), clothed thinly with small yellowish hairs.

Eyes eight, in two rows on the front of the cephalothorax, the foremost row hanging over, as it were, the base of the falces, but considerably above them. The four intermediate eyes form a square; the front pair of the four are placed on a protuberance, and are rather the largest and the darkest-coloured of the eight. The eyes of the side pairs are contiguous and placed on a tubercle.

Legs short, stouter than those of species of this genus in general, furnished with fine bristly hairs, chiefly placed in rows along the different joints. Colour reddish yellow, of a brighter and clearer hue than the abdomen; their relative length is 1, 4, 2, 3. Each tarsus ends with three claws.

Palpi like the legs in colour, and with a minute curved claw at the end of the last joint.

Falces small, conical, and vertical.

Maxillæ obliquely truncated at the end on the outer side, and greatly inclined towards the labium.

Labium semicircular.

Sternum broad, convex, and punctured like the cephalothorax, similar also to which, all these parts are of a deep mahogany-brown.

Abdomen short, broad, *very* convex above, and greatly projecting over the base of the cephalothorax; it is of a rusty-yellow colour, thinly clothed with hairs of a paler hue; about the centre of the upper side are four depressed spots of a deep red-brown colour, in the form of a square, the front side rather the shortest: these spots are plainly marked in all the specimens, though of a deeper colour in some than in others. In one specimen two more similar minute spots were visible, forming another square towards the spinners. One specimen had a kind of ragged line composed of minute white spots running round the front of the upper part of the abdomen; and this specimen had a palish longitudinal line down the centre. A long and irregularly oval patch of deep red-brown occupies each side, and there are two smaller ones of the same colour on the upper part of the front of the abdomen, one on each side of the medial line. The under part is of the same colour as the upper, with a broad band of deep red-brown along the middle, enclosing the spinners, which are of a dull rusty-yellow colour.

I discovered this species, which seems nearly allied to *Theridion quadripunctatum,* though differing in size and habitat, under heathy ledgés on Bloxworth Heath, Dorset, in September 1860. In the peculiar punctation of the cephalothorax and sternum, *Theridion stictum* resembles *Theridion guttatum,* a very pretty little species, taken by myself for the first time, as British, in the summer of 1860, at the roots of heath, &c., near Winchester, and at Bloxworth, Dorset.

Theridion inornatum.

General colour plain; abdomen shining brownish black; nearly all the rest of the spider is of a reddish-yellow colour, except part of the first and second pairs, and a conspicuous longish spot on the fourth pair of legs, which are dark red-brown: palpi short; cubital joint gouty; digital joint large; palpal *organs highly developed; maxillæ rather pointed at their extremity.*

Adult male.—Length $\frac{1}{13}$ of an inch; relative length of legs 1, 4, 2, 3, the shortest just half the length of the longest.

Cephalothorax small, and very prominent at the eyes, with a slight indentation in the medial line. Colour reddish yellow; lateral margins, in adult females, but not in the males, dark red-brown.

Eyes eight, on front of cephalothorax, in two transverse rows, the four intermediate ones forming a square, the two front ones of which are placed on a strong projection, and are larger and darker than the rest of the eight; the eyes of each lateral pair are placed on a small tubercle, and are contiguous.

Legs moderately long and robust, and provided with hairs; relative length 1, 4, 2, 3. Each tarsus ends with three claws. Colour reddish yellow, the tibiæ of the first and second pairs strongly tinged with deep red-brown, and a longish conspicuous spot of the same colour at the end of the tibiæ of the fourth pair.

Palpi short; cubital and radial joints very short; cubital rather gouty-looking, and radial somewhat lengthened on the inner side at the end; digital joint large, oval, convex, and hairy outside; palpal organs highly developed and prominent, and, with the joint to which they are fixed, of a coppery-brown colour.

Falces short and vertical.

Maxillæ rather pointed at the end, and inclined towards the *labium*, which is semicircular.

Sternum convex and heart-shaped. All these parts are coloured like the legs, though of a duller tinge, being more suffused with pale brown.

Abdomen oviform, and projecting slightly over the base of the cephalothorax; colour blackish brown, with an opake shining leaden hue, differing in intensity in different individuals, some, especially immature females, being of a yellowish brown, while several immature males had the cephalothorax and palpi very dark brown, and all the legs more or less clouded and blotched with the same colour.

The adult female differs from the male only in being rather larger, and in having the front part of the cephalothorax less prominent.

Immature specimens of both sexes were discovered by myself under pieces of stone and rock, in the island of Portland, in October 1859, and *adults* of both sexes in the same locality in June 1860. Like many of this genus, it is a dull, sluggish spider.

Family Linyphiidæ. Genus Linyphia.

Linyphia albula.

General colour pale and plain; cephalothorax with some obscure converging lines; abdomen with a pale yellowish-brown longitudinal band down the centre of the upper side, slightly ramose, and tapering to the spinners, a little above which are a few pairs of small spots of a brown colour.

Adult female.—Length $\frac{1}{8}$ of an inch; length of cephalothorax $\frac{1}{16}$, breadth $\frac{1}{24}$; breadth of abdomen $\frac{1}{20}$; length of a leg of the first pair $\frac{3}{10}$; length of one of the third pair $\frac{1}{6}$; relative length of legs 1, 2, 4, 3.

Cephalothorax oval, compressed on the sides towards the front. Colour palish yellow, slightly suffused with drab; several obscure brownish lines commence near the eyes, and, running back, meet at a small indentation in the medial line, where they are met by some obscure converging rays which come from the lateral margins.

Eyes eight in number, small, and seated on black spots on the front part of the cephalothorax; the four centre eyes (of which the two front ones are the smallest of the eight) form a trapezoid with its shortest side forwards. The eyes of each lateral pair are seated obliquely on a small tubercle, and are contiguous.

Legs long, slender, furnished with hairs and a few fine spines. Colour like that of the cephalothorax, only rather paler, with the tarsal and metatarsal joints darkest. Each tarsus ends with three claws.

Palpi furnished with hairs and spines; same colour as the legs, though rather darker at the extremity.

Falces powerful, conical, a few teeth on the inner surface, and rather inclined towards the sternum.

Maxillæ strong, *straight,* the outer angle at the end curvilinear.

Labium semicircular, and prominent at the top.

Sternum heart-shaped and convex. All these parts are darker and more suffused with brown than the cephalothorax.

Abdomen slender, oviform, thinly clothed with hairs; projecting moderately over the base of the cephalothorax; of a yellowish-white or pale cream-colour, the under side rather the darkest: a light yellowish-brown band (with several small short branches issuing obliquely from it across to the sides) runs from end to end of the abdomen; this band is broadest at the end near the cephalothorax, and fines-down to a dark line before it reaches the spinners, just above which are six or eight small brown spots in pairs; the first two pairs are nearer together than the second pair is to the third pair, and the fourth pair (mere dots) are nearer to the third pair than the third to the second. When more specimens have been captured, it will probably be found that there is some variety in these spots and the branching of the abdominal band. Two faint, curved, brown lines (one on each side of the under part) meet each other near the spinners. The spinners are tipped with blackish brown; the sexual organs are of a dark reddish-brown colour, rather prominent, and with a small, oval, brownish-yellow process connected with their hinder margin.

A single adult female of this species was discovered by myself on a holly-bush at Hursley, near Winchester, in May 1860

Genus Neriëne.

Neriëne Huthwaitii.

Size moderate; abdomen greenish brown, with a leaden hue; the rest of the spider of a more or less dark brownish yellow: palpi short; radial joint nearly double the length of the cubital, and clavate; digital joint very small; palpal organs simple, and not very prominent.

Adult male.—Length $\frac{3}{20}$ of an inch; length of cephalothorax $\frac{1}{12}$; breadth $\frac{1}{16}$; relative length of legs 1, 4, 2, 3.

Cephalothorax oval, slightly prominent behind the eyes, and with slight furrows on the sides converging towards an indentation in the medial line. Colour dull yellow with a tinge of brown.

Eyes eight, in two rows across the front of the cephalothorax, and seated on black spots; those of the hinder row are equidistant from each other, the two middle ones being the largest of the eight, and the two middle ones of the front row the smallest and darkest-coloured, and *very* close to, but not touching each other. The eyes of each side pair are placed obliquely on a small tubercle, and touch each other.

Legs moderately long, hairy, same colour as the cephalothorax; relative length 1, 4, 2, 3 (1 and 4 being equal in length). Each tarsus ends with three claws.

Palpi same colour as the legs, and short; *the radial joint is double the length of the cubital,* clothed with longish hairs, *and clavate; digital joint very small;* oval, convex, and hairy outside: palpal organs simple in structure, and not very prominent nor highly developed; a straight black spine issues from their extremity, and their colour is slightly darker than the rest of the palpi.

Falces long, powerful, conical, vertical, convex in front near the base, divergent at the extremity, and armed with strong, sharp teeth on the inner surface.

Maxillæ obliquely truncated at the extremity on the outer side, slightly curved and inclined towards the labium: these last parts (maxillæ and falces) resemble the legs in colour, though perhaps a trifle more suffused with brown.

Labium semicircular and prominent at the top.

Sternum broad and heart-shaped: these parts are of a dark-brown colour.

Abdomen longish oval, hairy, and projecting a little over the base of the cephalothorax; colour dark greenish brown, with a leaden hue; branchial opercula dull yellow.

An adult male of this species was sent me by the Rev. T. W. Huthwaite, who captured it at Calke Abbey, near Derby, in the summer of 1860. I have received from Mr. Huthwaite many other rare and interesting species captured in the same and other localities; and I have great pleasure in naming after its captor the present species, which appears new to science.

Genus Walckenaëra.

Walckenaëra unicornis.

Abdomen black-brown; rest of the spider dark brownish red, except the legs, which are reddish yellow: frontal eminence moderate; from the top of it, in the centre of the four pairs of eyes, there rises a short vertical projection, the top of which is enlarged and slightly notched, but without any hairs on it: radial joint of palpi with two projections—a long, bifid, hairy, obliquely curved one in front of the digital joint, and a short blunt one underneath it; palpal organs very highly developed and complicated.

Adult male.—Length $\frac{1}{10}$ of an inch; length of cephalothorax $\frac{1}{20}$, breadth $\frac{1}{24}$; relative length of legs 4, 1, 2, 3.

Cephalothorax oval, prominent before, with a short vertical projection issuing from the middle of the space occupied by the eyes; this projection is enlarged and notched at the top, and is much paler in colour than the rest of the cephalothorax, which is of a dark brownish red.

Eyes eight, on front and top of cephalothorax, in four pairs forming two cross rows curved from each other; the hinder row much more strongly curved than the front one. The two middle eyes of the front row are much closer together than the two middle ones of the hinder row, and are the smallest of the eight; the eyes of the two side pairs are placed on a small tubercle, and touch each other.

Legs slender, furnished with hairs, and of a yellowish-red colour; relative length 4, 1, 2, 3. Each tarsus ends with three claws.

Palpi short, same colour as the legs, except the digital joint, which has a brown tinge; radial joint larger than the cubital, and with two projections at its extremity—a long, bifid, hairy, obliquely curved one in front of the digital joint, and a short blunt one underneath it; digital joint short-oval, convex and hairy outside, and with a lobe on the outer side near the base: palpal organs *very* highly developed, prominent, and complicated in structure; they are of a dark reddish-brown colour, and have a black filiform spine at their extremity on the outer side; this spine is curved into a circular form, and is enveloped in membrane.

Falces conical, divergent at their extremity; a few teeth on the inner surface, and inclined towards the sternum.

Maxillæ short, and strongly inclined to the labium.

Labium semicircular, prominent at the top, and with the maxillæ and falces of a brownish red, palest at the base of the labium.

Sternum heart-shaped, convex, dark brown, tinged with red.

Abdomen oviform, sparingly furnished with hairs, projecting slightly over the base of the cephalothorax; colour brownish black; branchial opercula and spinners yellowish white.

Five adult males of this species were discovered by myself on underwood at Lyndhurst, New Forest, at the end of May 1860.

It is closely allied and similar in *general* appearance to *Walckenaëra cuspidata* (Blackwall, Edinburgh Phil. Mag. iii. p.257), though not quite so large nor so richly coloured: one chief difference seems to be the form of the vertical projection on the frontal eminence, which, in *W. unicornis,* has *no hairs at the top* (where it is enlarged and notched) and *is paler-coloured and more vertical*; while in *W. cuspidata* it is more projecting forwards, jet-black, and crowned with hairs. The position of the eyes also differs from that of *W. cuspidata,* the hinder row being more strongly curved, and so separating the two centre pairs of eyes more than in that species.

It is also allied to *Walckenaëra monoceros,* but differs from it not only in the points mentioned above, but in colour and general appearance, though resembling it more in the position of the eyes than it does *W. cuspidata.*

Walckenaëra ludicra.

Size very small; colour nearly uniform pale murky ochre-yellow; frontal eminence very large, shaped like the hood of a cabriolet, and greatly inclined backwards, so that in most adult male spe-

cimens it nearly touches the front part of the abdomen; radial joint of palpi short both actually and relatively, with a stoutish, hairy, pointed projection in front, and a smaller one underneath; digital joint of moderate size; palpal organs moderately developed and complicated, with a curved black spine near the end on the inner side.

Adult male.—Length $\frac{1}{18}$ of an inch; relative length of legs 1, 4, 2, 3.

Cephalothorax. Front part very elevated, the elevation very convex behind, flattened in front, inclined backwards so much as, in most adult males, nearly to touch the abdomen, and compressed on the sides close above the lateral pairs of eyes; there is a slight indentation, behind the eminence, in the medial line. Colour pale murky ochre-yellow; frontal eminence clouded with brownish, and lateral margins dark brown.

Eyes eight; two on the top of the frontal eminence, widely removed from each other; the other six are placed much lower down (but considerably above the frontal margin, which projects like a ridge over the insertion of the falces): they are in three pairs, forming one general row; the eyes of the side pairs are contiguous and placed obliquely; the intermediate pair are separate, parallel to the frontal margin, and by far the smallest of the eight; the rest are nearly uniform in size. The eyes are all seated on small blackish protuberances.

Legs robust, moderate in length, clothed with hairs, and the third and fourth pairs with a few small black spines; relative length 1, 4, 2, 3. Colour pale murky ochre. The tibiæ of the first and second pairs tinged with brown.

Palpi short, same colour as the legs, except the radial and digital joints, which are brown; radial joint very short, and, relatively, the cubital joint is long; the former has a short, stoutish, pointed, hairy projection in front, and a smaller one underneath; digital joint short, broad, convex, and hairy outside; palpal organs reddish brown in colour, moderately developed, prominent, complicated in structure, and with a curved black spine near the extremity on the inner side.

Falces conical, rather inclined towards the sternum, and with a few teeth on the inner surface; they are inserted into the forehead, not in a straight, but in a vandyked suture.

Maxillæ short, convex at the base, and inclined towards the labium.

Labium semicircular, prominent at the top, and, with the maxillæ and falces, pale murky-ochre-yellow-coloured.

Sternum broad heart-shaped and convex, with a blackish margin.

Abdomen oval, sparingly clothed with hairs, pale murky shining ochre-coloured; in many individuals of both sexes strongly tinged with brown.

The female resembles the male in colour, but is larger, and wants the frontal eminence, the front of the cephalothorax being merely slightly elevated, with a longitudinal indentation in the medial line.

Both sexes of this very remarkable-looking spider (both mature and immature) were discovered by myself in abundance on furze-bushes at Hursley, near Winchester, Lyndhurst, and at Bloxworth, Dorset, at the end of May 1860.

Walckenaëra saxicola.

Cephalothorax dark brown; abdomen brownish black; legs pale yellowish brown, with the tibiæ of the first and second pairs dark brown; frontal eminence moderate, and behind it a slight transverse dip or compression: palpi short; radial joint shorter, but larger and stronger than the cubital, and with several projections; digital joint large; palpal organs highly developed and complex.

Adult male.—Length $\frac{1}{13}$ of an inch; relative length of legs 4, 1, 2, 3.

Cephalothorax prominent in the region of the eyes, rounded and very convex, compressed on the sides, and with a slight transverse dip behind the frontal prominence; behind this dip there is an indentation in the medial line. Colour dark brown.

Eyes eight, on front and top of cephalothorax in four pairs, forming two transverse rows curved from each other, the front row far more strongly curved than the hinder one; the eyes of the middle pair of the front row are much closer together than the middle ones of the hinder row, and the smallest of the eight, the central ones of the hinder row being the largest; those of the side pairs are on a small tubercle, and touch each other.

Legs moderately long, not very slender, furnished with hairs; their relative length is 4, 1, 2, 3. Each tarsus ends with three claws. Colour pale yellowish brown, *with the tibiæ of the first and second pairs dark brown.*

Palpi short: radial joint about the same length as the cubital, but *much* thicker and stronger; it has three projections at its extremity—a long, slender, deep-brown one curved outwards in front of the digital joint, a strong crescent-shaped one in front towards the outer side, and a short obtuse one underneath; the two latter are not so dark-coloured as the first: digital joint large, somewhat oval, convex and hairy outside: palpal organs highly developed, complicated, and with a black filiform spine near the middle, curved in a circular form, and within the curvature a black spine enveloped in membrane and directed obliquely forwards and downwards; the palpal organs are of a reddish-brown colour.

Falces conical, armed with a few teeth on the inner surface; rather darker-coloured than the legs, and inclined towards the sternum.

Maxillæ short, obliquely truncated at the end on the outer side, and inclined towards the labium.

Labium semicircular, prominent at the top, and, with the maxillæ and *sternum* (which latter is broad, convex, and heart-shaped), of a dark-brown colour.

Abdomen oviform, thinly clothed with hairs, and projecting but slightly over the cephalothorax. Colour brownish black.

The female differs from the male only in being rather larger and in having the frontal prominence smaller; the sexual organs are highly developed and very prominent.

Adult males and females of this very active species were taken (but rarely) by myself, under pieces of rock and stone, near Pennsylvania Castle, in the island of Portland, in July 1860. It seems to be allied to *Walckenaëra antica* (*W. apicata* of Blackwall, Linn. Trans. xviii. 637,—*Argus anticus,* Walckenaer, Hist. Nat. des Insectes Apt. t. ii. p. 357), resembling it in the relative colouring of the legs, but differing from it remarkably, both in the form of the cephalothorax and also of the radial joint of the palpi and in the structure of the palpal organs; it is likewise much smaller, and far less richly coloured.

L.—*On the Discovery of* Macrauchenia *in Bolivia.* By Charles Carter Blake.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

In the February Number of the 'Quarterly Journal of the Geological Society,' a report of a paper appeared, read by Prof. Huxley on Nov. 21, 1860, respecting "a new species of *Macrauchenia* (*M. boliviensis*)" obtained by Mr. Forbes from the mines of Corocoro, in Bolivia. In this paper the following note is inserted:—

"As the Guanaco ranges into the highlands, it may not be a too sanguine expectation to hope for the future discovery of remains of the great *Macrauchenia,* also, in Bolivia" (p. 83).

As this statement, unaccompanied by any reference to the corroborative testimony of other palæontologists, is calculated to leave the reader under the impression that remains of *Macrauchenia patachonica* are yet undiscovered in Bolivia, I must respectfully indicate to those readers of your valuable periodical who are unacquainted with the fact, that Dr. Weddell, writing in Castelnau's 'Expédition dans les Parties centrales de l'Amérique du Sud,' 4to, Paris, 1855, states, on page 36 of the 7th Partie (Zoologie), and on page 203 of the 6th volume of the 'Histoire du Voyage,' 8vo, Paris, 1851, that bones of *Macrauchenia* were found at Tarija, in South Bolivia, imbedded in the soil with *Mastodon Humboldtii, Scelidotherium, Megatherium,* three species of true *Auchenia, Equus macrognathus* vel *neogæus, Ursus,* &c. He does not specifically distinguish them from *M. patachonica,* and figures them under that name on plate 8 of the 7th Part. If the remains described by Prof. Huxley should prove to be of a distinct species, the fact would be not merely that "a small and a large species of Auchenoid mammal ranged the mountains and the plains of South America respectively," but that two nearly similar species of *Macrauchenia* co-existed in the highlands of Bolivia during the post-pleistocene epoch. As Tarija, on the eastern slopes of the Bolivian Andes, is almost beyond the limits of the geographical range of the Guanaco, which is by no means such a denizen of the plains as Prof. Huxley would infer, the existence of a fossil Auchenoid mammal (a so-called "*hueso de gigante*") at that place is a fact of much more importance than the existence of a similar animal at Corocoro, in the elevated valleys of the Aymará country, at the foot of the enormous Illimani*.

The specific name *boliviensis,* applied by Prof. Huxley to the smaller form, will no doubt be abrogated by succeeding naturalists, as founded on a misconception of the geographical distribution of the genus.

Prof. Huxley, impugning the philosophical laws of "correlation of structure" as defined by Cuvier and Owen, suggests that, upon the Cuvierian method of induction, a palæontologist, reasoning alone from the cervical vertebræ of *Macrauchenia,* would have confidently predicted its Cameloid affinities. But when Prof. Huxley founds an argument, put hypothetically into the mouth of an ideal adversary, upon a structure so liable to

* As Mr. Forbes, in the memoir preceding Prof. Huxley's, mentions at great length the *Salinas,* the volcanic origin of common salt, and the physical geography of Peru and Bolivia, I may be permitted to indicate that much valuable information on these subjects is to be found in Mr. William Bollaert's 'Antiquities and Ethnology of South America,' 8vo, Lond. 1860, and in his paper in the 'Journal of the Royal Geographical Society,' vol. xxi. 1851, with map. Apparently the researches of both MM. Castelnau and Bollaert have been unknown to Messrs. Forbes and Huxley.

variation as the perforation by a blood-vessel of a cervical vertebra, it can hardly be accepted as a correct exemplification of the principle which Cuvier has so successfully applied. The non-perforation of a cervical vertebra by an artery is certainly not such a character, subserving an important purpose, and denoting ordinal distinction, as the presence of a marsupial bone in an Opossum, with which Prof. Huxley compares it. The analogy which it is attempted to deduce, as adverse to the principles of correlation, therefore totally fails, whilst this high law of comparative anatomy, "*aussi certaine qu'aucune autre en physique ou en morale*," remains unimpaired by the re-discovery of Macrauchenian remains in the Andes.

I remain, Gentlemen,
Your obedient Servant,
CHARLES CARTER BLAKE.

LI.—*On the Recent* Terebratulæ; *in Reply to some Observations by* Professor E. Suess, *of Vienna.* By LOVELL REEVE, F.L.S.

To the Editors of the Annals of Natural History.

GENTLEMEN,

While working out a Monograph of the recent *Terebratulæ* for my 'Conchologia Iconica,' a summary of which appeared in your Journal for March, and was translated into the Paris 'Journal de Conchyliologie' for April, I had occasion to study the valuable researches on their geographical distribution by Prof. E. Suess, published, in 1859, in vol. xxxvii. of the 'Proceedings of the Imperial Academy of Sciences of Vienna.' I was not slow to appreciate the labours of that distinguished naturalist; but having discovered some of his conclusions to be founded in error, I thought it necessary to allude to them, adding, "I mention these instances, not with the view of casting disparagement on Prof. Suess's philosophy, but as exemplifying the inconvenience of going into philosophical dissertations before the materials have been thoroughly sifted and verified." I have read Prof. Suess's comments in your last Number on my exceptions to his views; but it does not appear to me, as I shall presently demonstrate, that he has shown any of my criticisms to be groundless. Prof. Suess remarks that the greater part of his statements are taken from English catalogues, and that his errors are mainly due to English authors. I suspected this; and my conviction that his conclusions ought to be received with caution was founded upon the discovery that some at least of those statements were erroneous. What, I would ask, is the worth of an elaborate superstructure of philosophical dissertation, if the materials upon which it is raised are open to the suspicion of being unsound in fact, in principle, in detail? Prof. Suess may delight, with great interest to himself, and with much advantage to science, in the pleasures of generalization; it is always pleasant

"To suck the sweets of sweet philosophy;"

but he who wishes to be secure must not shirk the drudgery, necessary for scientific accuracy, of examining and testing details. The catalogues from which the greater part of Prof. Suess's statements are taken are, I repeat, excellent; but does it follow that they are faultless? The erroneous statements (few, indeed, in number) which have been taken along with the true ones have been corrected by subsequent research, and would have been corrected, had opportunity offered, by the authors themselves. The alleged error in which Prof. Suess says I am myself involved turns out to be a mare's nest. I announced, in my 'Revision,' that the repetition, in 'Moll. Voy. Samarang,' of the same habitat and bathymetrical particulars for *T. capensis* (*Kraussia Deshayesii*, Dav.) and *T. abyssicola* must surely be an error. It will presently be shown, on unimpeachable testimony, that the original statement is the correct one.

