H. Wicks sculp.

Richard Taylor

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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1860.

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

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

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

J. Taylor, *Norwich*, 1818.

ALERE FLAMMAM.

CONTENTS OF VOL. VI.

[THIRD SERIES.]

NUMBER XXXI.

Page

NUMBER XXXIII.

NUMBER XXXIV.

NUMBER XXXV.

NUMBER XXXVI.

PLATES IN VOL. VI.

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. 31. JULY 1860.

I.—*Note on the Structure and Terminology of the Reproductive System in the* Corynidæ *and* Sertulariadæ. By Prof. Allman.

In Professor Huxley's Monograph of the Oceanic Hydrozoa, lately published by the Ray Society—a work which, in accuracy of description, copiousness of illustration, and philosophic treatment of its subject, must take its place in the first rank in the literature of the lower groups of the animal kingdom,—the author proposes a terminology, partly special, for the particular groups which form the subject of his memoir, and partly intended to apply to the Hydrozoa in general.

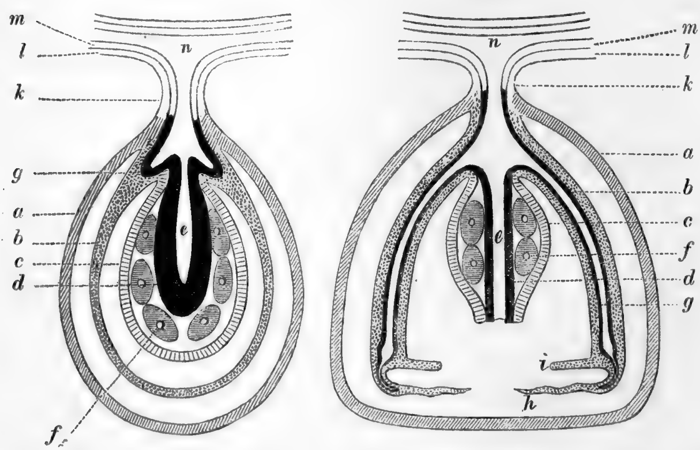
The greater part of Prof. Huxley's terminology is, I think, very valuable, and supplies a want long felt in the descriptive phraseology of this section of the animal kingdom; but I am nevertheless unable to coincide with him in that part of his work where he objects to my use of certain terms in the description of those parts of the Corynidæ and Sertulariadæ which are concerned in the function of reproduction.

I have given to Prof. Huxley's remarks on this matter that careful consideration to which they are entitled, not only from the authority with which their author's sanction must invest them, but from the excellent spirit in which they have been made; and it is not because I have any particular affection for my own terms, or would wish to insist on their priority as a claim for their retention if any better be suggested, that I would now defend them, but it is because, while admitting the force of Prof. Huxley's criticism in some points, I feel that in others he has not entirely understood my views, and that several of his objections to my terms are founded on a misapprehension of the sense in which I have used them.

It is true that, since I first proposed a terminology of the parts in question, increased opportunities of observation have given me a clearer perception of the relations of these parts, and have somewhat modified my original views; but I see no reason to abandon the opinions I had expressed in some of my later publications.

I fear indeed that I have been occasionally somewhat obscure in my definitions, and that the sense in which I wished to apply certain terms has thus been not at all times sufficiently apparent. The accompanying diagrams, however, will explain my views of the structure of the parts under consideration, and, far better than any mere description, will fix the meaning of my terminology.

Fig. 1. Fig. 2.



Plans of typical Gonophore. 1. Containing sporosac. 2. Containing medusoid. The same kinds of shading and the same letters are adopted in the two figures, with the view of indicating the homologous parts.

a, ectotheca; *b*, mesotheca or umbrella; *c*, endotheca; *d*, spadix; *e*, cavity of spadix; $c+d$, manubrium; *f*, generative elements; *g*, radiating canals; *h*, marginal tentacle; *i*, velum; *k*, peduncle; *l*, ectoderm of cœnosarc; *m*, endoderm of cœnosarc; *n*, somatic cavity.

The *gonophores* are certain buds of a peculiar structure, destined for the formation and protection of the generative elements.

The typical gonophore presents an external investment (*ectotheca*); a second investment (*mesotheca*), which lies immediately within the ectotheca; a third one (*endotheca*), situated immediately within the mesotheca; a central, more or less elongated body (*spadix*), which lies in the axis of the gonophore, and contains a cavity in free communication with that of the polype or cœnosarc ("somatic cavity" of Huxley); and lastly, the *generative elements* (ova or spermatozoa), which surround the spadix and are themselves immediately invested by the endotheca.

The ectotheca is a simple extension of the ectoderm of that part of the zoophyte from which the gonophore arises, and it encloses either a *sporosac* or a *medusoid*.

Professor Huxley objects to the use of the term "medusa," by which I have hitherto designated one form of the contents of the ectotheca, believing it "to be better to avoid all chance of confounding the detached reproductive organ of a hydrozoon with a truly independent organism;" and he prefers the expression "medusiform gonophores."

There is value in this criticism, and I by no means desire to insist on the retention of the word "medusa;" but "medusiform gonophore" does not express my meaning; for in the Corynidæ and Sertulariadæ, where the ectotheca is invariably present, it is not properly the gonophores that are medusiform, but rather that part of them which is contained within the ectotheca. In the Calycophoridæ and Physophoridæ (?) the ectotheca is apparently obsolete, at least after the very early stages of the gonophore have been passed, and the expression "medusiform gonophore" would then be quite applicable; all difficulty, however, will be avoided by the adoption of the term "medusoid" —a term which has already been for some time in use.

The mesotheca, endotheca, and spadix of the gonophore *may* all enter into the composition of a sporosac (e. g. *Tubularia indivisa*); they or their homologues *must* all enter into that of a medusoid.

When the mesotheca is present and contractile, the body is a medusoid; when it is absent or non-contractile, the body is a sporosac. The mesotheca becomes in the medusoid an *umbrella* ("gonocalyx" of Huxley).

Professor Huxley maintains that the transition between what I term sporosacs and medusæ (medusoids) is so gradual that no line of demarcation can be drawn between the two, though he would admit the applicability of the term sporosac to such forms as we meet with in Hydractinia. I believe, however, that the distinction is a practical one, and that the *differentiæ* involved in the above definitions are sufficiently decided for all purposes of description.

1*

The endotheca and spadix, taken together, form the *manubrium.* The endotheca is the ectoderm, and the spadix the endoderm of the manubrium. It is between the endotheca and spadix that the generative elements are developed.

Professor Huxley would restrict the term manubrium to "the central polype-like sac of a medusiform gonophore, which is surely the homologue of the whole sporosac of *Hydractinia*, and not of its central cavity only." I admit that, in some of my earlier papers, I was not very clear myself on the homologies in question; and Professor Huxley, manifestly misled thereby, has here stated my views as somewhat different from what they really are. For me, however, as I at present understand the matter (see Rep. Brit. Ass. for 1858, Trans. Sec. p. 120, and Proc. Roy. Soc. Edinb. Dec. 1858), the manubrium is the whole of the "peduncle," "stomach," or by whatever other name it may be called, which depends from the centre of the umbrella in a medusa or medusoid; and I apply the same term to what I consider the homologous part in a sporosac,—namely, the whole sporosac *minus* the ectotheca and mesotheca.

The gonophore is borne as a bud, on the one hand *directly* either by the cœnosarc (*Cordylophora*, *Eudendrium*), or by the polype (*Coryne*); or, on the other hand, by a special column-like support, from which it is also developed as a bud (*Laomedea*, *Sertularia*, *Tubularia*). This support is the *blastostyle.*

The blastostyle with its gonophores may be naked (*Tubularia*, *Hydractinia*), or it may detach from its sides a layer of ectoderm, which will secrete upon its external surface a chitinous polypary in the form of a capsule or gonangium, whose axis will then be occupied by the blastostyle in the form of a column carrying the gonophores on its sides.

Prof. Huxley would restrict the term blastostyle to the axis of the capsule in such forms as that last described, and believes that when the stalk of the gonophores in *Tubularia* is also called so, the same name is applied to two different things,—this part in *Tubularia* containing the representatives of both the blastostyle and capsule of *Laomedea*.

In one sense this is true—in that, namely, in which it is true that the naked polype of *Tubularia* contains the representative of both the hydrotheca* and polype of *Laomedea*; for there can

* The term *hydrotheca* has been proposed by Huxley to designate the cup-shaped receptacle in which the polypes of the Sertulariadæ are lodged, and which is commonly known as the "polype-cell." It is a valuable addition to our terminology of these animals, and is particularly useful in enabling us to avoid the ambiguity which attaches to the word "cell" when used in this sense, now that we have in histology an entirely different application of the term.

be no doubt that the gonangium in *Laomedea* is the homologue of a hydrotheca: so that, if we admit the validity of Prof. Huxley's objection, we must, on the same grounds, refrain from calling by one name the polype of *Tubularia*, where no hydrotheca exists, and that of *Laomedea*, which is protected by a hydrotheca,—a practice which few would venture to adopt.

II.—*On the Tribe* Colletieæ, *with some Observations on the Structure of the Seed in the Family of the* Rhamnaceæ. By John Miers, F.R.S., F.L.S. &c.

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

8. Talguenea.

The characters of this genus have been imperfectly known, but they are sufficiently distinct from all others of the *Colletieæ*, especially from *Trevoa*, with which it has been confounded. It was originally proposed by me, in 1825, for the plant which I called *Talguenea costata*, after its vernacular name of *Talguén*; but Sir Wm. Hooker, in 1830, who had not then seen the fruit of *Trevoa*, considered it to be congeneric with the latter genus; and, on the authority of Dr. Gillies, he suppressed *Talguenea*, and placed the two typical plants as distinct species of *Trevoa* (Bot. Misc. i. 158). The former celebrated botanist, in 1833, having then seen the fruit of *Trevoa*, was induced to suppress that genus, and to refer *T. trinervis* to *Retamilia*, and at the same time (Bot. Misc. iii. 174) he first adopted the genus *Talguenea* as I had originally proposed it. It is strange that Dr. Gillies should have confounded two plants so totally distinct, as not only had he ample opportunity, while he resided with me at Concon, of examining them in the living state, but he also saw my drawings, in which their characters are fully shown. Colla, claiming the authority of Bertero, referred both *Talguenea* and *Trevoa* to *Colletia* (Mem. Torin. 37. p. 53). The prominent characteristic of *Talguenea* lies in the structure of its fruit, which consists of an indehiscent membranaceous carcerule, surmounted by its enlarged persistent style, of nearly equal length, and enclosed in its entire and unchanged calyx, which is perfectly free from it and about three-quarters of its length. The ovary is always 3-locular, each cell having a single erect ovule, but of these seldom more than one is perfected; the fruit, however, is occasionally 2-locular, or more rarely 3-celled. Among other peculiarities, we see in all the axils of *Talguenea* a very large squamose tubercle growing beneath the spines, from which issue many crowded fasciculated leaves and flowers; whereas in *Trevoa*, as before shown, this tubercle becomes extended into an elongated branchlet, on which the leaves are distributed in pairs, by distinct intervals, and towards the extremity become abortive, when the flowers assume a spicated or racemose appearance. I have defined its generic features in the following manner:—

Talguenea, nob. — *Calyx* petaloideus, turbinato-tubulosus, membranaceus, 10-nervis, fere ad medium 5-fidus, laciniis oblongis, acutis, 3-nervatis, apice callosis, æstivatione valvatis, demum reflexis, tubo intus piloso, persistens, immutatus et marcescens. *Petala* 5, erecta, laciniis æquilonga et alterna, rotundato-oblonga, concava, subcucullata, unguiculata. *Stamina* 5, petalis inclusa et cum unguibus inserta; *filamenta* tenuia, pilosa, complanata, medio carinata, margine membranacea et ciliata, apice repente inflexa; *antheræ* parvæ, reniformi-rotundatæ, 2-lobæ, lobis 2-valvatis, valvula antica breviore, et hinc rima hippocrepica latissime hiantes. *Discus* fere obsoletus, calyci adnatus, ovarium fulciens et ejus diametrum vix excedens, cum toro confusus. *Ovarium* superum, disco paululo immersum, 3-loculare; *ovula* erecta, in loculis solitaria. *Stylus* filiformis, longe exsertus, ultra medium patentim hirsutissimus, superne glaber, profunde 3-sulcatus. *Stigma* breviter 3-lobum, lobis obtusis, adpressis, glutinosis. *Fructus* carcerularis, chartaceus, valde hirsutus, oblongus, calyce immutato inclusus, eo paulo longior, stylo persistente terminatus, indehiscens, 3-locularis, sæpius abortu 2- vel 1-locularis, loculis monospermis. *Semen* ovatum, lenticulari-compressum, structura omnino ejus *Colletiæ*.

Arbusculæ *Chilenses valde ramosæ*, ramulis *confertis, tortuosis, decussatim divaricatis et oppositis, junioribus brevibus et spinosis*; folia *integra, oblonga, in petiolum brevem cuneata, sub-5-nervia, nervis parallelis costata, supra glauca, infra albido-sericea, e tuberculo majusculo infra spinam egrediente cum floribus glomeratim congesta*; flores *fasciculati, albescentes.*

1. *Talguenea costata,* nob., Trav. ii. 529; Hook. Bot. Misc. iii. 174;—Trevoa 5-nervia, *Gill. et Hook.* ibid. i. 158, tab. 45 B.;—Colletia Tralhuen, *Bert. Colla, Mem. Torin.* 37. p. 53, tab. 7;—arbuscula orgyalis, ligno duro rubro, tortuose ramosissima, ramulis fuscis, cinereo-tomentosis, spinosis, spinis decussatim oppositis, validiusculis, subulatis, folio subbrevioribus; foliis oppositis, vel e gemma squamosa sub singula spina enata plurimis aggregatis, oblongis, mucronatis, basi cuneatis, supra glauco-viridibus, parce pubescentibus, subtus pilis adpressis incanis sericeis, nervosis, nervis 5–7 subparallelis superne immersis, et hinc profunde sulcatis, subtus nervis costato-prominentibus, petiolo breviusculo, sericeo; stipulis

squamosis, acutis, fusco-rubris, sericeis, ciliatis, linea transversali connexis; floribus 4–6, vel plurimis, in singulam gemmam conglomeratis, pedunculo calycis longitudine, tomentoso, tubo calycino turbinato, extus pubescente, intus præsertim infra stamina piloso, limbi laciniis 5, acutis, reflexis, tubo brevioribus; petalis 5, niveis; staminibus reconditis; ovario piloso; fructu calyce marcido incluso et eo paulo longiore, stylo piloso, acuminato.—Chile, in Prov. centralibus.—*v. v.* prope Limache, Concon, Quillota, et aliis locis.—*v. s. in herb. Mus. Paris.* (Gay); *in herb. Hook.* (Cuming, 713; Bridges, 433); *ibid.* (Banda oriental.?, Tweedie). Vernac. *Talguén.*

The trunk of the Talguén, on account of its hardness, is useful for turning-purposes; but it is mostly employed in Chile as fuel in the mining localities, for which it is admirably adapted, and is much sought for about the copper-works of Quillota, Illapel, and Petorca. In some places the trunk grows to a considerable size, and is preferred, on account of its indestructibility when sunk in the ground, for the construction of the cottages and ranchos of the country. Its spines are spreading, ½ inch long, their acute tips being reddish; the leaves are 6–9 lines long, 2–3 lines broad, on very short reflected petioles; the peduncles are nearly 2 lines long; the tube of the calyx is of the same length, and the lobes of its border are 1 line long. The carcerule is a thin indehiscent chartaceous shell, 2½ lines long, 2 lines in diameter, enclosed by the free and somewhat extended calyx, and is surmounted by the hirsute persistent style, which is equal to it in length: it is rarely 2-locular, generally by abortion only 1-celled, in which case the axis with the abortive cells form a prominent ridge that runs down one side of the shell, and leaves a corresponding impression on the enclosed seed. The seed is polished, of a dull brown colour, oval, and somewhat compressed*.

In Sir Wm. Hooker's herbarium I find a specimen, as above mentioned, stated to have been found in the woods of the Uruguay, with a ticket in Tweedie's handwriting; but I suspect that the ticket belongs to another specimen, which by mistake has been changed, and that the plant came originally from Chile, for I perceive no difference whatever between that specimen and others collected in the latter country. It can hardly be imagined that the same species of a genus so peculiarly Chilean should be found at a distance of 1500 miles, in a different soil and climate, with the lofty Cordillera of the Andes intervening,

* A drawing of this plant, with analytical details, will be given in the 'Contributions,' Plate 41 B.

without the least indication of its existence in any intermediate place. As I have met with other accidental, though rare, instances, in that extensive herbarium, of a similar interchange of tickets, I entertain the greatest doubt of the correctness of the locality in question, for the reasons stated.

2. *Talguenea mollis*, n. sp.;—fruticosa, spinosa, ramis ramulisque rectis, teretibus, griseo-tomentosis, spinis foliis triplo brevioribus, foliiferis, tenuibus, aciculatis; foliis submembranaceis, ellipticis, utrinque acutis, subdenticulatis, superne fusco-viridibus, subtus canescentibus, utrinque sericeis, 5-nerviis, nervis supra immersis, subtus vix prominulis, petiolo brevi; stipulis majusculis, oppositis, navicularibus, subamplexicaulibus, extus griseo-sericeis, intus rubro-pilosis, apice 2-dentatis; inflorescentia in racemis brevibus oppositis multiflora, floribus in fasciculis 6–8, approximatis, fasciculis 6–8-floris, idcirco 30–60 in racemo, hinc crebriter conglomeratis, pedicellis flore longioribus, cano-sericeis.—Chile, in Prov. Rancagua.—*v. s. in herb. Mus. Paris.* (Bertero, 188).

This species has a different aspect from the former: the branchlets are quite straight and sericeous, and the spines much thinner, not exceeding 4 lines in length, and foliiferous in the middle. Its leaves are much thinner in texture, neither sulcated above, nor costately nerved beneath, the nervures being very fine, and scarcely prominent; they are remotely denticulated with extremely short teeth, sericeous on both sides, silvery below, 9–10 lines long, 4½ lines broad, on a petiole 1½ line long; the stipules are comparatively large, concave, opposite, and meeting each other in the middle of the stem, which they thus completely embrace; they are deeply bifid, 1½ line long, externally sericeous, internally and on the margin red. The racemose branchlets are 1 inch long, and bear from forty to sixty flowers, crowded in the manner above specified *.

9. Scypharia.

Under this head are brought together a few spinose shrubs, or small trees, more or less foliaceous in habit, distinguished by their opposite leaves; small flowers, with an urceolate 5-fid calyx; small, deeply emarginate, naviculate petals, enclosing as many stamens; and a 2-celled ovary: they are very different from *Trevoa*, to which they approach the nearest in their floral structure. In most of them the fruit is unknown; but Kunth describes that of his *Rhamnus Guayaquilensis* as being an oval drupe, somewhat fleshy, smooth, and bilocular, or by abortion 1-celled, as in *Trevoa*. The manuscript characters contributed

* This species will be represented in the 'Contributions,' Plate 41 c.

by Bonpland are not to be relied on, as Kunth found them disproved by the analysis he made of the dried specimens; the latter may therefore be accepted as the more correct. They correspond thus with the general features of the *Colletieæ*, and the species here associated harmonize sufficiently together. Kunth describes the nut as containing two hard and crustaceous pyrenæ, one of which he found abortive, the other emptied by caries: this coating evidently corresponds with the hard crustaceous covering of the seed common to all the *Colletieæ*. The genus, therefore, in the absence of perfect specimens, can only be characterized imperfectly, and its features will no doubt require some modifications whenever better evidence can be obtained; but in the mean while, the facts already established tend to confirm its validity. Its name is derived from σκύφος, *scyphus*, in allusion to its cup-shaped disk, after the example of *Discaria*, to which genus one of the species has been referred by Dr. Hooker, on account of its disk.

Scypharia, nov. gen.—*Calyx* campanulatus, semiglobosus, coloratus, glaber, limbo 5–6-fido, laciniis ovatis, acutis, æqualibus, immutatus et persistens. *Petala* 5, interdum 6, parva, inter lacinias alterna, iisdem dimidio breviora, subreniformia, apice plus minusve profunde emarginata, aut bifida, basi unguiculata, lateribus inter se mutuo plicata, et stamina claudentia, glabra, alba. *Stamina* tot quot petala, et cum eorum unguibus inserta; *filamenta* subulata, glabra; *antheræ* ellipticæ, 2-loculares, utrinque rima longitudinali dehiscentes. *Discus* cupuliformis, calycis tubo brevior, et ei omnino adnatus, carnosus, flavescens. *Ovarium* superum, globosum, fundo disci insitum, glabrum, 2-lobum, 2- (vel 3-?) loculare; *ovula* erecta, in loculis solitaria. *Stylus* teres, crassus, brevis, glaber. *Stigma* 2-lobum, lobis obtusis, conniventibus. *Fructus* drupaceus, ovatus, imo calyce persistente suffultus, 2-locularis, loculis monospermis, vel abortu 1-locularis. *Semen* crustaceum; cætera ignota.