Prof. Suess has not much to complain of. There are only four, out of the large and interesting number of facts due to English authors, upon which I dispute his accuracy:—

1. Prof. Suess says, "Mr. Reeve states that *Waltonia Valenciennesii*, Dav., is identical with *Terebratella Evansii*," which is true enough; but it is not in reference to this identity that I go on to remark, "and Prof. Suess might have detected this, even without any examination of the specimen, from Mr. Davidson's excellent figures of it." I make this remark in reference to the extraordinary view, which I am sorry to see maintained, that *Waltonia* is an *Argiope*. I have been to Paris to examine the *Waltonia*, but it was not to be found. The mutilation of the loop has nothing to do with the question. The figure, even with the ascending branches and horizontal bars of the loop broken away, shows that it is no *Argiope*, while there are clearly indications of its being a *Terebratella Evansii*. I declare that this was my conviction on first examining the figures and description. I communicated my suspicions to Mr. Davidson; he confirmed them. The figure shows, says Prof. Suess, that the specimen is an abnormal one, the plaits of which do not reach the umbo. What I term "obviously a blunder"—using the word, not offensively, but as indicating a mistake which it would be scarcely courteous to refute—is the slip of Prof. Suess in mistaking the impress of these plaits for internal apophysial septa.

The conclusion to which a persistence in this opinion leads the Professor—namely, that *Argiope*, a very special form of *Terebratula*, belonging to the temperate waters of the Lusitanian and Celtic provinces of geographical distribution, ranges to New Zealand—is, to my mind, a very serious error. He might as well look for strawberries on the summit of Mont Blanc.

2. The next conclusion of Prof. Suess to which I take exception is that of including *Terebratella* in his list of South African types of geographical distribution,—drawn from a statement of English authors, that a single valve in the British Museum, which I found on examination to be a bleached *Kraussia rubra* (a strictly South African type), is a *Terebratella*. Prof. Suess says, "If Mr. Reeve will re-peruse my paper, he will find the following passage: '*T. algoensis*, Sow. sp. (ranged among *Terebratella* by Mr. Davidson in Ann. Nat. Hist. 1852, p. 368) is only known by one single greater valve; the generic position is therefore rather doubtful.'" I particularly noticed the passage; and it occurred to me that to include the genus *Terebratella*, on no better evidence than this, in a tabular exposition of types intended for the demonstration of a theory was very unphilosophical.

3. The errors recorded here appear trifling, but they involve important principles in geographical distribution. My complaint, equally against Mr. Davidson and Prof. Suess, is that Corea should be given as the habitat of *Kraussia Deshayesii* (*T. capensis*, Ad. & Rv.), when the Cape of Good Hope is so plainly given for it in the original description of Mr. Adams and myself in 'Moll. Voy. Samarang.' I found that Mr. Davidson had been misled by a displacement of labels in Mr. Cuming's cabinet, and that Prof. Suess had been misled by Mr. Davidson. But Prof. Suess *suspected* some mistake when, on tabulating the habitats of the *Terebratulæ*, he found *Kraussia* to be specially a South African type, and remarked, "some confusion may exist here." Why, then, did he not give a preference to the habitat originally recorded in 'Moll. Voy. Samarang'? The theoretical difficulties which suggested some confusion should have suggested also that the habitat given by Mr. Arthur Adams, who himself dredged the species *in situ*, was most likely to be the correct one. The displacement of labels in Mr. Cuming's cabinet has been extremely perplexing, and even led to my accusing Mr. Adams and myself of an error, which has given Prof. Suess the temporary gratification of remarking, "You see that my doubts with reference to Messrs. Adams and Reeve's statements were justified." It happened that Mr. Cuming had got *T. abyssicola* (the original specimen) also labelled Corea; and I was induced to believe from this circumstance, coupled with the fact of the shell being a *Terebratulina* (a type already represented in

that locality), that a mistake had really been made by Mr. Adams and myself in repeating the same habitat and bathymetrical particulars for this species as are given in the preceding paragraph for *K. Deshayesii*. The two habitats originally published have been just proved to be correct by a most singular coincidence. Mr. Davidson, while looking over his stores of recent *Terebratulæ* a few days since, discovered a group of *Kraussia rubra* (an undoubted Cape species) with three specimens of true *Terebratulina abyssicola* attached to it,—dredged, beyond all question, like the original specimens, together.

4. The point of my criticism under this head is, that I object to any sort of comparison between *T. spitzbergensis* and *frontalis* and *T. transversa*. *T. spitzbergensis*, as its name implies, is a small, semitransparent, subarctic form of *Terebratula*. *T. frontalis*, which is unknown to me (and I cannot gather much from Middendorf's figure in 'Reise Sib.'), is also a northern form of *Terebratula*, the "quasi representative," as I have no reason for doubting, of *T. spitzbergensis* in the North Pacific. But what relationship can there be between either of these species and *T. transversa*? Prof. Suess has not seen *T. transversa*. The shell in the collection of Mr. Norris which bears that name appears to me to be nothing more than a huge worn monstrosity of the bold *T. magellanica*, which ranges along the western coast of South America from the Straits of Magellan to Chili. There is no vestige of a loop in the shell, but its general resemblance to *Terebratella magellanica* leaves no room for doubt as to the genus to which it belongs.

I am indebted to Prof. Suess for pointing out some errors in my 'Revision;' but they are unimportant, and little affect the question of geographical distribution. I give Japan, instead of Java, as the habitat of *T. rubella*, on the authority of a memorandum in the collection of Mr. T. Lombe Taylor, which I believe to be correct. His specimens were procured from Capt. Sir E. Belcher, who, according to this memorandum, dredged them in that locality. My insertion of *T. labradorensis* (only known from Labrador) among the North European instead of the North American types is an unlucky blunder. The only error which I admit in the whole list of my synonymy is that of citing *Waldheimia euthyra* as a synonym of *Terebratula vitrea*. The species is unknown to me; and I followed Dr. Gray, in the Museum Catalogue, not having seen the German edition of Mr. Davidson's 'Classification of Brachiopoda,' in which the loop is figured.

Prof. Suess says, "Nor do I approve the altered generic position of several species. Every one familiar with the fossil type of the genus *Magas* must see that the generic position assigned to *Terebratella crenulata* and *Evansii* by Dr. Gray and Mr. Reeve is erroneous." Not having sufficiently understood the fossil type of *Magas*, I may have erred in this respect; but the loop of these species is a little removed from the typical loop of *Terebratella*, as seen in *T. magellanica*, and is at least intermediate in its characters between that and *Magas*. The only other altered generic position that Prof. Suess can disapprove of (he does not name any other) is that of removing *Terebratella Cumingii* into the genus *Bouchardia*. Mr. Davidson himself was puzzled to know what to do with this species when first describing it, and only referred it to *Terebratella* provisionally, with a note of interrogation. The shell possesses a particular generic structure apart from any consideration of the loop; and that structure—an acuminated beak with a terminal foramen, far removed from the typical structure of *T. magellanica* or *cruenta*, which species possess allied though not similar loops to that of *B. Cumingii*—is the structure of *Bouchardia tulipa*. The new species in the British Museum which I have named *Bouchardia fibula*, and which Mr. Woodward has shown me to be almost identical with the fossil *T. compta*, has a similarly acuminated beak with a terminal foramen. The change of loop in these three shells appears to me to be a gradual modification in which that organ becomes enfeebled and rudely callosified, ceasing to be any longer available as a generic character.

In drawing up my tables of geographical distribution, I included only those species of which I obtained actual specimens for examination, comparison, description, and drawing, and I discarded all of which the species and habitat could not actually be verified. But, with all this care, the work is far from perfect. Prof. Suess will be able to improve materially upon my 'Revision' in the next edition of his 'Wohnsitze.' Here are the materials. Further research has enabled me to add the following names to the synonymy:—*T. scobinata*, Gmelin, and *T. decussata* and *irregularis*, De Blainville, are varieties of *Megerlia truncata*, Linn. *T. subvitrea*, Leach, is the same as *Waldheimia cranium*, Müll. *T. bilobata* and *pectinata*, De Blainville, are further varieties of *Terebratella magellanica*, Chemn. *T. sanguinolenta*, Gmelin, is the same as *Terebratella sanguinea*, Chemn. *T. nucleus* and *avenacea*, Müller, are varieties of *Terebratulina caput-serpentis*, Linn.; and *T. rotundata*, De Blainville, is a variety of *Kraussia rubra*, Pallas. I incline to believe also that *T. Kochii*, Kuster, and *T. eximia*, Philippi, are merely varieties of *Waldheimia globosa*. But even the name *globosa* seems destined to fall into the obscurity of a synonym. Mr. Davidson, whose few venial errors, made in the very dawn of his invaluable researches, have been lifted into such undeserved significance by this discussion, has communicated to me the discovery that either *Waldheimia globosa* or *W. dilatata* was collected nearly a century ago by the illustrious navigator Capt. Cook, and named by Solander *Anomia venosa*. The name only appeared in manuscript at first in the Portland Catalogue; but, a few years later, another specimen was brought to England from the same locality by Capt. George Dixon; and in the narrative of his expedition, published in London in 1789, a very excellent figure and description are given of it *.

In conclusion I may refer to another statement of Prof. Suess, in which it will be more agreeable to me to convict him of error. He says he is "no friend of critics." This is a *lapsus calami*, which I am sure he will unreservedly admit. I learn from our mutual friend Mr. Davidson, that he is a man of great rising talent, a friendly correspondent, full of genial sympathies, and has attained by merit and industry to a most distinguished position.

I am, Gentlemen,
Your very obedient Servant,
LOVELL REEVE.

Hutton, Brentwood,
May 2, 1861.

* "At Falkland Islands we met with a curious kind of shell, of the *Anomia* genus of Linnæus, of which, though the species are numerous in a fossil state in most parts of the globe, few have been discovered recent, or fresh from the sea. One only of this sort was before known in Europe, which was brought over by my late worthy commander, the much regretted Captain Cook, in his first voyage round the world: it was in the Portland Museum, and was named by the late celebrated Dr. Solander, in his MS. description of that splendid cabinet, *Anomia venosa*, which specimen is now in the collection of M. Calonne of London.

"This kind (as do all that are properly of this genus) adheres to coral rocks, by a ligament that comes from the animal through the hole in the larger valve. The internal structure (peculiar to shells of this genus) is very singular, and consists of two testaceous rays, which commence near the hinge in the lesser valve, where they adhere; from whence, leaving the shell, they proceed to near the edge, then bend towards the other valve, and turn back to their commencement, where they unite. This internal part is very delicate, and breaks upon the smallest touch, but is thicker in the part nearest to the larger valve. The shell takes its name from certain parts of the animal which run in a branched form along the inside of the shell, which being held to a strong light or a candle, gives it a beautiful veined appearance. The outside is smooth, and of a pale brown colour.

"The specimen from which the engraving was made is in the private collection of Mr. George Humphrey, dealer in natural curiosities, Albion Street, near Blackfriars Bridge, London." (A Voyage round the World, performed in 1785–8. By Capt. George Dixon. Dedicated to Sir Joseph Banks.)

LII.—*Notices of British Fungi.* By the Rev. M. J. Berkeley, M.A., F.L.S., and C. E. Broome, Esq.

[Continued from p. 382.]

[Plates XIV. to XVII.]

Acrospeira, n. g.

Hyphasma decumbens; flocci fertiles erecti sursum ramosi, ramuli apice subquadriarticulati spiraliter convoluti, sporæ subglobosæ granulatæ e uno alterove articulo oriundæ.

952. *Acrospeira mirabilis,* B. & Br. in Berk. Int. to Crypt. Bot. p. 305. f. 69 *a*. On sweet chestnuts, Bristol, C. E. B.

A most curious fungus, in which the dark granulated spores are formed by a transformation of the second joint from the top of the branchlets. All the four terminal joints swell, but the second only in general proves fertile, though in a few instances the terminal joint also is transformed.

953. *Peronospora sordida,* n. sp. Maculis latis hypophyllis irregularibus sordide pallidis; floccis supra vage dichotomis, apicibus furcatis inæqualibus; sporis obovatis apice apiculatis.

On leaves of *Scrophularia*. Jedburgh, A. Jerdon, Esq.

Forming broad, irregular, dirty, pallid spots on the under side of the leaves; threads loosely dichotomous above; tips forked, unequal; spores obovate, apiculate, ·001 inch long.

954. *Cylindrium septatum,* Bonorden, Myc. f. 16. On decayed wood. Batheaston, Dec. 1859.

Forming a white bloom on the matrix. The genus differs from *Oidium* in the septate spores.

955. *Fusarium heterosporium,* Nees, Nov. Act. Acad. Nat. Cur. ix. p. 135. On the glumes and seeds of rye. Peppering, near Arundel.

956. *Peziza* (Geopyxis) *Geaster,* n. sp. Sessilis subterranea fusca globosa in lacinias paucas dein rupta, extus villosa.

Amongst comminuted stone and earth. Wentworth, Mr. J. Henderson.

At first globose, about half an inch in diameter, brownish, covered with a villose coat, then bursting into a few laciniæ; asci linear; sporidia elliptic, with a large globose nucleus, and sometimes one or two smaller ones, ·0008–·0009 inch long.

The surface is not warty, as in *P. arenaria*. The sporidia of *P. sepulta,* which is a far coarser species, are mostly smaller, ·0004–·0005 inch long, though occasionally of the same dimensions as in our species.

957. *P.* (Dasyscyphæ) *Vectis,* n. sp. Minuta depresso-subglobosa atro-fusca granulata pilis brevibus fuscis vestita; mar-

gine irregulari; disco concavo pallido; sporidiis filiformi-fusiformibus uniseptatis.

On dead stems of *Centaurea nigra*. Ryde, Rev. A. Bloxam.

Minute, subglobose, somewhat depressed, dark brown, rough with short brown hairs; disk concave, pale; sporidia between filiform and fusiform, ·0012 inch long.

958. *P.* (Dasyscyphæ) *ilicincola*, n. sp. Fasciculata; cupulis extus albido-furfuraceis intus subroseo-cinereis; sporidiis globosis nucleo magno conformi.

On holly. Chiselhurst, Nov. 1859.

Fasciculate; cups furfuraceous, externally dirty white, within cinereous tinged with rose; asci clavate; sporidia at first uniseriate, at length irregularly biseriate, globose, ·00025 inch in diameter, with a large globose nucleus.

Plate XVI. fig. 17. *a.* Plant *in situ*; *b, c.* asci and sporidia, both magnified.

959. *P.* (Dasyscyphæ) *calyculæformis*, Schum. Sæll. p. 424; Fl. Dan. t. 2032. f. 2.

Var. Gregaria, stipite fusco glabro, margine subconnivente. On dead wood, Mossburnford, A. Jerdon, Esq.

Our plant agrees with Schumacher's in habitat; it is not, however, scattered in growth. It has a decidedly dark-brown stem, which is smooth; and the margin is rather connivent than erect. We prefer, however, proposing it as a variety to making it a distinct species. No one appears to have found Schumacher's plant.

960. *P.* (Mollisia) *paulula*, Roberge, in Desm. Exs. no. 2010. On *Juncus maritimus*. Isle of Wight, Rev. A. Bloxam.

961. *Helotium infundibulum*, Fr. Summ. p. 355. On dead sticks. Twycross, Rev. A. Bloxam, Dec. 1854.

962. *H. ferrugineum*, Fr. Summ. p. 356. On dead wood. Twycross, Rev. A. Bloxam.

963. *H. imberbe*, Fr. Summ. p. 356; b. *sessile*, Fr., Batsch, El. f. 56. On decorticated willows. Mossburnford, A. Jerdon, Esq.

Sporidia clavate, ·0004–·0005 inch long.

**H. fagineum*, Fr. Summ. p. 356. On beech mast. Colleyweston, C. E. Broome.

964. *Thelebolus terrestris*, A. & S. p. 71. t. 2. f. 4. On fir-leaves. Richmond, Yorkshire, Miss Plues.

Exactly the plant of the 'Conspectus;' but, unfortunately, the sporidia are not yet formed.

965. *Patellaria proxima*, n. sp. Orbicularis scutelliformis depressa subimmersa atra; ascis clavatis; sporidiis oblongis utrinque obtusis curvulis 4–5-septatis.

On dead oak. Little Heath, Barking, Dec. 1859.

Orbicular, shield-like, depressed, somewhat immersed, black; asci clavate; sporidia biseriate, oblong, obtuse at either end, slightly curved, 4–5-septate.

Closely resembling *P. atrata*, but differing materially in the fruit.

Plate XVI. fig. 18. Asci and sporidia magnified.

966. *Stictis chrysophæa*, Fr. Syst. Myc. vol. ii. p. 194. On dead wych elm. Batheaston, C. E. B.

Asci clavate; sporidia fusiform, 0·005 inch long.

Plate XVI. fig. 19. *a, b.* Asci and sporidia magnified; *c.* paraphysis.

967. *Phacidium simulatum*, n. sp. Erumpens cupulari-linearis, margine irregulari; disco lineari rufo-fusco; sporidiis obovatis.

On dead stems of *Clinopodium*. Langridge, Somers., C. E. Broome.

Linear, but cup-shaped, erumpent, with an irregular margin; disk linear, red-brown; asci clavate; sporidia obovate, ·0004 inch long, binucleate.

Plate XVI. fig. 20. *a.* Plant, natural size; *b.* magnified; *c.* asci and sporidia.

968. *Ailographum maculare*, n. sp. Peritheciis utplurimum simplicibus subconcentricis in maculas orbiculares dispositis; ascis brevibus oblongis; sporidiis oblongo-clavatis.

On an old mat made of *Typha*. Hainault Forest, May 1859.

Forming little orbicular black patches, in which the perithecia are disposed in a somewhat concentric fashion; perithecia mostly simple; asci short, oblong; sporidia oblongo-clavate, 0·0005 inch long. Mycelium matted, brown, producing here and there dark patches.

Very distinct in habit and in the longer asci.

Plate XVI. fig. 21. *a.* Plant, nat. size; *b.* the same, magnified; *c.* asci; *d.* sporidia; *e.* threads of the mycelium. (All but the first magnified.)

969. *Cordiceps pistillariæformis*, n. sp. Pusilla, clavula fusca, stipite cylindrico pallido basi dilatato subæquali.

On wych-elm twigs. Batheaston, Nov. to Feb., C. E. Broome.

Plant 2 lines high; head oblong-ovate, granulated from the perithecia which are sunk in its substance, rather longer than the pallid cylindrical stem, which is slightly swollen at the base.

This curious plant has not, at present, been gathered with perfect fruit. It grows on a sclerotioid substance; but whether a part of it or not, we are unable to say.

Plate XVI. fig. 22. *a.* Plant, nat. size; *b.* magnified, when young, *c.* when older.

970. *Hypocrea inclusa*, n. sp. Subterranea parasitica tota

inclusa; peritheciis astomis globosis hyalinis confluentibus; ascis linearibus; sporidiis octonis globosis.

Leigh Wood, Bristol, Sept. 1859, C. E. Broome.

Parasitic in the flesh of *Tuber puberulum*, occupying the place of the asci; perithecia globose, hyaline, confluent; asci short, linear; sporidia 8, globose, ·00015–·0002 in diameter.

PLATE XVII. fig. 23. *a.* A thin slice showing the parasite within the tissue of the truffle; *b.* asci and sporidia.

**Diatrype stipata*, Curr. The fruit figured in this Journal as that of *Valsa hypodermia* belongs to this species. That of *V. hypodermia* is fusiform and hyaline. Mr. Currey now believes that his plant is identical with *Sphæria dissepta*, Fr.

971. *Nectria Albertini*, B. & B.; *Sphæria rosella*, A. & S. t. 9. f. 3. Peritheciis gregariis ovatis acutis papillatis roseis subiculo tomentoso roseo insidentibus; sporidiis medio tumidis fusiformibus uniseriatis.

On the ground, on sticks, leaves, &c. Leigh Wood, Bristol, C. E. Broome.

This differs from the plant gathered by Bloxam and Carmichael in the larger fusiform, not short oblong, uniseptate sporidia. In *N. Albertini* they are ·0014 inch long, in *N. rosella* only ·0005. We have a plant from Madeira which agrees in the fusiform sporidia, but in which the perithecia are sunk as in *Hypocrea*. In Rabenhorst's specimen of *Sphæria rosella*, besides the asci and oval spores, there are what we believe to be stylospores, oblong and triseptate, ·001–·0012 inch long.

PLATE XVII. fig. 24. *a.* Asci and sporidia of *N. Albertini*; *b.* ditto of *N. rosella.*

**Nectria Peziza*, Fr. Summ. p. 388. *Sphæria aurea*, Grev. t. 47, usually referred to *N. aurantia*, Fr., is scarcely different from *N. Peziza*. *Sphæria aurantia β. fulgens* appears to be the same.

**Melogramma oligosporum* (No. 895) = *Sphæria macrospora*, Desm.

972. *Sphæria* (Villosæ) *scatigena*, n. sp. Peritheciis liberis ovatis subtiliter hispidis, pilis brevibus rigidis; ostiolo papillæformi, apice truncato; sporidiis globosis.

On horse-dung, King's Cliffe, with *S. stercoraria*, Sow. Spring.

Perithecia free, ovate, rough, with very short rigid hairs; ostiolum papillæform, truncate; asci cylindrical; sporidia uniseriate, broadly elliptic, subglobose, at first surrounded with gelatine, ·0008 inch long, flattened, so that a lateral view gives a narrow elliptic outline.

The sporidia in *S. stercoraria* are ·00012 inch long; the perithecia are immersed in a decided stroma even when solitary.

PLATE XVII. fig. 25. *a.* Ascus; *b.* surface of perithecium; *c.* sporidium. (All more or less magnified.)

973. *S.* (Denudatæ) *ordinata,* Fr. Syst. ii. p. 454. On decorticated fallen oak branches. Little Heath, Essex, Dec. 1859. Barking.

Perithecia scattered or aggregated, arranged in lines, ovate, with a papillary orifice, rusty brown becoming black, covered at first with a tomentose veil, sometimes regularly attenuated, resting on a brownish friable mycelium; asci clavate; sporidia biseriate, curved, fusiform, hyaline, multiseptate, ·0015 inch long, sometimes shorter.

This appears to be the plant of Fries. Montagne's plant has elliptic fruit like *Sphæria millegrana,* ·0005 inch long.

PLATE XVII. fig. 26. Ascus and sporidia magnified.

**S.* (Denudatæ) *pulveracea,* Ehrh. Our specimens are exactly the same as *S. millegrana,* Schwein.

974. *S.* (Cæspitosæ) *naucosa,* Fr. in Myc. Heft ii. p. 36. On elm. Batheaston, Jan. 1860, C. E. Broome.

Asci clavate; sporidia ·001 inch long, obovate, multicellular, with vertical and transverse septa.

We have no typical specimens. The perithecia, when old, are almost black; the ostiola obsolete; the surface smooth and shining, with generally a single fissure at the apex.

PLATE XVII. fig. 27. Asci and spores magnified.

975. *S.* (Platystomæ) *Jerdoni,* n. s. Peritheciis sparsis l. subcongestis subglobosis, ostiolis angustioribus linearibus; sporidiis una cum utroque articulo medio constrictis bi- trinucleatis.

On *Rubus Idæus.* Mossburnford, A. Jerdon, Esq. East Bergholt, apparently on elm, with the perithecia more scattered, Rev. C. D. Badham.

Perithecia scattered or slightly crowded, subglobose, with narrower linear ostiola; asci clavate; sporidia biseriate, ·0012–·00125 inch long, strongly constricted in the centre, as also each of the two bi- trinucleate joints.

PLATE XVII. fig. 28. Sporidia magnified.

976. *S.* (Ceratostomæ) *stylophora,* n. sp. Peritheciis primum tectis demum liberatis in fasciculos orbiculares dispositis ovatis sursum attenuatis; ostiolis sesquilongioribus; ascis late clavatis; sporidiis fusiformibus hyalinis uniseptatis utrinque appendiculatis.

On *Acer platanoides.* Mossburnford, A. Jerdon, Esq.