Suffrutices *Ecuadorenses et Gallapagenses, interdum spinosi*; spinæ *decussatim oppositæ, divaricatæ*; folia *oblonga, sæpius glaberrima, petiolata, cito caduca*; flores *pauci, minimi, fasciculati, axillares vel sub spinis propullantes.*

1. *Scypharia Guayaquilensis*;—Rhamnus Guayaquilensis, *H.B.K.* vii. 55;—Rhamnus decussatus, *R. & P. in herb. Lambert.*;—Sageretia Guayaquilensis, *Brongn. Ann. Sc. Nat.* x. 360;—fruticosa, suborgyalis, ramosissima, subspinosa, ramis ramulisque angulato-tetragonis, lævibus, glabris; spinis elongatis decussatim oppositis, sparsis, patentibus, glabris, apice pungentibus, axillis foliiferis pluribus munitis et hinc casu

foliorum nodosis; foliis oppositis, parvis, obcordatis, apicem versus rotundatis, profunde retusis et mucronatis, e medio in petiolum brevem cuneatis, integerrimis, crassis, nervis immersis, utrinque glabris et pallidis, caducis; floribus sparsis, viridibus, 5-meris; petalis bilobis, squamæformibus, filamentis brevissimis; ovario glabro, 2- (vel 3-?) loculari; fructu obovato-rotundo, compressiusculo, calyce parvo suffulto, lævi, parce carnoso, 2-loculari, loculo abortivo sæpe uniloculari.—Ecuador ad Guayaquil.—*v. s. in herb. Mus. Paris.* (Bonpland).

I have examined the original specimen of this plant, described by Kunth, which is in a very unsatisfactory condition: the two loose leaves that accompany it, certainly do not belong to it as that able botanist suspected. Bonpland related, in his notes, that they were alternate; but the cicatrices on the branches show them to have been opposite, which is confirmed by the specific name given to it by the authors of the 'Flora Peruviana,' indicating that both the leaves and spinescent branchlets are decussately opposite. The axils of the secondary branchlets are about ½ inch apart; those of the tertiary branchlets or ramiform spines, which are 1½ to 2 inches in length, are about 4 lines apart, these branchlets being quite square, with prominent decurrent angles. The loose leaves described by Kunth, with their short petiole, are 1½ inch long and 10 lines broad, and evidently belong to some other plant. I found a few of the real leaves still remaining; they are very small, being only 3 lines long and 3 lines broad, on a petiole ¼ line in length: these, on account of their minuteness, had been overlooked by that botanist. The flowers are small, and almost sessile. Kunth was correct in his opinion that this species and his *Rhamnus senticosa* are congeneric, and that neither of them really belong to *Rhamnus**.

2. *Scypharia parviflora*;—Discaria parviflora, *Hook. fil. Linn. Trans.* xx. 229;—suffruticosa, intricata, ramis ramulisque strictis, tetragonis, compressis, subaphyllis, crebre spinescentibus; spinis decussatim oppositis, longissimis, horizontaliter patentibus, striatulis, calloso-pungentibus, internodiis spinis 5-plo brevioribus; foliis oppositis, oblongo-obovatis oblongisve, utrinque obtusis, apice mucronulatis, integerrimis, caducis, opacis, supra viridibus, subtus cuticula resinoso-crustacea glaucis, glabris, pinnato-nervosis, nervibus omnino immersis, petiolo brevissimo, subtereti, superne canaliculato; floribus sparsis, minutis, solitariis, binisve, subsessilibus, 5-meris; petalis 2-fidis, latissime spathulatis, ungue brevi; ovario

* A representation of this species will be found in Plate 42 A of the 'Contributions.'

2-loculari.—Ins. Gallapagos.—*v. s. in herb. Hook.*; Albemarle Island (Darwin).

This plant appears to correspond well in its characters with the preceding and the following species: it grows abundantly, forming thickets near the sea. Its branchlets are slender and very glabrous; the spines are from 12 to 20 lines long, and the internodes 4 lines apart; the leaves are nearly 1 inch long, and 4 lines broad, on a petiole 1 line in length. It is worthy of remark, as indicative of the limit of the genus, that many of the plants of the Gallapagos are identical with those of Guayaquil, which is in the same latitude, and the nearest opposite point of the continental coast *.

3. *Scypharia senticosa*;—Rhamnus senticosa, *H.B.K.* vii. 54;—Sageretia senticosa, *Brongn. Ann. Sc. Nat.* x. 360;—Colletia spicata, *Willd. in R. & Sch.* v. 513;—fruticosa, orgyalis, ramosissima, spinosissima, glaberrima, subaphylla, ramis suboppositis, ramulis teretibus, spinis decussatim oppositis, longissimis, subulatis, teretibus, patentissimis; foliis paucis, ad basin spinarum solitariis, ovatis, basi rotundatis, integerrimis sub-5-plinervibus, subcoriaceis, glaberrimis, glauco-viridibus, deciduis, petiolo brevi, supra canaliculato, glabro, basi articulato; floribus 5-meris, minutis, 5–6, sub basi spinarum fasciculato-glomeratis, sessilibus, viridibus, bracteolatis; fructu baccato, globoso, abortu 1-spermo; semine lenticulari.—Vern. *Molono* incolarum.—Peruvia alta, Prov. Truxillo ad Contumasay.—*v. s. in herb. Mus. Paris.*, Zarzal (Bonpland, 3720).

There is a great approximation of characters between this and the two former species, and more especially with the last, the principal difference consisting in its ovary, which is represented as being 3-locular,—a difference which it must be remembered exists also in *Trevoa*. Contumasai, where it is found, is scarcely 4° south of Guayaquil. Its branchlets are glaucous, and obsoletely pubescent, as well as sub-4-gonous; its spines are horizontal and opposite, sometimes a little alternate, and from 10 to 20 lines long; its leaves are said to be not quite an inch long, on a petiole 1 line in length, but they are now wanting in the specimen. Kunth observes that the leaves are very deciduous, and that the specimen he examined was almost aphyllous, looking quite like a *Colletia*; the same may be said of *S. pauciflora*. The floriferous branchlets are about the length of the spines, spring from below them, and are more slender and flexible: the flowers (1 or 2) are sessile in the opposite axils of the nodes,

* This species will be represented in the 'Contributions,' Plate 42 B.

which are about a line apart; they are very minute, scarcely more than a half-line in length and diameter*.

Species dubiæ.

4. *Scypharia tetragona*;—Colletia tetragona, *Brongn. Ann. Sc. Nat.* x. 366;—ramosa, ramis ramulisque elongatis, virgatis, patentibus, tetragonis, angulis prominulis, spinosis, glaberrimis, nodis remotis sæpius aphyllis, spinis validis, subulatis, valde divaricatis, apice calloso-pungentibus; stipulis rudimentariis, calloso prominentibus, apice (e petioli delapsi articulatione) cicatricosis, sub spinis ortis, foliis deficientibus; racemis aphyllis, spina longioribus, inter stipulas et spinas enatis, tetragonis, sub-6-floris; floribus decussatim oppositis, pedicellis brevissimis, imo articulatis, calyce persistente, breviter campanulato, membranaceo, 15-striato, margine breviter 5-lobo, lobis obtusis, mucronulatis.—"Peruvia." —*v. s. in herb. Mus. Paris.* (Dombey).

I have seen the above-named original specimen, which has neither flower nor fruit; but its racemes remain, showing a few of its persistent calyces. After examining it attentively, I have come to the conclusion that it is not a *Colletia*, though probably belonging to the same tribe. Attached to the sheet in which it is enclosed is a small cartouch, containing some loose drupes, and labelled "Volkameria calva." These drupes are without any calyx, are fleshy, dark-coloured, apiculated by the base of the style, and 5 lines in diameter; they contain each two nuts, which quite correspond with the structure of that genus. We may therefore inquire, do these drupes belong to the specimen in question? It appears to me they do not; for if they had been there when Brongniart described his "*Colletia tetragona*," he would not have failed to notice so manifest a clue to the nature of the plant. It is therefore most probable that these seeds have been since placed there by mistake. This conclusion is confirmed by an examination of the specimen. In *Volkameria* and other Verbenaceous plants of the same tribe, the occasional presence of spines is owing to the growth of the petiole of abortive leaves; and we invariably find in all such cases both the inflorescence and young branchlet sprouting out from above such spine. But in the specimen in question, as in all the *Colletieæ*, the spine is not produced from a petiole: it is superior not only to the floriferous branch, but also to the peculiar process which served as a support to the fallen leaf; for that calloid process shows a scar upon its extremity, indicating the articulation of the petiole upon it, similar to the same structure seen in

* A drawing of this species will be given in Pl. 42 c of the 'Contributions.'

Scypharia Guayaquilensis, only that in the former case the lateral teeth are not developed: the floriferous branch, as in the *Colletieæ,* rises from between that process and the spine, and is quite analogous to the racemose twig of the species last mentioned; it has a similar 4-angled stem, with salient angles, and the flowers in both cases are nearly sessile, and placed at some distance in decussate pairs. In this specimen of "*Colletia tetragona,*" although the fruit has fallen away, the persistent calyx is of a somewhat campanulate form, with five short rounded lobes, and within, at its base, is the vestige of an apparently small disk, with a free border, showing in the middle the scar where the fruit was attached. There is another consideration: in *Volkameria spinosa,* and other species of that genus, the inflorescence is a cyme, 3-chotomously branched, the flowers being borne upon long slender pedicels, bracteated at their base; but in this plant the flowers are arranged in almost sessile pairs upon a straight rachis. These circumstances induce me to retain the plant among the *Colletieæ,* where Brongniart first placed it, and to arrange it provisionally in *Scypharia,* with which it offers so many points of analogy, until a better knowledge can be obtained concerning it. I may also add that its spines exactly conform to those of the *Colletieæ,* having the same corneous pungent apex*.

Observations.—The *Rhamnus microphyllus,* H.B.K. tab. 616, from Mexico, might be thought to belong to *Scypharia,* on account of its 2-lobed petals and 2-celled ovary; but its habit is quite incompatible. Its branches are spineless, decumbent, and alternate; its leaves are also alternate. Its relation is probably with *Microrhamnus ericifolia,* A. Gray (Pl. Wright. p. 34), to which perhaps *Colletia disperma,* DC., is allied, all being indigenous to Mexico.

A new genus has lately been proposed in the 'Linnæa' (xxviii. 618), by Dr. Philippi, under the name of *Sciadophila,* founded upon the *Colletia Maytenoides* of Dr. Grisebach, a plant from one of the southern provinces of Chile (Valdivia). I have carefully examined this plant, and find that in its general habit and in its floral structure it differs in no respect from the genus *Condalia* of Cavanilles. Dr. Philippi places his genus among the *Colletieæ*; but it evidently belongs to the *Rhamneæ* (*Frangulineæ,* Reiss.): the segments of the calyx are divided to the margin of the disk, and are deciduous, as in *Condalia,* it has also no petals; the stamens are of the same form, and are similarly situated; in the structure of its ovary, in its style and

* This plant will be figured in Plate 42 D of the same work.

stigma, it likewise agrees; and the fruit is also a berry, seated on the persistent cupular base of the calyx. In its general habit it quite resembles other species of *Condalia,* its leaves being alternate, and it has no spines. Dr. Philippi describes its flowers as being pentamerous; but in the specimen I examined they were certainly tetramerous, as in the other species of the genus. I do not doubt the accuracy of the former statement; for it is very probable that its flowers may occasionally be abnormally pentamerous. I add below, in a note, my observations upon the above-mentioned plant*.

III.—*On certain Musical* Curculionidæ; *with Descriptions of two new* Plinthi. By T. Vernon Wollaston, M.A., F.L.S.

Whilst residing in the remote and almost inaccessible village of Taganana (towards Point Anaga), in the north of Teneriffe, during the spring of 1859, my attention was called to a peculiarity in a beautiful species of *Acalles* (I believe the *A. argillosus,* Schönh.), which I do not remember to have seen recorded concerning any other Coleopterous insect whatsoever. It was on the 22nd of May that my Portuguese servant (whom I had sent out to collect) brought me home eleven specimens of a large *Acalles* which he had captured within the dried and hollow stems of a plant growing on the rocky slopes towards the sea, and which I have but little doubt (from his description) was the *Kleinia neriifolia,* DC., so common throughout the islands of the Canarian archipelago. I had been accustomed to find such a number of insects in the dead branches of the various Euphorbias, that my attendant also had discovered, from time to time, the *locus quo* of many a rarity by imitating my method of research; and, to use his own expression, he was about, in this instance, to throw away these rotten stems as worthless, when he was arrested by a loud grating, or almost chirping, noise, as

* *Condalia Maytenoides*;—Sciadophila Maytenoides, *Phil. Linn.* xxviii. 618;—Colletia Maytenoides, *Griseb. loc. cit.* p. 619;—frutex vix orgyalis, inermis, ramulis gracilibus, striatis, subglabris, valde foliosis; foliis alternis, elliptico- vel lanceolato-oblongis, utrinque acutis, integris, margine cartilagineo, subrevoluto vel interdum obsolete crenulato, glaberrimis, subtus paulo pallidioribus, crassiusculis, nervis superne omnino immersis, subtus vix prominulis, rachi superne sulcato, infra prominente; petiolo brevi, pallido, canaliculato; stipulis parvis, caducissimis; floribus axillaribus, solitariis, vel binis, glaberrimis, calycis tubo urceolato, brevi, limbo 4-fido, æquilongo; staminibus 4, laciniis dimidio brevioribus, erectis, antheris parvis, globosis, apicifixis; ovario glabro; stylo staminibus æquilongo, glabro, crassiusculo, subulato; stigmate 3-dentato. Bacca (sec. Phil.) nigra, basi angustata, insipida.—Chile, in nemoribus Prov. Valdiviæ.—*v. s. in hb. Mus. Paris.* (Philippi).

of many creatures in concert; and on looking closer for the mysterious cause, he detected a specimen of *Acalles*, from which it was quite evident that a portion of the noise proceeded. On shaking the hollow stem, so as to arouse its inmates, and putting his ear alongside it, the whole plant appeared musical, as though enchanted; and it was evident to him, therefore, that there were more of the performers within,—a conjecture which proved to be correct, for, on breaking open the branches, he captured nearly a dozen of them.

No one who has studied the genus *Acalles* in a state of nature, particularly the comparatively gigantic forms of subaustral latitudes, and who has marked their dull, obscurely-variegated surfaces and nodose bodies (often with such difficulty distinguished from the masses of lichen and wood to which they have chanced to adhere), as well as their singular mode of counterfeiting death, when disturbed, by contracting their legs under them, and applying their head and rostrum so closely against their chest as to appear at first sight, even when thrown about, mere shapeless masses, motionless and inanimate,—can be surprised that an uneducated eye should have failed in perceiving at once the tenants of those stems, when first exposed to view: but naturalists who are acquainted with the species of this singular group would rather anticipate such a result as not only probable but almost certain.

So pleased was I with the accomplishments of these anomalous musicians, when brought to me, that I felt quite a reluctance (even though an entomologist) to put them to death. I therefore made a compromise with my feelings, and killed only eight of them. The remaining three I kept alive for several weeks, and even took them to Madeira,—where, however, they unfortunately died (as I imagine, from hunger) just before embarking for England. So long as they lived, however, it was a constant source of amusement to make these creatures stridulate, or "sing," as it was usually called, which they would invariably do, for almost any length of time, when alarmed,—as, for instance, when held between the finger and thumb, and slightly pinched. In this manner I have had four of them chirping at a time; and so loud was the noise produced that it might be heard at the distance of many yards.

It was some time before I was able to satisfy myself, not only as to the *modus operandi* of this proceeding, but even as to the exact region of the body from whence it emanated; for they would often stridulate when lying on their sides, with their limbs closely retracted and their head applied to their chest, and in fact whilst to all appearance perfectly passive and inanimate. Most Coleopterists are aware of the power possessed by many

Longicorns of emitting a grating noise from their thoracic segments—the great central region of their body; and as I had formerly taken some pains to ascertain the precise nature of their stridulating instrument as represented in the Atlantic genus *Deucalion,* my first supposition was that this Canarian *Acalles* had probably a similar mesothoracic file, over which the constricted and roughened edge of the pronotum was made to slide —an arrangement which I made out satisfactorily (*vide* Ins. Mad. p. 432) in the *D. desertorum,* and which I thought might possibly exist (although I had never hitherto suspected such a fact) in certain members of the *Curculionidæ* also. But on closely examining the creature whilst producing its notes, I could perceive no upward and downward movement of the head and prothorax, such as is necessitated in the case of the Longicorns whilst performing, and which causes the tuberculous inner surface of the latter to sweep over the dorsal file of the mesonotum; nor, indeed, for a long time, could I detect any motion in the body whatsoever. But at length a minute and rapid vibration of the apical segment of the abdomen—so rapid that, to the naked eye, it was scarcely appreciable—became evident, which at once solved the mystery, so far indeed as it could be solved without an actual dissection.

And so the matter rested until now, when (after the lapse of nearly a year) I have again taken it in hand, and have destroyed a specimen of the *Acalles argillosus,* so as to discover the exact nature of the mechanism on which its musical capabilities depend; and I feel bound to add that, although the structure is so evident as to leave no doubt whatsoever on my mind as to the *modus operandi* in generating the sound, it nevertheless seems to me to be an instrument scarcely adequate to occasion notes thus shrill and audible. In the Longicorns this was not so; for there the elongate file (in the form of an isosceles triangle) was extended along the whole length of the mesonotum, and was so *comparatively* coarse and regular in its parallel ridges, that it was not possible for a roughened surface (like the inner layer of the pronotum) to slide across it without a noise of some kind being produced. But in the case of the *Acalles,* the *pygidium,* although roughened, is not very sensibly so; whilst the small portion of the inner surface of the elytra against which (at each successive pulsation) it is brought to play is far less strictly file-like than was the triangular mesothoracic space of *Deucalion.* And yet this is certainly the contrivance by means of which this little Curculionidous musician is enabled to perform its anal "song." On carefully inspecting its abdomen, it will be seen that the terminal portion of it (represented by a single visible segment below, and by two when viewed from above) is *free*;

and that, when the insect is alarmed, it is in a state of constant and most rapid vibration. Now, whilst the under surface of this abdominal apex is merely clothed with scales, the upper surface (or pygidium) is destitute of scales, but slightly rough, deeply punctured, and *setose*; and the inner portion of the elytra (*corresponding with the constricted, or suddenly-attenuated, apical region*, as seen from above), against which the pygidium comes in contact at each of the pulsatory movements, is, to the naked eye, merely dull and subopake (instead of being glossy, like the rest of the inner tegument of the elytra); but when viewed beneath the microscope, this duller portion is coarsely shagreened, or, more strictly, perhaps, minutely and very densely subreticulate: and I conceive that it is by the play of the bristles of the pygidium against this subreticulated portion of the inner surface of the elytra (assisted, perhaps, by the setæ at the apex of the *dorsal* apical segment, which comes in contact with the inner surface of the *ventral* apical segment, which is likewise reticulate) that the music is generated.

In the gigantic *Acalles Neptunus* from the Salvages (an old specimen of which I have just destroyed, in order to ascertain whether it also possesses a similar stridulating instrument), the reticulations of the inner surface of this constricted apical portion of the elytra are much more elongate, appearing, at first sight, almost like the ridges of the mesothoracic file of *Deucalion*; nevertheless, when viewed beneath a high magnifying power, they are perceived (no less than those of the *A. argillosus*) to be true reticulations, or meshes, being more or less irregular in their formation, and made up of obliquely-transverse, as well as longitudinal lines. I should therefore conclude, from the large size of the insect and the comparative coarseness of its subanal apparatus, that it is, in all probability, a species of great musical capabilities.

Whether *all* the *Acalles* have this remarkable power, I will not undertake to pronounce; but so far as the numerous representatives from the Atlantic islands are concerned, I have but little hesitation, from the general appearance of the constricted apical region of their elytra, in believing that they have. And, indeed, this conjecture has been absolutely verified in five of the Madeiran ones by the direct and careful observations of Mr. Bewicke, from whom I have received some very interesting remarks concerning them. On my arrival at Funchal, from Teneriffe, in June 1859, I exhibited my specimens (then in a lively state) of the *A. argillosus* to Mr. Bewicke, and requested him to listen attentively to the Madeiran species, whenever he chanced to meet with them, during the following summer, in order to ascertain whether or not they had a similar stridulating propensity; and I have since been assured by him that he has heard the music constantly in the *A. dispar, nodiferus, terminalis,* and *ornatus*; and that "it was distinctly audible" in even the minute *A. Wollastoni,* which is the smallest of all the Madeiran *Curculionidæ* hitherto discovered.

But it is not in *Acalles* only that I have observed this anomalous proceeding. After having become familiar with it in the *A. argillosus,* I detected it likewise, before leaving Teneriffe, in a large and noble *Plinthus,* which seems to be peculiar to the Canaries. In that insect, however, the music was scarcely so loud, *in proportion to the size of the creature,* as was that of the *Acalles*; nevertheless the stridulating instrument is, perhaps, somewhat better defined. It is entirely the same, in position and general character, as the one which obtains in *Acalles,* except that the subopake portion of the inner tegument of the elytra (corresponding with the constricted apical region as seen from above) is, instead of being *subreticulose,* strictly *file-like,* being made up of a series of minute, closely-set, regular and parallel ridges, similar to those on the mesonotum of the Longicorns. I subjoin the following diagnosis of this magnificent *Plinthus*:—

Plinthus musicus, n. sp.