At first covered, then exposed; perithecia collected in little orbicular patches, ovate, attenuated above, with styliform ostiola longer than themselves; asci broadly clavate; sporidia biseriate, hyaline, fusiform, uniseptate, appendiculate at either end.

PLATE XVII. fig. 29. *a.* Group of perithecia; *b.* sporidia. (Both magnified.)

977. *S.* (Subtectæ) *holoschista*, n. sp. Peritheciis viridi-atris demum collapsis floccis albidis cinctis; sporidiis biconicis mucosis, dissepimento gelatinam percurrente.

On alder. West of England.

Perithecia blackish green, collapsed, and then looking like a *Peziza* surrounded by whitish hairs; sporidia surrounded by gelatine, biconical, uniseptate, constricted at the septum, which passes completely through the mucous envelope; length, when the gelatine has been absorbed, ·0015–·0018 inch.

Allied to *S. siparia.*

PLATE XVII. fig. 30. Asci and sporidia magnified.

978. *S.* (Subtectæ) *blepharodes*, n. sp. Peritheciis tectis depresso-globosis; ostiolis duplo longioribus; ascis clavatis; sporidiis biseriatis hyalinis fusiformibus.

On twigs of *Acer pseudo-Platanus*. Mossburnford, A. Jerdon, Esq.

Completely covered by the cuticle; perithecia globose, depressed; ostiola piercing the cuticle, twice as long; asci clavate; sporidia biseriate, hyaline, fusiform, ·0005 inch long.

PLATE XVII. fig. 31. Sporidia magnified.

979. *S.* (Obtectæ) *obtecta*, Curr. in Journ. Micr. Sc. vol. vii. p. 8. t. 11. f. 16. On wych elm. Batheaston, Feb. 1859.

Completely concealed by the cuticle; perithecia subglobose, scarcely becoming free from the matrix; walls thick, jet-black; gelatine white; asci clavate: sporidia biseriate, in an early stage biconical, pointed at either end, with the endochrome proportionally small; when old, shorter, biconical, obtuse, dark brown, the outer coat being entirely absorbed. Young sporidia ·0024 inch long; old, ·0015–·002.

PLATE XVII. fig. 32. *a.* Asci and young sporidia; *b.* full-grown sporidia. (Both magnified.)

980. *S.* (Caulicolæ) *glœospora*, Berk. & Curr. Peritheciis globosis depressis subcuticularibus; ostiolo papillæformi; sporidiis oblongo-cymbæformibus 4-septatis articulis torulosis.

On dead stems of *Artemisia Absinthium*. Fleetwood, Rev. A. Bloxam.

Perithecia globose, depressed, growing beneath the cuticle; ostiolum papillæform, black; asci clavate; sporidia ·001–·0012 inch long, biseriate, quadriseptate, oblong, somewhat cymbæform, joints swollen; endochrome of a pale golden brown.

PLATE XVII. fig. 33. Sporidia magnified.

981. *S.* (Caulicolæ) *pinodes*, B. & Blox. Sparsa minutissima subhemisphærica depressa astoma; ascis brevibus; sporidiis medio constrictis uniseptatis.

On pea-stems. Twycross, Rev. A. Bloxam.

An obscure species, with scattered, extremely minute, subhemispherical, depressed, mouthless perithecia; asci short; sporidia ·0007 inch long, constricted in the middle, uniseptate.

PLATE XVII. fig. 34. Ascus and sporidia magnified.

982. *S.* (Caulicolæ) *caulium*, Fr., Desm. Ann. d. Sc. Nat. sér. 2. vol. xv. tab. 14. fig. 2 *a*. On dead stems of *Epilobium hirsutum*. Batheaston, Dec. 1858, C. E. Broome.

Exactly the plant of Fries, Scl. Suec.

983. *S.* (Foliicolæ) *Cariceti*, n. sp. Peritheciis subglobosis immersis; ostiolis punctiformibus; sporidiis linearibus curvatis utrinque acutis.

In marshy ground, on *Aira cæspitosa*. Batheaston, Dec. 1858.

Perithecia subglobose, minute; ostiola minute; asci clavate; sporidia biseriate, linear, curved, ·003–·004 inch long, acute at either end.

PLATE XVII. fig. 35. Ascus and sporidia magnified.

**S. Rabenhorstii*, B. & Br. Ann. Nat. Hist. ser. 2. vol. ix. p. 324 = *Valsa suffusa*, Fr.

984. *S.* (Foliicolæ) *microspila*, n. sp. Peritheciis globosis sparsis, singulo pluribusve macula minuta fusca e mycelio subtili oriunda immersis; sporidiis oblongo-ellipticis uniseptatis.

On leaves of *Epilobium montanum*. Orton Wood, near Atherstone, Rev. A. Bloxam.

Perithecia scattered, globose, one or more immersed in a minute brown spot arising from the delicate mycelium; asci cylindrical; sporidia ·0002–·0005 inch long, oblongo-elliptic, uniseptate.

PLATE XVII. fig. 36. Ascus and sporidia magnified.

985. *Rhizoctonia Menthæ*, n. s. Primum floccoso-cæspitosa fulva, demum compacta violacea.

On mint in gardens, just above the surface of the soil. Batheaston, C. E. Broome.

When young, consisting of little tufts of short tawny threads resembling in structure, though not in colour, those of *R. violacea*; creeping below, erect above and slightly branched, and bearing apparently at their tips subglobose conidia ·003–·004 inch in diameter. The tips at length acquire a violet tint, which gradually spreads as the tufts become compact and converted into sclerotiiform bodies as large as a grain of mustard-seed, which are connected with each other by a violet web. These bodies are in general quite smooth, but occasionally they retain about them little tawny patches which still show traces of the original threads. There is no papillæform apex as in *R. Crocorum*.

This appears to be the first time that anything like fruit has been found in *Rhizoctonia.* The little spore-like bodies seem, however, rather to be conidia than true spores; and we have yet to ascertain what is the real character of these destructive parasites.

[To be continued.]

LIII.—*On the Cerebral Characters of Man and the Ape.* By Prof. Richard Owen.

[Plates XIX. XX. XXI.]

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

It may be acceptable to those who desire to know the facts of the observed differences between the structure of the brain in the lowest race of Man and in the highest race of Ape to be able to compare the figures of the parts as seen and delineated by Tiedemann*, Vrolik, and Schroeder van der Kolk†, at a period before the authors of 'Vestiges of Creation' and 'Natural Selection' had revived the question of the transmutation of species, and by anatomists investigating and recording the facts without reference to, or apparently a thought of, the question whether Man be or be not a descendant of the Ape.

I therefore send exact copies of the figures of the smallest Negro's brain, figured by Tiedemann in the 'Philosophical Transactions' for 1836, and of the brain of the Chimpanzee, figured by the Dutch anatomists in the Transactions of the Royal Netherlands Institute for 1849. Figs. 1 and 2, Pl. XIX., show the brains of the Negro ‡ and the Chimpanzee of the natural size, and the relative size of the cerebrum to the cerebellum, as observed by Schroeder van der Kolk and Vrolik § in the Chimpanzee (*Troglodytes niger*). Figs. 1 and 2 in Pl. XX. show the extent to which the cerebellum is overlapped by the cerebrum, by means of a vertical section of the brain of the Negro||, and by a like section of the brain of the Chimpanzee¶. Fig. 3. Pl. XX. is a copy of fig. 4. plaat 2 (*tom. cit.* Schroeder van der Kolk and Vrolik), showing the extent of the development of the lateral ventricle and its principal eminences in the brain of the Chimpanzee.

* "On the Brain of the Negro compared with that of the European and the Orang utan," Phil. Trans. 1836.

† "Ontleedkundige nasparingen over de gedaante en het Maaksel der Hersenen van den Chimpanse." Nieuwe Verhandlingen der erste Klasse van het Koningl. Nederlandsche Instituut, &c. Amsterd. 4to.

‡ Tiedemann, *loc. cit.* tab. 32.

§ *Loc. cit.* pl. 1. fig. 2.

|| Tiedemann, *loc. cit.* pl. 33.

¶ Schroeder van der Kolk and Vrolik, pl. 2. fig. 1.

My own dissections of the brains of the Chimpanzee, and Orang utan, and of a partially decomposed one of the Gorilla, have assured me of the accuracy of the Dutch anatomists' figures, as rightly and truly representing the degree to which the brain in the Ape approaches in size and structure to that in Man; save that, in the Gorilla, in connexion with its greater proportional muscular development, the proportional size of the cerebellum is larger than in the Chimpanzee and Orang; and in that respect both the latter Apes seem to approach nearer to Man.

But the difference, as compared with the Negro, is so much greater than is that observable between any two steps in the descending series from the Chimpanzee to the Lemur—or, in other words, the rise in cerebral development is so great and sudden in the Negro, especially when the bulk of Man's body is considered*, that it seems to me to constitute one and the most important of the differential structural characters between the Human and Ape kinds.

In the brief definitions used in systematic zoology for groups characterized on such differences, the meaning of terms must be defined; and this I was careful to do in my Paper on the primary distribution of Mammals according to cerebral characters†. I had previously, with other anatomists, used the term 'posterior lobe' of the cerebral hemisphere in a somewhat vague sense; knowing, as Cruvelhier, Todd, and others have stated, that there was no natural boundary marking out a posterior lobe from the so-called middle lobe in the human brain. To make my meaning clear, when it became especially requisite to do so, I therefore proposed a definition from internal structure and relative position, and signified the 'posterior lobe' as that "which covered the posterior third of the cerebellum and extended beyond it." The accepted definitions in Human Anatomy, of the 'posterior cornu' of the lateral ventricle and its eminence the 'hippocampus minor,' were so precise and determinate, that propositions regarding them could not, I thought, be mistaken. As it seems, however, that they have been, I here quote from a late and deservedly esteemed compendium of descriptive Anthropotomy ‡: "The 'posterior cornu,' or digital cavity, curves backwards into the substance of the posterior lobe, its direction being backwards, outwards, and then inwards. On its floor is seen a longitudinal eminence which corresponds with a deep sulcus between two convolutions: this is called the 'hippocampus minor'" (p. 463).

* From known physiological necessity, the brain is relatively large in immature and small warm-blooded Vertebrates.

† Proceedings of the Linnæan Society, 1857.

‡ Anatomy, Descriptive and Surgical, by Henry Gray, F.R.S. 8vo, 1858.

A transverse eminence, called *pes accessorius* or *eminentia collateralis* (by the Dutch anatomists termed 'pes hippocampi minoris'), is "placed between the hippocampus major and minor at the junction of the posterior with the descending cornu" (p. 465). This latter part is indicated "als aanduiding van den kleinen vogelklaaw (*pes hippocampi minor*) (pl. 2. fig. 4 *e*)," p. 9 *. There is no continuation of the lateral ventricle curving backwards, outwards, and inwards, nor any eminence accompanying it in those directions and extent, in any known Ape.

However, I have no more doubt that my fallible fellow-labourers in anatomical science have spoken the truth, as they conceived it, in affirming the higher Apes to possess the 'posterior lobes,' 'posterior horn of the lateral ventricle,' and 'hippocampus minor,' than that I believe myself to be enunciating a strictly scientific truth when, agreeably with the definitions of those parts, I affirm them to be peculiar to the human species.

I am, Gentlemen,

Your obedient Servant,

Richard Owen.

EXPLANATION OF THE PLATES.

Plate XIX.

Fig. 1. Upper surface of the brain of a Negro, nat. size. (Phil. Trans. 1836, pl. 32, Tiedemann.)

Fig. 2. Upper surface of the brain of a Chimpanzee, nat. size (Nieuwe Verhandlingen der erste Klasse van het Koningl. Nederlandsche Instituut, plaat 1. fig. 2; Schroeder van der Kolk and W. Vrolik): *c*, cerebrum; *b*, cerebellum.

Plate XX.

Fig. 1. Left moiety of a bisected brain of a Negro, nat. size. (Phil. Trans. 1836, pl. 33, Tiedemann.)

Fig. 2. Left moiety of a bisected brain of a Chimpanzee, nat. size. (Nieuwe Verhandlingen, &c., plaat 2. fig. 1; Schroeder van der Kolk and W. Vrolik.)

Fig. 3. Right moiety of a dissected brain of a Chimpanzee, showing the lateral ventricle, nat. size. (*Ib.* pl. 2. fig. 4; *ib.*)

In this and the following figure—*a*, corpus striatum; *p b*, tænia hippocampi; *c*, hippocampus major; *d*, descending cornu of ventricle; *e*, pes accessorius, seu pes hippocampi minoris; *f*. hippocampus minor; *g*, posterior horn of lateral ventricle.

Plate XXI.

Right moiety of a dissected Human brain, showing the lateral ventricle, nat. size. (Gray, Anatomy, Descriptive, &c., 8vo, p. 462. fig. 244.)

* Ontleedkundige, &c., *loc. cit.*

LIV.—*On the possible Identity of* Paussus lineatus, *Thunberg, and* P. Parrianus, *Westwood; with Notes on the Characters of Specimens taken at the Cape of Good Hope.* By W. H. Benson, Esq.

Paussus lineatus was described and imperfectly figured by Thunberg, in 1781, from a specimen taken by him at the Cape in 1772. In 1847, Westwood described and figured *P. Parrianus* from a Natal specimen. When I made my first capture of the latter species, under Table Mountain, in June 1846, I recorded in my journal an impression that it was *P. lineatus*; but on observing that Thunberg had omitted any mention of the hinder excavation and other less important characters, I arrived at the conclusion that the species was undescribed, while expressing surprise that a *Paussus* so frequent near Cape Town should have escaped the notice of the Swedish naturalist.

On the other hand, it is an important fact that no species tallying more accurately with *P. lineatus* has yet been discovered, notwithstanding the large accessions latterly made to the genus from Southern Africa; while the really slender form of *P. Parrianus*, especially when viewed with the antennæ set in the position indicated in Thunberg's drawing, and an agreement in other particulars, some of which have been omitted by Westwood, afford grounds for suspicion that the two species may eventually prove to be identical. Moreover, the imperfection of the magnifying powers possessed in Thunberg's day, and the difficulties which must have attended the delineation of the figure, eighty years ago, by an artist unaccustomed to sketch such minute forms, and with but few allied species for comparison, should be borne in mind. In spite of increased facilities for observation, and the better-known peculiarities of various sections and numerous species, the figures and descriptions of these minute insects have not, even in more recent times, been devoid of important errors, which have led to confusion by a too implicit reliance on published characters.

One of my specimens has the antennæ fixed nearly in the position in which Thunberg's figure was drawn; and it is remarkable how nearly the form of the clava corresponds therewith, when observed by the unassisted eye; and even when a lens is used, the angularity of the summit alone presents any very obvious difference. Compared with Westwood's figure in the 5th vol. of the 'Transactions of the Entomological Society,' pl. 2. f. 3, wherein the clava is given in a position which it scarcely approaches naturally in any specimen, the whole insect has a slender appearance, agreeing better with the copy of *P. lineatus* in pl. 94 of the 'Arcana Entomologica' than with the stout form portrayed in the 'Trans. Ent. Soc.,' where the anterior portion of *P. Parrianus* is deficient in slenderness, exhibiting a shortness and breadth in the prothorax and front of the head which are far from being characteristic.

Thunberg's characters of the head of *P. lineatus* are, "Caput suborbiculato-angulatum, punctis depressis, inæqualè marginatum." In the description of *P. Parrianus* the slight concavity of the centre of the head is recorded, as well as the scarcely raised margin of the organ, which is said to be subelevated posteriorly. In reality, the hinder margin will be found to be considerably elevated when compared with the rest of the head; and a double prominence, separated by a longitudinal impression, and unnoticed in the figure or description of either species, will be evident on examination. The surface of the head is closely punctate; and a transverse row of indistinctly formed impressions runs across the cavity between the eyes, the central one being deepest, and placed at the termination of a slightly impressed sulcus running back from the emargination of the clypeus. In Thunberg's figure, the shading of the head expresses not unaptly the posterior marginal elevation, which is not well represented in the engraving of *P. Parrianus*.

A sure token of the carelessness of Thunberg's artist, in certain details, will be observed in the forward position given to the eyes, at the sides of the clypeus, instead of at the wide part of the head further back, in the great size of the scutellum, and in the form of the apices of the elytra,—characters which we may feel assured are non-existent in any species of *Paussus*. Westwood, in p. 627 of the 2nd vol. of the 'Linnæan Transactions,' admitted that *P. lineatus* was "indifferently figured," and, in p. 648 of the first volume, stated that he was not convinced that the species ought not to be inserted in the first section of the genus, viz. with a sub-bipartite thorax. Actually the thorax in Thunberg's figure has much similarity to the appearance presented to the unarmed eye in *P. Parrianus*; and the correctness of Westwood's first impression is materially strengthened by the circumstance that the anterior portion of the prothorax has the outline observable in the 1st section, and not known to exist in a single species of the 2nd section, whether African or Asiatic. The shading of the central part of the prothorax of *P. lineatus* is very imperfect; and a slight depth added to it would assimilate that part to *P. Parrianus*; and would correspond with Thunberg's description of an apparently bipartite prothorax—"Thorax inæqualis, lateribus utrinque unispinosis, antice elevatus; postice rotundatus, foveis in medio 3 impressis," these three impressions answering to the two pits formed by the front part of the raised W, to which the sculpture of the disk is compared in *P. Parrianus,* added to the deep central cleft between the tubercles of the anterior portion.

The difference noted in the colouring of the elytra of the two species is immaterial, inasmuch as, in one specimen which I possess, the elytra, instead of being black with a testaceous border, are testaceous, with an elongate dark separate patch on each wing-case; and in another example the dark portion is nearly obsolete.

We now come to a more minute survey of the important clavæ of the antennæ; and if those of *P. lineatus* are imperfectly and cursorily described, we shall find that the appliances of modern science have not sufficed to obviate certain omissions, and that an incorrect idea of portions of the clava is afforded even in the highly magnified extra figures of *P. Parrianus.*

It is due to the distinguished entomologist to whom science is so deeply indebted, and who has done so much to extend our knowledge of this particular family, to observe that he was probably unwilling to injure specimens by detaching clavæ in order to examine them carefully from every point of view; whereas, after furnishing examples to his and some other cabinets, the number of specimens still retained by me rendered such injury a matter of less consequence, and conferred some advantages, notwithstanding my limited experience. The published figure of *P. Parrianus* is taken from a very small specimen. Some of my examples are larger than the size assigned to *P. lineatus.*

It is scarcely a subject for surprise that Thunberg should have omitted to record the partial excavation actually found in *P. Parrianus,* when the more apparent and determined navicular cavity of *P. thoracicus,* Don., was passed over by Lamarck in 1817: the whole of his description of *P. trigonicornis,* Latr., was summed up in the short characters, "*P.* rubro-ferrugineus, antennarum articulo secundo compresso trigono"! It may be objected that Fabricius, in describing *Cerocoma lineata,* wrote "clava elongata integra." Had he actually examined a specimen, or judged merely from Thunberg's omission?

Thunberg made no attempt to describe the general form of the clava, and contented himself with recording its breadth, compression, obtuse summit, and the truncate base spined at its exterior angle,—omitting the other characters, inclusive of the parallel undate rugæ on the upper surface, although a rude attempt to represent them is evident in the figure. These rugæ are replaced, in the figures of *P. Parrianus,* by a series of marginal loops, which fail to give a correct idea of the character of the sculpture; and the ridges are not even alluded to in the printed description in the 'Trans. Ent. Soc.,' although they occupy such a large portion, and are so conspicuous on the upper side of the clava. If, as is frequently the case with specimens of *Paussus*, Thunberg's beetle was gummed on a card, the position given to the clavæ in the figure of *P. lineatus* would have effectually prevented the obtainment of a view of the cavity. Is the species still extant in any Swedish collection?

There is something very peculiar in this partial excavation, which stops far short of the extremity of the clava. It lies chiefly under the crenulated portion of the upper and hinder side, shelving gradually towards a longitudinal sulcus bounding the inner margin of the slightly elevated lip of the lower and hinder edge, which falls far short of the superior margin. The upper side of the clava is convex, and is occupied chiefly by the undate ridges and furrows; and there exists a corresponding row of slight depressions along the anterior margin, which, in certain positions, make the sculpture appear as if it extended over the whole breadth of the clava. The under side is concave, and traces of obsolete transverse furrows are also visible in the deeper portion of the depression.

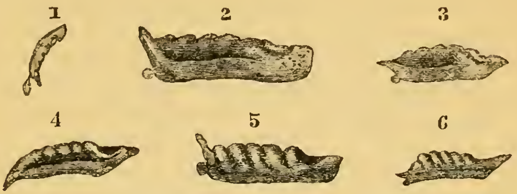
Another feature peculiar to this clava is that the last of the five crenulations, instead of forming (like the first four of the upper posterior margin) the edge of the excavation, is lobed, and thrown obliquely backward on the thick portion which intervenes, on the lower face, between the excavation and the summit, and it exhibits, moreover, on the upper side, a long concave sinus towards the thickened extremity of the clava. The first four crenulations are curved over the polished internal cavity. The convex thickened part of the lower side towards the extremity is punctate.

A small polished ball intervenes between the clava and the first joint of the antenna, and plays in a socket in the latter. It is indicated in Westwood's fig. 3 *d*.

In my notes on the capture of *P. Parrianus* at the Cape (printed in the 5th vol. of the Trans. Ent. Soc. pp. 30–32), I stated that I had detected no sexual distinctions. On a reexamination of fourteen specimens, of which I retain either the perfect form or the abdominal portion, I find in seven individuals two diverging spines on the under side of the centre of the podex, like those which I recorded in my specimen of *P. Burmeisteri*, W. Similar spines are present in my Futtehpore specimen of *P. thoracicus*; and they are delineated in the 'Arcana' in pl. 90. f. 2 *c* and pl. 93. f. 2 *b*, in specimens of *P. Stevensianus* and *P. armatus*. In one of the two figures given by Capt. Boys of *P. Fichtelii* they are also apparent. They are, doubtless, a sexual appendage; and if, as I am inclined to believe, they are peculiar to the male, their connexion with crepitation (which I also consider to be a male character), in my specimen of *P. Bur-*

meisteri, is an interesting fact. On occasions when a pair of *P. Parrianus* occurred, only one individual was recorded as having crepitated. When eight were found together, several were noted as exhibiting the habit; and two specimens, taken singly, crepitated on capture.

Cheltenham, April 29, 1861.



Clavæ of Antennæ of *Paussus Parrianus*, Westw.

1. View of right clava in the position delineated in Thunberg's specimen of *P. lineatus*.
2. Right clava, under side, with the partial hinder cavity, in profile.
3. Right clava, exhibiting more of the excavation.
4. Right clava: direct view into the excavated portion bounded above by the overhanging superior crenulated edge, and below by the inferior lip.
5. Left clava, upper face.
6. Left clava viewed in profile from the anterior edge.

LV.—*Zoological Notes on perusing* M. Du Chaillu's '*Adventures in Equatorial Africa.*' By Dr. J. E. Gray, F.R.S., V.P.Z.S.

A short time ago we were informed that there had arrived a new traveller from Africa who had examined the country near the equator—in fact, the tract between those examined by Livingston and Speke. He read his paper before the Geographical Society; and I suppose, as I find no astronomical observations, not even any diaries of his route in his 'Explorations,' and the most odd-looking ranges of mountains in his maps, that they soon discovered that he had but few qualifications for a scientific geographer. But some of the Fellows of the Society seem to have been so much interested with his tales of his adventures with the Gorilla and other animals, and especially with his extraordinary accounts of the cannibal propensities of the inhabitants, that they have assigned to him a room in their house in which to show his collections, and have invited the fashionable world of London to come and inspect them.

If these gentlemen had been as conversant with zoology, and especially with the zoology of Western Africa, as they are with its geography, they would soon have discovered that M. du Chaillu was as little able to extend the domains of zoological and ethnological science as he was to be a good geographer; but unfortunately some persons are often most interested in that which they know least about.

I shall pass over the disgusting accounts of the cannibal habits of the natives (see pp. 84, 88, 94), which disfigure the narrative, merely with the declaration that I cannot believe them without better evidence. The occurrence of cannibalism to the extent which he states to exist among certain tribes, as the 'Fans,' is simply impossible; the tribe would soon cease to exist: it is quite as impossible as the celebrated story of the two Kilkenny cats. Further, it is inconsistent with the accounts of all my friends who have lived in different parts of the west coast of Africa, and even at Gaboon itself: they say they often hear of its existence, but have never been able to trace a case home; while, on the contrary, they say the negro has a great fear of a dead human body. I do not deny that sometimes the chiefs, at a religious ceremony, or out of bravado, do eat some parts of their enemies that have been killed in battle; but I cannot believe, without much better evidence, that man does what no other animal is here accused of doing—that is, eat as common food its own kind: it may be done as an exception, while in a morbid state, as when a sow eats its young, but not as a rule.

In the preface to the 'Adventures' (p. viii), the author observes, "A brief summary of the results of my four years' travels will perhaps interest the reader. I travelled, always on foot, *and unaccompanied by other white men*, about 8000 miles. I shot, stuffed, and brought home over 2000 birds, of which more than 60 are new to science. I killed upwards of 1000 quadrupeds, of which 200 were stuffed and brought home, with more than 80 skeletons. Not less than 20 of the quadrupeds are species hitherto unknown to science.

"The singular region of Equatorial Africa, the interior of which it was my fortune to be the first to explore, and of whose people and strange animal and vegetable productions I give some account in the following pages, is remarkable chiefly for its fauna, which is in many respects not only extraordinary, but peculiar. In this comparatively narrow belt, extending on either side of the equator, is found that monstrous and ferocious Ape, the Gorilla. Here, too, and here only, is the home of the very remarkable nest-building Ape, the *Troglodytes calvus*, the 'Nshiego mbouve' of the natives; of the hitherto unknown *Kooloo kamba*, another Ape no less remarkable than the *T. calvus*; and of the Chimpanzee. North, south, and east of this region the Lion lords it in the forest and the desert; only in this tract he is not found."

As soon as I was informed that the collection was open to the Fellows of the Geographical Society and their friends, I went to look at it; and I must own that I was much disappointed at not finding a single animal that I had not before seen from the different trading stations on the west coast of Africa, and that all the species that were marked with new names were merely old friends under new designations; and I was much surprised to observe that they were generally preserved in such a state as to show that they must have been prepared in or near the habitation of civilized man, and not in the "jungle," whence they would have to be carried.

The specimens were generally in a bad condition, and a number of them were so stretched that it would be quite impossible ever to reduce them to a natural state. Since I saw them, I have been informed that some more specimens of the Gorilla have been stuffed by Mr. Bartlett; and this family of "Mr., Mrs., and Miss Gorilla," as they are called, affords an interesting group of objects to the fashionable visitors.

I did not observe a single specimen which would show that the collector had examined any country that had not before been open to European collectors; in fact, all the specimens exhibited were such as might be obtained from, and may have been sent home by, the missionaries and traders at the different stations on the west coast of Africa. I was also astonished to find species which I had hitherto believed to be local to parts of the coast distant from each other, all here said to be found in one single limited locality.

I may observe that perhaps M. Du Chaillu uses the phrase "new and undescribed" in a peculiar sense; for he calls the 'wild Bull' "a quite new and hitherto undescribed species of Buffalo" (p. 306), yet he terms it *Bos brachyceros* (or, as he chooses to write it, *Bos brachycheros*)—the name by which I described and figured it in 1837.

As far as I can understand, it seems to be the popular belief that nothing was known of the Gorilla and its osteology until M. Du Chaillu arrived here with his collection; indeed, the editor of a leading literary and scientific weekly journal said to me the other day, "You don't mean to say that there are any bones of the Gorilla in this country except those brought by M. Du Chaillu?" I think the best answer to that question is in the fact that the only figure of the skeleton of the Gorilla in M. Du Chaillu's book, viz. the figure of the "Skeleton of Man and the Gorilla," at p. 370, is not from any skeleton that he brought, but from that in the British Museum; nor is it an original figure, but a copy of the photograph taken by Mr. Fenton for the Trustees of the British Museum, and now sold at the Kensington Museum for a few pence. The upper bone of the left arm (which in the specimen is broken and repaired, and shortened) has been made perfect; but the artist, in making the alteration, has forgotten to increase its length, so as to make it of the same length as the perfect bone on the right side. It is not correctly copied; for the skeleton of the Gorilla is made stronger, broader, and more powerful, while that of the Man is proportionally diminished, so as to give anything but an accurate comparison.

The animal represented in the frontispiece is not from any specimen he collected, but is copied, with a very slight and prudish alteration, from M. Geoffroy's figure, published in the 'Archives du Muséum,' vol. x. p. 1, from the specimen in the Paris Museum, and there called *Gorilla gina*. The figure of the "young Gorilla" given at p. 206 is from pl. 7. f. 2 of the same paper, also from a specimen in the Paris Museum. This paper was published in 1858.

Without entering into particulars with regard to the habits of the adult Gorilla, which we have not had the means of verifying, it is evident that we must make great allowance for the exaggeration which some travellers seem to think it necessary to infuse into their narratives; and it is certain that the same correction is necessary as regards the plates which are given to illustrate the habits of the animal, which have evidently been prepared from the notes of the traveller, and not executed by an artist who has seen it in its native haunts. But I cannot avoid stating that the following accounts of the young Gorilla are not consistent with those that I have received from persons who have kept more than one specimen alive for several months in the Gaboon, or with the fact that one lived so long in confinement as to be shipped for the Zoological Society, and these specimens were described as anything but specially malignant or ferocious :—

"I think the adult Gorilla utterly untameable. In the course of the narrative, the reader will find accounts of several young Gorillas which my men captured alive, and which remained with me for short periods till their death. In no case could any treatment of mine, kind or harsh, subdue the little monsters from their first and lasting ferocity and malignity" (p. 352).

"But the Gorilla is entirely and constantly an enemy to man—resenting its captivity, young as my specimens were—refusing all food except the berries of their native woods, and attacking with teeth and claws even me, who was in most constant attendance upon them; and finally dying without previous sickness, and with no other ascertainable cause than the restless chafing of a spirit which could not suffer captivity nor the presence of man" (p. 353).

"A young one of between two and three years of age required four stout men to hold it, and even then, in its struggles, bit one severely."

Having himself given these wonderful accounts of the habits of the Gorilla, he observes (p. 347), "I am sorry to be the dispeller of such agreeable delusions,—but the Gorilla does not lurk in trees by the road-side, and drag up unsuspicious passers-by in its claws and choke them to death in its vice-like paws; it does not attack the elephant and beat him to death with sticks; it does not carry off women from the native villages; it does not even build itself a house of leaves and twigs in the forest trees, and sit on the roof, as has been confidently reported of it. It is not gregarious even; and the numerous stories of its attacking in great numbers have not a grain of truth in them."

A naturalist, in a note to Mr. White, observes, "I was surprised, on my return to Europe, to find the Gorilla all the go, and the matter treated in this country as if the specimens brought by the American [traveller] were the only ones Europeans had as yet cast eyes upon. A very fine *fully*-developed specimen of *Troglodytes gorilla* was shown at the Meeting of Naturalists at Vienna in 1856, and had been there for some time. I was much struck with the vast difference in size between the huge Vienna specimen (being almost a head taller than I am, and I am 6 feet odd) and those exhibited at the Royal Geographical Society's rooms. Dr. Norton Shaw thought that I was going to stuff him when I told him that I had seen the Gorilla years ago, and in much better condition." I may say that there are specimens in Paris, Brussels, and Leyden, as well as in the British Museum collection, which are quite as large as those which I saw in Whitehall Place. I think I may say, without any fear of contradiction, that the Gorilla and its osteology and anatomy are far better known than nine-tenths of the mammalia in existence.

I have already referred to the author having appropriated Geoffroy's figure of the old and young Gorilla, and Fenton's photograph of the Gorilla-skeleton, to illustrate his work, and, I may add, without a word of acknowledgment of the source whence he derived them. He seems to have very peculiar ideas as to the way in which figures may be used to illustrate species, and also apparently to believe that the figures of the same species need not be alike in some important characters: thus, at p. 359, he gives two figures inscribed "*Nshiego mbouve* and young (*Troglodytes calvus*)," in which the figure of the older animal has rather small, and that of the young very large ears. The figure of the adult is probably an original one; but the figure given as the young of this which he calls (I believe, erroneously) a new species, is a copy of Geoffroy's figure of the photograph of the common Chimpanzee (*Troglodytes niger*)! and at p. 423, the two figures of the "Nshiego mbouve, in his shelter," have both large ears, like the young animal copied from the Chimpanzee; and as this is drawn by Mr. Wolf, they are probably drawn from that animal: so that three out of the four figures of this presumed species are from the Chimpanzee.

M. Du Chaillu gives three figures of the 'Kooloo kamba,'—the entire animal at p. 270, at p. 360 the head, and at p. 361 the ear and part of the head: the ears of the first two figures are very large in comparison with the other parts, while the detail figure of the ear at p. 361 is much smaller; and the form and expression of the faces of the figures at pp. 270 and 360 are very different from each other.

The figure of the young 'Nshiego mbouve' given at p. 232 (and we must recollect that this animal is regarded as a new and most distinct species, and named *Troglodytes calvus*, as distinct from the Chimpanzee or *Troglodytes niger*) is a facsimile copy of the figure given by M. Geoffroy in the 10th volume of the 'Archives du Muséum,' tab. 7. f. 4, as a representation from life of the young Chimpanzee in the Jardin des Plantes at Paris! And the figure of the presumed new species, on the plate at p. 359, which, as I have before observed, is so unlike the figure of the older animal on the same plate, is a copy of the same figure of Geoffroy's, but reversed in the copying.

I examined with care all the specimens of the apes in the collection at White Hall Place, and could only make out two—the Gorilla and the Chimpanzee: they are in different states of goodness, or, rather, badness; and one had lost the skin and hair of the scalp; and the above account of the figures of these presumed species renders them very doubtful.

But the most remarkable instance is at p. 454, where the author, describing an *Anomalurus*, says, "On examination, to my joy I found it a new species..... I have named this little animal the *Anomalurus Beldeni*;" and on the opposite page he gives a figure which he names *Anomalurus Beldeni*: this figure is a beautiful and accurate copy of Mr. Wolf's figure of *Anomalurus Beecroftii* in the 'Proceedings of the Zoological Society,' 1852, t. 32, from which, no doubt, M. Du Chaillu regards his *A. Beldeni* as distinct, or why does he give it another name? or does he think that one figure may serve to represent two species?

Species are not only described as new that have long been well known, but they are figured in such an incorrect or exaggerated manner as to render it impossible to make out what species they are intended to represent, much less to correct the error of the describer. Who, for example, could believe that the animal figured on the plate opposite p. 422, and called the White-faced Hog (*Potamochœrus albifrons*), is the same as the one now living in the Zoological Society's Gardens, which is well figured in the 'Proceedings' of the Society for 1852, p. 129, t. 34, as the Painted Pig of the Camaroons (*Potamochœrus penicillatus*)? yet the specimen in M. Du Chaillu's collection from which the figure is pretended to be taken is not only that species, but even the same variety of it.

Who could believe that the 'Naive' (the Wild Bull of Equatorial Africa)—"*Bos brachycheros*" on the plate at page 175, and again on the plate entitled "the Leopard and his prey" at p. 125, and also where it is shown tossing a native, at p. 204—is the same animal as *Bos brachyceros*, described and figured by me in the 'Magazine of Natural History' for 1837, and in the 'Annals of Natural History,' vol. ii. p. 284, t. 13? Yet the specimen in the collection leaves not the slightest doubt on the subject; and also shows that the position of the horns in each of these three representations is not consistent with nature, for they are all represented as having the horns recurved from the root, while they ought to have been represented as spreading out on the sides, and only recurved at the tips: so that persons who might be inclined to doubt the identity of my *Bos brachyceros* and M. Du Chaillu's *Bos brachycheros* (which, by the by, at p. 174, and again at p. 306, he calls "a quite new and hitherto undescribed species of Buffalo") must not be led away, by this inaccuracy in the representation of the animals, to believe the traveller's statement, and regard the two animals noticed under such nearly similar names as two species.

As to the animal being "new and undescribed," I may state that it and its habits were described by Denham and Clapperton, who brought home a head of it, now in the British Museum, under the name of the 'Zamouse;' that it was described and figured by me in 1837, as above referred to; and that it was described by Dr. Rüppell as found in Abyssinia.

I may observe that I am not inclined to place more reliance on his statement of the habits of this animal than the figures lead us to place in his accuracy as regards the representation of it. He describes it, at p. 124, as "a very savage beast," and at p. 306 remarks, "I do not think the *Bos brachycheros*, the wild bull of this country, could be tamed." The specimen which I described, on the contrary, lived for some years in the Surrey Zoological Gardens, and then went to the Jardin des Plantes at Paris, where it died; its skin is preserved in the museum of that institution. It was as tame and gentle as our common cattle. It is well known at Sierra Leone as the Bush Cow, and appears to be generally distributed over intertropical Africa.

At p. 306 he observes, "I saw several specimens of a very beautiful Antelope, *hitherto unknown*, which may be considered by far the handsomest Antelope yet discovered in Africa. This animal, of which I am enabled to give an excellent representation drawn from a well-preserved specimen in my collection, is rare and very shy, swift of foot, and exceedingly graceful in its motions, though more heavily built than most of the Antelope kind." On the opposite page it is figured as "the Bongo Antelope, *Trogelaphus albovirgatus*."

This animal, so far from being new, was noticed by Afzelius in the last century, and is the *Antilope euryceros* of Ogilby, described in 1836 from a head sent by Lieut. Allen from the Bight of Biafra, and the *Tragelaphus euryceros* of my 'Catalogue of the Hoofed Animals in the Museum Collection,' p.137. The skin in M. Du Chaillu's collection is certainly a very beautiful one, and it may be considered as the most interesting specimen in his collection; but the figure is so indifferent, and the description of the animal so incomplete, that it would be impossible to determine its real nature without having an opportunity of examining the skin. Indeed, the figures of the horns are so inaccurate (neither showing the frontal ridge nor the spiral twist), that they would lead one to refer the animal to a genus (or, rather, subfamily of genera) very different from that to which it really belongs; and the plate in the work appears to be a slightly altered copy of the figure of *Tragelaphus Angasii* from Port Natal, published in the 'Proceedings of the Zoological Society' in 1848.

I do not find anything in the work to confirm the opinion expressed in the preface—"Thus I feel almost certain that the Elephant of this region is a variety distinct in several particulars from his South-African brother." It is of little use making such observations unless they are backed by some reasons, or are supported by some specimens either of the animal or of some of the characteristic portions of the skeleton, as, for example, the skull or the teeth; but nothing of the kind appears to have been collected, or, at least, none are shown. At the same time he gives an account of the habits of the animal, and the mode of killing it by forming a "tangle" for it of "the vines they (the natives) tear down, and with them ingeniously, but with much labour, construct a kind of high fence or obstruction not sufficient to hold the elephant, but quite strong enough to check him in his flight, and entangle him in the meshes till the hunters kill him" (p. 82), which they do thus:—"At the first rush of the elephant, the natives crowd round; and while he is struggling in their toils, they are plying him with spears, often from trees, till the poor wounded beast looks like a huge porcupine: this spearing does not cease till they have killed their prey" (p. 83). From our knowledge of how long it took to kill 'Chunie' at Exeter

Change, with all the appliances of modern civilization, we might think this would be a protracted encounter; but no such thing, according to this veracious tale-teller. We are told that, in one case, where the elephant had killed one of the men, "they so beset it with spears, that in a few minutes it was dead" (p. 83); and further, at the time he first saw it, he observes, "To-day *we* killed four elephants in this way." It must be recollected that the spears are not even said to be poisoned, and, by the figures on the plate, they are of the usual slight and slender form. Some of the natives are even represented drawing the arrows out of the body of one elephant that they have killed, in order that they may use them against a second one!! The elephants of Equatorial Africa, if this account is true, must be much less strong and vivacious than those in other parts of Africa or India, where they are accustomed to tear up trees and force a path through the jungle. This account is very different from one I received from a friend who was for some years on the coast of Equatorial Africa. He says: "The officers and crew of his ship went to attack an elephant they saw near the coast. Jack armed himself with all manner of dreadful instruments of war. The party, more than 100 strong, shot at it from a distance, with all kinds of arms, great and small; at last the elephant charged them, when the whole band retreated helter-skelter; and a few days afterwards they saw the elephant enjoying himself as if nothing had happened to disturb his repose." What a pity they had not a few native spears, and the courage of these despised blacks! Yet, I would ask, what credit can be placed on the observations of a traveller who informs his readers that he "travelled always on foot, and unaccompanied by other white men," and who can sit down deliberately to tell us he took part in killing the elephant in the manner described; and not satisfied with merely telling us, absolutely places before the public a picture which professes to represent the scene, the mere inspection of which is enough to render every sensible person, who knows anything of the strength, intelligence, and habits of the elephant, suspicious as to the veracity of the relater?

I need hardly say with reference to a work with plates so manufactured, that the artist evidently had the Indian elephant, and not the African, in his mind when he drew this plate.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

The Botanist's Guide to the Counties of Aberdeen, Banff, and Kincardine. By G. Dickie, M.A., M.D., Prof. of Botany in the University of Aberdeen. 12mo. pp. xxxii, 344. London: Longmans, 1860.

Local Floras and lists of the native plants of Scotland are not abundant; and few of those that we possess pretend to much completeness. The 'Flora of Berwick' and the 'Botany of the Eastern

Borders,' by our lamented colleague Dr. Johnston, refer only partially to Scotland; Greville's and Woodforde's Edinburgh lists are now rather ancient, and require to be replaced by a modern work entering into particulars not then considered necessary. Gardiner's 'Flora of Forfarshire' supplies most of what is required concerning that county, which is especially interesting from its having been the chief field of the late G. Don's researches and discoveries, and also because it is "probably the best botanical county in the Highlands." The anonymous 'Collectanea for a Flora' of Moray was greatly praised on its publication, and, in the words of Mr. Watson, "took the lead in rejecting and questioning the introduced species of its district on something like a sound and uniform principle." Murray's 'Northern Flora' is unfortunately a mere fragment. Edmondston's 'Flora of Shetland' concludes the list of local floras, as far as their existence is known to us. This last-mentioned little book has now become so exceedingly scarce, and is in some respects so peculiar, that a new volume about the plants of Shetland (including also, if possible, Orkney) is very much wanted.

In addition to these more complete works, we possess lists of plants noticed in some districts either during a short residence therein, or in the course of a hasty tour. Although very incomplete, these catalogues are valuable when drawn up by qualified persons, with sufficient care, and uninfluenced by the desire (which is unfortunately common) to swell them as much as possible by including species of doubtful claim to insertion; but they are in no sense local floras.

It will thus be seen that a new and carefully prepared flora of a Scottish district is a valuable addition to our sources of information concerning the geographical distribution of plants in Britain. Dr. Dickie has produced such a work—one which will take a high place amongst the best of its class. The country to which it relates forms part of the "East Highlands" province of Watson. It consists of the counties of Aberdeen, Banff, and Kincardine, forming "a continuous quadrilateral tract of land in the north-east of the middle third of Scotland, of about 2960 square miles." It is "bounded on the south by one of the main offshoots of the Grampians and the N. Esk river, which separate it from Perthshire and Forfarshire; on the west by Inverness-shire, Elginshire, and the river Spey; on the north and east by the German Ocean." It includes much of the highest land in Britain surrounding the sources of the rivers Dee, Don, and Avon, and is especially deserving of notice as including within its limits the beautiful and botanically rich district commonly known by the name of Braëmar. Dr. Dickie furnishes us with a small but sufficient map of these counties and of portions of those adjoining them.

The 'Introduction' treats of the geography and climate. The latter is illustrated by tabular statements of the range of temperature and fall of rain, derived from observations made at Castle Newe, in Strathdon, at a height of 868 feet above the sea-level, at Braëmar 1180 feet above the same, and less perfectly at Aberdeen. At

Braëmar the temperature fell to zero of Fahrenheit in December 1859, to 9° in 1858, and to 4°·9 in 1857. At Castle Newe the lowest temperature observed during many years occurred in February 1838, when it is stated to have fallen to −12°. [We have not seen any account of the weather there at Christmas 1860.] The lowest temperature at Aberdeen is not mentioned. The average annual fall of rain and snow at Braëmar has been 33 inches, at Castle Newe 34, at Aberdeen 28 inches.

The flora is contrasted with that of Britain, taking Dr. Arnott's 'Flora' as the authority for the latter, and with the lists and districts used by Mr. Watson in his 'Cybele.' Special attention is also paid to the altitudinal distribution of the plants, and an interesting and instructive diagram given in illustration of it.

The 'Introduction' is followed by a good summary of the "Physical and Geological Structure" of the counties from the pen of Mr. Alex. Cruickshank.

The number of Phænogamic species included in this book is 690; and 91 others, which it is thought by Dr. Dickie ought to be excluded, as not truly indigenous are named in an appendix.

The author's tendency is manifestly rather towards Mr. Bentham's than Mr. Babington's views concerning species; and we have been amused by the rather frequent recurrence of the words "considered by some as identical" when obscure or ill-understood plants are being noticed. Dr. Dickie's opinion, if founded upon his own observations, would be highly valuable; not so that of the anonymous "some."

In addition to the scientific nomenclature, an English name is given to each species. Had these been the names used in the district, they would have possessed interest (and the real Gaelic name would have been of great value, as tending to show what are the ancient plants of the country, and as such known to the old inhabitants); but being often simply the names invented by English botanists, they are as much a technical nomenclature as the Latin terms, labour under the disadvantage of being unknown to most students, and are, we venture to add, undeserving of being known, and quite useless.

The time when plants flower in that northern region is well worthy of contrast with the seasons recorded for the blooming of plants in the southern parts of the kingdom. Dr. Dickie seems to have noted it carefully.

The localities are arranged as occurring in the counties of Kincardine, Aberdeen, and Banff respectively. We should have been better pleased to have seen the whole region treated as one, and divided into districts founded upon their physical and other peculiarities, the internal county boundaries being totally neglected. The inconvenience of the plan which is adopted is well illustrated by Banffshire, which extends as a long narrow strip of country from Ben-na-muichdhui, about 4300 feet in altitude, to the sea: it is sixty-eight miles in length, with an average breadth of only fourteen. The same may be said in a less degree of Aberdeenshire, which is narrow and mountainous at its upper end, although it widens greatly near the coast. If it is thought undesirable to neglect the county boundaries, Mr. Watson's vice-counties of North and South Aberdeenshire might well be adopted, although they are not altogether free from the objections to which we have adverted.

Taking Mr. Watson's floral types as a guide, Dr. Dickie arrives at the following results relative to the Aberdeenshire flora:—

"1. British.—Most of these constitute our common plants, almost everywhere diffused, and many of them familiar to all as ordinary weeds. Some of this type, however, though abundant in more southern parts of Britain, become scarce here, and may be ranked among our rare species; such are *Ranunculus auricomus, Arabis hirsuta, Arenaria trinervis, Bidens cernua, Lycopus europæus, Listera ovata, Malaxis paludosa, Alisma ranunculoides*, &c. &c.

"2. English.—Of this type comparatively few reach us, and some of them, though now extensively spread, very probably may have been introduced along with seeds of agricultural plants.

"3. Scottish.—Plants of this division are well represented in this part of Scotland, being 58 in number, and therefore about five-sixths of the British species, so designated, occur here. Most of them are abundant, and several are species highly prized by southern collectors. A few examples may be mentioned: *Rubus saxatilis, Trientalis europæa, Linnæa borealis, Pyrola media, Pyrola minor, Goodyera repens, Listera cordata*, &c. Three of them, *Linnæa, Trientalis*, and *Goodyera*, may be specially noted as very widely distributed and abundant here.

"4. Germanic.—There are only eight examples of this type in our list, and they are mostly rare or local plants; the total number of such in the British Flora being estimated at more than 190.

"5. Atlantic.—*Sedum anglicum* and *Scilla verna* are the only representatives; the latter confined to the north-western part of our coast, on the borders of the Moray Frith.

"6. Highland.—The plants belonging to this division are estimated at about 100 species in the whole British Flora; of these eight-tenths are found in our list. Many of these are very local, and entirely confined to the higher districts. A few of them reach the coast, and are found almost at the sea-level, viz. *Sedum Rhodiola, Saxifraga oppositifolia, Saxifraga hypnoides*, and *Polygonum viviparum*. Some others appear at a lower altitude along the course of the Dee and Deveron; such have probably been transported by floods; viz. *Oxyria reniformis, Epilobium alpinum, Alchemilla alpina*, &c. Among the more interesting of this type, found in the interior, and usually very local, may be mentioned *Astragalus alpinus, Mulgedium alpinum, Arbutus alpina*, and various species of *Saxifraga, Hieracium, Salix, Juncus, Carex*, and *Poa*.