P. squamis fuscis dense nebulosus et setulis demissis pallidioribus parce irroratus; rostro graciliusculo, ad basin (ante oculos) leviter rotundato-ampliato; prothorace inæquali, carinato, parce punctato (punctis maximis); elytris ante apicem lateraliter constrictis, utroque ad apicem ipsum leviter acuminato (excavationem parvam communem efficiente), squamis albidioribus circa humeros et apicem, necnon aliis maculam parvam rotundatam discalem et fasciam fractam transversam postmediam efficientibus (omnibus plus minus obsoletis), ornatis, profunde striato-punctatis, interstitiis alternis leviter elevatis; femoribus dentatis.

Long. corp. lin. 6–6½.

Habitat editiora sylvatica Teneriffæ, sub lapidibus, passim.

A distinct and beautiful *Plinthus,* which may be well known (when in a fresh and *unrubbed* condition) by the paler scales about the sides of its prothorax, as well as about the humeral region and apex of its elytra,—which last have also a small discal patch and a much broken postmedial fascia. It is closely allied to another and still rarer species, of which I likewise add a diagnosis,—this being perhaps the best place in which to do so, though I did not happen to observe any stridulating power in any of the few specimens which I have hitherto captured of it. In the *P. musicus* I not only observed it frequently, but I even effected the noise artificially by vibrating (though somewhat clumsily) the terminal segment of the abdomen; but I have not thought it worth while to destroy one of the examples of the *P. velutinus* in order to satisfy myself of a similar subanal contrivance in that species also. There can be no doubt, however, that it would stridulate; though, judging from its less constricted or attenuated elytral apex, I should imagine that its notes would probably be less audible than those of its ally. Both the *P. musicus* and *velutinus* have strongly carinated prothoraces, and their femora have a powerful tooth beneath.

Plinthus velutinus, n. sp.

P. squamis atris densissime tectus, sed vix setulosus; rostro ad basin (ante oculos) sat fortiter rotundato-ampliato; prothorace inæquali, carinato, sed vix punctato; elytris ante apicem minus lateraliter constrictis, apice ipso integro, squamis albidioribus ad humeros ipsos, necnon aliis punctum minutum discalem et maculam vix majorem transversam postmediam efficientibus (omnibus plus minus obsoletis), ornatis, leviter striato-punctatis, interstitiis alternis obsolete elevatis; femoribus dentatis.

Long. corp. lin. 6–6½.

Habitat Teneriffam, in iisdem locis ac præcedens, sed illo multo rarior.

Nearly resembling the *P. musicus*; nevertheless its much darker surface and almost total freedom from additional decumbent setæ, as well as its nearly obsolete elytral patches (which, *when not obliterated*, are reduced to four small punctures, or spots), in conjunction with its slightly shorter and broader rostrum (which is rather more distinctly widened at the base, immediately in front of the eyes), its nearly *unpunctured* prothorax, and the *entire* and less laterally constricted apex of its more feebly sculptured elytra, will readily distinguish it from that species. It is very much rarer than the *P. musicus*, occurring beneath stones in the moist woods of a lofty elevation; and although both species ascend to an altitude of at least 7000 feet above the sea, the *P. velutinus* would seem to inhabit principally the *upper* portion of that range, attaining its maximum, perhaps, at about the height of 6000 feet. Most of the specimens of it, however, which I have as yet secured were captured amongst the Retamas of the Cumbre, above the Agua Mansa; whereas the *P. musicus* is found, not only in that upland tract, but also at the Agua Mansa itself, and likewise in the sylvan districts of the Agua Garcia and towards Point Anaga, in the latter of which it is tolerably common at Las Mecedes (beyond Laguna) and above Taganana—making its appearance at an altitude of about 2000 feet.

IV.—*Mollusca Japonica: New Species of* Odostomia. By Arthur Adams, F.L.S., &c.

The genus *Odostomia*, as at present constituted, comprises a very incongruous assemblage. Many species appear to belong to *Parthenia,* such as *O. terebellum* and *O. Humboldtii,* Phil. *O. Achates,* Gould, is an *Obeliscus,* as is also, I believe, *O. lamellata,* Carp. The British forms also require supervision; and this is the more necessary in a family where the species are already so numerous and of such small dimensions. In the work by my brother and myself, which is merely a rough sketch of the molluscous subkingdom, every genus of small shells could not be minutely analysed; but when complete monographs of all the genera shall have been made by competent persons, some degree of exactness will be given to the smaller divisions, and the study of species be thus facilitated. In the meantime, I offer descriptions of fourteen species of *true Odostomiæ* from a sea whence not a single species has hitherto been obtained by naturalists.

1. *Odostomia oblonga,* A. Adams.

O. testa ovoidea, utrinque acuminata, alba, solida, imperforata; anfractibus normalibus 4, planatis, ultimo magno ovato; apertura oblonga, antice producta et acuminata; plica parietali obliqua, valida; labro arcuato, subincrassato.

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

2. *Odostomia hyalina,* A. Adams.

O. testa ovato-conica, tenui, subdiaphana, alba; anfractibus normalibus 5, planulatis, ultimo ad peripheriam subangulato; suturis acute exaratis; apertura oblongo-ovali, antice subproducta; plica parietali transversa, valida; labro in medio subangulato.

Hab. Mino-Sima; 63 fathoms.

3. *Odostomia elata,* A. Adams.

O. testa elongato-conica, spira acuminata, alba, nitida, solida; anfractibus normalibus 5, planatis; suturis exaratis; anfractu ultimo ad peripheriam subangulato; apertura ovata; plica parietali obliqua; labro in medio subangulato.

Hab. Mino-Sima; 63 fathoms.

4. *Odostomia scalina,* A. Adams.

O. testa elongato-conoidea, subturrita, spira elata, alba, rimata, tenui; anfractibus normalibus 5, convexis, ultimo rotundato; suturis impressis; apertura oblonga; plica parietali parva, transversa; labro simplici, acuto.

Hab. Mino-Sima; 60 fathoms.

5. *Odostomia tenera*, A. Adams.

O. testa oblonga, spira subacuminata, albida, tenui, nitida, subdiaphana; anfractibus normalibus 5, planiusculis, ultimo ad peripheriam vix angulato; apertura ovata; labio arcuato, tenui; plica parietali subobliqua; labro in medio vix angulato.

Hab. Mino-Sima; 63 fathoms.

6. *Odostomia pupa*, A. Adams.

O. testa rimata, oblongo-ovoidea, pupoidea, alba, opaca; anfractibus normalibus 5, convexiusculis, ad suturas vix angulatis; anfractu ultimo elongato, ad basin rotundato; apertura ovali; labio recto; plica parietali transversa, conspicua.

Hab. Korea Strait; 63 fathoms.

7. *Odostomia obesula*, A. Adams.

O. testa rimata, ovoidea, alba, nitida, solidiuscula; anfractibus normalibus 4, planatis, ultimo ad peripheriam subangulato; suturis exaratis; apertura ovata, antice subproducta; plica parietali valida, transversa; labro arcuato.

Hab. Korea Strait; 63 fathoms.

8. *Odostomia ventricosa*, A. Adams.

O. testa ovato-conica, anguste umbilicata, tenui, subpellucida, alba; spira acuta; anfractibus normalibus 4, ultimo ventricoso; suturis acute exaratis; anfractibus planiusculis, obsolete longitudinaliter substriatis; apertura ovali, antice margine subreflexo et producto; plica parietali obliqua, parva.

Hab. Mino-Sima; 63 fathoms.

9. *Odostomia Japonica*, A. Adams.

O. testa magna, rimata, elongato-ovoidea, alba, eburnea, nitida, solidiuscula; anfractibus normalibus 5, convexiusculis, longitudinaliter tenuissime substriatis; apertura oblonga, antice producta; plica parietali parva, obliqua.

Hab. Mino-Sima; 63 fathoms.

10. *Odostomia nana*, A. Adams.

O. testa ovoidea, oblonga, alba, tenuiuscula, vix rimata; anfractibus normalibus 4, convexiusculis, suturis impressis; apertura ovata; plica parietali obliqua, conspicua; labio antice subreflexo; labro arcuato, simplici.

Hab. Mino-Sima; 63 fathoms.

11. *Odostomia pygmæa*, A. Adams.

O. testa oblonga, ovoidea, alba, lævi; anfractibus normalibus 4, convexiusculis; suturis simplicibus; anfractu ultimo ad peripheriam rotundato; apertura ovali, antice subproducta; plica parietali conspicua, obliqua.

Hab. Mino-Sima; 63 fathoms.

Subgenus Evalea, A. Adams.

Testa elongato-conica, subturrita; spira elata; anfractibus transversim sulcatis aut striatis. Apertura ovata, antice producta; plica parietali transversa, valida.

The fact of many species of this genus being transversely grooved or striated is, I consider, of sufficient importance to keep them distinct, as peculiarities of surface and sculpture are great aids in determining species.

12. *Odostomia* (*Evalea*) *elegans*, A. Adams.

O. testa conica, oblonga, vix rimata, solidiuscula, albida; spira acuminata; anfractibus normalibus 5, convexiusculis, transversim sulcatis; sulcis exaratis; apertura ovata, antice subdilatata; labio crasso; plica parietali transversa, valida.

Hab. Mino-Sima; 63 fathoms.

13. *Odostomia* (*Evalea*) *pyramis*, A. Adams.

O. testa oblongo-conica, turrita; spira acuminata, producta; anfractibus normalibus 5, convexiusculis, transversim sulcatis; apertura oblonga; labio incrassato; plica parietali valida, transversa.

Hab. Mino-Sima; 63 fathoms.

14. *Odostomia* (*Evalea*) *arcuata*, A. Adams.

O. testa ovato-acuminata, subumbilicata, spira elata subtortuosa retrorsim inclinata, alba, solida; anfractibus normalibus 5, planatis, tenuiter transversim striatis; apertura oblonga, antice producta et acuminata; labio incrassato; plica parietali transversa, valida.

Hab. Mino-Sima; 63 fathoms.

Shanghai, Feb. 10, 1860.

V.—*On the Occurrence of Spiders and their Webs in Coal-pits.* By R. H. Meade, F.R.C.S.

Extensive masses or layers of web-like tissue have often been noticed in some of the northern collieries, and they have generally been considered as the mycelium of a fungus; in fact, some years back, a filamentous cottony substance, obtained in some of the Durham coal-pits, was submitted by Mr. Hunt (of the London Mining Record Office) to the examination of the Rev. M. J. Berkeley, and pronounced by him to be fungous matter.

On the 7th of February last I received a small spider from Mr. Stainton, the learned editor of the 'Entomologists' Annual,' accompanied by a note stating that it had been sent to him to be named, by a correspondent who gave the following account of it:—"It is the insect which spins those enormous and compact sheets of web in all our northern collieries; and I feel interested in it, for I believe that some eminent naturalists have contended that these webs were not the production of a spider, but fungi." The spider was a minute species of *Neriene*, not quite the eighth of an inch in length, which had become dry and shrivelled, so that it was impossible to determine its specific name. I wrote word to that effect to Mr. Stainton, and also said that it seemed highly improbable that such a small spider could construct large masses of web, even if the structures in question were really the production of spiders at all, which I doubted, but which question, I added, might easily be settled by examining some of them with the microscope.

On the 16th of February I received another communication on this subject, from Mr. David P. Morison, of Pelton Colliery, Chester-le-Street, Durham (the gentleman who had written to Mr. Stainton). He enclosed in a letter a living specimen of the same spider which I had received before, and also a small portion of web wound round a piece of wood. In his letter, Mr. Morison said, "Mr. Stainton was so kind as to forward your letter to me for perusal; and I see that you doubt that these enormous webs are the production of these little creatures. If they are *fungi*, how can the following facts be accounted for?—1. On passing, last night, through the portion of our underground workings in which these webs abound, I observed that the gaps I had made in the webs on my last visit to that quarter were being spun over again; and on one of them I counted twenty-three or twenty-four little spiders busily engaged in mending the rent. 2. In these webs, on closer inspection through a small pocket magnifier, I discovered a few wings, &c., of a small Midge (at least I imagine them to be so), surrounded by several coats of web." Mr. Morison added that the webs clung with great tenacity to the face and hands of any one passing through them; and also that they could be wound round a piece of wood, which he did not think the filamentous tissue of a fungus could be.

On examining the small specimen of tissue sent to me, I at once saw that it was genuine spiders' web, which had become blackened with coal-dust; and on looking at it through a microscope, I found adhering to it numerous scales from the wings of moths (apparently belonging to the family of the *Tineidæ*), and also fragments of the legs and bodies of the same insects. The spider enclosed with the web I determined, on careful examination, to be an adult male of *Neriene errans*, a small species of a pale brown colour, described by Mr. Blackwall *, which had hitherto been found only among grass, and on rails, in North Wales and in the south of Lancashire. Apparently from its living in a subterranean abode, its colour was more dusky than that of the ordinary terrestrial species, which made me suspect at first that it might be a new, though a nearly allied, species; but several more mature individuals, both male and female, having been sent to me, at my request, by Mr. Morison, all doubts as to their identity with *Neriene errans* was removed, both from my own mind and from that of my friend Mr. Blackwall, to whom I submitted them.

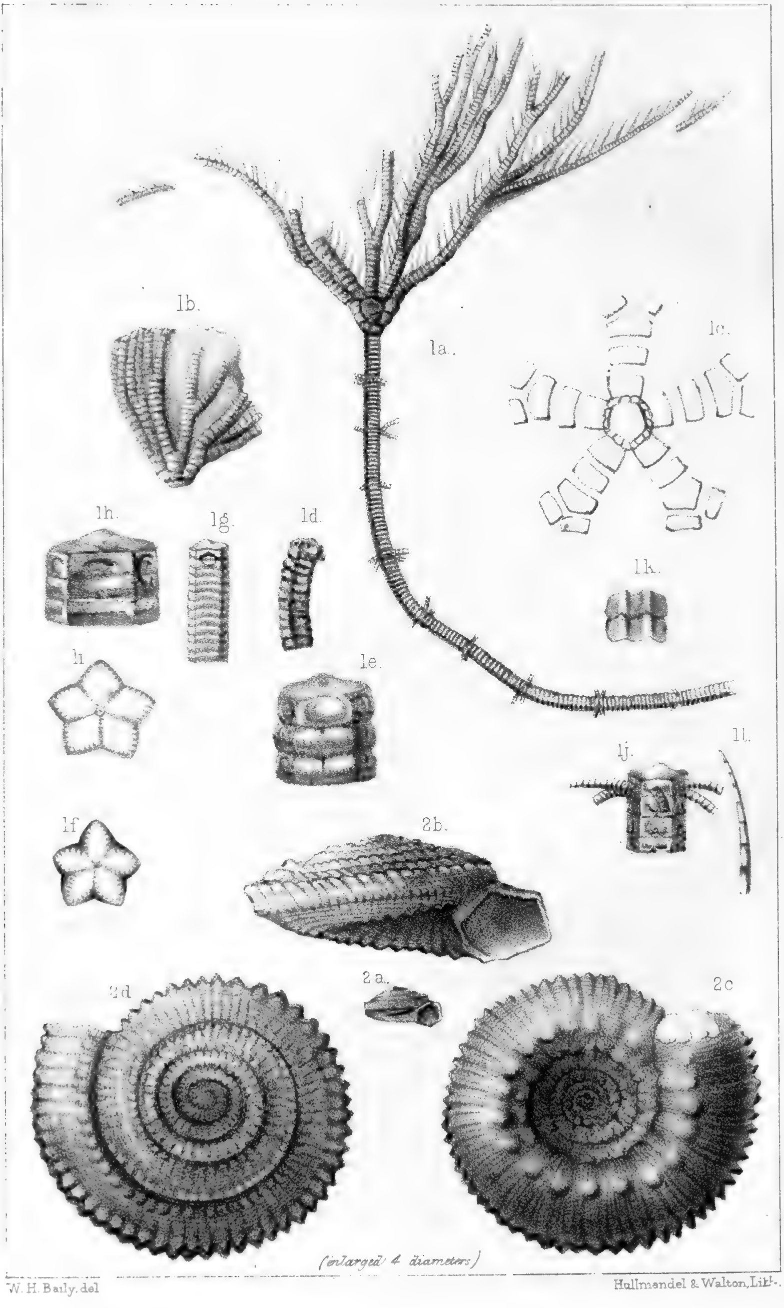
The portion of web which I received was so small, that I thought it possible that masses of filamentous fungous matter might also exist in the mines; so I requested the favour of a larger specimen for examination. Mr. Morison promptly acceded to my wish, and sent me a mass of similarly blackened tissue, which also I found to be genuine cobweb. Mr. Morison likewise forwarded (through Mr. Read, of the Pelton Colliery) another portion to Mr. Hunt, of the Mining Record Office, who submitted it to Mr. Berkeley for his opinion, which fully coincided with my own.

Mr. Morison says, in one of his letters to me, that when the webs are spun in damp places, they appear, like everything else there, to be dotted all over with a kind of mould; and he thinks that this, having been examined casually, might have led to the supposition that the webs themselves were fungous growths.

The mine in which these spiders and their webs were found is called the Pelton Colliery. The seam of coal (part of the "Hutton seam") averages 4 feet 6 inches in thickness, and is 320 feet below the surface of the ground; about 75 horses and ponies are employed in the mine; and Mr. Morison suggests that the insects upon which the spiders live are conveyed down with the fodder for the horses. He also tells me that "the spiders themselves are to be found in the *waste*, or parts of the pit not actually at work; and the webs are generally spun in galleries through which little or no air passes. The spiders seem to be quite gregarious, as whenever a rent has been made in any one of these productions, they may be counted by scores together (so our wastemen tell me) repairing the damage. They seem to be, in spite of their dark existence, very susceptible to light, and the appearance of a lamp produces no small commotion amongst them."

It is an exceedingly interesting fact that a minute spider,

* Linn. Trans. vol. xviii. p. 643.



W. H. Baily, del.

Hullmandel & Walton, Lith.

Fig. 1. Pentacrinus Fisheri. *Forbes*.
2. Solarium Binghami. *Baily*.

ordinarily living in the open fields, should find its way to such a depth beneath the surface of the ground, and multiply to such an extent as to be able to construct, by the united labours of hundreds, immense sheets of web, stretching through all the deserted subterranean galleries. It seems that this little creature, at the same time that it shifted its abode, must also have acquired new instincts, becoming social and gregarious in its habits, and thus departing from the manners of most of the spider tribe, which are usually solitary, except when quite young. It may be said that numerous and large spiders' webs are often met with in other dark underground places besides coal-pits (as cellars, caves, &c.); but these are always constructed by larger species, each individual living separately, and having its own web; the spiders forming them may also mostly be referred to the genus *Tegenaria,* to which our common house-spider belongs.

Bradford, May 30, 1860.

VI.—*Description of a new Pentacrinite from the Kimmeridge Clay of Weymouth, Dorsetshire.* By William H. Baily, F.G.S. &c.*

[With a Plate.]

The beautiful fossil Crinoid forming the subject of this communication received a MS. name from the late Prof. Edw. Forbes, who dedicated it to his friend the Rev. Osmund Fisher, by whom it was procured from the Kimmeridge Clay near Weymouth, and liberally presented, with numerous other interesting fossils from the neighbourhood, to the Dorchester County Museum. On visiting that Museum, I found that it had never been described or figured, and have therefore drawn up the following description, with illustrative figures, of this interesting species.

Class ECHINODERMATA.

Order Crinoidea. Genus *Pentacrinus,* Müller.

Pentacrinus Fisheri, Forbes, n. sp. Pl. I. fig. 1 *a.*

P. calyce parvo lævi; articulis basalibus clypeiformibus, quinque; articulis radialibus amplis, quinque; articulis brachialibus amplis, triangularibus, quinque; brachiis decem bifurcatis, articulis cuneiformibus, alternis; pinnulis articulis octo; columna pentagonale; ramulis articulis contiguis.

Diagnosis.—Calyx small, smooth, and composed of five shield-

* Communicated by the Author; having been read before the Dublin University Zoological and Botanical Association, December 16, 1859.

like thick plates, having a double excavation at their lower extremity, where they articulate with the pentagonal stem; radial plates five in number, about twice as broad as long; brachial plates also five, broad and triangular, supporting the rays, which are ten in number, very long, composed of cuneiform alternating articulations, and bifurcating four or more times, every alternate joint of these rays being furnished with a long, slender, eight-jointed pinnule. The column consists of a number of pentagonal joints, of equal length, each united by a crenulated margin, and for the greater portion of its length comparatively smooth, but towards the calyx becoming strongly ridged and beaded across the exterior surface of each angle. At about every eighth joint on each of its five angles a closely-jointed ramule was articulated.

Dimensions of small specimen.—Length of calyx $\frac{1}{10}$, diameter $\frac{2}{10}$ inch. Diameter of column rather less than $\frac{1}{10}$ inch. Length of rays about 2 inches; length of column nearly 5 inches (probably much longer when perfect).

Dimensions of larger specimen.—Length of calyx $\frac{3}{20}$, diameter $\frac{5}{20}$ inch. Diameter of largest fragments of column $\frac{2}{10}$ inch; other portions vary in diameter from rather less than $\frac{1}{10}$ to $\frac{2}{10}$ inch.