"We can now form some idea respecting the characteristic features of the Flora. The plants belonging to the English, Germanic, and Atlantic types constitute but a very insignificant part of our native vegetation. In addition to the more common species, constituting the British type, there is a general intermixture of Scottish forms, and in particular localities the Highland type predominates."

In addition to the flowering plants, we are furnished with a very full list of the localities for the Mosses, Characeæ, Lichens, Algæ, and Fungi.

Although we have made a few objections to parts of this book, we nevertheless can recommend it very strongly to the notice of our readers, especially to those who may contemplate a Highland tour.

Seasons with the Sea-horses; or Sporting Adventures in the Northern Seas. By JAMES LAMONT, Esq., F.G.S. London: Hurst and Blackett, 1861.

A SHORT visit to Spitzbergen, in 1858, whilst yachting on the coast of Norway, convinced the author that "wonderful sport, and of a most original description, was to be obtained there by any one who would go at the proper season, with a suitably equipped vessel and proper boats, manned by a crew of men accustomed to the ice and to the pursuit of the walrus and the seal." In the spring, therefore, of 1859 Mr. Lamont prepared his expedition; and after some little delay he started, in company with another keen sportsman, Lord David Kennedy, for Hammerfest, whence they took a regular "jagt" or sealing-sloop, with boats, harpoons, lines, lances, blubber-knives, casks, provisions, &c., and with a "Skyppar" and crew of Norsemen. We will not follow our adventurers through their weary waitings in fogs and mist, their exciting boat-hunts after seal, walrus, and bear, their scrambling chases of the white bear on the coast-ice, and their more pleasant stalking of silly reindeer on the land—resulting in the killing of 46 walruses, 88 seals, 8 bears, 1 white whale, and 61 reindeer—besides some other 20 walruses and 40 seals slain but lost,—but we propose to avail ourselves of some of the many scraps of natural-history information that this very interesting book on Northern sports affords. We must premise that our author is not a mere sportsman, blind to everything but his victims and the general aspect of the scenery around. On the contrary, he has his eyes open to zoological, botanical, and geological phenomena; and in the last-mentioned department of science especially, though an amateur, he has not been by any means unsuccessful in recording facts of importance, and in bringing home useful material for geologists to work upon, as the Appendix to his book, and the Journal of the Geological Society, attest.

Mr. Lamont scarcely leaves Hammerfest before he finds something to observe about ptarmigan, mosquitoes, cod-fish, and the arctic shark; the last (sought after for the sake of his liver and there sulting "cod-liver oil") affords such good sport, between Finmarken and Bear Island, where he is fished for with lines baited with seal-blubber at from 100 to 150 fathoms, that "a summer month with *Squalus borealis*" will perhaps be the title of one of next year's sporting books.

The habits, character, and features of the Great Spitzbergen Seal (*Phoca barbata*) are given at pages 55 *et seq.*, and full instructions how to shoot him through his brain, small as it is, are carefully laid down. Ten feet long, six feet in circumference, weighing 600 pounds, with blubber 2 or 3 inches thick, and worth for its oil (at present) about 5 or 6 dollars, and one or two more for its skin—these are points of interest in this seal. A bushel of nice fresh prawns, in the stomach of one, was evidence of seals' diet. Medusæ and Clios seem also to be their food. The "Talking-seal" in London would have eaten, it is said, a hundred pounds of fish a day, if it could have got it. In cutting up some large seals in Deeva Bay, Mr. Lamont "found the stomachs of several of them containing a bushel or so apiece of small fish about 5 or 6 inches long and resembling young cod. I believe," says he, "there are no fish of any size in the Spitzbergen seas, for we tried often with hook and line and never caught a single one" (p. 116).

"The Great Arctic Seal dives in exactly the same manner as the walrus—I mean by making a semi-revolution, whale-fashion, as he goes down; but, singularly enough, the Small Seal of Spitzbergen (*Phoca vitulina*), called by the hunters the 'Stein-Cobbe,' from his habit of occasionally lying on the rocks [the great seal being found on the ice only], dives by suddenly dropping himself under water, his nose being the last part of him which disappears, instead of his tail, as with his great congeners *Phoca barbata* and the walrus." The small seal, much less abundant than the large seal, "has a very fine spotted skin, and is about 60 or 70 lbs. in weight; he is much fatter, in proportion to his size, than *Phoca barbata*; and, his carcase in consequence having less specific gravity in proportion to its bulk, he floats much longer after he is killed in the water, so that they are seldom lost after being shot" (p. 155). . . . . . "There is also a third variety of Seal found in the Spitzbergen seas (*Phoca hispida*?), the 'Springer' or 'Jan Mayen Seal,' as he is called by the hunters." This seal is gregarious, the others are solitary in their habits. It swims rapidly in bands of from 50 to 200, leaping simultaneously (porpess-fashion) at wide intervals. This seal is very rare at Spitzbergen, but enormously abundant to the westward amongst the vast ice-fields around Jan Mayen's Island: it weighs from 200 to 300 lbs., and is the fattest and most buoyant of all the Arctic *Phocæ*.

Mr. Lamont soon brings us into acquaintance with the Walruses also,—a cow-walrus and calf among them; these latter give the harpooner an opportunity of showing how the possession of the calf or "junger," and making it grunt and cry, enable the hunters to bring a whole herd of walruses within reach of the harpoon or rifle.

A full-sized old bull-walrus weighing 3000 lbs. may yield some 600 lbs. of blubber, with only about double the quantity of oil that a good seal yields. Its hide is worth from four to eight dollars, and is used for harness, soles, rigging, and for glue: while seal-skins are converted into "dog-skin" gloves, "Dundee kid," &c. Young walrus is stated to be "good meat and without the disagreeable fishy flavour of seal, but slightly insipid."

Walruses frequent the ice-floes in water at from 10 to 15 fathoms; they "cannot descend in more than about 25 fathoms." Towards the end of August they herd on islands or the mainland, in secluded bays, in closely packed masses, "sometimes to the number of several thousands;" "and there they remain in a semi-torpid state for weeks together." When met with in this state by the hunters, a rich harvest of blubber, hide, and ivory is obtained; but too often brutally wanton and reckless massacres of the valuable beasts seem to have taken place (p. 187).

The "old bulls are always very light-coloured, from being nearly devoid of hair; their skins are very rough and rugose, like that of a rhinoceros; and they are generally quite covered with scars and wounds, inflicted by harpoons, lances, and bullets, which they have escaped from, as well as by the tusks of one another in fights amongst themselves. I have frequently observed them fighting with great ferocity on the ice. They use their tusks against one another very much in the manner that game-cocks use their beaks. From the animal's unwieldy appearance and the position of his tusks, one is apt to fancy that they can only be used in a stroke *downwards*; but, on the contrary, they can turn their necks with great facility and quickness, and can strike either upwards, downwards, or sideways, with equal dexterity. I have little doubt but that in the amatory season these conflicts are often fatal. Old bulls frequently have one or both their tusks broken, which may arise either from fighting, or from using them to assist in clambering up the ice and rocks. These broken tusks soon get worn and sharpened to a point again by the action of the sand, as the walrus uses his tusks, like the elephant and the boar, for ploughing his food out of the ground, with this difference, that the operations of the sea-elephant, as he ought to be called, instead of the sea-horse, are carried on at the bottom of the sea. I have frequently opened the stomachs of walruses and found their food to consist of quantities of sand-worms, starfish, shrimps, and clams and cockles. I believe they also eat submarine algæ or sea-weeds, and Scoresby mentions having found the remains of young seals in their stomachs; but I imagine the latter case to be an unusual one" (p. 141). . . . "The calf has no tusks the first year; but the second year, when he has attained the size of a large seal, he has a pair about as large as the canine teeth of a lion; the third year they are about 6 inches long. Tusks vary very much in size and shape according to the age and sex of the animal. A good pair of bull's tusks may be stated as 24 inches long, and 4 lbs. apiece in weight." A very large pair, of unusual size, "measured 31 inches in length when taken out of the head, and weighed 8 lbs. each." Cows' tusks are seldom more than 20 inches long, and 3 lbs. each in weight; they are set closer together than in the bulls, and even overlap at the points as in the stuffed specimen in the British Museum—which gives a poor notion of a lively walrus according to our author. The tusks in bulls sometimes even diverge; and the more widely set, especially when diverging from one another in curves, the more savage and dangerous the hunters find the bull to be (p. 144). For other particulars as to the features and habits of the walrus, and how to shoot him, we refer the reader to pages 145, 153, 154, and 211. The state of the walrus-trade, the former extension of the huntinggrounds in Bear Island and Finmarken, and the gradual limitation of the walrus to the banks and skerries north of Spitzbergen are mentioned at page 176, &c.

The Ivory-gulls, greedy and rapacious, and ever fighting and squabbling over their prey, are constant in their attendance on the "flenzers" when stripping the skin and blubber from the carcases. Gulls and guillemots get inexhaustible banquets on the Medusæ and Clios. *Larus parasiticus* and *L. glaucus* have their tyrannical and thievish habits described at p. 270.

Gulls, fulmars, eider-ducks, and auks, occupying the islands as breeding-places, are sadly vexed by the egg-eating propensity of the white bear, whose other favourite sport seems to be seal-stalking, whence apparently much of the vigilant wariness of the latter persecuted animal, who is also continually alarmed by the loud booming reports from the glaciers on some parts of the coast (p. 166).

A good-conditioned full-sized male bear, upwards of 8 feet in length, almost as much in circumference, and $4\frac{1}{2}$ feet high at the shoulder, will yield upwards of 400 lbs. of blubber, the carcase being about 1200 lbs.; his skin, though thin, weighs upwards of 100 lbs., and is valued on account of its coat only. "The White Bear," says Mr. Lamont, "as is well known, subsists principally on seals, and he kills many of them on these sheets of 'fast' ice; but how he manages to get within arm's length of them there, is beyond what I can understand. When the seals are floating about on loose drift-ice, bruin's 'little game' is obvious enough; he 'first finds his seal,' by eyes and nose,—in the use of both of which organs *U. maritimus* is unsurpassed by any wild animal whose acquaintance I have ever made, —and then, slipping into the water half a mile or so to leeward of his prey, he swims slowly and silently towards him, keeping very little of his head above water: on approaching the ice on which the seal is lying, the bear slips along unseen under the edge of it [diving also, if need be] until he is close under the hapless seal, when one jump up, and one blow of his tremendous paw, generally settles the business. The seal cannot go fast enough to escape by crossing to the other side of the iceberg; if he jumps down when the bear is close to him, he does the best he can for his life; for, if he does not jump actually into the arms of his foe, and gets into the water, he is very likely to escape, the bear having no chance whatever when the seal is once fairly afloat. It cannot be very easy even for an animal of such prodigious strength as the polar bear to keep hold of a six-hundredweight seal during the first contortions of the latter, and a furious struggle must often take place. That the seals often escape from the grasp of the bear is certain, for we ourselves shot at least half-a-dozen large seals which were deeply gashed and scored by the claws of bears" (p. 107).

It is stated that an old bear will kill the biggest bull-walrus, although nearly three times its own weight, by suddenly springing on him from behind some projecting ice, seizing him by the back of his neck with his teeth, and battering in his skull with repeated blows of his enormous fore paw (p. 122). The author met with one bear at a distance of about twenty-five miles from shore; some have been floated across to Iceland; others to within swimming-distance of northern Norway. Mr. Lamont believes the Polar Bear "to be the largest and strongest carnivorous animal in the world," but a great coward in general; and, in his opinion, "affords less sport and may be killed with less danger than almost any large wild animal with which I am acquainted"—and he seems to have made a shooting-acquaintance with every beast of sport in Europe, Asia, Africa, and America.

The capture of two young bears, their dam being slain, was effected on the 13th of July. "They were about the size of colley-dogs, and no sooner did they feel themselves fast, than, quite regardless of our presence," says the author, "they began a furious combat with one another, and rolled about amongst the mud, biting, struggling, and roaring, until they were quite exhausted." After making a hearty meal off their poor mother's carcase, these ungracious cubs were taken on board and cribbed on deck. The male cub proved "savage and tyrannical towards his sister," and indeed a "ferocious and irreclaimable young demon." We ourselves lately saw these interesting children of the North in the Jardin des Plantes, at Paris; and certainly sulkiness and spite seemed to cling to the one, whilst the other was meeker, and certainly sleeker.

Only one school of White Whales came across our hunters, and one individual was captured (p. 213). It was not full-grown, measured 14 feet long, and 10 feet in circumference; the skin was half an inch thick; the blubber was $2\frac{1}{2}$ inches thick, and weighed 500 lbs. This produces a far finer oil than that of seal, bear, or walrus.

Of Reindeers, their habits, abundance, tameness, and fatness, we have an account at pp. 242 *et seq.* The best stags weighed about 300 lbs. Venison was plenty; and the author grows rapturous about haunches, kabobs, and marrow-bones. "I think the flesh of the reindeer," says he, "is the richest and most delicious meat, wild or tame, which I ever tasted, with the exception of a fat Eland and a diminutive West-Indian animal called by the negroes the 'Lapp' (*Cœlogenys* or *Cavia paca*). After a somewhat extensive experience in that line, I am inclined to award to the Lapp the palm of being the best culinary animal in the world. Unlike the flesh of most wild animals, the venison of the reindeer is not improved by keeping; and I think it is never better than the same day, or even the same hour, that the animal is killed. When it is kept long, the fat gets dark-coloured, and acquires a rank and unpleasant taste and odour."

The scheme for reaching the Pole, treated of at p. 193, &c., is well worthy of consideration; the reindeers, however, on whom would rest the burden of supporting the vitality of the suggested expeditions, might have a different opinion, if the subject were made comprehensible to their rather obtuse intellects.

Mr. Lamont does not finish his book without a bold plunge into the progressive-development-hypothesis. Striking well out as a silvery-grey-brown Bear of Norway, he tries his hand at fish- and sealcatching on a supposititious shore, till he gets out of his depth in the lapse "of a few thousands, or a few millions of years," and comes back at last as a Polar Bear of "natural selection." Again he tries his strength in the icy waters, this time in the mysterious form of an unknown animal, and we find him floundering in the mid-sea of a "much more difficult and complicated problem"—the origin of the Walrus (p. 276). We do not well see how he gets out; but next we find him (p. 282) high and dry in South Africa, showing the relation of rapid desiccation and local drought to the several kinds of Antelopes inhabiting "the vast Kalihari Desert," and of which "some do not drink above once in three or four days, and others are never known to drink at all." As our author leaves "the discussion of the subject to abler pens," we leave it too—with pleasure, and conclude by saying, that for the most part we have had much pleasure in reading Mr. Lamont's lively book, full of facts, straightforward and healthy in its tone. The book is well got up, and is illustrated by some characteristic sketches of sporting scenes in Spitzbergen.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 22, 1861.—Dr. J. E. Gray, V.P., in the Chair.

Descriptions of Two Species of Crustacea belonging to the Families Callianassidæ and Squillidæ. By Adam White, Assistant Zool. Dep. Brit. Museum.

The *Callianassa* here described is from the Camaroons River, W. Africa, whence it was brought by the captain of an African trader to J. Aspinall Turner, Esq., M.P., the well-known possessor of a very fine collection of African insects. Mr. Turner liberally presented it to the Museum, with the information, that this long-bodied Crustacean appears periodically in the river in prodigious numbers, which disappear in the course of ten days or a fortnight. The natives are very fond of them, as they are delicious eating; and as soon as they make their appearance in the river, the men leave their usual pursuits to catch them.

Genus Callianassa, Leach.

Callianassa Turnerana, n. s.

C. processu rostrali breviter trispinoso; digito superiore obtuso, intus quadridentato; abdominis segmentis tertio quarto quintoque plagis duabus pellucidis, pilis densis brunneis postice obsitis.

Long. unc. $6\frac{3}{4}$.

Hab. Africa occ. (Camaroons).

Moveable finger of the large claw blunt at the end, the back gradually curved, the base with three or four small tubercles arranged longitudinally, and with indications of another row; the inner edge has four teeth, the two largest near the base, united so as to form one large lobe with another tubercle inside. There is a considerable space left between the moveable finger and the fixed one; the edge of the latter is toothless, but is hollowed on the inside and at the base, where it is covered with closely placed rounded tubercles; the immoveable finger is not much arched, and is pointed. The outside and greater part of the inside of the claw are very smooth, the lower edge being fringed with long and rather coarse hairs, which are arranged in tufts, as they are also, in a double row, on the upper edge of the moveable finger. There are, besides, four rows of distant tufts of hair on the outside of the greater claw. Wrist sharp-edged above and below, and crenulated on the lower margin. Rostral process with three short sharpish teeth. Third, fourth, and fifth abdominal segments with a large tuft of hairs covering the greater part of a pellucid space on each side, in the third and fourth behind the middle of the segment, in the fifth about the middle.

Central caudal plate rather broader than long, at the end three-lobed, the central lobe the longest and the largest: this central plate has two longitudinal furrows, which divide it into three parts, the central part bulging at the base, from the large rounded tubercle which nearly covers it. Outer plate as if formed of two anchylosed plates, with a rounded outer margin, which is closely and densely covered with brown hairs. On the upper side these hairs extend over nearly the apical half of one (the outer) of the two portions of which the outer plate seems to be formed.

In the Illustrated Proceedings of the Society for 1850 there is the description and figure of a fine species of *Gonodactylus*, belonging to the second section of the genus as defined by Milne-Edwards, that in which the rostral plate is rounded and not pointed in front. The species is from China, and, from the peculiar armature of the caudal ring, received the name of *G. cultrifer*. The species now described is remarkable for the singularly armed caudal ring, which, with the sixth abdominal segment, is covered with outstanding spines. This species, which I have named *Gonodactylus Guerinii*, belongs to the first section of the genus, that in which the rostral plate is armed on the median line with a long spiniform tooth. It was obtained on the voyage of H.M.S. 'Herald.'

Genus Gonodactylus, Latr.

Gonodactylus Guerinii, n. s.

G. carapace subquadrato, processu rostrali spinis tribus longis armato; abdominis segmento quinto ad apicem breviter spinosulo, segmentis quinto et caudali spinis plurimis longis erectis armatis.

Long. unc. $2\frac{1}{4}$.

Hab. Matuka, Fiji Ins.

Carapace as wide behind as long, in front almost a third narrower than behind, the central plate extending beyond the lateral plates over the base of the rostral process; the anterior lateral angle of outer plate subquadrate, the posterior lateral corner subrotundate;

lateral edges of carapace subcoriaceous. Rostral plate with its body wide but not deep, with three strong and sharp spines in front; central spine longest, not so long as the ophthalmic pedicel; the other two come out obliquely, one on each side of the body of the rostral plate.

First four abdominal rings smooth above; fifth abdominal ring smooth at the base, at the tip with four or five transverse rows of short spines longest at the tip; sixth segment with many (about fifty) crustaceous spines, bluntish, and with a short coriaceous bristle at the end; caudal ring on its dorsal surface with twenty-two long outstanding crustaceous spines tipped like the others, each of the lateral margins with two rows, like combs, of crustaceous spines, which meet behind and terminate at the end of the lateral spines—two of the four which arm the hinder margin of the caudal ring. This hinder margin has three notches, the middle one deepest, their projecting sides ending in the spines, the sides of which are pectinated with smaller spines. Segment of raptorial leg before the claw rather slender, not bulged at the end beneath. The claw minutely serrulate on the inside near the tip. From the indications of marbling in the dried specimen, this curious *Gonodactylus* is most probably finely and variedly coloured when alive.

February 12, 1861.—John Gould, Esq., F.R.S., in the Chair.

On the Asiatic Snake called Taphrometopon lineolatum by Professor Brandt. By Dr. W. Peters, of Berlin, For. Mem. Z.S.

The late Professor Eversmann of Kasan discovered in the year 1822, on his journey from Orenburg to Buchara, a species of Snake, which was described by Lichtenstein* as "*Coluber trabalis*, Pallas." The specimens are, as I find from the manuscript notes which Eversmann sent with his collection, from Buchara and the desert of "Burzuk" (Barusek), on the eastern shores of lake Aral, and bear in our museum the label "Nordasien, Eversmann." There were originally five examples of this snake in our collection; and three are still there. One of them was sent in December 1823 to Temminck. Now, as the description of *Chorisodon sibiricum* (in the 'Erpétologie Générale,' viii. p. 901) may perfectly well be applied to the *Coluber trabalis*, Lichtenstein (not Pallas), in the Berlin Museum, and as Bibron expressly remarks that his "*Monodiastema*" is founded on a specimen in the Leyden Museum labelled "*Coluber trabalis*†," the latter is doubtless the same which Temminck received from Lichtenstein in 1823. I think this explanation necessary to prove that the habitat of the Leyden specimen is not Siberia properly so called, but the more southern part of Central Asia.

This snake is (what I should not have found out from Bibron's description), in the form and concavity of the head, and in the lanceolate longitudinally-grooved scales, very much like *Cœlopeltis la-*

* Ed. Eversmann, 'Reise von Orenburg nach Buchara,' Berlin, 1823, p. 146.

† Duméril (*l. c.* p. 902) cites *Coluber trabalis*, "Schlegel." But this seems to be a mistake; for Schlegel's *Coluber trabalis* is, as Dr. Günther (Catalogue of Snakes, p. 93) justly remarks, synonymous with *Coluber* (*Elaphis*) *dione*, Pallas, and the true *Coluber trabalis* of Pallas only a variety of *Zamenis atrovirens*, Shaw, sp.

certina. There is scarcely any difference in the plates of the head, excepting in the loreal, which is single and very long. But the general form of the body and tail is very different, much longer and more slender than in *Cœlopeltis*. In a specimen of 1·065 m. in length the head is in all dimensions only half as large as in a *Cœlopeltis lacertina* of 0·930 m. in length. All this agrees exactly with the description Brandt (Bulletin Scientifique de l'Académie des Sciences de St. Pétersbourg, iii. p. 243) has given, in 1837, of a new species of snake, brought home by M. Karéline from the eastern shores of the Caspian Sea. His description, although rather short, is very accurate; but he has omitted to pay attention to the form of the teeth.

"TAPHROMETOPON, n. g. *Scutum verticale valde elongatum, postice angustissimum. Corpus necnon cauda valde elongata et tenuia. Frons et vertex depressa. Frontis et verticis ratione ad genus* Cœlopeltis *accedit, sed præter corporis staturam, capite, præsertim rostro longiore, tetragono et scuto loreo elongato, simplice, necnon superciliis minus acute prominentibus differt.*"

"COLUBER (TAPHROMETOPON) LINEOLATUS. *Caput sat angustum, oblongo-tetragonum. Collum penna anserina paulo crassius. Squamæ medium dorsum obtegentes omnes satis anguste lanceolatæ. Abdomen subplanum, album. Collum et abdominis anterior pars punctis lateralibus minoribus et centralibus paulo majoribus olivaceo-nigricantibus adspersa. Frons et verticis, necnon occipitis medium e griseo olivascentia. Dorsum cinereum, exceptis lineis quatuor e nigricante olivaceis, quarum duæ in superciliis incipientes parallele, sed parum distincte in medio dorso pallidiores ad caudam usque decurrunt, et duæ aliæ pone nares initium capientes ab oculis interruptæ in lateribus corporis subevanidæ et magis griseæ conspiciuntur. Corporis longitudo* 1′ 11″, *caudæ* 5½, *abdominis latitudo summa* 4‴."

Brandt does not mention the grooved appearance of the scales; but his specimen seems to have been very young, according to the dimensions he has given.

A few years later, in 1841, apparently the same snake was described and figured by Eichwald (Fauna Caspio-caucasica, p. 123, t. 29) under the name of *Cœlopeltis vermiculata*, from the western shores of the Caspian Sea. At least, the number of the longitudinal rows of scales, seventeen, agrees with *Chorisodon*, and not with *Cœlopeltis lacertina*, which has nineteen rows of scales. Yet I have some doubts of their identity, the general form of Eichwald's species being more like that of the latter.

The examination of the teeth of the three Berlin specimens shows no free space between the maxillary teeth, as described by Bibron; but they form a continued row, excepting the hinder furrowed ones, which are separated, as usual, by a small interval from the rest. There are (fig. 5) first seven very small teeth, only loosely attached to the maxillary bone, then three very long and strong ones, followed again by four smaller ones. Bibron found a free space in front of the longer teeth, because the two small ones before them were detached.

The nine palatine and fourteen pterygoidal teeth are still smaller, decreasing in size from the front palatal tooth. It is therefore very fortunate that Brandt's name has the priority, as neither Bibron's "*Monodiastema*" nor Duméril's "*Chorisodon*" would be very suitable appellations for this form. The lower jaw has on each side eighteen teeth; they increase very rapidly from the first to the fourth, which is followed by fourteen smaller ones. Bibron counts twenty-five; I might have found the same number, or more, if I had reckoned the changing teeth on the inner side. The form of the transversal and pterygoidal bone is the same as in *Cœlopeltis,* and not as in *Psammophis* (*moniliger*).

I can hardly add anything to the external description given by Lichtenstein and Bibron. The front part of the frontal (vertical) plate is either straight, or it forms a very obtuse angle; the loreal is curved a little (see fig. 2); and all the specimens have nine upper and ten lower labials. One specimen has 192 abdominal scuta and 103 pairs of subcaudal scales; the second 189 abdominal scuta and 90 pairs of subcaudal scales; the third 189 and 99. All have the anal plate divided, and seventeen longitudinal rows of scales. All have four large dark olive-coloured bands and a smaller middle one on the head. In one, all four bands continue to the end of the tail; the second shows, as described by Bibron, no lateral bands, but three rows of small dark spots on the dorsal part; and the third has neither lateral nor dorsal strokes, the head-bands being lost on the neck. One of them has the lips and the under part of the head yellow, and without any spots; in the two others the labials and the chin are dotted with black. All have the middle of the abdominal scuta dotted with black, and a black longitudinal stroke on their external parts, which forms on each side an uninterrupted line to the end of the tail. The rest of the under side is yellowish, but appears to have been during life of a red colour.

	A.	B.	C.
Total length	$1^{m}\cdot065$	$1^{m}\cdot115$	$1^{m}\cdot065$
Length of tail	0 ·28	0 ·25	0 ·27
——— of head	0 ·022	0 ·024	0 ·025
Distance of eyes	0 ·006	0 ·007	0 ·007
Breadth of head behind	0 ·010	0 ·010	0 ·010
Greatest breadth of body	0 ·012	0 ·015	0 ·014

The largest specimen contained in its stomach three species of lizards, viz. *Phrynocephalus helioscopus,* Pallas, *Eremias velox,* Pall., juv. (*vittata,* Eversmann), and *Eremias variabilis,* Pall.

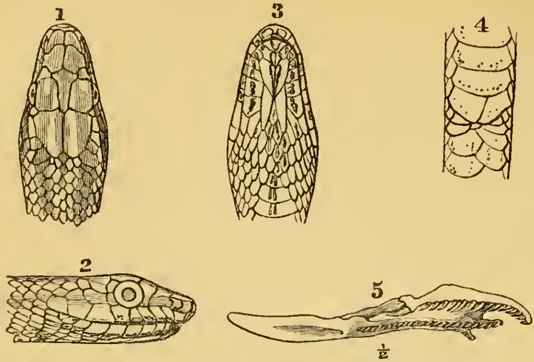
Conclusions.—1. *Chorisodon sibiricum,* Dum. & Bibr., does not come from Siberia properly so called, but from the sandy deserts of Central Asia, around Lake Aral and the Caspian Sea.

2. The row of unfurrowed maxillary teeth is not interrupted by a diastema.

3. *Chorisodon* is closely allied to *Cœlopeltis*; it would therefore be most unnatural to separate them into two different families.

4. The name *Chorisodon sibiricum* (date 1854) must be rejected,

as it applies to the same species which had been named in 1837, by Brandt, *Taphrometopon lineolatum*.



EXPLANATION OF FIGURES.

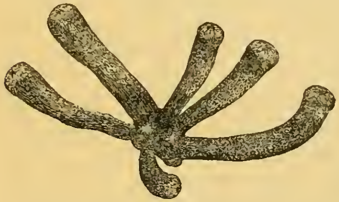
Figs. 1–3. Head, viewed from different sides. Nat. size.—Fig. 4. Anal region. Nat. size.—Fig. 5. Maxillary, palatinal, and pterygoidal bones, with the teeth, from the right side. Twice magnified.

MISCELLANEOUS.

On an undescribed Species of British Zoanthus. By E. W. H. Holdsworth, F.L.S., &c.

In August 1860 I received from Mr. T. H. Stewart, of the Royal College of Surgeons, a *Zoanthus* which had been taken by him a few days previously whilst dredging for Echinoderms in Plymouth Sound. After a careful examination of the specimen, I am induced to regard it as specifically distinct from *Z. Couchii*, to which species, of the three found on our coasts, it is most nearly allied. As the polypes were unfortunately dead, and beginning to decay when they came into my possession, they were at once immersed in spirit; and their characters were noted whilst in that condition.

The specimen consists of an unattached group of ten polypes, of various ages, ranging from a simple bud to individuals an inch in length. They are all united at the base, which is rounded below, and encloses a small sandy nucleus, particles of the same material being also aggregated on the surface from which the polypes spring, and between their points of union. This radiating mode of development is the same as in some of the free varieties of *Z. Couchii*, and will doubtless bear a similar explanation. The largest polypes are nearly a quarter of an inch in diameter at the head, and taper slightly downwards. This form, however, is most apparent in half-grown examples. The dermal coating consists of fine siliceous sand,



as in *Z. Couchii*; but the marginal serrations are not nearly so conspicuous as in that species, and indeed require a careful scrutiny, under dissection, to distinguish them at all. The colour of the tentacles, as observed by Mr. Stewart at the time of capture, was a distinct red; and after some days' immersion in spirit, the tint was still perceptible through the integument surrounding the head, where the sand is less densely impacted than in other parts of the surface. The distinctions between these polypes and those of *Z. Couchii*, so far as I am now able to judge, consist in the colour of the tentacles, the comparative absence of the serrated margin, and especially in the great length of the body in the new species,—a character, I believe, of considerable importance; for, although *Z. Couchii* is extremely liable to variation in the development of the basal membrane, and in the size of the polypes, the proportion of length to breadth is tolerably constant. Large specimens quite equal the present species in breadth; but their length is barely half what we here find, even in the contracted state, and in this instance it would be increased under expansion by at least a quarter of an inch. The variation to which many of our marine polypes are subject should at all times make us cautious in admitting new species; but I think the above characters will justify me in making the addition in the present case.

This specimen was dredged in 20 fathoms, on a bottom of sand, pebbles, and broken shells, and did not afterwards sufficiently expand to allow more than the decided colour of the tentacles to be made out. This unusual colour in a British species induces me to propose for it the specific title of *rubricornis*.—*Proc. Zool. Soc.* March 12, 1861.

The Chronology of M. Du Chaillu's *Travels.*

[As the present Number of the 'Annals' contains a paper by Dr. J. E. Gray on M. Du Chaillu's zoology, we have thought that the following letter, reprinted from the 'Athenæum' for May 25, might not be uninteresting to our readers.—W. F.]

May 22, 1861.

The point at which I chiefly stumble, in reading M. Du Chaillu's book, is the difficulty in understanding his chronology. According to his own account, he appears to be, "like a bird, in two places at once." He has two versions of 1858 and two of 1859, with different events happening at the same time. I can get over one of the difficulties by merely reading, at p. 392, "Oct. 10, 1858," instead of "Oct. 10, 1859." But the other perplexity, the double history of 1858, is too much for me.

One point, I suppose, is beyond a doubt. The history commences with 1856, for so M. Du Chaillu repeatedly tells us, and ends (p. 467) on the 10th of February 1859. Within these three years and one month, which M. Du Chaillu often calls "four years," all the events are included.

1. Now, beginning with Jan. 1856, we first hear (p. 7) of a stay in the Gaboon country, "to become thoroughly acclimated." Then (at p. 28) he sets out on a journey on the 27th of July. He returns

in October (pp. 115, 116), and then makes a trip up the Moondah River in November. And so ends 1856.

2. Then, remaining on the coast for some months, he sets out on a journey into the interior (p. 149) on the 23rd. This, we find at p. 164, must have been May 23, 1857. At p. 166, we find June 1. So that we have reached June 1857. This journey ends (pp. 177, 178) on the 27th. And at p. 185 we learn that M. Du Chaillu now "remained several months near the Gaboon." And so ends 1857.

3. On Feb. 5 or 10 he begins a new journey (p. 188); so that we have reached Feb. 1858. At p. 197 we reach April 13; at p. 204, April 20; at p. 205, May 4; at p. 218, May 27. Then June 10, Aug. 1, Aug. 13, Sept. 9, Nov. 10, and at p. 244, Nov. 30. So that 1858 is well accounted for.

4. But, strange to say, in chap. xv. we begin 1858 *all over again*, with a new story, quite incompatible with the first. At p. 247 we find the date of Jan. 1858, and at p. 248 we are told that on Feb. 26 M. Du Chaillu set out for Goombe, whence he proceeded to Obindji, and there we find him in March and April 1858. Yet, fifty pages before (pp. 190–195), we found him residing on the coast all March and April 1858, distant 100 or 150 miles from Obindji. These two accounts are wholly irreconcileable. I felt a doubt, at first, whether the 1858 of pp. 190–195 ought to be read 1857; but this cannot be, for in March and April 1857 M. Du Chaillu is among the Shekianis, in quite another part of the country (pp. 144–153). This second story, however, which begins at p. 248, proceeds regularly enough, all through April, May, June, and July of 1858, until, at p. 310, we reach Aug. 13.

5. Then we come to a fresh narrative, which, at p. 392, begins with Oct. 10, 1859. This, however, clearly should be Oct. 10, 1858. But the *double duty* put upon this year, 1858, quite passes my comprehension. The narratives of pp. 188–244 and pp. 248–310 are clearly incompatible.—R. B. S.

On the Anatomy of the Sipunculi.
By MM. Keferstein and Ehlers.

The authors have investigated the *Sipunculus nudus* and *S. tessellatus* at Naples. The most striking part of their observations is that relating to the generative organs. The *Sipunculi*, according to them, are hermaphrodites. The testicles are two long tubular glands which open outwards close to the anus. The ova are formed in cæca situated in the thickness of the skin, and ciliated internally. When the ova have attained a certain size, they pass through the interstices of the muscular tissue and fall into the liquid of the perivisceral cavity, in the midst of which they acquire their final development; they are then excluded through a pore situated at the posterior extremity of the animal. These statements are evidently in opposition to those of Krohn, who found distinct sexes both in the *Sipunculi* and the *Phascolosomata*.

The authors further differ from Krohn in that they have found no trace of vessels in *Sipunculus nudus*. Krohn describes the ventral nervous cord as completely surrounded by a vessel. MM. Ehlers and Keferstein regard this supposed vessel as an external layer of the nervous system. Another vessel, or something supposed to be such, described by Delle Chiaje and Grube, is merely, according to the authors, a ciliated furrow running along the intestinal canal.—*Göttinger Nachrichten,* Nov. 13, 1860; *Bibl. Univ.* April 20, 1861, *Bull. Scient.* p. 387.

On Two new Species of Heteropelma. By P. L. Sclater, Esq.

HETEROPELMA AMAZONUM.

Saturate olivaceo-brunneum, subtus dilutius, ventre præcipue cinerascentiore, alarum remigibus extus rufescente limbatis : rostro nigro, basi mandibulæ inferioris albida : pedibus fuscis.

Long. tota 6·75, alæ 3·4, caudæ 2·6.

Hab. In ripis fl. Huallaga, loco Chamicuros dicto (*Hauxwell*).

Mus. P. L. S.

Obs. Assimilis *H. turdinæ* sed statura minore, et vix major quam *H. virescens.*

This *Heteropelma,* of which I possess a single example, collected by Mr. Hauxwell on the Huallaga, is closely allied to *H. turdinum*; but is of a much brighter tinge above, and in size scarcely exceeds *H. virescens.* Its structure is strictly typical.

HETEROPELMA FLAVICAPILLUM.

Cinerascenti-olivaceum, pilei medii semicristati plumis, nisi in apicibus, flavis : alis caudaque fuscis olivaceo limbatis : subtus pallide cinereum, gula et ventre medio albicantioribus : tectricibus alarum inferioribus pallide sulphureis : rostro et pedibus nigris.

Long. tota 6·0, alæ 3·1, caudæ 2·5, tarsi 0·6, rostri a rictu 0·65.

Hab. In Brasilia mer.-or. *Mus.* P. L. S.

I have long had Brazilian specimens of this bird in my collection, but have never been able to find a name for it. Though small in size, and somewhat abnormal in coloration, it appears to agree in every essential particular of structure with the typical *Heteropelmata*; the outer toe being united to the middle toe up to the commencement of the third phalange, the scales of the tarsi being similar, and the bill of the same formation. In colour this species very nearly resembles the *Muscicapa aurifrons* of P. Max. (*M. luteocephala,* Lafr.) —a bird referred by Cabanis to *Elainea* and by Burmeister to *Euscarthmus*; but which, I think, from the structure of the feet, ought rather to be placed near to, if not in the genus *Heteropelma.*—*Proc. Zool. Soc.* Dec. 11, 1860.

On a new Species of Kerivoula. By R. F. Tomes, Esq.

KERIVOULA ARGENTATA.

In the 'Annals' for December 1858 I described at some length the peculiarities of the present group of Bats, giving my reasons for regarding these peculiarities as generic. All that was stated respecting the several species then enumerated may with equal exactness be said of the present one; and I may add that I have since that time again examined the fine collection of Bats in the Leyden Museum, and that, with the exception of identifying my specimens of *K. papillosa* with the *Vespertilio papillosus* of M. Temminck, and examining a specimen of my *K. ærosa*, labelled "Gorontalo," I saw nothing which in any way either confirmed or modified my previous opinions of the genus.

The present species is of larger size than either of the African species before described, fully equal in size to the *K. papillosa*, and in the colour of its fur it differs from all the other species. Compared with the African species which it most nearly resembles, it possesses some of the characters of both *K. lanosa* and *K. ærosa*.

The top of the head is elevated in about the same degree as in *K. ærosa*; and it greatly resembles this species in the shape of the muzzle and the distribution of the hair on the face; but in the shape of the ears it approaches more nearly to *K. lanosa*, differing from it only in having the inner rounded margin toward the top of the ears more prominent even than in that species. The tragus is remarkably narrow, and tapers evenly to an exceedingly acute point; near the bottom of its outer edge is a narrow notch, or rather slit, and below it a small and pointed process, which is placed, in fact, immediately above what may be called the foot-stalk or narrow root of the tragus. Inside the ear, and vertically beneath the tragus, is a well-defined fleshy tubercle, of a flattened form, and about one line in length.

In the quantity and distribution of the fur on the membranes, this species is intermediate between *K. lanosa* and *K. ærosa*, but it has fewer adpressed hairs on the wings than either. The fur of the back extends on to the membranes of the flanks a little, and on to the interfemoral membrane in a scattered manner, but more thickly on to the tibiæ and feet, especially on to the latter, which are well clothed. Beneath, it extends a little on to the membranes near the sides of the body. The *os calcis* is well clothed with short adpressed hairs; and between it and the tail-tip the membrane is fringed with closely-set hairs, which curve downwards and have a comb-like appearance, as in *K. lanosa*.

The fur is everywhere long and silky; that of all the upper parts is of four colours—at the root very dark grey for a fourth of its length, then yellowish, passing into a pale but bright rust-colour, and the tips of the hairs of a shining and silvery white. There is very little variation in the colouring of the different parts of the upper surface. Beneath, the fur is unicoloured and dirty-white, on the sides of the neck and on the cheeks tinged with rust-colour.

The teeth, as far as may be gathered from inspection without removing the skull from the specimen, are like those of *K. lanosa*, the upper incisors being, as in that species, nearly of the same length. The outer incisors in the lower jaw have the singular and prominent cusp, which I have mentioned as peculiar to the genus, quite as much developed as in any of the species.

	"	‴
Length of the head and body, about	2	0
——— of the head	0	8
——— of the ears	0	5
Breadth of the ears	0	$5\frac{1}{2}$
Length of the tragus	0	4

		'''
Greatest breadth of the tragus, barely	0	1
Length of the fore-arm	1	6
——— of the thumb and its claw	0	4½
——— of the first finger	1	6
——— of the second	3	6
——— of the third.....................	2	6
——— of the fourth	2	4
——— of the tibia	0	7½
——— of the foot and claws	0	4½
——— of the *os calcis*	0	10
Expanse of wings, about	12	0

Hab. "Otjoro, December 1st, 1859. Female."

Proc. Zool. Soc. Jan. 22, 1861.

On a new Genus and Species of Parrakeet (Geopsittacus occidentalis, *Gould*) *from Western Australia.* By John Gould, F.R.S.

All the upper surface grass-green, each feather crossed by irregular bands of black and greenish yellow; feathers of the crown and nape with a streak of black down the centre; throat and breast yellowish green, passing into sulphur-yellow on the abdomen; spurious wings brown; primaries and secondaries brown, narrowly fringed with a greenish hue on their external webs, with the exception of the first three; the primaries and secondaries have also an oblique mark of yellow near their bases, which mark increases in breadth and in depth of colour as the feathers approach the body; two centre tail-feathers dark brown, toothed on the edge of both webs with greenish-yellow; the next on each side dark brown, toothed on the outer web only with brighter and longer marks of yellow; the remainder dark brown, crossed by bands of yellow, which in some cases are continuous across both webs, and in others alternate; under tail-coverts sulphur-yellow, crossed on their outer webs with narrow oblique and irregular bands of blackish brown; bill horn; feet fleshy.

Total length 10 inches, bill ½, wing 5½, tail 5, tarsi ⅞.

Hab. Western Australia.

Remark.—At a first glance this bird has the appearance of a *Pezoporus formosus* with an undeveloped tail; but on a careful comparison it is found not only to differ from that species in some parts of its colouring, but also in form—sufficiently so, indeed, to warrant the opinion that it will be necessary to make it the type of a new genus. Its whole contour and colour reminds one of *Strigops*. The points in which it differs from *Pezoporus* are the possession of a thick bluffy head, larger and more swollen nostrils, the total absence of any red mark on the forehead, a much larger wing with more rounded primaries, a very short tail the two centre feathers of which are much shorter than the two next on each side, and, lastly, in having very differently formed feet, with short and feeble nails, whereas in *Pezoporus* they are prolonged and slender. For this new bird I propose the generic name of *Geopsittacus*, with that of *occidentalis* as its specific designation.—*Proc. Zool. Soc.* March 12, 1861.

Description of a new Squirrel (Sciurus Gerrardi) *from New Granada.* By Dr. John Edward Gray, F.R.S., V.P.Z.S.

Mr. Edward Gerrard lately brought to me a Squirrel that he had not been able to identify with any other specimen in the Collection, or with any of the American species lately described, and which he was convinced was distinct from any of the American Squirrels of about the same size in the Museum by the peculiar form of its skull.

I have therefore drawn up a short description of the species, and named it after my assistant, who has done so much to extend the osteological collection in the Museum, and who is so ready to impart his extensive knowledge of Vertebrate animals and their osteological structure to any one who may desire to profit by it.

Sciurus Gerrardi.

Blackish: hairs brown, with black tips, with a broad subapical orange ring; cheeks yellowish brown; fore part of the back, sides of the neck and body, shoulders, and outer side of the fore legs, and front of the hinder legs bright-red bay; feet pale bay; base of the tail blackish, with the hairs slightly varied with pale-orange rings; middle of the tail bright bay, end black; throat from under the eyes, inside of the fore legs, chest, and belly pure white; ears blackish, with very short scattered hairs.

Hab. New Granada. British Museum.

Size and form of the European Squirrel, but the tail longer and the ears not pencilled. The skull is very different from that of *Sc. Langsdorffi,* being small and more lengthened.

The newly born young specimen is coloured precisely like the adult; but the tail is slender, rather depressed, but nearly cylindrical, covered with elongate close-pressed hair.—*Proc. Zool. Soc.* March 12, 1861.

On a new Genus of Australian Freshwater Fishes. By Dr. Albert Günther, For. Memb. Zool. Soc.

Fam. Percidæ. Group Apogonina.

Nannoperca.

Body compressed, oblong, covered with scales of moderate size. Dorsal fins slightly continuous at the base, the first with seven spines. No recumbent spine before the dorsal fin. Three anal spines. Narrow bands of villiform teeth in the jaws, on the vomer and the palatine bones. None of the bones of the head serrated. Branchiostegals six; pseudobranchiæ present. Lateral line none.

Nannoperca australis.

B. 6. D. 7 $\frac{1}{8}$. A. $\frac{3}{7}$. V. 1/5. L. lat. 30. L. transv. 12.

This species resembles a young Perch in general appearance, but is more elongate; the greatest depth of the body is above the root of the ventral fin, and contained four times and five-sevenths in the total length; the length of the head is contained three times and two-thirds in it. The snout is moderately produced, as long as the orbit, with the cleft of the mouth oblique and rather narrow, the maxillary extending to below the front margin of the orbit. The lower jaw projects beyond the upper. The teeth are villiform, those of the palatine bones minute and forming only a short series. The eye is of moderate size, one-fourth of the length of the head, and much wider than the interorbital space. The scales advance superiorly to between the hind margin of the orbits, and inferiorly to the præorbital. None of the bones of the head are serrated; the præoperculum has two ridges along its margins, like *Apogon*, but the ridges are very close together. The spinous dorsal fin commences somewhat nearer to the snout than to the root of the caudal; the length of the first spine is not quite one-half of that of the second, which is the strongest and longest, its length being one-half of that of the head; the following spines rapidly decrease in length. The soft dorsal fin is slightly continuous with the spinous, both being nearly equal in height; its anterior spine is short, although longer than the last of the spinous dorsal. Caudal fin rounded, its length is contained six times and a half in the total. Anal spines strong, the second and third are nearly equal in length. The root of the ventrals is situated behind that of the pectorals; they do not quite extend to the vent, and are as long as the pectorals. The colour appears to be greenish above, each scale having a darker margin.

Two specimens of this fish, the larger of which is 33 lines long, were received from the Murray River, and, having been given me for determination by Mr. Holdsworth, are now deposited in the British Museum Collection.—*Proc. Zool. Soc.* March 26, 1861.

On the Retrograde Metamorphosis of certain Nematode Worms. By Dr. R. Molin.

In the females of four species of the genus *Hystrichis*, M. Molin describes a phenomenon which he considers as a kind of retrograde metamorphosis—a phenomenon which puts a period to their existence, and which is in relation to the development of the generative organs. The adult and fertilized females constantly hollow out a gallery in the coats of the œsophagus of an aquatic bird. Immediately afterwards there commences in them an extraordinary development of the generative organs. These organs attain such large proportions that the skin of the worm is distended by them, and the animal becomes gradually converted into a sort of vesicle. M. Molin admits that this metamorphosis brings on the destruction of the body of the mother, and that the ovaries with the eggs are thus set free. Lastly, the embryos, on becoming developed, quit the gallery or cyst, which is cicatrized. From the drawings and descriptions of M. Molin, the worm, when distended, appears to retain its intestinal canal. It would seem therefore that there is simply a dilatation of the body of the mother without any true retrograde metamorphosis, unless it be that there is a kind of degeneration of the skin. The fact itself, however, does not thus lose its interest.—*Sitzungsber. der Akad. der Wiss. zu Wien*, xxxviii. p. 706; *Bibl. Univ.* April 20, 1861, *Bull. Scient.* p. 388.