Remarks.—This *Pentacrinus* is remarkable for its graceful form, which it owes to the slender stem and great proportionate length of its arms; the calyx, like that of the typical and recent example of this genus (*Pentacrinus caput-Medusæ*) is small, and composed of but few plates, the basal series or pelvis consisting of five very convex and solid elements, the lower portion of each being excavated to form an articulating surface, which rests securely upon the pentagonal stem; to these are closely fitted the five radial plates; upon them rest the five triangular brachial plates, the sides of which support the long rays or arms, which bifurcate several times, and are ten in number; commencing from the brachial plate, they continue for about three-tenths of an inch to the first subdivision, consisting of from eight to ten irregularly-shaped joints closely fitting to each other and bearing a second triangular plate, the sides of which, like that of the first brachial plate, support the second division, one branch of which, consisting of fifteen joints, again, bears the third triangular plate, from which springs a third subdivision; to one of the branches of this division sixteen more joints can be counted without any further branching, the termination of this, the best-preserved of the arms, being still wanting. The plates composing the rays become flatter and more closely set towards their upper part, their surfaces being marked by a continuous double line or angular ridge (Pl. I. fig. 1 *k*).

The rays, in consequence of the numerous subdivisions, were probably, in the perfect specimen, fifty or more in number. The delicate pinnules or tentacula with which they are furnished are not closely arranged, but attached to every alternate joint; they are about $\frac{4}{20}$ of an inch in length, flattened, angular, and curved, consisting of about eight elongated joints (fig. 1 *l*). The column or stem is composed of pentagonal plates of nearly equal thickness, each having a star-like, crenated articulating surface (fig. 1 *i, f*), the external face of each angle being ornamented with a faint band of bead-like markings, which become strong ridges accompanied by a central depression or pit towards the upper portion of the stem. At variable intervals, generally about the eighth joint, spring the ramules or auxiliary side-arms, five in number, developed from an articulating surface between each of the angles of a joint (fig. 1 *j*); in the specimen under consideration they are mostly broken off near the base; the portions which remain show that they were round and closely jointed; one of these articulating surfaces may be seen in the enlarged figures of portions of the stem (figs. 1 *h* and *e*).

The plan of the arrangement of plates composing the calyx (fig. 1 *c*) is taken from a well-preserved and larger specimen, which is quite relieved from the matrix, exhibiting most perfectly the whole of the plates of the head, with the lower subdivision of the arms, their upper portions being imperfect (fig. 1 *b*).

Affinities and Differences.—This species somewhat resembles *Pentacrinus Milleri*, Austin, but differs in the following particulars:—it is of more delicate proportions; the branching of the rays takes place at longer intervals; the tentacles are not so closely set; the column has sharper angles and square sides; whilst in *P. Milleri* the angles of the pentagonal joints are much rounded and very prominent, and in our species the ramules are situated at greater distances. *Pentacrinus scalaris*, Goldfuss, said to be a synonym of *P. Milleri*, is a species founded upon portions of the stem only; in some of its varieties, as figured by Goldfuss, it bears a considerable resemblance to the stem of *P. Fisheri*: it is, however, considered by good authorities to be identical with *P. Milleri*, from which our species is certainly distinct.

Locality and Stratigraphical Range.—This interesting addition to the Echinodermata of the Secondary Rocks was discovered by the Rev. Osmund Fisher, in the Kimmeridge Clay, at Green Hill, Weymouth, Dorsetshire. It was obtained from a bed of dark-blue clay, the surface of which was covered with the remains of this and other individuals of the same species.

EXPLANATION OF PLATE I., Figs. 1 *a*–1 *l*.

Fig. 1 *a*. *Pentacrinus Fisheri*, natural size: 1 *b*, detached head of a larger specimen; 1 *c*, plan of arrangement of plates composing the calyx of a larger specimen (natural size), showing articulating surface of ramules; 1 *d*, joints from the upper part of the column; 1 *e*, part of ditto, enlarged; 1 *f*, articulating surface of ditto; 1 *g*, portion of column, of still larger diameter, nat. size; 1 *h*, part of ditto, enlarged; 1 *i*, articulating surface of ditto; 1 *j*, portion of the column, enlarged, showing fragments of the ramules articulated to one of the joints; 1 *k*. two plates from the upper part of the rays, showing a double ridge; 1 *l*, one of the pinnules.

VII.—*On a new Species of* Solarium *from the Upper Greensand, near Dorchester.* By W. H. Baily, F.G.S.

Class MOLLUSCA. Order Gasteropoda.

Fam. **Littorinidæ.**

Solarium Binghami, Baily, n. sp. Pl. I. fig. 2 *a*.

S. testa parva discoïdea-depressa; spira prope plana; anfractibus (6) clathratis, marginibus bicarinatis tuberculatis, umbilico magno profundo margine tuberculosa ornato; apertura angulosa.

Diagnosis.—Shell small, discoidal; spire nearly flat, consisting of six whorls, their margins bicarinated and ornamented with varices or tubercles; whorls decussated with longitudinal and transverse lines; umbilicus large and deep, its margin being ornamented with a row of tubercles gradually decreasing in size; mouth angular.

Dimensions.—Elevation $\frac{2}{10}$ inch; diameter $\frac{4}{10}$.

Affinities and Differences.—This pretty little *Solarium* differs specifically from all other described forms, being distinguished from *S. moniliferum*, Michelin, by its very depressed spire and large, deep umbilicus; and from *S. albensis*, D'Orbigny, by its depressed spire and reticulated sculpturing. Its nearest affinity, however, is with these, and more remotely with *S. ornatum*, Fitton,—all species from the Gault, the two former being from foreign localities, the latter a British species.

Locality and Stratigraphical Range.—This beautifully preserved specimen was collected from the Upper Greensand at Bingham's Melcombe, near Dorchester, by the Rev. C. W. Bingham, a gentleman who has enriched the Museum of that town with many contributions, and to whom I have much pleasure in dedicating it.

EXPLANATION OF PLATE I., Figs. 2 *a*–2 *c*.

Fig. 2 *a*. Side view of *Solarium Binghami*, natural size; 2 *b*, the same, magnified 3 diameters; 2 *c*, upper surface of the same; 2 *d*, under surface of the same.

VIII.—*On the Nomenclature of the* Foraminifera.

By W. K. Parker, M. Micr. Soc., and T. R. Jones, F.G.S.

[Continued from vol. v. p. 477.]

32. Orbulites marginalis. Hist. An. s. Vert. ii. p. 196, No. 1. "Recent; European Seas; discovered by M. Sionest on Corallines, Fucus, &c."

Under this name Lamarck placed the living European *Orbitolites*, which, though smaller than the fossil specimens from Grignon (and than the Australian and South Sea individuals), doubtless belong to the same species, *O. complanata*.

33. Orbulites lenticulata. Hist. An. s. Vert. ii. p. 197, No. 3. "O lentiformis, superne convexa, subtus planiuscula. Habite,—se trouve fossile à la Perte du Rhône, près du Fort de l'Ecluse, à huit lieues de Genève. Elle y forme des masses considérables. M. Brard. Mon cabinet."

According to Bronn, this fossil was named *Madreporites lenticularis* by Blumenbach, 1805, Naturhist. Abbild. Nr. u. Fig. 80. It has been recognized by D'Orbigny as a Foraminifer. In his 'Cours Elém.' ii. p. 193, and 'Prodrome,' ii. p. 143, he gives it the generic name of *Orbitolina*, and regards it as "an unsymmetrical *Orbitolites* coated with encrusting cells on one side." This we do not accept as a correct definition of its relationship. Our views of the structure and relationship of this form will be best understood if we trace it from its simplest variety to its highest state of development. It is among both recent and fossil specimens, from many parts of the world, that we collect our materials for the elucidation of this protean and hitherto misunderstood Rhizopod.

1. Among the abundantly varied *Foraminifera* from the Tertiary beds of Grignon we find a very minute, smooth, scale-like shell (about $\frac{1}{100}$ inch in diameter), thin, transparent, and sparsely perforate, and consisting of a circular, subconical, tent-like top covering one or two relatively large subannular chambers, which are not distinctly separate.

Seen from below, these chambers, occupying the greater part of the hollow of the tent or shield, present a convex aspect, with a central pit or umbilicus,—the outer and lower, or marginal, portion of the shield bearing very slight indications of annular septal markings, left probably by the sarcode that occupied the concavity.

Seen from above, or from the side, this little subconical shell presents (by transparency) faint appearances of three whorls of a spire due to the first and second cells (the latter being somewhat semilunar) and the outer rudimentary septum. We name this variety *Orbitolina simplex*.

2. In the Indian seas is a similar little shell (about $\frac{1}{100}$ inch in diameter), which, however, exhibits four narrow curved chambers (each forming nearly three-fourths of a circle), arranged around a central, globular primordial cell, and composing the low cone of the shell and its thin margin. In company with this (which represents a varietal stage in advance of No. 1), we find other specimens (about $\frac{1}{80}$ inch in diameter) possessing as many as ten semiannular chambers. This variety may be termed *Orbitolina semiannularis*.

3. From the Arctic, British, Mediterranean, and other seas we have obtained some specimens of a very small Foraminifer ($\frac{1}{80}$ inch diameter) having the shape of the one last described, and a very similar arrangement of chambers. It has, however, a greater complexity of structure, owing to the presence of numerous secondary septa, transverse and short, in all but the first two or three chambers. These superadded septa begin to appear in a rudimentary form in the third or fourth chamber, on the inside of the peripheral wall; they never reach the umbilical border of the annulus, and are irregular in their development, even in the newest chambers, where they are sometimes thirty or more in number. The base of the shell, or umbilical area, is traversed by raised, sinuous, thread-like lines of shell-matter. In older individuals these are succeeded by thicker and irregularly wavy ridges, and ultimately nearly the whole of the basal surface is masked by this exogenous growth, excepting a thin margin, formed by the newest of the annular chambers, the transverse septal lines of which are also limbate by superadded calcareous matter.

This shell, in its different stages of growth, has been well described and illustrated, under the name of *Patellina corrugata*, by Prof. Williamson (Monograph, p. 46, pl. 3. figs. 86–89); and he notices the difficulty of placing this shell in its true relation to other forms.

Orbitolina (*Patellina*) *corrugata* is present in most sea-beds that are rich with Foraminifers, from the littoral zone down to 500 fathoms; but it does not occur in great abundance.

4. In the shore-sands from Melbourne, Australia, rich with a group of Foraminifers almost the exact counterpart of those of Grignon, we find a small, subconical, finely perforated shell, exceedingly like that last noticed (No. 3), but not unfrequently attaining four times the size ($\frac{1}{20}$ inch). A difference, however, exists. After the primordial chamber, there is usually only one semilunar chamber, those succeeding being annular. The latter are subdivided by short, transverse secondary septa, as in *O. corrugata*; and the cells have a regular alternately concentric arrangement.

The annularity of the chambers in this larger variety is a marked parallel to the concentric cyclical growth of *Orbitolites*, small delicate varieties of which have frequently no annular chambers, whilst the large forms are almost wholly cyclical.

The under surface of this Australian Patelline *Orbitolina* (which we denominate *O. annularis*) is concave, partially occupied by superadded imperfect cells, entangled, as it were, in the exogenous matter, which tends to arrange itself in granules, and more or less obscures the annular structure, which is still, however, apparent towards the margin. The rudimentary cells in the umbilical shell-substance are evidently homologous with those secondary lobes which are formed on the umbilical surface of certain *Rotaliæ*, and which, in certain Asterigerine varieties (such as *Asterigerina lobata*, D'Orb.—a variety of *Rotalia Beccarii*, Linn.), attain a well-marked and symmetrical development.

5. In the white mud of the coral-reefs of Australia, at from 10 to 20 fathoms, there is an abundance of a still larger form, with a diameter of $\frac{1}{10}$ inch and upwards, retaining the same essential characters of structure as the foregoing, but presenting a modification of the secondary chambers, the annular chambers being divided into numerous small vesicular cells. Here the vesicularity gradually masks the annularity of the structure, until, except sometimes in the thinnest specimens, we have a massive little cellular body, sometimes resembling a delicate *Planorbulina*, sometimes losing itself in a low cone of thickly set minute vesicles.

In these specimens the secondary or cross septa of the annular chambers are perfectly developed, compared with the short abortive partitions in *O. corrugata*; and the exogenous umbilical cells of the variety No. 4 (from Melbourne) have been advanced to the condition of cells almost as large and perfect as those of the subdivided annuli. The umbilicus is so far filled up that the base of the cone is almost flat, although generally the last two annular series of chambers may be seen from beneath (as in the case of *O. corrugata*), and a slight concavity remains. This is our variety *O. vesicularis*.

As the subdivisions of the annular chambers lose the cuboidal form and become vesicular, they take on a polygonal shape, being placed alternately concentric. The shell also has the pseudopodial passages relatively larger than in the less-developed forms with flattened feeble cells*. Thus also in delicate conical varieties of *Rotalia Turbo* (such as *R. rosacea*, D'Orb., and *Asterigerina*

* In this state *O. vesicularis* has much resemblance to some of the *Planorbulinæ*; but the latter have two or three tubular and margined apertures to each chamber, they have coarser pseudopodial pores, and no umbilical cells.

Planorbis, D'Orb.) the pseudopodial foramina are extremely small compared with those of larger and more inflated varieties (such as *R. vesicularis*, Lam.).

O. vesicularis seldom preserves its simple single disk of cells; for not only do the umbilical cells increase in number, and become perfect in form, but the upper series have one or more superimposed layers of similar annuli, the primary septa of which are immediately adapted to the earlier septal rings*. These upper or additional layers may or may not extend over the whole area of the first system of rings, being sometimes confined to the centre and heaped up; but sometimes they extend all over, and even beyond, the primary disk. As this growth becomes more perfect in regularity and in the number of its layers, it leads us to the next variety.

6. Accompanying No. 5 are others, differing in shape; some high, like a sugar-loaf, and others subhemispherical. Dr. Carpenter has pointed out to us that in these forms (some of which are $\frac{1}{9}$ inch in diameter) not only is the regularity of arrangement in the overlying annuli well marked, but a vertical section presents several tiers of cells, separated laterally by radial septa, which pass upwards and outwards from the primary cells to the periphery. At the same time, the umbilical cells strive, as it were, to overtake the cyclical series in their growth. They increase in potency, taking on a regularity of arrangement almost equal to that of the upper cells; and the inferior surface of the shell becomes flat, and even convex. The umbilical cells have now an annular arrangement, and, like the others, are placed in tiers, but with shorter radii; for they are still fewer than on the other face, and hence the shell is unsymmetrically biconvex. The primary cells are necessarily subcentral, lying nearest to the umbilical face.

The upper surface now loses almost all trace of the annular structure, from the increasing importance of the polygonal arrangement of the secondary cell-walls. The polygons in No. 5 were elongate somewhat in the direction of the annuli; but now they have become more regular throughout. The upper set of chambers now grows mutually with the umbilical; the two sets being welded together at the edge and growing together. This variety may be termed *O. congesta*; it has passed from the Patelline to the Orbitoline form.

7. We have also from the same coral-mud numerous spherical specimens, differing from the foregoing in shape, but not generally larger (about $\frac{1}{9}$ inch). Their structure is absolutely similar;

* Our attention has been lately drawn to this form of growth by Dr. Carpenter, who has been engaged in researches on some of the larger forms of this group.

the still greater potency of the umbilical system of cells is here the sole cause of variation. Many of the globular specimens have an irregular hole or subcylindrical cavity, bevelled off at the margin, on some part of the surface: this is the remnant of the earlier concavity of the base, the edges of which, growing downwards and inwards, have failed to meet and to make up a perfect globe.

This little spherical *Orbitolina*, which may be termed *O. lævis**, is very common. It occurs also at Fiji, in the West and East Indies, in the Mediterranean, and on the British coast, as far north at least as the Isle of Arran. It is found in the shelly sands of rather shallow water; whilst the little *Orbitolina corrugata*, inhabiting the same seas, lives at a greater depth, on muddy bottoms and in shell-sands. In the fossil state the globular form is found in the Tertiary beds of Palermo, Bordeaux, and San Domingo. The last yields the largest.

8. Among the spherical specimens from the Rewa reefs of Fiji there are some rather flattened individuals (having the same essential structure as those described above, and $\frac{1}{8}$ inch in diameter), which present at their margin one or more small conical or nipple-like processes, composed of cells similar to those of the body, but more compressed. In other specimens these projections are larger and give a lobulate form to the shell, the outline being somewhat like that of an ivy-leaf, and imitating *Calcarina Spengleri*, or *Polystomella unguiculata* with thickened spines. Other individuals have subcylindrical spines which do not always lie on one plane. The length of the spine sometimes exceeds the diameter of the body of the shell. Similar forms occur on the coasts of New Zealand.

Dr. Carpenter has lately shown us that in these spinous and stellate forms the growth of the shell is symmetrical, the two convex surfaces having about equal proportions of the annular tiers of cells. The vertical section in such forms reminds one of the structure of *Orbitoides*, excepting,—1st, that in the latter and flatter Foraminifer the two surfaces of the shell are unequal; 2ndly, the over- and under-lying cells have usually an irregularity of arrangement; and 3rdly, the central cells are small, but numerous, regular, and distinct.

Coexistent with the habit of producing lobes or processes (as holds good also in *Calcarina* and *Polystomella*), we find an increased development of the interlocular or canalicular passages, to the sarcode of which the granulations and overgrowths in other forms are due. Here we find smooth, minute, glossy

* On account of the absence of the roughly limbate septal edges seen in some other varieties.

hemispherical knobs of this exogenous shell-matter quincuncially arranged over the whole surface, three or four cells being included in the area of each quincunx. This style of exogenous growth is also recognizable in some of the spherical lobeless individuals.

The bead-ornament suggests the name *O. sphærulata* for this variety*.

9. A still larger variety of the massive *Orbitolina,* having a sugar-loaf form, a flat or slightly concave base, and a diameter of $\frac{1}{5}$ inch, occurs fossil at Ciply (Belgium), in the uppermost Cretaceous series. It is much mineralized, but appears to have the same structure as the foregoing, including the crystalline knobs on the angles of the septa; but these clear beads are connected together by strings of granules of the same substance, small and variable in size, protruding on the edges of the septa. As a variety, this may be named *O. sphærulolineata.*

10. In the same deposit are somewhat smaller and globular specimens, in which the granular growth of the septal edges is still greater; so that continuous, rough, sinuous walls of division are produced, marking out irregular polygonal spaces, including one or more cells, the faces of which lie low down below the surface. Essentially similar septal projections constitute the limbate feature in *Rotalia Beccarii,* var. *Schrœteriana,* and *R. repanda,* var. *Carocolla.* Similar globular *Orbitolinæ* (*O. globularis,* Phillips, sp.) are common in other Cretaceous deposits.

Millepora? globularis, Phillips (Geol. Yorks. pl. 1. f. 12) and Woodward (Geol. Norf. pl. 4. f. 10–12), *Tragos globularis,* Reuss (Böhm. Kreid. p. 78, pl. 20. f. 5), *Coscinopora globularis,* D'Orb. (Prodrom. ii. p. 284) and Morris (Cat. B. Foss. 2nd edit. p. 27), is our *Orbitolina globularis*†. Michelin's *Ceripora Avellana* (Icon. Zooph. p. 208, pl. 52. f. 13), from Sarthe, appears to us to be a large specimen of the same variety. Its probably adherent habit and perforated condition are not inimical to this view.

* Denys de Montfort (Conch. Syst. i. p. 146) has given a curious hybrid picture of his *Triophorus baculatus,* which consists of a three-spined *Orbitolina,* according to its surface-ornament and its vertical section, but outlined apparently after a three-spined *Calcarina Spengleri,* fig. *e,* pl. 15, in Fichtel and Moll's 'Test. Microsc.' The indication of an aperture (the broken newest chamber in *Calcarina*) is also after F. & M. Its sectional aspects appear to have been taken, the *vertical* (Orbitoline) from nature, the *horizontal* (Calcarine) from Fichtel and Moll's fig. *k,* with the sectional feature of the spine (also Calcarine) added from some other source. Some stellate form of *O. sphærulata* may perhaps claim the name of *O. baculata,* Montf.

† The characteristic structure is visible in some specimens preserved in the British Museum, and formerly in the collection of the late John Brown, Esq., of Stanway.

In some of the figured specimens of *O. globularis* the not unusual hole in the base is indicated. Occasionally individuals are perforated by a more or less irregular tubular cavity. The roundness of the specimens, and their holes and tubular cavities, appear to have suggested to the old "flint-folk" of the Valley of the Somme that they might be used for beads; for such perforated *Orbitolinæ* are frequent in the gravel that yields the flint axes.

11. The sinuous superficial mesh-work, formed by the edges of the overgrown septal planes, is a marked feature in the subconical *Orbitolinæ* from the Lower Cretaceous rock of the Perte-du-Rhône (Aptian) and of Sarthe (Cenomanian), from the Greensand of Warminster and Haldon Down, and from the Chalk-marl and Chalk (Turonian and Senonian); also in the little globular fossils of the Chalk known as *Tragos* and *Coscinopora globularis*, varying from the size of shots to that of bullets; and when we find a similar structure apparent in the still larger, irregularly rounded, sponge-like fossils accompanying these globular and conoidal *Orbitolinæ* in the Chalk, we know not how to separate the several forms, where size and some irregularity of shape appear to be the only distinctive characters.

The conical, hemispherical, and flattened forms of *Orbitolina*, so common in the Cretaceous deposits, and known under twelve or more different names, are referable to one specific type, namely the *O. concava*, Lamarck, sp.; and to this type, not only these comparatively large plano-convex and concavo-convex varieties belong, but also the large, limbate, globular forms on one hand, and the small, less limbate, and smooth forms, both round and flattened, recent and fossil, on the other.

Orbitolina concava, Lam. sp., *O. conica*, D'Arch. sp. (Mém. Soc. Géol. France, ii. p. 178), and *O. conoidea*, Gras (Foss. de l'Isère, p. 51, pl. 1. f. 4–6), are concavo-convex individuals, more or less thickened, presenting the typical characteristics of the genus, but neither in too simple nor in too exaggerated a condition. This variety has been figured by Phillips (Geol. Yorks. pl. 1. f. 11), Woodward (Geol. Norf. pl. 4. f. 9), and Mantell (Foss. S. Downs, pl. 16. f. 22–24), and described as a Lunulite. The typical form (*O. concava*) is well figured by Michelin, Icon. Zooph. pl. 7. f. 9.

O. gigantea is a name given by D'Orbigny (Prodrome, ii. p. 279) to a large concavo-convex specimen from Royan, nearly 4 inches in diameter. What a contrast to the little recent *O. annularis* and its congeners!

12. Faujas's "Numismale" or "Lenticulaire" from Maestricht (Hist. Nat. Mont. St. Pierre, p. 186, pl. 34. f. 1–4) is an *Orbitolina*. This, described and figured by Bronn (Leth. Geogn.

3rd edit. vol. ii. pt. 5. p. 94, pl. 29^1. f. 29) as *Hymenocyclus** *Faujasii* (*Lycophris Faujasii*, Defr.), consists of a plano-convex disk, about half an inch wide, with a central mamilla on the upper (convex) side. Its vertical section shows two horizontal series of chambers: the upper and largest appear to be the subquadrate subdivisions of the primary annuli (seen also in the horizontal section, which shows four periodical stages of growth around the undivided primordial cells); the lower set may be umbilical cells imbedded in a copious growth of exogenous shell-matter. These characters point it out as a gigantic ally of variety No. 4 above described (*Orbitolina annularis*). It is very closely allied to, if not identical with, *O. lenticularis*, Blumenbach (*O. lenticulata*, Lamarck). This latter is figured by Bronn (Leth. Geogn. 3rd edit. pl. 29^2. f. 22) after Lamouroux (Polyp. pl. 72. f. 13–16), and presents similar features, though obscured by fossilization and wear. The *O. lenticularis* is from the Aptian beds of the Perte du Rhône; and some specimens are carefully figured and described by Deluc† in the Journ. Phys. lvi. p. 344, figs. 1–6. These are concavo-convex, about $\frac{1}{4}$ inch in diameter, and have a structure almost identical with that of the little recent *O. annularis* from Australia, both as to the smooth upper and radiate lower surface, and as to the "engine-turned" arrangement of the subdivided primary chambers. In the larger and fossil form we appear to have more than one tier or layer of cells. From Deluc's remarks we may conclude that some individuals by their porous surface show a limbation of the septal edges. We cannot separate Deluc's specimens from *O. concava*, on one hand, and *O. annularis* on the other. A short notice and some carefully executed figures of *Orbitolina lenticularis* are to be found in Pictet and Renevier's 'Paléontologie Suisse; Fossiles du Terrain Aptien,' p. 166, pl. 23. figs. 3 *a*–3 *f*.

The *Cyclolina cretacea*, D'Orb. For. Foss. Vien. p. 139, pl. 21. f. 22–25, judging by D'Orbigny's description and figures, is an excessively outspread, thin, discoidal variety, presenting an extreme form of *O. annularis*, of which it is in essential features an exact counterpart, consisting of a series of perfect annuli, with very little development of the umbilical cell-growth. The shell is finely perforate, the perforations being best seen on

* This name is proposed by Bronn to take the place of "Orbitoides," which he rejects as a "hybrid word." D'Archiac, in describing his *Orbitolites media*, expresses his belief that it is the same as Faujas's Numismale. D'Orbigny correctly places D'Archiac's species under *Orbitoides*, and incorrectly includes Faujas's also. Bronn follows D'Orbigny in this, and makes *O. Faujasii* a type for *Hymenocyclus*.

† His fig. 2, however, evidently gives a somewhat mistaken view of the structural details of the vertical section.

the newest or outermost annuli. Bronn, *op. cit.* p. 86, errs in describing the apertures or pores as being on the *edge* of the last chamber. The septa of the annular chambers are limbate; but the secondary or cross septa (though probably present) give no evidence of their existence. This absence of limbation of the secondary septa is such as occurs in certain specimens of *Orbitolites.*

Orbitolina discoidea, Gras (Foss. de l'Isère, p. 52, pl. 1. f. 7–9), is a thick flat form; and possibly *Orbitolites plana* and *O. mamillata,* D'Archiac (Mém. Soc. Géol. France, ii. p. 178), may also be *Orbitolinæ* of the same character. D'Archiac's *Orbitolites media* (*op. cit.* p. 178), placed by D'Archiac and Bronn with *O. Faujasii,* is an *Orbitoides,* as D'Orbigny has indicated. The last, however, mistook *O. Faujasii* for an *Orbitoides.*

D'Orbigny's species *O. radiata* (Prod. ii. p. 280), from Royan, is not well characterized. There are many radiate and stellate Foraminifers in the Maestricht Chalk and the Nummulitic Tertiaries which may be either *Orbitolinæ, Orbitoides,* or *Calcarinæ.* The radiate ridging of the surface would not be a feature at variance with the growth and habit of *Orbitolina.* We have not yet, however, sufficient means of comparison to be satisfied as to the relations of the forms referred to, although we believe them to be *Calcarinæ.*

With regard to the relationship of *Orbitolina* to *Orbitoides,* we may say that they have the same structure, as far as the cell-growth and the interstitial substance* are concerned; but *Orbitoides* is always subsymmetrically discoid, or lenticular, heaping cells on both faces of its primary, annular, subdivided chambers; whilst *Orbitolina,* which has one symmetrical variety, has many that have no pretence to bilateral symmetry, any more than the conical *Rotaliæ,* and, in its typical concavo-convex form, it bears the same relation to *Orbitoides* that *Rotalia* does to *Nummulina.* The umbilical growth of irregular and imperfect cells in *Orbitolina* is a feature similar to the astral formation of the divided umbilical lobes of the chambers in some *Rotaliæ* (for instance, *Asterigerina lobata*); and we may say that *Orbitolina* has the same relation to *Rotalia* that *Cycloclypeus* has to *Nummulina,*—Williamson's *Patellina* representing *Heterostegina.*

The following are the most important varieties of *Orbitolina concava,* Lam.:—

1.	Orbitolina simplex, *P. & J.*	Tertiary: Grignon.
2.	—— semiannularis, *P. & J.*	Recent: Indian Ocean.

* The limbation, arising from septal granulation, of the stellate *Orbitolinæ* from New Zealand and Fiji, and of the conical specimens from Ciply, is not unlike that of some of the *Orbitoides* of the Maestricht Chalk.

3. Orbitolina corrugata, *Williamson.*	Recent: British, Arctic, and Mediterranean Seas.
4. —— annularis, *P. & J.* ..	Recent: Melbourne.
5. —— vesicularis, *P. & J.* ..	Recent: Australia.
6. —— congesta, *P. & J.*	Recent: Australia.
7. —— lævis, *P. & J.*	Tertiary: Bordeaux, St. Domingo, Palermo. Recent: British, Medit., W. & E. Indian, and Pacific Seas.
8. —— sphærulata, *P. & J.* ..	Recent: Fiji and New Zealand.
9. —— sphærulolineata, *P. & J.*	Cretaceous: Ciply.
10. —— globularis, *Phillips*. ..	Cretaceous: England an Europe. Tertiary: Grignon.
11. —— concava, *Lamk.* [Type.]	Cretaceous: England and France.
12. —— lenticularis, *Blumenb*...	Cretaceous: England, France, and Maestricht.

34. Orbulites concava. Hist. An. s. Vert. vol. ii. p. 197, No. 4.

"*O.* uno latere convexa, subantiquata; altero concava. Habite: fossile de la commune de Ballon, département de la Sarthe, à quatre lieues N.-E. du Mans. Communiquée par MM. Menard et Desportes. Sa surface convexe offre souvent des cercles concentriques d'accroissement."

This is the *Orbitolina concava*; it is figured by Michelin, Icon. Zooph. pl. 7. f. 9. We regard it as the type of a species including numerous varieties; see above.

35. Orbulites macropora. Hist. An. s. Vert. ii. p. 197, No. 5.

Lamarck gives no locality for his specimen. Defrance says that *O. macropora* is found at Maestricht. Goldfuss indicates Grignon as the locality for the specimen which he has figured as *Orbitulites macropora*, Lam. (Petref. pl. 12. f. 8). We have not seen such a large-chambered Orbitolite in the Grignon deposits; but we have obtained very fine specimens of the *O. macropora* from the Chalk of Maestricht, whence Faujas, Hafenow, and Bronn also got it. D'Orbigny refers it (under the name of *Cupulites macropora*) to Grignon (Prodrome, ii. p. 397). Galeotti mentions it as occurring at Forêts and St. Gilles (Tertiary), Belgium; and Serres found it in the building-stone of Montpellier (Leth. Geogn. 3rd edit. ii. pt. 5. p. 967).

Bronn unnecessarily distinguishes this form by a generic appellation—*Omphalocyclus macroporus*. At first sight this Orbitolite has distinctive characters, compared with the common varieties of *O. complanata*—such as its small primordial chamber, the strong limbation of the septa, the comparatively thick disk and large chambers, readily worn down so as to resemble pores; but these features are not accompanied by any peculiarity of structure essentially different from the mode of growth of the later and world-wide *O. complanata*.

O. macropora is common in the Bryozoan Chalk of Maestricht, and appears there as the first representative of a genus and species which (with some others, namely *Lagena, Rotalia Turbo, Calcarina Spengleri, Planorbulina Poeyi*, and *Amphistegina vulgaris*), first occurring in that deposit, have continued through the Tertiary period to our own day.

36. Orbulites Pileolus. Hist. An. s. Vert. vol. ii. p. 197, No. 6.

" *O*. uno latere convexa, altero concava; margine sulco exarato. Habite: fossile de .... Mon cabinet. Ses pores ne sont point apparens."

This is probably a thick and conical individual of *Orbitolina concava*. Lamarck gives no locality for his specimen.

37. Orthocera Acicula. Hist. Anim. s. Vert. vol. vii. p. 594, No. 5.

" *O*. testa recta, superne peracuta, subaciculari; striis longitudinalibus rectis. Habite: dans la Méditerranée? Mon cabinet. Coquille très-droite, et remarquable par sa forme aciculée. Sa longueur est de 4 lig. trois quarts."

This delicate, tapering, costated shell will be catalogued as *Nodosaria Raphanus*, Linn., var. *Acicula*, Lam.

" Orthocera " is not required as a generic or subgeneric name for any of the *Nodosariæ*.

38. Nodosaria dentalina. Hist. Anim. s. Vert. vol. vii. p. 596, No. 2.

" *N*. testa elongato-subulata, leviter arcuata; articulis tumidiusculis, glabris. Habite? Mon cabinet. Cette coquille, un peu arquée, et n'offrant qu'un léger renflement dans ses articulations, rappelle en quelque sorte la forme d'une très-petite Dentale. Ayant environs 2 lignes de longueur."

This is evidently the same smooth, delicately acicular, and gently bent variety of *Nodosaria* which was subsequently named *Dentalina communis* by D'Orbigny. *N. dentalina*, however, is a very apt and serviceable name. Besides this well-marked and not uncommon form, there is a host of closely-allied varieties, fossil in many clays and other deposits of Tertiary, Secondary, and even Palæozoic age, and living in the present seas*. *N. dentalina* flourishes on muddy sea-bottoms at a depth of about 100 fathoms; but it extends also in its range from shallow water to 700 or 800 fathoms or more.

39, 40, 41. *Nodosaria Raphanus*, Linn., *Vaginulina Legumen*, Linn., and *Nodosaria Radicula*, Linn., are figured in the Tableau Encyc. et Méth. pl. 465. figs. 2–4, and catalogued in Hist. Anim. s. Vert. vol. vii. pp. 593, 595, & 596; but the figures are bad copies of older engravings (after Plancus), and nothing new is added in the descriptions.

* Ann. Nat. Hist. ser. 3. vol. iv. p. 345.

42–62. The Fichtelian species. Comparing the list of the Foraminifera figured in the Tabl. Encyc. Méth. with those catalogued and briefly described in the Hist. Anim. s. Vert. vol. vii., we find that Lamarck had considered and reconsidered their relations to each other and to the rest of the minute shells which he thought to be microscopic Cephalopods, and that consequently he had laboured to arrange them in a systematic form. That he failed in doing so is not to be wondered at, having no light as to their real relationships. Some of the terms applied by Lamarck to the Fichtelian species and varieties are serviceable, although his notions of the generic groupings were wrong. He did not advance beyond Fichtel and Moll in the definition of the species; indeed at first he retrograded in that respect, giving specific names to several *varieties* of *C. Cassis* in the Tabl. Enc. Méth. In publishing his Hist. Anim. s. Vert., however, he appears to have recognized the propriety of giving wider limits to the specific groups.

63, 64, 65. Nothing need be said of *N. Fascia*, Linn., *N. Raphanistrum*, Linn., and *N. obliqua*, Linn., catalogued in the Hist. An. s. Vert. vol. vii. p. 594.

66. "Nodosaria Siphunculus" is a *Serpula*. See Ann. Nat. Hist. 3 ser. vol. iii. p. 480, where the Linnæan species and varieties of *Nodosaria* are treated of (pp. 477–479).

IX.—*Note on* Carduella cyathiformis. By Professor Allman.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

My attention has been directed to a communication "On the *Lucernaria cyathiformis* of Sars," by Mr. Gosse, in last month's Number of the 'Annals.' The following passage occurs in it: "In the 'Quarterly Journal of Microscopical Science' for this month, Professor Allman has described and figured what he considers to be the *Lucernaria cyathiformis* of Sars, instituting for it a new genus, under the name of *Carduella*. I feel sure he was not aware that I had already separated it from *Lucernaria*, under the generic name of *Depastrum*, in the 'Annals' for June 1858, p. 419."

The paragraph here referred to, in which Mr. Gosse institutes his genus *Depastrum*, occurs in his excellent "Synopsis of the British Actiniæ;" and I confess that it had entirely escaped my memory, until the remark above quoted caused me again to refer to the paper which contains it. I find the genus *Depastrum* there defined as follows:—

"*Depastrum* (Gosse). Corpus repente contractum, et supra et infra alvum. Tentaculorum fasciculi inter angulos disci positi, vix separati."

The genus includes a single species, viz.—

"*D. cyathiforme* (Sars). Semipollicare. Brunneum."

Now it is manifest that this definition will not at all apply to the *Carduella cyathiformis* of my paper in the 'Microscopical Journal,' nor to the *Lucernaria cyathiformis* of Sars, with which I consider *Carduella cyathiformis* to be identical.

The species on which Mr. Gosse founded his genus *Depastrum* is indeed an entirely different animal. It differs from *Carduella*, as Mr. Gosse now admits, in its octangular instead of circular disk; in the unequal length of the tentacles, and their clavate, rather than capitate, form; in the fasciculate grouping of the tentacles, and their arrangement in two or three rows, one within the other, instead of their disposal in a single circle; in their origin from the margin, instead of the surface, of the disk; as well as in other particulars of less importance.

It is plain, then, that, in Mr. Gosse's "Synopsis," the *Lucernaria cyathiformis* of Sars remains unaffected, though it is there cited as a synonym of *Depastrum cyathiforme*.

But another question here arises: may a generic diagnosis be so framed as to embrace within it the two species? Mr. Gosse is of opinion that it may, and he now proposes a generalization of his original diagnosis of *Depastrum*, so as, by the omission of certain characters, to enable it to embrace the genus *Carduella*, which he would accordingly suppress. The following is his amended diagnosis:—

"Corpus repente contractum, et supra et infra alvum."

Upon this point, however, I must entirely differ from Mr. Gosse; for, in thus amending his original diagnosis, the characters he omits, as of only specific value, are assuredly of a higher order than those which he retains as generic. Indeed, the genus *Depastrum*, as thus defined, would differ from *Lucernaria* far less than from *Carduella*.

Mr. Gosse reminds us that M. Milne-Edwards, in the third vol. of his 'Histoire Naturelle des Coralliaires,' just published (1860), gives the generic name of *Calicinaria* to the *Lucernaria cyathiformis* of Sars. I must nevertheless claim priority for *Carduella*, the genus having been so named by me at the Aberdeen meeting of the British Association in September 1859. (See Reports of the British Association for that year.)

I am therefore not prepared to abandon the name of *Carduella*, or to cancel the diagnosis I have proposed for the genus. *Depastrum*, as defined in Mr. Gosse's "Synopsis," is also undoubtedly a good genus, though it is a mistake to cite the *Lucernaria cyathiformis* of Sars as representing it.

I remain, Gentlemen,
Very faithfully yours,
Edinburgh, June 1860. GEO. J. ALLMAN.

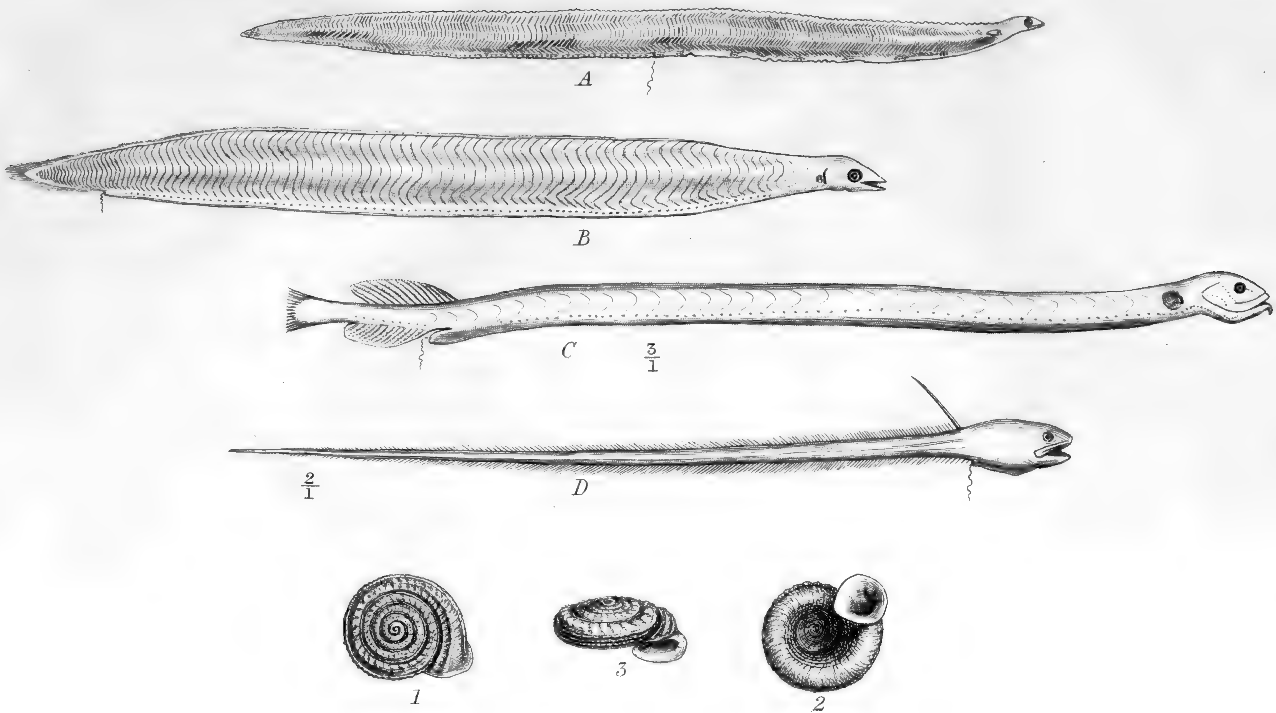
X.—*Description of a new* Helix; *and Notice of the Occurrence of* Planorbis glaber, *Jeffr., in Madeira.* By R. T. LOWE, M.A.

[With a Plate.]

DURING an excursion in the north of Madeira, a few weeks past, I had the good fortune to discover the following fine and entirely new *Helix,* living at an elevation of about 4000 feet, on a dry and partially wooded mountain-slope or bank, along the new Levada now constructing in the Ribêiro do Fayal. Its affinity is primarily, doubtless, with the rare Desertan fossil, *H. coronula,* Lowe; and next, though more remotely, with *H. tiarella,* Webb, and with the recent Porto-Santan *H. coronata,* Desh. Yet it exhibits also, both in size and certain peculiarities of form and sculpture, the nearest approach yet discovered amongst living Madeiran Helices to the strange and curious *H. Delphinula,* Lowe, known at present only as one of the most abundant Caniçal fossils of Madeira.

The discovery of so fine a recent species ought to stimulate afresh the researches of naturalists in the higher sylvan regions of the island, considering how remarkable it is that so large and striking a shell as this, however rare and local it may be, should have hitherto escaped all observation.