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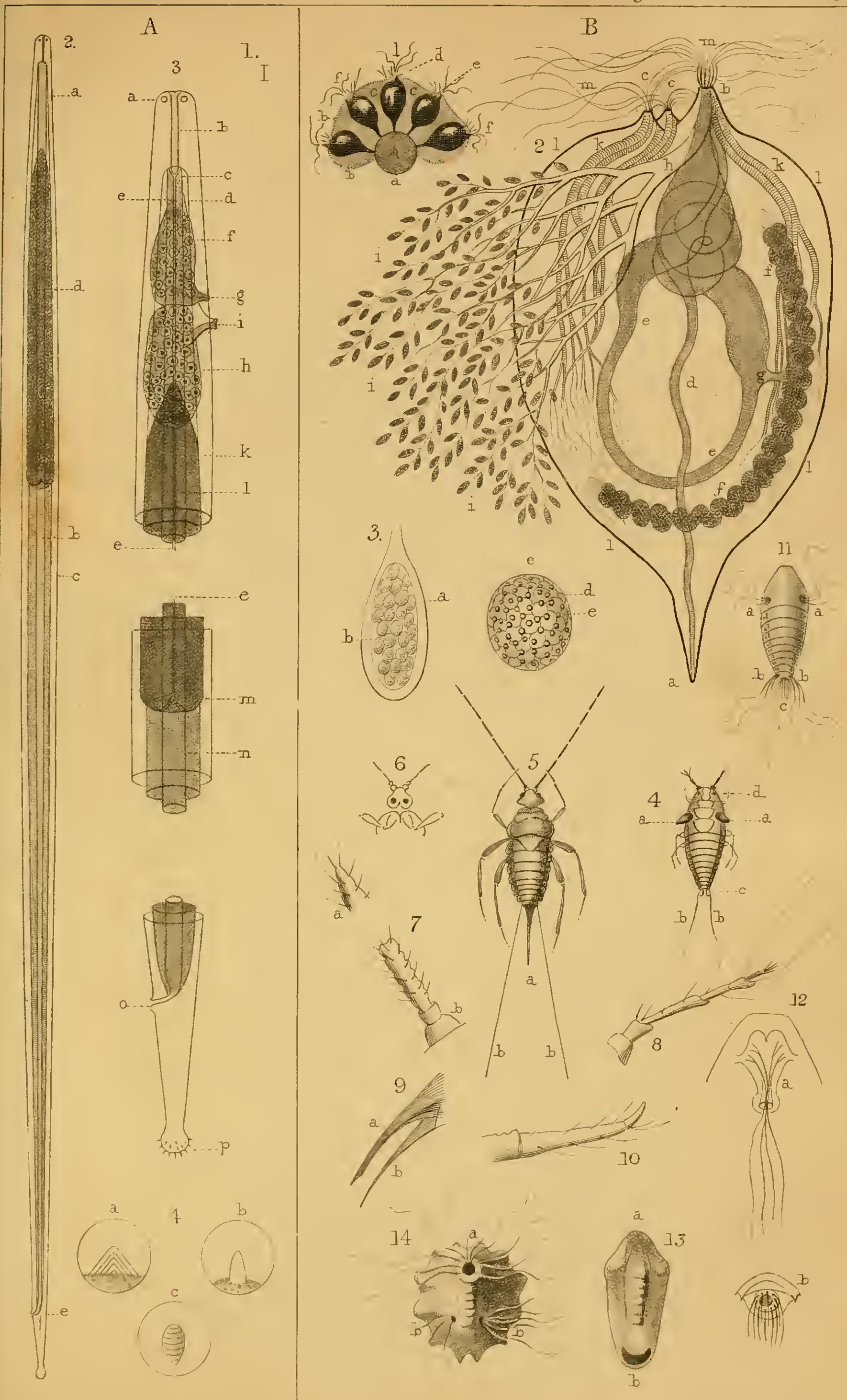
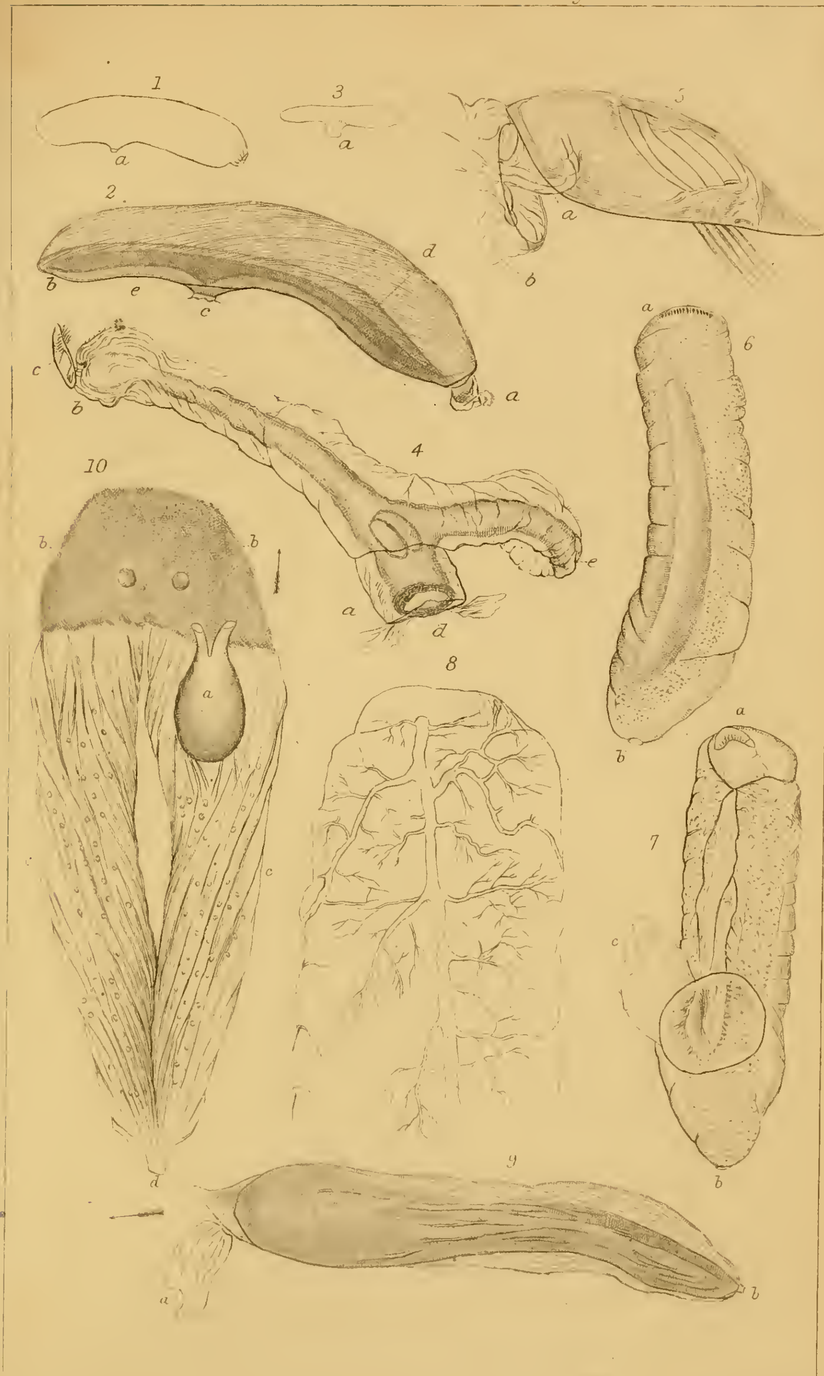


H I.C. del.

J. Basire sc

J. Basire Sc.



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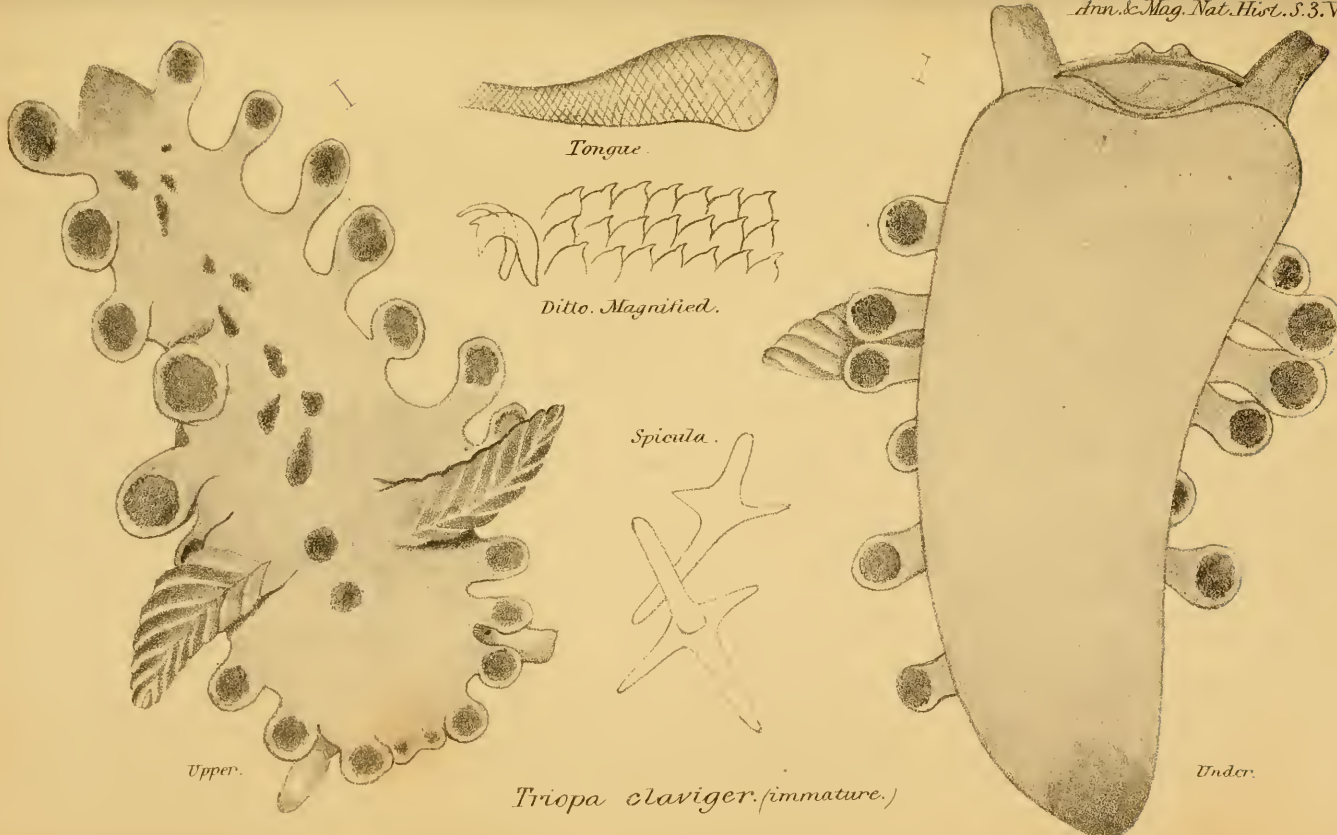


Triopa claviger. (immature.)

C. C. delt. J. Basire, lith.

Fig. 1

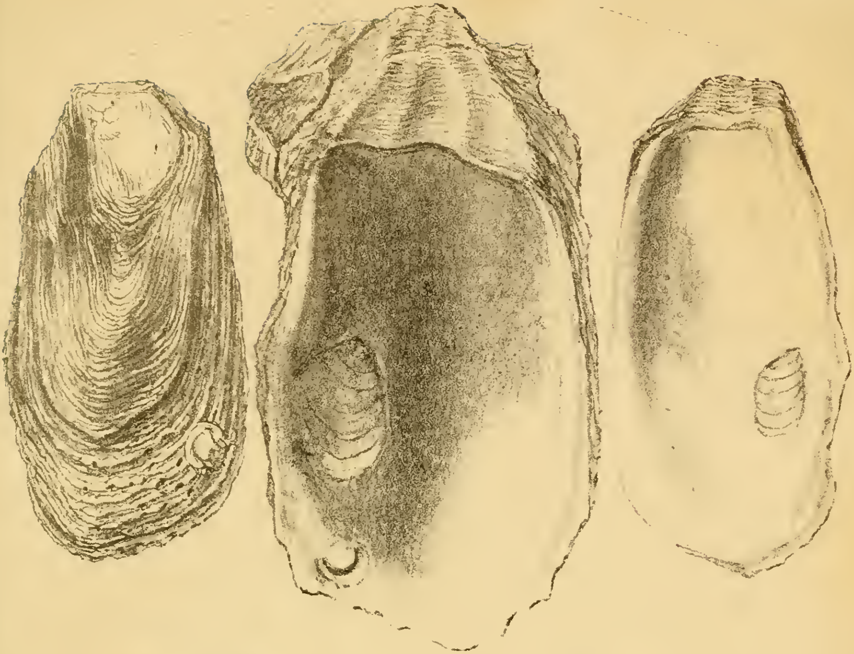
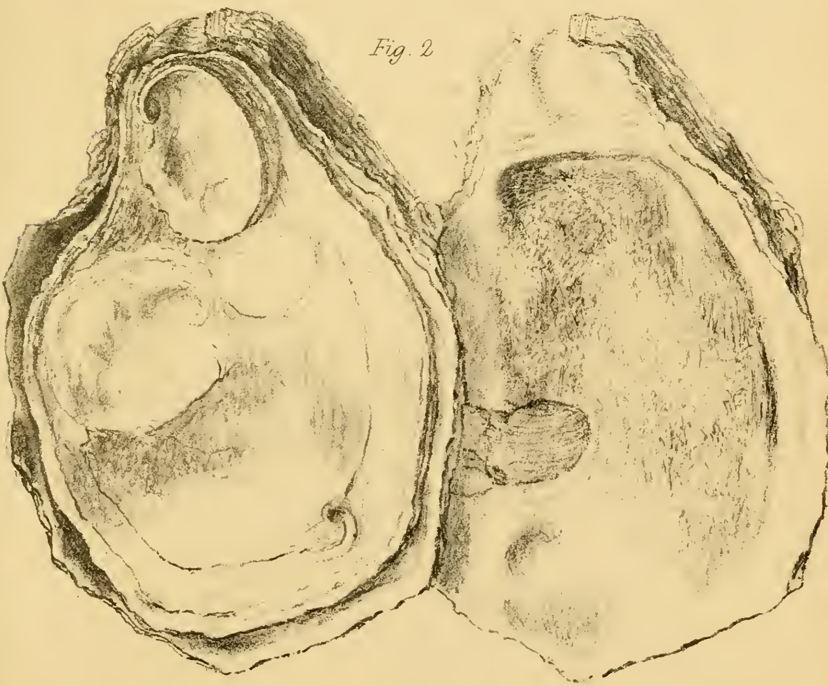


Fig. 2



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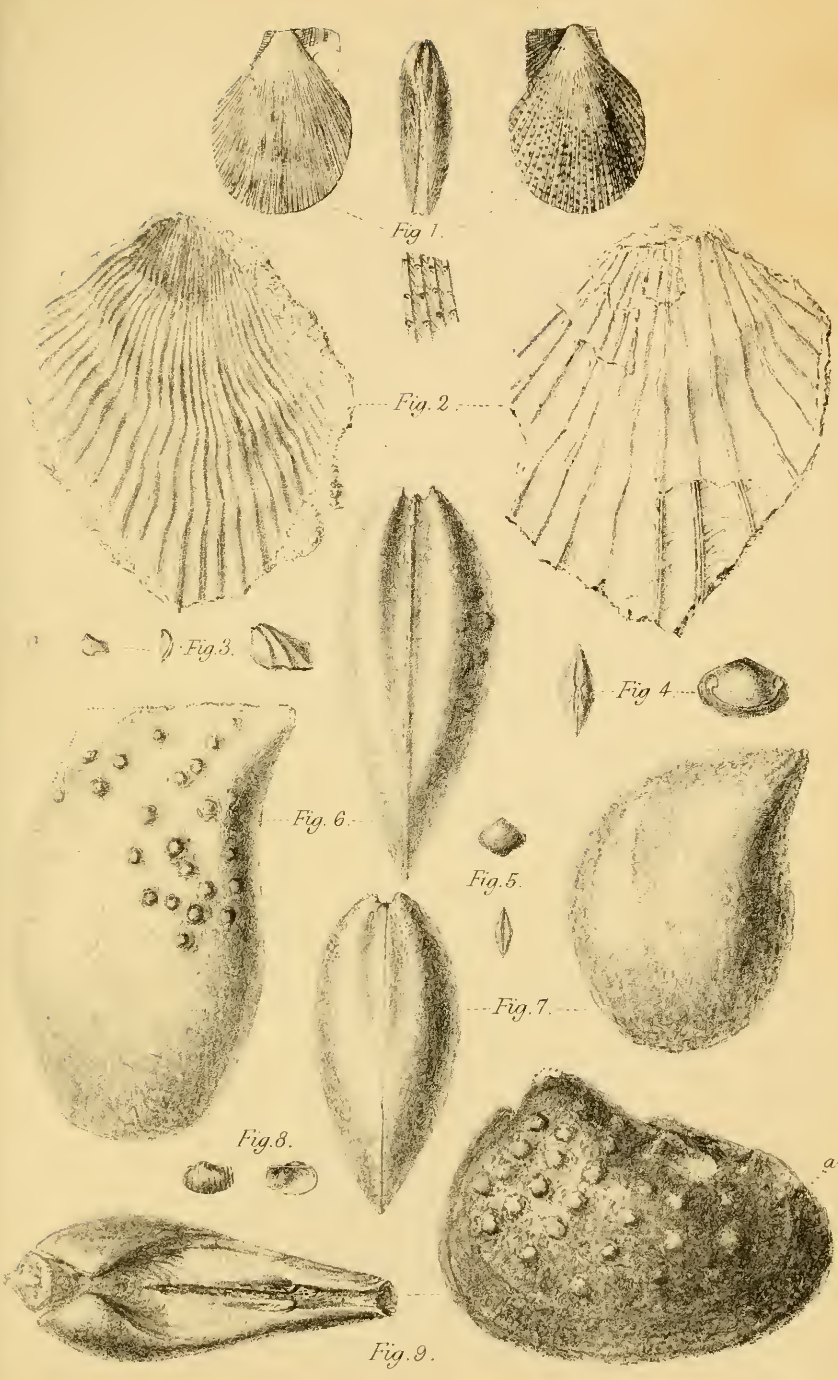

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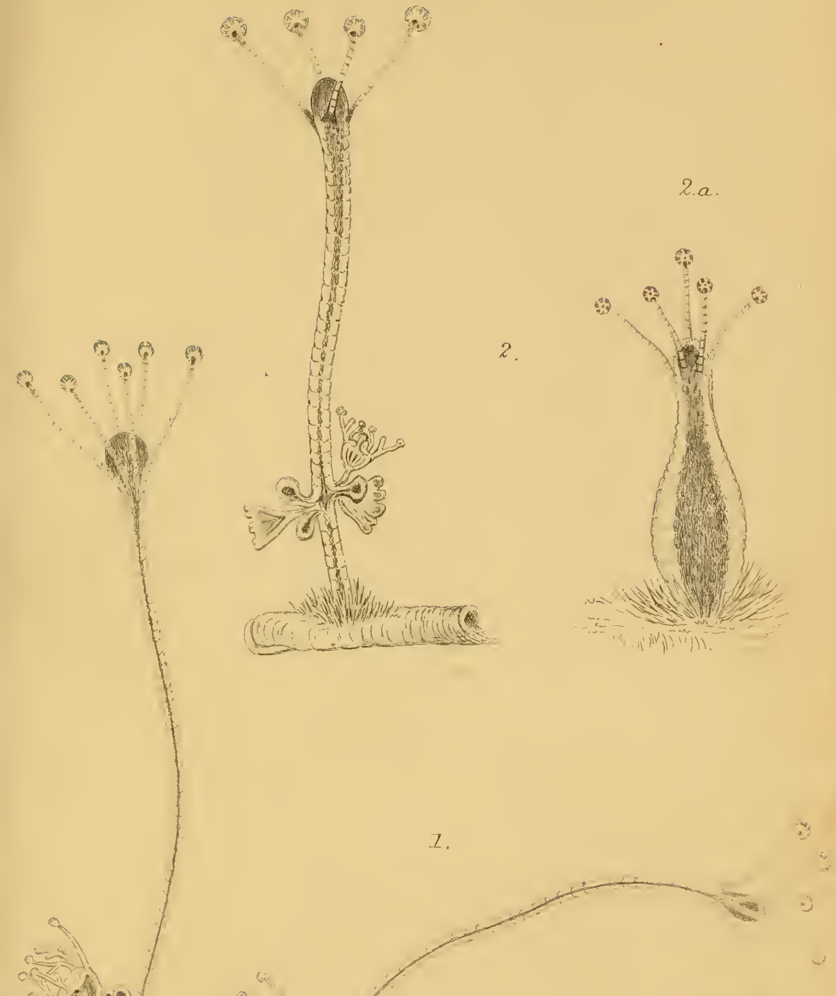
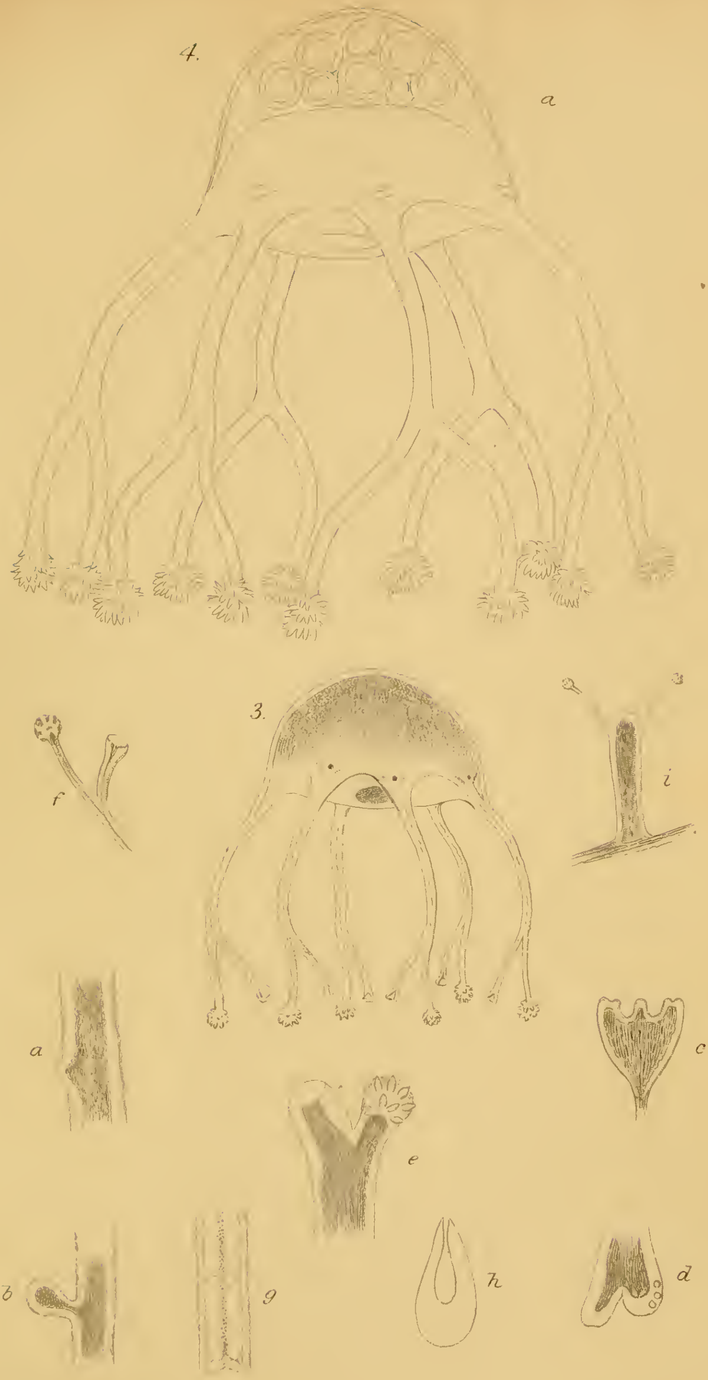


T Hincks del.