The main points of interest attaching to *H. delphinuloides,* independently of its great rarity and beauty, are—1st, its supplying in some sort a link between the two remarkable Madeiran groups Craspedaria and Coronaria, in size agreeing better with the single known representative of the former, *H. Delphinula,* than with any previously described member of Coronaria; and 2ndly, its offering a living analogue, in the group Coronaria, to the fossil type, and indeed sole representative, of Craspedaria. The abundance, moreover, of *H. Delphinula* in a fossil state, and its apparent extinction as a living species, are curious facts when contrasted with the extreme rarity of its recent representative, *H. delphinuloides,* and the absolute non-occurrence of the latter as a fossil. But since the possibility of the one being a mere modification of the other is entirely inadmissible, the discovery of *H. delphinuloides* doubtless strengthens much the probability of the existence also in a living state of the true *H. Delphinula* itself in some of the many still unexplored sylvan nooks and



J. De C. Sowerby sc.

glens of the inner mountain mazes and recesses of the island,—reduced perhaps, as in the case of the abundant Porto-Santan fossil, *H. coronata*, Desh., and of the rarer *H. Lowei*, Fér., to a few individuals surviving in a single spot.

Except the discovery in July 1855, by Mr. Wollaston and myself, in Madeira, of living *H. tiarella*, Webb, and of a single live example of *H. Lowei*, Fér., in 1857, by Sr. J. M. Moniz, in the Ilheo de Cima, off Porto Santo, this fine new *Helix* is by far the most important and interesting addition made of late years* to the Madeiran Helicological fauna, whose treasures are thus proved to be by no means exhausted. My first impression, on its discovery, was indeed that of utter astonishment how so large and striking a species could have escaped previous detection. It was found alive, on the 17th and 18th of April last, in a single spot, on the surface of the somewhat moist, loose, friable, black vegetable mould, amongst tufts of grasses, ferns, &c., on a steep, dry, sunny bank clothed with shrubs of *Vaccinium* and Heath (*Erica arborea*, L.), mixed with a few scattered trees of *Laurus*, at the foot of perpendicular crags, along the new Levada called the Levada da Fajãa dos Vinhaticos, about three miles below its source in the bed or stream of the Ribêiro do Fayal, a little below the top or ridge on the S.W. slope of the great lateral spur or buttress through which the principal or longest tunnel has been perforated. Searching here for common sylvan species with my Portuguese attendants, the first example was discerned by one of them, José Rodriguez of Machico, whose good fortune was almost simultaneously shared by the rest of us; for, though apparently quite local, and confined here to a short and narrow band of a few yards wide, reaching down the mountain-side some fifty yards or more, it seemed tolerably abundant on the spot; and a reward of at first a pistreen (10*d.*), and then a bit (5*d.*) for each example, soon procured a fair supply of living specimens. In association with it, I found *H. actinophora*, *H. bifrons*, and *Vitrinæ* abundantly. *H. membranacea* and *erubescens* also occurred more sparingly.

In the first moments of surprise at the sight of these examples lying on the black mould of the bank, under dead leaves amongst the grass and herbage, I imagined that I had either found some extraordinary new *Cyclostoma* of the discoidal group typified by *C. planorbula*, Lam., or discovered at last the long-desired recent shell of *H. Delphinula*. Presently undeceived as to the former notion by the protrusion of the animal, I perceived almost as soon the untenableness of the latter; for, though in size and general aspect, no less than in the open spirally-grooved umbi-

* *H. coronata*, Desh., was discovered alive by Mr. Wollaston in 1848.

licus, and some other peculiarities of sculpture, *H. delphinuloides* is allied to *H. Delphinula*, it is a truly distinct species; and the fact that one so large and remarkable has remained so long undiscovered in Madeira only gives, as before observed, fresh vigour to the hope that the real *H. Delphinula*, in a living state, will even yet reward the diligent researches of some explorer of the more retired glens and interior recesses of that apparently inexhaustible and wondrous field, the inner ravine and mountain region of Madeira. The locality of the present nearly connected species suggests the probability that, like so many others of the Caniçal fossil shells, *H. Delphinula* also was a sylvan species, and that it is consequently to be looked for in the higher forest regions of the island.

Group Coronaria, Lowe.

Helix delphinuloides, Lowe. Plate III. figs. 1–3.

T. latissime et perspective umbilicata, orbiculato-discoidea, tenuiuscula, subpellucida, pallide testaceo-carnea v. livido-purpurascens, sæpe subcretaceo-plumbea v. griseo-violascens albida, junior acute dentato-carinata, supra concinne crenatim radiato-plicatula et sæpe undatim oblique flexuoso-striolata, subtus spiraliter sulcato-costata eleganterque clathrato-cancellata; *spira* convexo-depressa, planiuscula; *anfract.* 6–6½, planatis (nec contabulatis), ad suturam denticulato-marginatam antice impressam æqualiter radiato-pliciferis, ultimo (aliquando subbicarinato) cylindrico (carina antice evanescente) costis spiralibus pluribus distinctis (unica supra, 4 v. 5 infra carinam majoribus) sulcato-cingulato costellisque annularibus striolisque intermediis creberrimis tenuissimis transversis exquisite decussato-cancellato, antice valde deflexo soluto producto; *umbilico* omnino aperto, patulo, largo, profundo, ad apicem usque pervio, spirali; *apertura* relevata, expanso-tubæformi, inæqualiter subcirculari; *peristomate* circinato-producto, undique relevato-disjuncto, expanso-reflexo, *margine* tenui, acuto, subflexuoso-plicato, intus inæqualiter subsulcato.

Diam. maj. 15–17, min. 13–14, alt. 6–9 mill.; anfr. 6–6½ mill.

Hab. ad terram inter gramina et herbas in declivibus dumosis ad basin rupium convallis Ribêiro do Fayal dictæ Maderæ ad alt. 4000 fere ped.

Animal a true *Helix*: yellowish brown; sides of foot pale cinereous; the whole with a warm pale sienna tint. Tentacles, and a line backwards from the base of each, blackish; the upper pair rather long.

Averse to move, but not slow or timid when once in motion. When quiescent, the pointed yellowish-brown tip of the foot appears within the mouth of the shell; but when disturbed, the animal retracts itself far back within. When brought down to Funchal, the animals all died in three or four days.

In the paler violet-grey or chalky-whitish-shelled examples, the animal is much paler than in the brownish flesh-coloured or purplish-shelled individuals.

Shell rather thin, light, and fragile; opake, but pellucid when held up to the light; of a uniform peculiar dull-brownish flesh-colour or livid purplish, sometimes, even in living examples, of a pale violet-grey or lead-colour or chalky-white, entirely without lustre or polish. Shape planorbiform, orbicular, depressed, with the spire flattened and but slightly convex, sharply keeled whilst young, but either without any keel or obscurely double-keeled when adult, the keel minutely but not regularly toothed in the young shell. The sculpture is very elegant and complex: above, the volutions are regularly and distinctly, but not strongly, plaited at their upper edge with short, equidistant, oblique ribs radiating from the suture about half-way across their breadth; beneath, they are very regularly and strongly ribbed and grooved spirally, the somewhat broad or flattened ribs being also beautifully cancellated by regular, sharp, equidistant, annular or transverse finer riblets. Whilst there is only one larger or more prominent spiral rib above the evanescent keel on the last volution, there are usually about eight or ten below it; and sometimes the uppermost of these is stronger and a little remote, and separated by a broader or deeper groove from the rest below, forming a sort of secondary lower keel. Again, on the upper side the volutions, and especially the last, are often marked with flexuose or zigzag, very oblique waved striæ, as in *H. Delphinula*; and on both sides they are found, under the lens, to be covered with excessively fine and thickly crowded, close-set, transverse striæ, passing along the annular and across the spiral ribs and their interstices. Thus, in well-developed individuals, there are four distinct systems of sculpture, viz. the spiral and annular ribs, and the flexuose and microscopic striæ.

In shape and general aspect, *H. delphinuloides* bears a marked resemblance, as already mentioned, to some of the flattened discoidal *Cyclostomata*, and in colour it is often very like *C. elegans*, Müll. The large, open, spiral, beautifully grooved and cancellated umbilicus recalls to mind that of the marine genera *Solarium* and *Delphinula*, Lam.; and it is as much with reference to this analogy as to its affinity with *Helix Delphinula*, Lowe, that I have named the species.

H. delphinuloides is at once distinguished from *H. Delphinula* by wanting the sharp, thin, broad, projecting, rim-like keel; by its flattened discoidal shape, and wider, shallower umbilicus: and from its much nearer ally, the Desertan fossil, *H. coronula*, Lowe, it differs in being more than twice as large; in the flattened, not coronated spire; in the keel of the volutions not being strongly plicate-toothed and raised above the sutural line; in the volutions not being flattened above the keel; and lastly, in their less remote and strong, not tooth-like, radiating ribs or plaits.

I am indebted to Mr. Edmund Leacock of Madeira, a young and zealous entomologist, for several examples of a *Planorbis* found by him in a tank in Dr. Lister's beautiful and richly-stored garden at Funchal, where I understand the same shell had been previously obtained by Mr. J. Y. Johnson. These examples belong unquestionably to *P. glaber*, Jeffr. (*lævis*, Ald.); and, like *Helix aspersa*, Müll., in another garden at Funchal, the species has been doubtless introduced within the last few years from Portugal, where Dr. Bocage, Director of the Lisbon Museum, finds abundantly, in stagnant water, tanks, &c., everywhere, a shell precisely identical. Examples from Cintra, kindly communicated by this able naturalist, who is at present actively engaged in studying the very imperfectly explored Molluscan fauna of his country, perfectly agree with these Madeiran specimens, one of which is remarkable for exhibiting faint traces of spiral striæ towards the peristome on the under or lower and more concave side of the shell,—invalidating so far the specific difference, which has been, indeed, already called in question (see Gray's Man. p. 260; though compare also Forbes and Hanley, Brit. Moll. iv. 151), between *P. glaber*, Jeffr., and *P. albus*, Müll.

Lea Rectory, June 12, 1860.

EXPLANATION OF PLATE III.

Fig. 1. *Helix delphinuloides*, upper side; fig. 2, under side of the same; fig. 3, seen in profile.

XI.—*On a new Species of Black-fish found on the Coast of Cornwall.* By Dr. Albert Günther.

The genus *Centrolophus* (or the Black-fish of British ichthyologists) comprises fishes which evidently are inhabitants of the open sea, living in the Mediterranean and in the European part of the Atlantic, between lat. 30° and 58° N. They fall only occasionally into the hands of zoologists, which circumstance will account for the lateness of the discovery of a new European species.

The specimen on which I have founded the species was found thrown on shore near Polperro, in the month of February of the present year, during rough weather, and was stuffed and sent to the British Museum. Fortunately Mr. Couch had previously drawn a pencil sketch of the fish, which he kindly communicated to me as soon as I had informed him that the specimen was different from the other known species. It was evident from this sketch that the head of the specimen had been deformed by stuffing, but that the elongated form of its body is a natural character. The chief difference, however, from *Centrolophus pompilus* is in the increased number of the anal rays, which amount to thirty in the present specimen, while they vary between twenty-three and twenty-five in all the specimens of *C. pompilus* which have hitherto been examined. I have therefore no doubt about its specific distinctness, and propose to call it *Centrolophus britannicus*, not because I think it is confined to the British seas, but because it has been observed first on the British coast. The characters by which the three species of *Centrolophus* may be readily distinguished are, shortly, the following:—

Centrolophus britannicus. The height of the body is one-fifth of the total length; dorsal fin with 45, anal with 30 rays.

Centrolophus pompilus. The height of the body is one-fourth of the total length; dorsal fin with 39–41, anal with 23–25 rays.

Centrolophus ovalis. The height of the body is one-third of the total length; dorsal fin with 40, anal with 24–27 rays.

A further question arises, whether our new species has not been indicated by one of the earlier writers, or whether it has been confounded under the numerous denominations considered as synonyms of *C. pompilus.* The circumstance that the four specimens of the Black-fish observed on the British coast, and proved to belong to the genus *Centrolophus*, have been found on the coast of Cornwall, might lead to the unfounded supposition that the fish is peculiar to this part of England. I think it receives explanation from the fact that the ichthyology of Cornwall has been worked out more completely than that of any other part of the south coast of Britain,—first by Borlase, from the papers of Mr. Jago of East Looe, and afterwards by so excellent and indefatigable an observer as Mr. Couch. Jago observed two of the four specimens caught together in one net; and the accurate figure given by Borlase*, and the statements of the relative measurements†, of the distance of the commencement of the dorsal fin from the snout, &c., afford ample proof that those two fishes were not the *C. britannicus*, but belonged to the

* Borlase, Nat. Hist. of Cornwall, p. 271, pl. 26. fig. 8.

† Mr. Couch (Yarr. Brit. Fish. 2nd edit. i. p. 180) appears to have misunderstood Jago's description, in which the fish of thirteen inches is represented as three-fourths of an inch *broad.* Jago intended to give a statement of the horizontal width, and not, as Mr. Couch thinks, of the depth of the body.

true *C. pompilus*. They became, in the works of systematic authors, the Black-Ruffe of Pennant, *Perca nigra* of Gmelin, *Holocentrus niger* of Lacépède. The two other specimens which fell into the hands of Mr. Couch, and which were described by him in Yarrell's work, were also *C. pompilus,* as is evident from the number of the fin-rays stated*.

With regard to *Centrolophus morio,* Lacép. (Mr. Couch had marked his sketch with the name of *Centrolophus morio*?), Cuvier has examined the typical specimen to which Lacépède had given that denomination. He found it entirely agreeing with *C. pompilus,* especially with regard to the number of the fin-rays; and there is not the slightest doubt that *C. morio,* like *C. liparis,* Risso, is a nominal species, and synonymous with *C. pompilus*.

Finally, *Centrolophus crassus,* Cuv. and Val., if at all different from *C. ovalis,* cannot be confounded with our new species,—having the body as high as *C. ovalis,* and only thirty-nine rays in the dorsal fin.

Two other British specimens of the Black-fish are mentioned in Yarrell, Brit. Fish. 3rd edit. p. 250: one came under the observation of the Rev. George Gordon, at Lossiemouth (Moray Firth), the other under that of Mr. Rudd, at Redcar. No other information with regard to these two fishes has been preserved.

XII.—*On Additions to the Madeiran Coleoptera.*

By T. Vernon Wollaston, M.A., F.L.S.

[Continued from vol. v. p. 459.]

Fam. **Tenebrionidæ**.

Genus Gnathocerus.

Thunberg, Act. Holmiens. 47 (1814).

The present genus is identical with what I have hitherto cited as *Cerandria,*—Thunberg's name of *Gnathocerus,* which until lately appears to have been lost sight of by entomologists, having the priority in point of date. Hence the common *Cerandria cornuta* must be quoted as the *Gnathocerus cornutus*. Another species, detected by myself during the spring of 1859, has been added to our fauna since the publication of my last paper, which I conclude to be coincident (if indeed it be possible to draw any conclusion at all from such meagre descriptions as those of Fabricius) with the *Trogosita maxillosa* of the 'Systema Eleutheratorum.'

* Yarr. Brit. Fish. 2nd edit. i. p. 182.

Gnathocerus maxillosus? Fab.

G. lineari-elongatus, pallide rufo-ferrugineus, subnitidus; prothorace subconvexo, subquadrato, subtilissime punctulato; elytris punctato-striatis, antennis pedibusque rufo-testaceis.

Mas mandibulis elongatis, angustis, curvatis, falcatis, porrectis; fronte bituberculata, ad latera paulo subrecurvo-ampliata.

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

Habitat Maderam, sub cortice arborum laxo in ipsa urbe Funchalensi, Junio ineunte A.D. 1859 a meipso repertus.

Trogosita maxillosa? Fab. Syst. Eleuth. i. 155 (1801).

G. rather smaller, narrower, and more linear than the *G. cornutus*, being of almost equal breadth throughout,—the prothorax being less expanded anteriorly, and the elytra with their sides more strictly parallel; also usually a shade paler than that species, but with much the same sculpture. *Head* of the *females* a little more rounded anteriorly than is the case in the *G. cornutus*, and rather less elevated and expanded before the eyes (which, unlike those of that insect, project *perceptibly beyond* this developed lateral portion); head of the *males* likewise with this lateral portion scarcely more expanded than in the opposite sex (instead of immensely dilated, as in the *cornutus*), and with two central horn-like tubercles on the forehead (which are smaller and more medial than those of the *cornutus*, and not touching at their base the inner margin of the eye): also with the *mandibles* in the *males* greatly elongated, porrected, and incurved, but very much narrower and more sickle-shaped than those of the *cornutus*, and not so evidently *re*-curved towards their apex. *Prothorax* squarer than in the *G. cornutus*, being less expanded in front, and therefore straighter at the sides, and with the hinder angles less obtuse. *Elytra* with the sides perfectly parallel, instead of a trifle diverging posteriorly as in that species, and somewhat more deeply striated. *Limbs* (particularly the *antennæ*) usually a shade paler than those of the *cornutus*.

Several specimens of the present *Gnathocerus* were captured by myself (and subsequently, in the same locality, by Mr. Bewicke) beneath the dead, loosely attached bark of the Plane-trees in the Praça da Rainha, in Funchal, at the beginning of June 1859. Like the *G. cornutus*, it has doubtless been imported into the island, but seems to have naturalized itself even more completely than that species. Judging from two short observations in Lacordaire's recent volume on the Genera of the Heteromera, in the 'Suites à Buffon' ("Les mandibules du mâle sont beaucoup plus grêles que chez la *cornuta*;" and, "une seule espèce est décrite, la *Trogosita maxillosa*, Fab., Syst. Eleuth. i. 155," besides the *cornutus*), I conclude that it is in all probability coincident with the Fabrician *T. maxillosa*, and have cited it accordingly; nevertheless, if it should prove hereafter to be distinct from that insect, I would propose for it the trivial name of *falcatus*—in allusion to its narrow and *sickle*-shaped mandibles, which (*inter alia*) immediately distinguish its male sex from the corresponding one of its ally. It would seem that the female is the scarcer sex of the two; for out of the twenty-one examples from which the above description has been compiled, seven are females and fourteen males. And, indeed, the same appears to obtain in the *G. cornutus* also, since, of eleven Madeiran examples now before me, three only are females.

Fam. **Opatridæ**.

Genus Hadrus.

(Dej. Cat.) Woll., Ins. Mad. 502 (1854).

Hadrus Paivæ, n. sp.

H. oblongus, niger, subtiliter et crebre granulatus; elytris substriatis, levissime et subtilissime pubescentibus.

Long. corp. lin. $4–4\frac{1}{2}$.

Habitat Maderam orientalem, in illa prominente litoris calcaria ad Porto da Cruz, sub lapidibus juxta mare jacentibus, d. 18 Jan. 1859, copiose inveni. Species valde distincta, et in honorem Baronis ejus Lusitanici "Castello de Paiva" a me amica mente citata.

H. oblong (being of almost the same outline as the *H. alpinus*), black, almost free from scales, and rather more coarsely, and less closely, granulated all over than the *H. alpinus*, but not near *so* coarsely as the *cinerascens*. *Head* with the clypeus expanded into a lateral angle in front of the eyes, as in the latter species, instead of being rounded-off, as in the former one. *Prothorax* of the same shape as that of the *cinerascens*, being a trifle more expanded anteriorly than in the *alpinus*, and not quite so broadly flattened at the sides. *Elytra* very obsoletely striated, but *rather* more perceptibly so than in the *alpinus*, and, under a high magnifying power, beset with an excessively short, minute, and distant fulvescent pile. *Antennæ* and *tarsi* obscurely piceous.

As will be perceived from the above description, the present *Hadrus* is intermediate in its features between the *H. alpinus* and *cinerascens* (though remarkably distinct, and never merging into either of them)—combining the general outline of the former with the angulated clypeus of the latter; whilst in the relative *coarseness* of its sculpture (though not in its precise *character*) it is about midway between the two. In the pubescence of its elytra, also, which is *very* delicate and obscure, it is intermediate between the totally unclothed *H. alpinus* and the rather more evidently (though very minutely) setulose and roughened surface of the *H. cinerascens*. It was detected by myself, on the 18th of

January 1859, in abundance, beneath stones, close to the shingly beach of the low calcareous promontory at Porto da Cruz, in the east of Madeira proper; and I have great pleasure in dedicating it to my excellent friend the Barão do Castello de Paiva, to whose kindness I am indebted for much valuable assistance in procuring for me, at various times, specimens of Madeiran Coleoptera, and whose botanical researches, both in Madeira and the Canaries, are already well known.

Fam. **Staphylinidæ.**

(Subfam. Aleocharides.)

Genus Tachyusa.

Erichson, Käf. der Mark Brand. i. 307 (1837).

Tachyusa maritima, n. sp.

T. depressa, minute punctulata, subopaca, nigra et dense cinereo-pubescens; capite transversim subquadrato; prothorace late canaliculato, postice angustiore; elytris vix picescentioribus; antennis pedibusque dilute testaceis, illis gracilibus, apicem versus vix obscurioribus.

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

Habitat Maderam, rarissima; in salinis lapidosis juxta mare ad Sanctum Vincentium, inter lapillos velocissime cursitantia, duo specimina mense Decembri A.D. 1858 collegi.