J. Basire, sc



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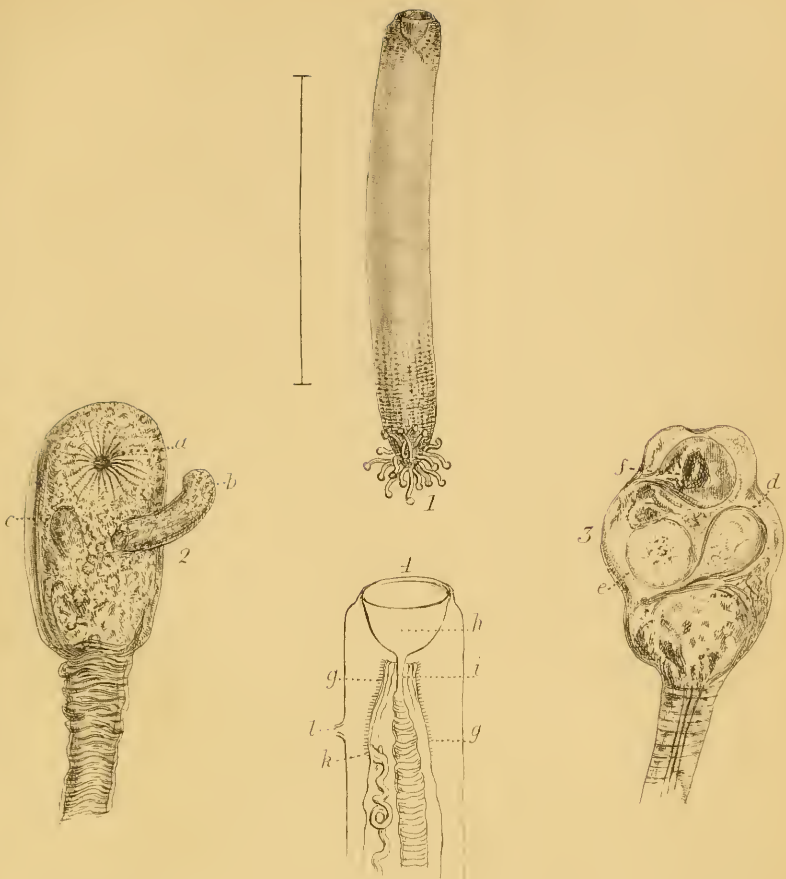
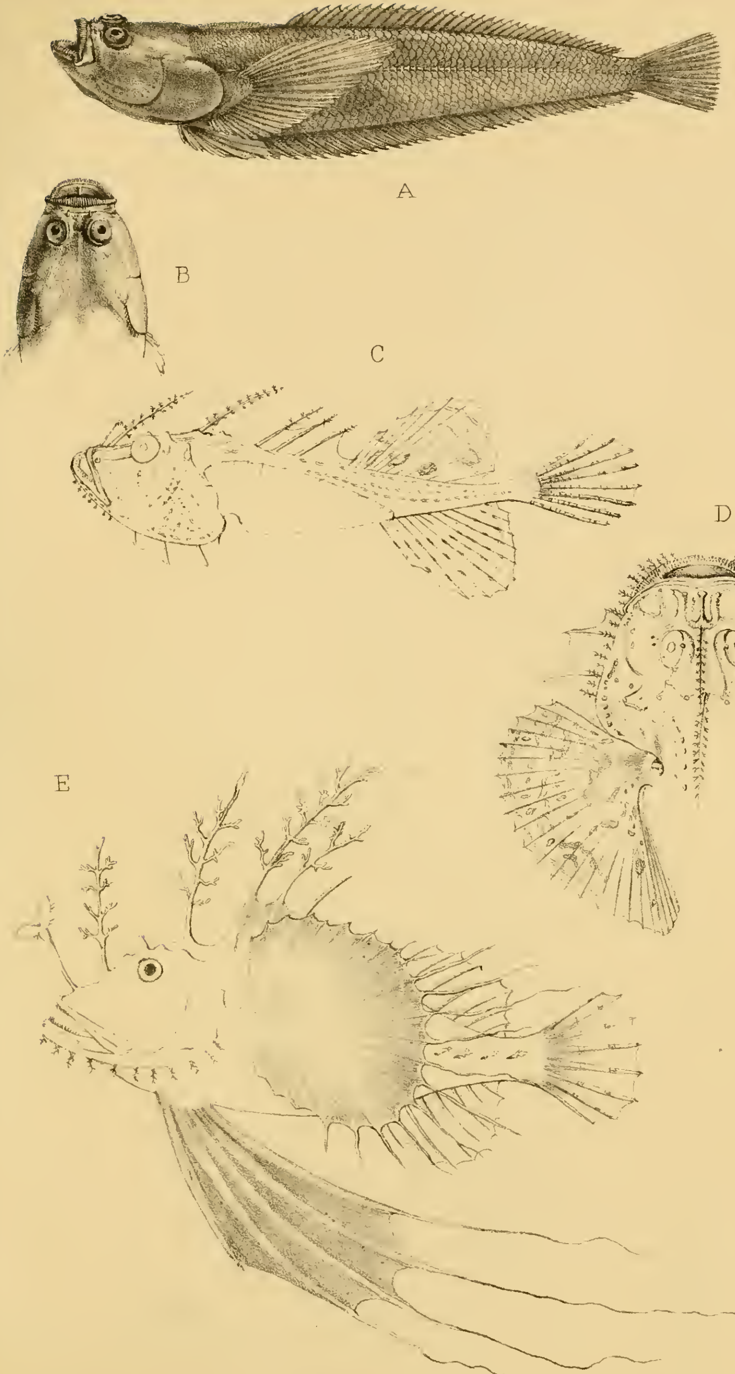


A. M. N. delt

J. Alder delt

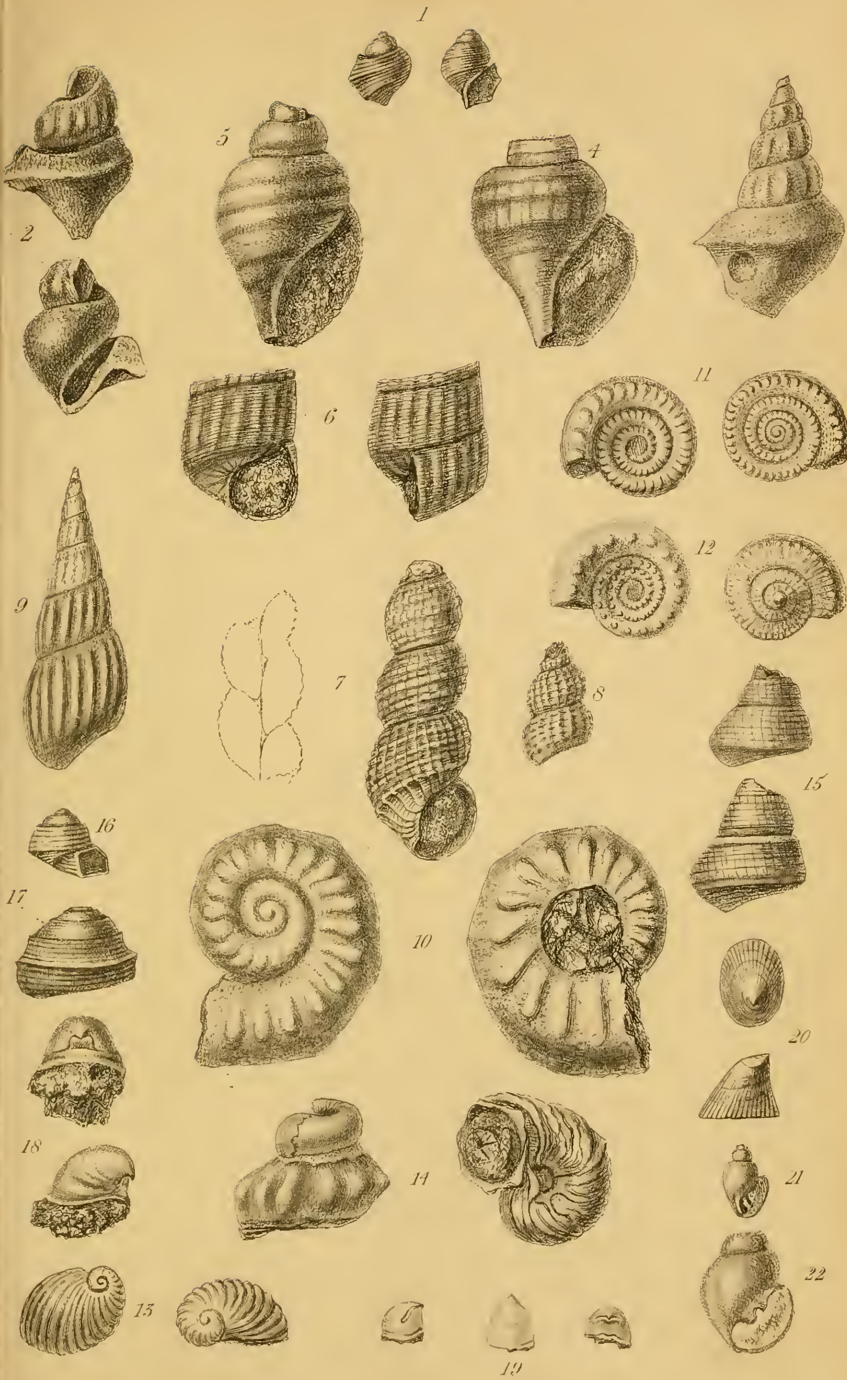
J. De C. Sowerby sct



ord

W.West imp

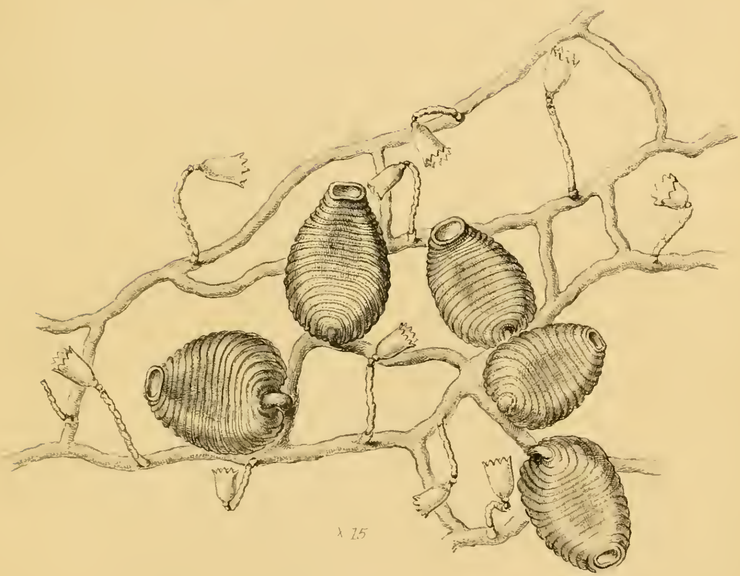
A.B. Crapatalus Novæ Zealandiæ, *Gthr* C–E Lophius piscatorius, young



J. De C. Sowerby, sc.

× 50

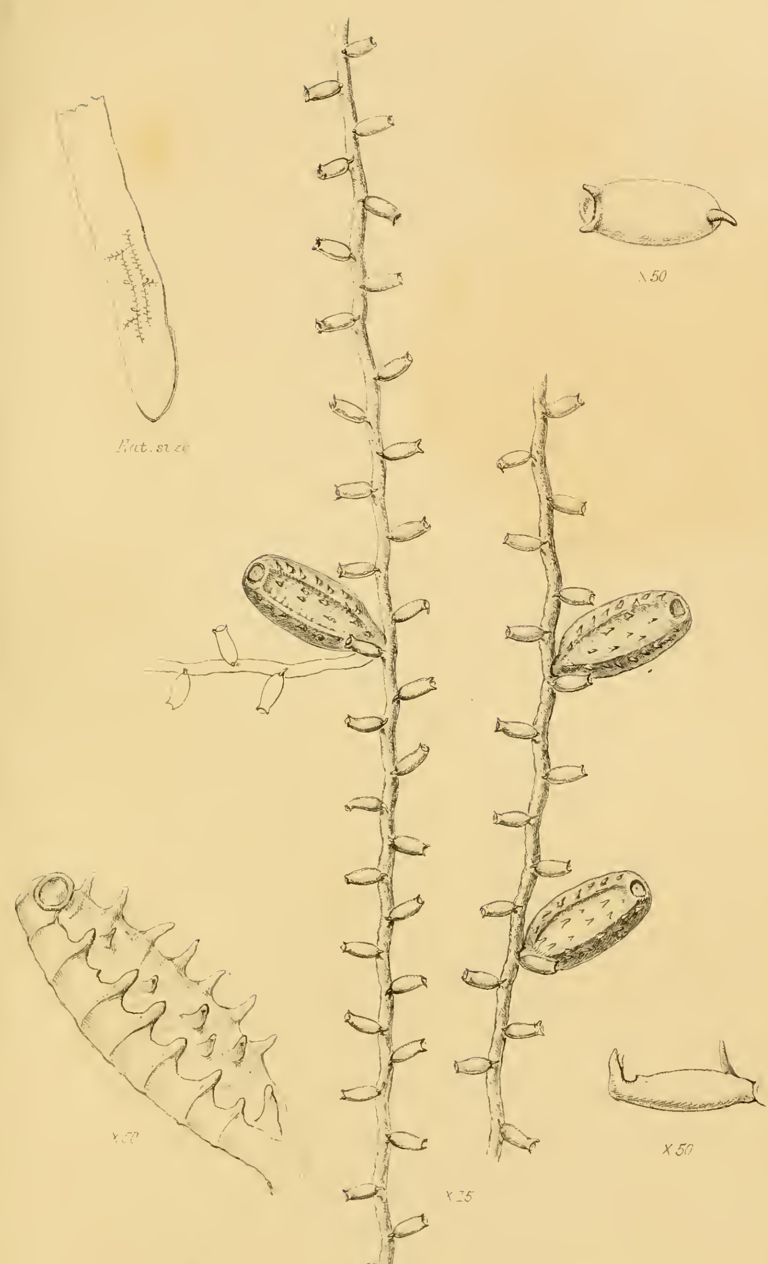
Nat. size



× 15

Tuffen West del. et sc.

W.N [illegible] imp



Tuffen West del. et sc.

W West imp.

M. J. B Del.

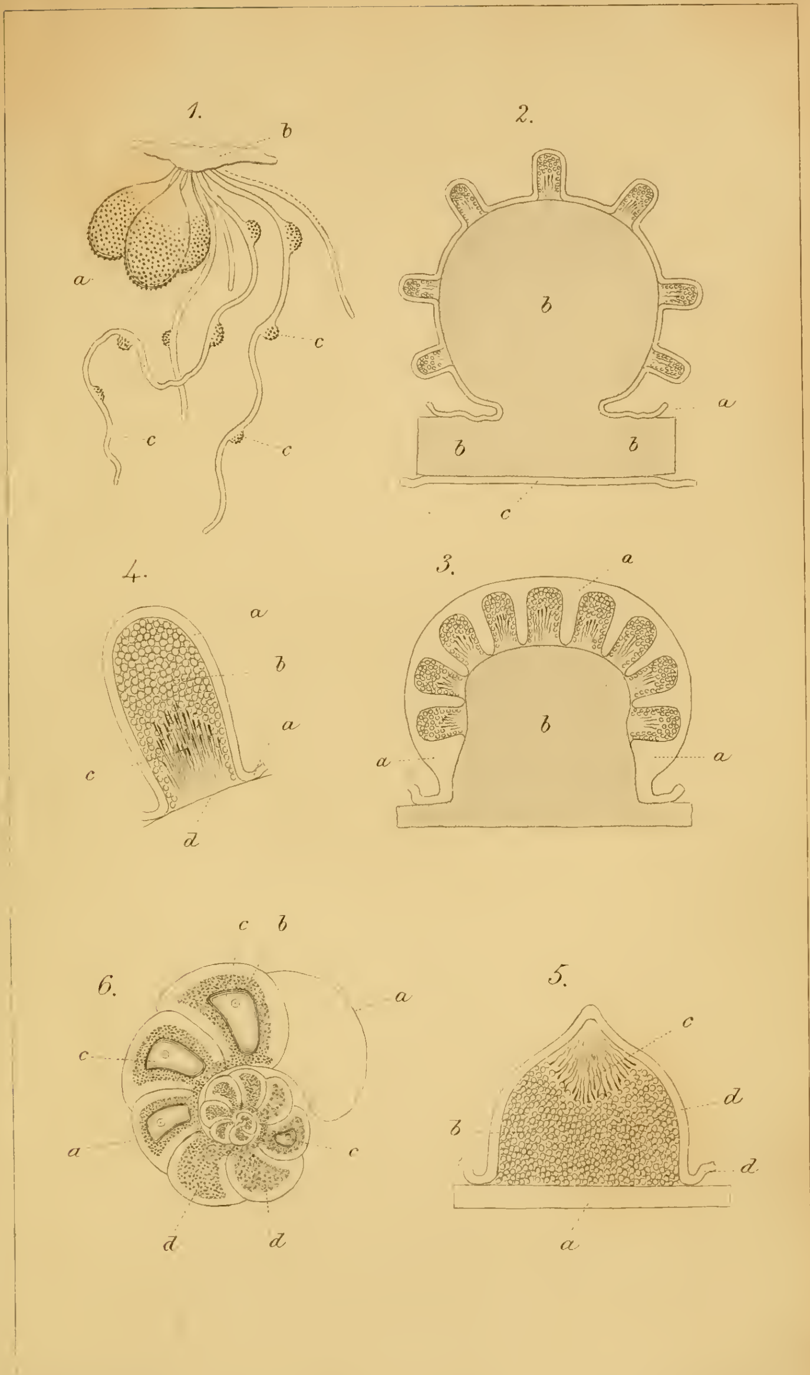
J. De C. Sowerby Sc.

M. J. B. & C. E. B. del.   J. De C. Sowerby sc.

M. J. B & C. E. B. del   J. De C. Sowerby sc

J B & C.E.B. del

J De C. Sowerby Sc



T. Strethill Wright, del.

J. Basire Sc.

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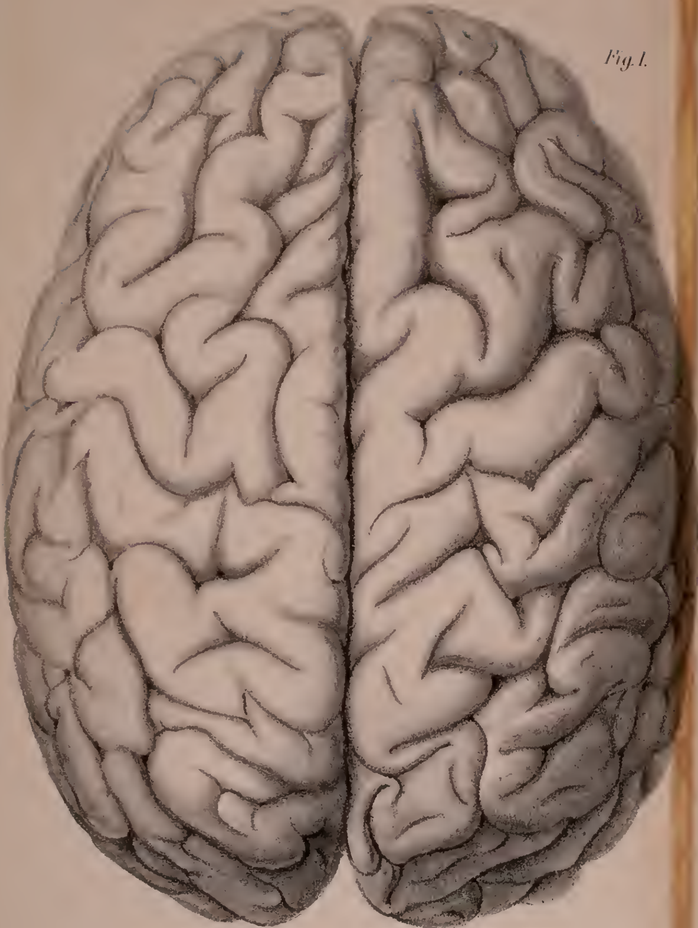

Negro.

Fig. 2.

Chimpanzee

Fig. 1.

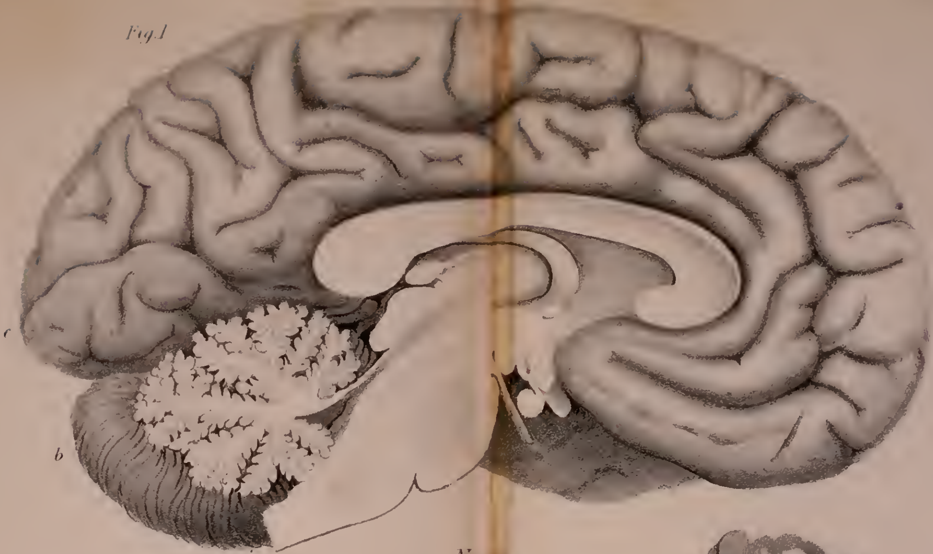

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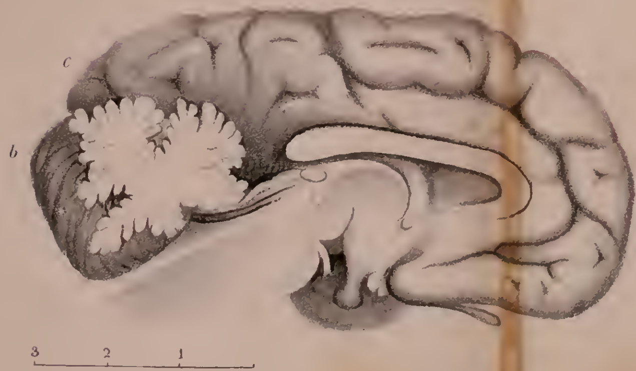
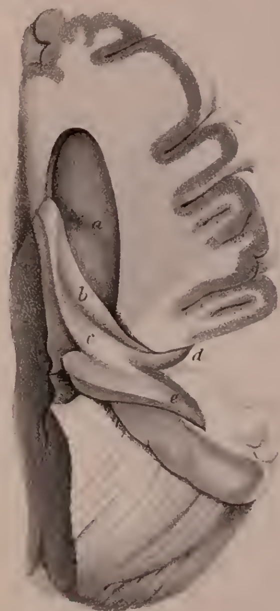
Fig. 2.



Chimpanzee.

Fig. 3.



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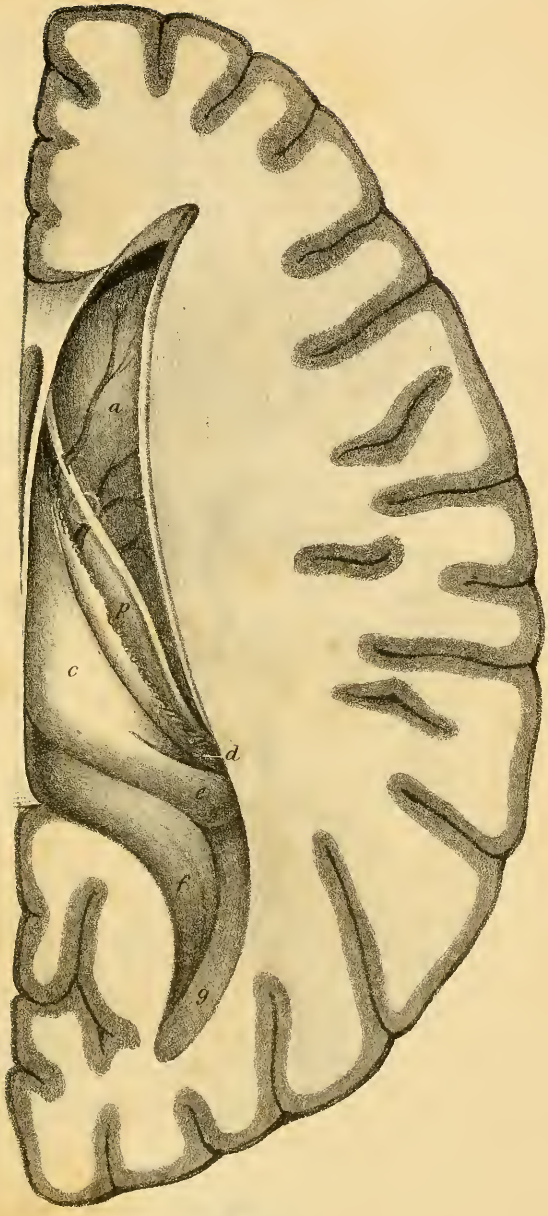

R. Parsons lith.   W. West imp.