T. depressed, dull-black, minutely punctulated, subopake, and densely clothed with cinereous pubescence. *Head* transversely subquadrate, being straightly truncated behind, and with the forehead slightly channeled down the centre. *Prothorax* a little narrowed posteriorly, and with a wide, but not very deep, channel down its disk. *Elytra* just perceptibly more picescent than the head and prothorax. *Abdomen* rather more shining. *Antennæ* slender, and a little longer than the head and prothorax; testaceous, being but very slightly more obscured towards their apex. *Legs* diluted testaceous.

Two specimens of the present very distinct *Tachyusa* were captured by myself, during December 1858, below high-water mark, on the shingly beach at São Vicente, at the exact point (close to the chapel-rock) where the stream empties itself into the sea. It would appear to be the representative of the *T. uvida* of more northern latitudes, being somewhat intermediate between that species and the *T. sulcata*. It is, however, rather smaller than the former, with its antennæ shorter, more slender, and (together with the legs) paler, and its head is not quite so long; whilst from the latter it recedes (*inter alia*) in being considerably larger and with altogether longer limbs,—the antennal joints, moreover, being much less transverse, and the legs of a paler hue.

(Subfam. Tachyporides.)

Genus Hypocyptus.

Mannerheim, Brachél. 58 [script. Hypocyphtus] (1831).

Hypocyptus reductus, n. sp.

H. acuminato-obovatus, convexus, niger, nitidus, pubescens; prothorace ad latera angustissime diluto; elytris valde abbreviatis, singulatim oblique truncatis; antennis pedibusque piceo-testaceis, illarum articulo ultimo longitudine reducto.

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

Habitat Maderam, in ipsa urbe Funchalensi a meipso semel lectus.

H. obovate, being rounded in front and acuminated behind, convex, black, shining, scarcely perceptibly punctulated (even beneath the microscope), and sparingly clothed with a fine, decumbent, cinereous pile. *Head* transverse, and somewhat acuminated between the eyes. *Prothorax* and *elytra* of the same breadth at their point of junction: the *former* with its hinder angles acute and produced, and with its *extreme* lateral edge narrowly diluted in hue; the *latter* very short, and each of them obliquely truncated behind. *Antennæ* but very slightly incrassated at their apex, and with their ultimate joint shorter and rather more obtuse than in the ordinary *Hypocypti*, rufo-testaceous at the base; their apical portion, as well as the *femora* and *tibiæ*, darker, or more piceous. *Tarsi* pale testaceous.

A single example of the present *Hypocyptus* was taken by myself from beneath a piece of board which was lying on the damp earth in the garden of the American Consulate, in the very centre of Funchal. From the circumstances of its capture, one might have imagined that it was in all probability a chance specimen which had been accidentally imported into the island, did not its decided specific divergence from the European *Hypocypti* tend to an opposite conclusion. Apart from minor features, the concolorous apex of its abdomen, in conjunction with the structure of its antennæ (which are somewhat slenderer and less clubbed than those of its more northern allies, and have their terminal joint shorter and more obtuse), will at once serve to characterize it.

Genus Mycetoporus.

Mannerheim, Brachél. 73 (1831).

Mycetoporus Johnsoni, n. sp.

M. rufo-testaceus, nitidus; pectore abdomineque (ano plus minus ferrugineo excepto) obscurioribus; oculis parvis; prothoracis punctis apicalibus a margine anteriore valde remotis; elytris convexis brevibus, punctorum seriebus fere obsoletis; antennis pallidioribus, apicem versus minus incrassatis.

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

Habitat Maderam editiorem sylvaticam, sub truncis prolapsis et cortice arborum laxo, passim. Species *M. prono*, Er., affinis, sed ab eo, nisi fallor, certe distincta, et in honorem cl. J. Y. Johnsoni, armigeri, scientiæ naturalis in Madera cultoris periti, citata.

Mycetoporus pronus, var. *β*, Woll., Ins. Mad. 573 (1854).

M. like the *M. pronus*, but rather smaller, with the *eyes* more minute, with the four transverse *prothoracic punctures* a little further removed from the anterior margin; and with the *elytra* shorter and more convex, and with their three rows of longitudinal punctures almost obsolete. The *antennæ*, also, are rather paler than in that insect, and not quite so incrassated towards their apex.

I am now for the first time induced to regard what I have hitherto considered as but a small state of the *M. pronus* as in reality specifically distinct. A recent and more thorough examination of it, with the advantage of a larger number of specimens than I had hitherto been able to command, has convinced me that it cannot be properly referred to that insect,—of which, indeed, I had always considered it a very *abrupt* and extraordinary variety; I have consequently removed it therefrom, and have much pleasure in dedicating it to my friend James Yate Johnson, Esq. (the accomplished editor of Mr. White's excellent 'Handbook for Madeira'), whose careful researches in various departments of the natural history of the island are well known. Its distinctive features, which will at once separate it from the *M. pronus*, may be immediately gathered from the above description.

(Subfam. Quediides.)

Genus Heterothops.

(Kirby) Steph., Ill. Brit. Ent. v. 256 (1832).

Heterothops minutus, n. sp.

H. niger; capite prothoraceque angustulis, nitidissimis; elytris prothorace paulo longioribus, pubescentibus, picescentibus, apice necnon abdominis apice distincte dilutioribus; antennis gracilibus, ad basin et pedibus dilute rufo-testaceis.

Long. corp. lin. $1\frac{2}{3}$–2.

Habitat Maderam australem, sub foliis marcidis in horto Bewickiano prope Funchal captus.

H. narrow, and acuminated both before and behind (though especially, of course, the latter), and black. *Head* and *prothorax* highly polished: the *former* narrow and oblong, with a small punctule on either side of the disk behind, and with about four more on each side, placed in a longitudinal row from the inner margin of the eye: the *latter* a good deal narrowed or laterally compressed in front, with the anterior angles somewhat deflexed, and the hinder ones rounded off; with a large and rather deep puncture towards either side on the hinder disk, and with another (rather smaller and more central) on each side of the fore-disk, besides a few obscure ones on the *extreme* margins. *Elytra* and *abdomen* much less shining, and more pubescent, than the head and prothorax, being somewhat densely clothed with a long, decumbent, and slightly paler pile, with a few darker and erect hairs intermixed: the *former* less black than the rest of the surface, being more or less obscurely piceous, and with their apical margin rather brightly diluted in colouring, or rufo-testaceous: the *latter* with its apex and the extreme posterior edge of each segment obscurely rufescent. *Antennæ* rather slender and fragile; their *two basal joints* and the *legs* diluted rufo-testaceous.

Two specimens only of the present *Heterothops* have as yet come under my observation, the first of which was captured by myself, from beneath dead leaves and vegetable refuse, in Mr. Bewicke's garden at the Palmeira, above Funchal, in the spring of 1859; and the second, I believe in the same locality, by Mr. Bewicke himself. It will probably be found identical with a species which I have taken abundantly in the Canary Islands, and is most allied, at first sight, to the common European *H. dissimilis*; nevertheless its head and prothorax are distinctly narrower than in that insect (the former being more oblong, and the latter more laterally compressed in front, and with the discal punctures more evident), its elytra are a trifle longer, and its antennæ are rather more slender and fragile, with their basal joints more brightly testaceous. In their general *facies*, the species of *Heterothops* very much resemble diminutive *Philonthi* or *Quedii*; nevertheless, apart from less important differences, the minute, subulated terminal joint of their palpi will immediately separate them from both of those groups.

[To be continued.]

XIII.—*Notes on* Dunlopea. By Dr. E. Perceval Wright, F.L.S., Lecturer on Zoology, Dublin University.

Dr. E. Perceval Wright exhibited to the Meeting* an annulose animal, which had been taken in India by Mr. Dunlop, one

* Communicated by the author; having been read at the Meeting of the Dublin University Zoological and Botanical Association on March 16, 1860.

of their Associate Members, and which he believed to belong to a new order of the group Turbellaria,—the straight alimentary canal and the absence of the anal orifice reminding one of the Rhabdocœla; while the apparent absence of cilia, and the peculiar worm-like form, give the animal a very Helminthoid appearance. Dr. Wright purposed to lay before the Linnæan Society a full account of this curious creature, when he would fully discuss the question of its proper position among the Annuloida; for the present, he would propose to name the genus after his friend A. Dunlop, Esq. It may be briefly characterized as follows:—

DUNLOPEA, nov. gen.

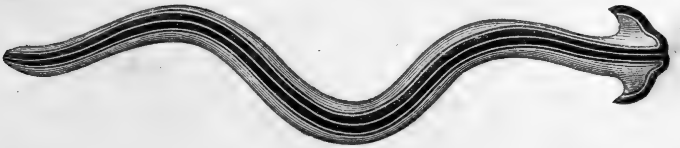
Body flattened, ribbon-like, transversely wrinkled, one portion gradually tapering to a tail-like extremity, the other tapering but slightly, and ending by projecting on each side, somewhat in the form of the head of the *Zygæna malleus.* No eye-dots or apparent anal orifice. Mouth (?) situated on the ventral portion, about midway between the two extremities, in the midst of a four- or five-lobed foliaceous appendage; strongly resembling the branchiæ of *Doris.* Living in the earth, and crawling in damp weather on the ground.

1. *D. ferudpoorensis*, n. sp.

So called after the district in which it was found. About 4 inches in length. Dorsal surface of a greenish-brown colour, with a line of light yellowish-brown running longitudinally along its central portion. Ventral surface of a lighter shade of colour. Central portion and (?) oral tuft of a light yellow colour.

2. *D. Grayia*, n. sp.

This and the following species have been examined through the kindness of Dr. Gray, of the British Museum, who, when he saw the specimen of *D. ferudpoorensis*, at once recognized the animal, and, after a search of a few moments, produced a drawing of this species, which was discovered by Dr. Cantor



in China, and is alluded to in his Catalogue of the Plants and Animals of that country. From the peculiar triangular head-lobes, and the brownish colour of the body, marked with yellow, this species can be easily distinguished from the foregoing one.

Dr. Cantor refers to a different species, found in 1836 by Mr. Griffiths under stones in the Naga Hills, and to another observed in Bengal (*vide* Ann. and Mag. Nat. Hist. 1842, vol. ix. p. 277).

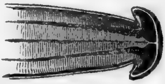
The woodcut, p. 55, is from a coloured drawing by Dr. Cantor in the Collection of the British Museum. The original specimen is also in the same collection.

3. *D. Cantoria*, n. sp.

This species, named after Dr. Cantor, who appears to have been the first to draw attention to this curious form, is the largest of the three species at present known. It was discovered by Mr. Fortune, the well-known Chinese traveller.

In length it is more than double that of either *D. Grayia* or *D. ferudpoorensis*; and the expanded hammer-head-like portion is exceedingly well marked.

There is something highly characteristic in the manner in which the peculiar longitudinal band (which seems to be of a different structure from the rest of the body) terminates towards the hammer-headed extremity: in *D. ferudpoorensis* it ends without expanding laterally; in *D. Grayia* it expands as shown in the previous figure; while in *D. Cantoria* it terminates in the manner here represented.



There appears to be no trace of this genus in the fine collection of annulose animals at the Jardin des Plantes, Paris. Full details, with carefully drawn-up specific descriptions, will shortly be forwarded to the Linnæan Society; in the mean time this brief notice may cause some attention to be paid to these little animals, which doubtless are common on the continent of Asia; and the author would be happy to receive specimens, so that he may be enabled to complete his account of the group. He is led to believe that, in addition to the localities given above, they occur likewise in the neighbourhood of Kandy (Ceylon) and near Calcutta.

BIBLIOGRAPHICAL NOTICE.

Cybele Britannica; or, British Plants and their Geographical Relations. By Hewett Cottrell Watson. Vol. IV. Longman & Co. 1859.

The fourth volume of the 'Cybele Britannica' fitly concludes a work whose value is already widely acknowledged, and will be yet more evident when other branches of our fauna and flora shall have been brought into comparison with the Flowering Plants. Then may be offered a sounder basis for explaining some of the phænomena of geographical distribution, which in our times are so full of promise, but whose existence has hitherto rather been made evident than satisfactorily accounted for.

The 'Cybele Britannica' is an "*opus per se*," as it is a model for future operations. We English botanists may well claim that our Flowering Plants have been better and more systematically explored than those of any other country. It is true that M. Lecoq has given, in ten royal octavo volumes, an account of the features of the flora of a portion of France, including an outline of the general "area" of each species; but we do not fear a comparison between his book and the English 'Cybele.' To say nothing of its lengthy disquisitions, and too often fanciful theories, there is, in the French work, great want of convenient tabular summaries. The plants of his own district are not nearly so thoroughly investigated by M. Lecoq, in his 'Études;' besides, the very size and expense of the volumes places them beyond the reach of most readers. Indeed, we do not feel at all sure that the comparison with Mr. Watson's work is fair to either writer, since M. Lecoq avowedly addresses himself chiefly to the general question, while Mr. Watson equally professes to give his attention rather to local and particular details.

When treating of his species, M. Lecoq first discusses the aspect and distribution of the order, then the statistics, range, &c., of the genus—very interesting points, it is true, but somewhat out of place in a local treatise. Then follows a kind of biography of each plant, extending often over two pages, separate paragraphs being besides devoted to—1. nature of soil; 2. altitude (often only approximately given); 3. a statement of the entire or general range. Here the very want of that precision which is so valuable a feature of the 'Cybele' is, in our eyes, the fault of the French author.

But we cannot help regretting that no place has been allotted by Mr. Watson for a few words respecting the *kind of soil* * most favourable to each species—whether silicious, calcareous, argillaceous or peaty, friable or compact; for this is a point always of high interest to the local observer, and one to which M. Jules Thurmann has recently devoted two volumes; Mr. J. G. Baker, too, has given a convenient abstract, in the shape of a pamphlet, where the English plants are arranged somewhat after the manner of M. Thurmann. We must, however, confess that we feel some misgiving as to the adoption of so difficult a terminology as that of the Swiss author. If the harsh terms of "Dysgeogenous" and "Eugeogenous" be fairly represented by "compact" and "friable," we might hope to find

* Something, indeed, is to be gathered from the terms "glareal," "ericetal," "rupestral," &c.; and, in most cases, mention is made of the attachment of a species to a calcareous substratum, which often greatly influences the assigning of plants to the "Germanic" or South-eastern group, because it is on the east side of England that the Chalk principally occurs. But the desideratum above mentioned consists in the absence of a line regularly devoted to a statement of the soil preferred by each species.

the English names adopted where the terrible Greek compounds would discourage any but an experienced classic. At the same time, however true in the main or convenient may be M. Thurmann's method of classifying soils according to their relative friability, his subdivisions seem to us rather consequences of the chemical nature of the soil than to be themselves of the first importance. From what is known of the inorganic constituents of plants, it is surely the chemical ingredients which determine the presence or absence, rarity or frequency of certain species, quite as much as the so-called "mechanical" conditions.

Mr. Watson has devoted a useful life and much conscientious labour to his favourite branch of botany. Many of our readers will remember the "Outlines of" and "Remarks upon" the "Geographical Distribution of British Plants,"—short sketches that gave high promise for the future, which promise is now amply fulfilled. These two preliminary volumes were presently followed (in 1843) by a more elaborate treatise, somewhat on the scale of M. Lecoq's. This third edition having proved too bulky, Mr. Watson, wisely foreseeing the hopeless length to which that work would have extended, proceeded (in 1847) to try a shorter plan in the four volumes by which his name has now become so generally known,—the 'Cybele Britannica.'

Of our author's fitness for his self-imposed task there can be no question: we are fortunate in meeting with a writer who, united to a rare judgment in weighing evidence, has a most happy method (all his own) of condensing particulars. His results are expressed with remarkable terseness; and the caution observed in even suggesting any general views, under the present imperfect *data*, contrasts very favourably with the proceedings of many other writers on the subject, who have been more ready to advance bold theories than to arrange sober facts.

It is not our object to discuss the plan and arrangement adopted by Mr. Watson, further than to say that we believe no smaller space could have done justice to the author's labours, since the remarks that follow the statistics of each species in the three earlier volumes of the 'Cybele Britannica' are so much to the point, and have contributed in no small degree to our present improved knowledge of the plants; still, we believe something might have been gained by giving in each case the names of the botanists whose testimony vouched for the occurrence of the plants in the several "provinces" or districts. Might we venture to suggest to future "Cybelists," with the view of giving due prominence to the certainty or uncertainty of the records, some such plan as the following:—

Suppose two lines to be given to the horizontal distribution of each species, the upper will contain the numerals which represent the "provinces," the second line will show the authorities, *e.g.*—

Vinca	Prov.	1	2	3	4	5	*	7	*	*
minor	Auth.	Ho.	Br.	Wts.	Bb.	Lg.	0	Dv.	0	0.

By "future Cybelists," we wish it to be understood we mean those who in other classes of plants, and in the animal kingdom, shall in due time follow in the track so ably marked out by Mr. Watson, and thus at length give us a complete system of the distribution of the existing fauna and flora of Britain. Not that it is desirable to attempt rash generalizations upon the range of any species within Great Britain; but we think an English naturalist will have done his duty, and have done it well, when he has arranged, in a manner so ready for reference, as many valuable details as those given in the 'Cybele Britannica.'

A first step has already been taken towards tracing the range of some of our Insects (Butterflies and *Sphingina*) through the same eighteen districts as the Flowering Plants; and we hope the system of the 'Cybele' will soon become generally adopted by English Faunists. Too much care cannot be exercised in strictly conforming to the rules laid down by Mr. Watson; and, as was said before, the mention of the authorities in each case will be a most desirable addition. It is hardly to be hoped that a similar exactness or fulness of detail is to be obtained at once in the various classes; but if even the horizontal range be carefully traced, it will be a great gain to the philosophic naturalist. We could wish, for instance, that the accomplished author of the 'British Quadrupeds' would, in his second edition, devote two or three pages to a sketch of Mammal distribution, as this would afford an opportunity of comparing more strictly the respective range of the so-called "faunas" and "floras" of Edward Forbes, in part founded upon the "types" of Mr. Watson.

On this subject our author remarks (pp. 8 and 506 of vol. iv.) that, although prepared to admit the possible soundness of Forbes's idea of a difference in age between the alpine and lowland floras, he does not see the necessity of granting that there is any real distinctness between the other "types." The plants are collected into groups only because they present a close resemblance in the *direction of their increase and decrease*; and if this be suggestive of a migration, it by no means equally indicates a difference of age and origin between the groups. It is often so difficult to assign a plant to any one type, that Mr. Watson has been compelled to have recourse to a double system of letters to indicate the species whose distribution is of this intermediate or uncertain character. Moreover, considerable changes have been made, since the appearance of the earlier volumes, by removing species from one "type" to another. Thus the "Atlantic" has 9 added, and 18 removed, chiefly to the "English" type. The proportions and constituents of the "Germanic" are still more altered, no less than 43 species being added, and about 30 taken away. The totals at present remain—127 for the "Germanic" against 69 for the "Atlantic," which thus becomes hardly more than one-half as large as the former, instead of about equal, as estimated in 1847. Mr. Watson also urges that the "types" are, after all, little more than "*climatal arrangements,*" determined by actual physical conditions: besides, it is well observed that it is easy to divide into as many groups the flora of any country, yet the geological history of each is utterly different. Such are some of the arguments advanced by Mr. Watson; and it must be allowed that many of the theories advocated by other writers besides Forbes rest too much upon negative evidence: this is especially true where use has been made of geological data. Perhaps it may be wiser to adopt the course recommended in the 'Cybele,' to postpone for a while our inquiries into the origin and age of species, and to collect hopefully the materials for the future edifice, rather than attempt to rear it upon an insecure foundation.

What we read in this volume of the distribution of the British flora is no bad example of the different groups into which the plants of a country may be subdivided according to individual fancy. Forbes saw five main groups, which he considered distinct in age as well as in character. Henfrey gives four, without touching upon the question of age. Watson has six "types," with a seventh to be added for the West Irish plants; and it also appears that the writer who acknowledges the greatest number of groups is the one who is least inclined to grant a distinctness in age.

Now, leaving out of question the alpine species, the actual features of the British flora are not very different from what might have been expected if the entire lowland vegetation were of uniform age. If we have upon our western shores many of the local and characteristic plants, is not the climate of the west coast quite exceptional as regards Europe? If the so-called "Iberian" plants of the west of Ireland were originally western species, peculiar to the outskirts of their continent, would not the wasting of the land leave just such characters as we now find? As the sea advanced, so would the "maritime" climate, and so would its appropriate plants be gradually driven back upon their outposts, till they found a last refuge upon the mountain slopes and shores of western Europe—more isolated, too, as being most exposed to the inroads of the sea. Of whatever date their origin, the species characteristic of the edge of a continent must naturally be sought at its circumference. Mr. Watson has allotted the species to their several "types" according to their distribution within Great Britain only. Still it may be said, roughly, that we should look among the "Atlantic" (even more, the "Hibernian") rather than the "Germanic," to the western rather than to the eastern side of Britain, for plants that may have once had their "metropolis" in this country. We have thought it necessary to give the more prominence to these considerations because it is so much the fashion to adopt as an axiom the necessity of a different epoch for every different "flora," that few care to incur the charge of being unphilosophical by venturing to question the correctness of this view.

But to return to the volume before us, the fourth of the 'Cybele Britannica.' Its author thus speaks of the nature of his task:—

"So many subjects crowd upon the attention in commencing this fourth volume, that it becomes really difficult to answer the questions, as to which of those subjects are to be treated at any length, which of them can be slightly noticed only, and which of them must be passed over entirely. References to the works of other writers, where some of his topics are treated in detail, may often greatly assist an author who desires to abbreviate or curtail; but such assistance would here be vainly sought, no works available in this way being in existence. The 'Cybele' must thus cite and arrange its own details, regarded from the geographic points of view. And, indeed, only details can have permanent value at present. Attempts at generalization, so usually made in conformity with the groups of systematic botany, can have extremely little value until those groups are made more settled and uniform." [But will this Utopian uniformity ever come?] "It is to the distribution of species, not of groups, that attention should be given at present, especially in a local treatise. Hence the resort to lists of species in this volume, as condensed summaries of details adapted for comparison and reference." (Introduction, p. 4.)

To extend our survey with equal exactness to the general range of British plants would indeed be a Herculean task, and one from which our author has wisely recoiled. It would require many years and many Watsons to obtain any results that could be fairly compared with those in the volume before us. But, as was said, the work is accomplished in England: let us see the foreign botanists do as much for themselves. Hence we are warned (p. 10) that the scope of the 'Cybele' "must needs be confined to a view of the present vegetation of Britain, and of the manner in which the component species of that vegetation are now distributed within the area of Britain itself, together with such inferences as may be drawn from existing circumstances in regard to the probable origin of those species here: that is, *whether placed in Britain by natural causes, or whether introduced by human agency*."

The details collected and examined in the three previous volumes are so re-arranged and corrected in the fourth "as to convert the individual and separated facts into collective and comparative expositions." Though dry reading, the arrangement of the species into tabular lists has been chosen as best adapted for reference, and because "thus the greatest amount of special and general facts can be recorded in a condensed form, under different points of view, and can thus be made ready for the use of Phyto-geographers whenever the botany of other countries shall become portrayed in like manner."

Mr. Watson is suspicious of general remarks: he tells us (p. 13) that, unfortunately, the so-called "general remarks" "are in truth" too often "only remarks of the most vague and inexact kind. True generalizations usually require much time and thought, combined with a scrupulous regard to accuracy: true generalizations are in consequence extremely rare."

In Chapter II. are discussed the terms *Orders, Genera,* and *Species,* with the inevitable conclusion that the two former have no abstract existence in nature (p. 27), but are conventional ideas only, though of course "bearing more or less accordance with the realities of nature, in so far as they are intended to express and classify the facts of nature, if this is done only by *dissevering a series or chain at those points where the links are widest or least coherent*" (p. 17).

The want of a uniformity of value in the several groups is stated to be the bane of the botanical geographer: Orders are unequal, Genera unequal; Species are unequal too (p. 44). (Here we are tempted to ask, how should we expect mathematical proportions where variety is as much the rule as unity is the law?) But the species are in the worse predicament, that the little we know of their distinctness and limits does not agree with our own definition: our conclusions are only inferences from data and proofs equally incomplete (p. 28). We much fear that human knowledge is doomed to remain imperfect in this particular. Such universal experience, extending over a series of years sufficient for such proof, is probably not within the reach of man. We commend Mr. Watson's definition of a species (p. 31), and his criticism on the subject, to those who wish for a near approach to the desired goal. The illustration given (pp. 48 & 279) of three grades of species is very apt:—

1. *Rubus fruticosus*: a super-species (? supra - Linnæan), or aggregate.
2. *R. saxatilis*: a true species, or integrate.
3. *R. discolor*: a sub-species, or segregate (? infra-Linnæan).
4. *Veronica agrestis*: a dimidiate species, *i. e.* a species halved, by the separation from it of *V. polita*.

The uncertainty (or want of fixedness) in species, as shown by the varying opinions of different authors, and even by the successive editions of the same writer, is sufficiently familiar to all those who have made a serious study of botany; and if the inconsistencies in the practice of authors are very clearly set forth (pp. 40, &c.), it is only one more proof of the fallibility of human judgment, and of the imperfection of our knowledge. May we hope that the rising generation of botanists, whose attention is thus called to a matter of no slight importance, will be found ready to double their efforts to remove this imputation of inconsistency by the only means from which there is no appeal—by a careful series of experiments and diligent cultivation of the plants.

The permanence of species is another question discussed in this chapter; but as this lies at the very root of Mr. Darwin's theory, we need not do more than refer our readers to the many able reviews and discussions which have so recently appeared upon the 'Origin of Species.'

Chapter III. deals with the "introduced species," a subject on which no one can be more at home than Mr. Watson; for to him is due very much of the progress recently made in this country in distinguishing strictly between such plants as are believed to be aboriginal (*i. e.* prehuman natives of the soil) and those which are either suspected or proved to have been imported by human agency.

We cannot help thinking that much yet remains to be done in the way of curtailing the given range of many plants—truly native, may be, in the south of England, but very unjustly reckoned indigenous to the northern counties, Scotland, or Ireland. Nay, there are doubtless many species, hitherto reckoned native, which a stricter and more philosophical inquiry may perchance reduce even below the rank of "denizens,"—that being the term used by Mr. Watson for cases of uncertainty. We may instance some of the "colonists," and wayside plants, such as *Lepidium Smithii.*

Alphonse DeCandolle is largely quoted, and his views are contrasted with Mr. Watson's own, in a complete list of the species which are distrusted in Britain, with the terms applied to them in the 'Cybele' and the 'Géographie Botanique.' It would appear that the Continental botanist is somewhat more inclined than our author to give any doubtful case in favour of the suspected plant, since, out of the whole 324, the 'Cybele' allows only 30 to be possibly native, whereas the 'Géographie' gives its verdict in favour of 48.

It is to be remembered that Mr. Watson lays more stress upon the right of private judgment, *i. e.* upon the nature of the station where the plant is found growing, than upon geographical considerations. Contrary to DeCandolle, he places actual conditions of growth first, range second and supplementary. The faculty of weighing evidence is one most essential to the botanical geographer (p. 84); but it is well remarked that this cannot be properly used when weighing book against book only—often good against bad authority. Mr. Watson justly observes that we should look to the competent local botanist for the particulars of the nature of the locality, and too much care cannot be exercised in this kind of observations. It should also be remembered that the general "area" of a species is always somewhat vaguely known: hence the danger of trusting to general works too implicitly. A disputed point might more safely be referred to the testimony of local floras.

Sufficient attention has hardly yet been paid in England to a strict and exact definition of the kind of localities affected by the different plants (p. 94); yet this is a point of the utmost importance towards distinguishing between natives and introduced plants.

The opinions of different British botanists are contrasted by a comparison between Watson, Babington, and Henslow, for Great Britain; and between Henslow, Baker, and Gordon, for their respective districts of Cambridge, York, and Moray. These tables (p. 110) possess unusual interest; and we trust they will be carefully studied by those who are engaged upon any local flora.

Chapter IV. is devoted to a general account of the physical geography and climate of Great Britain; but, though indispensable to the right understanding of the future chapters, we do not think any portion of it will require quotation: it must be read as a whole.

With Chapter V. begins the first table of distribution, of which we reproduce a line, to show how much is here condensed:—

	Long.	Lat.	Alt.	Zones.	Cou.	Type.
Anemone nemorosa	i.w.e.	s.m.n.	c.a.u.	1, 2, 3, 4, 5.	85.	B,

which will be easily read as "Found in Ireland, in the west and east; in the southern, midland, and northern districts of Great Britain; at coast level, 'ascending' and 'upper' stages of elevation; in five out of the six climatal zones,—*i.e.* in all except the highest. Occurs in 85 of the 112 vice-counties * or subdivisions; belongs to the British type of distribution, or the group universally spread throughout Great Britain." What must have been the amount of labour in the field no less than in the study requisite for the compilation of these fifty pages! Feeling the difficulty in many cases of assigning a plant precisely to any one of his "types," Mr. Watson has here made use of a second small letter, which indicates the other type to which the distribution of the species most nearly approaches after that indicated by the capital letter.

In Chapter VI. the species are arranged differently. Instead of following each other in systematic order, they are placed according to frequency, beginning with the most common, *Ranunculus Flammula,* down to *Epipogium aphyllum,* only less rare upon the Continent than in Britain, where a few roots alone have hitherto been discovered; and this is no critical species, or likely to be mistaken for any other plant.

The lines in this chapter run thus:—

Co.	26 Subprovinces.	S.	N.	W.	Sc.	E.	Bentham.
43.	*Sagina maritima.*	11.	15.	9.	11.	6.	*procumbens.*

(Occurs in 43 of the 112 counties and vice-counties; in 26 out of the 38 sub-provinces; in 11 of the 19 sub-provinces of South Britain; in 15 of the 19 sub-provinces of North Britain; in 9 of the 12 sub-provinces of the West of England, in 11 of the 13 Scotch, and in 6 of the 13 comprised in the East half of England. Joined to *S. procumbens,* as a variety only, in Mr. Bentham's 'Handbook.')

For comparison between local floras, we imagine this list should be thus used:—After carefully checking off every species, we should reckon up how many out of each 1st, 2nd, 3rd, &c., hundred are present in our district, and how many absent. Thus the absence of 20 species out of the most common hundred might be a more remarkable feature than the presence of 30 of the species between 800 and 900.

In Chapter VII. ("the areas of species") the plants are set in order of latitude from south to north, commencing with such as are restricted to Province 1 (Scilly, Land's-end, &c.). There are three subdivisions, into—1. Australs (or plants thinning out northwards); 2. General or ubiquitous species; 3. Boreal and montane. A line here is—

Sect. 5. Southward of 55° Lat. Temp. 48° Fahr. 8°·8 Centigrade.

Vicia bithynica. 1. 2. 3. * 5. 6. 7. * * 10.

From this list are to be deduced the characteristics of each county

* It will be easily understood that, by the use of this increased number of districts, far greater accuracy is attained than if eighteen Provinces only had been employed, as in the earlier volumes of the 'Cybele.' Still it is believed that the data to be obtained are not as yet sufficient to warrant the use of any more than eighteen districts for the other branches of our fauna and flora.

flora, as in the former, by reckoning up how many are absent, how many present, out of each hundred or section.

Chapter VIII. is devoted to a detailed account of the altitudes reached by the several species: first upon the Grampians; secondly, upon the mountains of the North of England (Lakes and Yorkshire). A few of the upper limits attained in other less explored districts are added, as a kind of supplement to or check upon the two former lists. The upper and lower limits of the plants are both given, and the names succeed each other in a descending series. The desirableness of a careful survey of the heights attained in Wales is very justly insisted upon; and we must urge that duty as no unworthy undertaking for a strong-limbed and energetic botanist who would do his science some service, and turn his knowledge of species to account.

In Chapter IX. the Orders are contrasted,—first, according to their prevalence among British plants in Europe, and in the world; secondly, as they occur in the west and east, in the south, middle, and north of Britain; and thirdly, according to their proportion in the three stages or zones of elevation.

In Chapter X. the author gives us the general results or recapitulation of his labours. It is in accordance with Mr. Watson's dislike of general remarks, that he is himself especially diffident and cautious in suggesting conclusions. If it may be said, with some truth, that the fourth volume of the 'Cybele' does not offer many new solutions of the grand problems of geographical botany, it should be remembered that such was not the professed object of its author. But, as regards the distinctive features of the flora of Britain, there is in the concluding chapter a mass of most interesting information, of which, however, space will not here permit a sufficiently extended notice. We must reserve the analysis and discussion of this part of the subject for a future occasion.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 11, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Description of a New Species of Cuscus (C. ornatus) from the Island of Batchian. By Dr. John Edward Gray, F.R.S., V.P.Z.S., Pres. Ent. Soc., etc.

Mr. Wallace has sent to the British Museum a series of Mammalia collected in the Island of Batchian in the year 1859.

The most interesting specimen is a new species of the genus *Cuscus*, belonging to the section of the genus which has the inner surface of the ears bald. It may be thus described:—

Cuscus ornatus.

Male pale golden-brown; back rather darker, with small irregular white spots; crown and back with a narrow longitudinal blackish streak, which is darker on the back, black on the crown, and indistinct on the nape; beneath rather paler, with a broad white longitudinal streak near the middle of the chest and front of the abdomen; ears produced beyond the fur, naked internally; the skull with a very deep concavity between the orbits.

. *Hab.* Batchian.

This species is most like *Cuscus orientalis*; but in that animal the male is pure white. It differs entirely from *C. celebensis* (from Celebes) in the general colour of the fur, and in having a distinct streak on the head and back, somewhat like the streak on the back of the female *C. orientalis*, but narrower and darker.

It differs from all the other species in the nakedness of the inner surface of the ears.

The white streak on the chest and belly is not exactly in the middle of those parts; and there is a square white spot on the upper part of the right fore leg, not found on the other legs.

This animal may possibly be the coloured male of *C. orientalis*; but all the known males of that species are pure white. Can albinism be the usual, and this coloured male the unusual, characteristic of that species?

The skull of Mr. Wallace's animal from Batchian agrees in general character with the skull of *C. orientalis* (sent to the Museum as *Cuscus Quoyii* from the Moluccas), but is yet sufficiently unlike to render it very doubtful if it be not a distinct species. It is smaller; the impression on the crown is deeper and furnished with a much more decidedly raised edge, which is extended behind on the central line to the occiput; and there is a notch or ridge at the upper front angle of the orbit, not to be found on the skull of *C. orientalis*.

Some of the converts to the theory of the mutation of species may think that this animal is an instance in point; but such a hypothesis derives no support from the observations I have made.

All the difficulties here started arise from the imperfect material which the specimen affords for arriving at any definite opinion on the subject; and I believe that this is the explanation of nine-tenths, or I may say ninety-nine in a hundred, of the cases on which the theory is attempted to be established. This is not to be wondered at when we consider how very few are the animals, even of our own country, and more especially of exotic species and genera, whose history and anatomy have been properly studied. Most naturalists are of necessity in the habit of describing species from the few specimens which are brought from abroad in a more or less perfect state, without being acquainted with the changes which the animal undergoes in growing from its birth to maturity, and without the slightest indication of its habits and manners. Now, we know from experience amongst the British birds (such for example as the Rook and the Crow, and the species of the Willow Wrens), that if we were called on to describe them from such materials we might make great mistakes. A mere examination of stuffed specimens might well lead to doubts as to their distinctness as species, but this could never be the case if we had seen them alive in their native haunts, and observed the extreme differences which exist in their habits, food, note, &c.

Judging from analogy, it is fair to believe that many of the species, even among the larger and best-known vertebrated animals, which are now considered doubtful, and sometimes only regarded as slight varieties, if properly observed and described, would prove to be quite distinct; and if this be the case with the larger animals, what must it be with the smaller articulated and molluscous or radiated animals, which are very rarely described, except from specimens in one condition, often indeed from some isolated part of the animal, as its shell or coral, as it is found in a museum? I cannot but think that until we have better materials to work from, it is rather rash to theorize on so important a question as the stability or mutability of species.

As regards the animal now before us, instead of knowing its history in all its states, and having a full account of its habits and manners (and I cannot conceive that any species is well established without all these particulars), we have only a skin with its separated skull, and that of one sex, of a genus in which the sexes sometimes differ greatly in external appearance, and of which the species are very imperfectly known.

Thus, for example, the section of the genus to which this specimen is referable contains at present two species,—one long known, and of which perhaps there are not more than twenty-five or thirty specimens in all the museums in Europe. The males in all these cases are pure white, and the females reddish with a narrow dorsal streak.

Last year I described a second species from a male, a female, and a young specimen in the British Museum, in which both sexes are ashy-grey without any dorsal streaks, and which has not been observed in any other collection. Now I have described a third from a single adult male, which is bright reddish-yellow varied with white spots, having a very distinct narrow dorsal stripe. I have every reason to believe that this is a good and distinct species, but without stronger evidence I can hardly say that it is so, particularly as I have no knowledge of the female. Moreover, all the males of the species most nearly allied to it in the different museums are pure white, a colour which is very rare in the animal kingdom, except when it arises from a state of albinism; and the eyes of this animal are represented in the published figures as red, as if it were an albino; and this male specimen has a distinct dorsal streak, which is the character that distinguishes the female of *C. orientalis* from the other species of the genus. I am therefore induced to inquire, can the males which we have hitherto had have been albinos? and is this the naturally-coloured male of that species? And though I ask the question in order to induce other naturalists further to examine the subject, I am myself inclined to regard *C. ornatus* as a distinct species. Whether this be the case or not, I do not think that this specimen affords any ground for believing that the three species of the genus were derived from a common origin, and have gradually separated themselves from each other, more especially as they all seem to be organized on very much the same plan, and are confined to a very limited space or group of islands on the earth's surface.

Description of a Soft Tortoise (Aspidochelys Livingstonii) from the Zambesi, sent to the British Museum by Dr. Livingstone. By Dr. John Edward Gray, F.R.S., V.P.Z.S., Pres. Ent. Soc., etc.

The British Museum has lately received from Dr. Livingtone the dorsal and sternal shields of a large fluviatile Soft Tortoise from the country near the Zambesi. It was accompanied by the skull of a fœtal African Elephant, and some other bones of that animal.

Some years ago I received through the Earl of Derby a Soft Tortoise from the River Gambia, which differed from the genus *Emyda*, to which it was allied, in having no bones on the hinder part of the margin of the dorsal shield. I therefore proposed to establish for it a new genus.

When I described this genus I called it *Cyclanorbis*, but received a note from Dr. Peters, before the account of this genus was printed, in which he informed me that he had found near Mozambique, on the River Zambesi, a Tortoise which was called *Casi*, which wanted these bones on the hinder part of the margin of the dorsal shield, and which he had proposed to call *Cyclanosteus frenatus*, on account of certain black streaks on the head. I obliterated my name, and adopted that which my friend Dr. Peters had suggested, and described the one I had received from the Gambia under the name of *Cyclanosteus Petersii* (Proc. Zool. Soc. 1853; Ann. & Mag. N. H. 1855, xv. 69; Catalogue of Shielded Reptiles in the British Museum, 64, t. 29).

The animal from the Zambesi which we have received from Dr. Livingstone agrees with the animal from the Gambia in wanting the bones in the hinder part of the margin of the dorsal shield; but it differs so essentially in the structure of the sternum that it is necessary that another genus should be established for its reception. Now, it may be the *Casi* of the natives, but unfortunately Dr. Livingstone has not sent its native name, and it may be the *Cyclanosteus frenatus* of Dr. Peters; but I cannot find any description of that animal. It is not noticed, nor any other Tortoise, in the review of the Amphibia collected during his Travels, which Dr. Peters published in the 'Monatsberichte der Berliner Academie,' 1854, p. 614, and which is reprinted in Wiegmann's Arch. 1855, p. 43. Under these circumstances, as I applied Dr. Peters' name *Cyclanosteus* to the animal from the Gambia, and first gave the character to that genus derived from that species, and, as my description of that genus appears to be the only one that has been published, I think that the name *Cyclanosteus* must be retained for the Gambian Tortoise, although probably Dr. Peters in his note intended it to refer to the Mosambique form. If I do so, the reference to Dr. Peters' MS. must be erased from my account of the animal in the papers above referred to, and I must give a new name to the genus, to be established on the Tortoise from the Zambesi.

This genus may be considered in some respects intermediate between *Cyclanosteus* and *Emyda*; for, though it has the simple flexible boneless hinder margin of the dorsal shield of the former genus, it has the seven sternal callosities of the latter; but these callosities, though they agree in number, are of a much smaller size compared with the size of the animal than those of the genus *Emyda*.

It is the giant of the group, agreeing in size and development with the genera of this family which have the legs exposed, and especially with the genera *Trionyx* and *Chitra*.

Aspidochelys.

Head ——? Limbs ——? The hinder margin of the dorsal disk expanded, flexible, without any bony plates. The sternum broad, rounded before and behind, hiding the feet, with very distinct moveable flaps over the hinder feet. Sternal callosities 7, the odd one behind the oblong anterior pair lunar, transverse, the hinder pair large, oblong, only united together on the hinder part of the inner margin.

Hab. Africa.

Aspidochelys Livingstonii.

? *Cyclanosteus frenatus*, Peters, MSS. in Gray, Cat. Shielded Reptiles Brit. Mus. p. 64.

Hab. Mozambique, in tributaries of River Zambesi? (*Dr. Livingstone*).

The dorsal shield is 22 inches long and 17 inches wide over the convexity of the back.

Further Evidence of the Distinctness of the Gambian and Rüppell's Spur-winged Geese (Plectropterus gambensis and P. Rüppellii). By Philip Lutley Sclater, M.A., Secretary to the Society.

The recent death of the males of the two species of Spur-winged Geese (*Plectropterus gambensis* and *P. Rüppellii*), of which I pointed out the external differences at one of last year's meetings* of the Society, has given me the desired opportunity of comparing the tracheæ and skeletons of the two birds, and showing that these afford ample corroboration of their specific distinctness. Before proceeding to do this, I should remark that the individuals to be compared are both, as we know from their dissection, adult males. The specimen of *P. gambensis* is in all probability the older of the two, having been living many years in the Society's Gardens. That of *P. Rüppellii* was received from Eastern Africa in June 1858.

Comparing, first of all, the skulls of these two birds together, we see that the frontal protuberance, which in *P. gambensis* (fig. 1) is

* See P.Z.S. 1859, p. 131.

hardly elevated 0·2 inch above the general level, rises to an enormous size in *P. Rüppellii* (fig. 2), attaining a height of 1·05, a breadth of 0·75, and a length from back to front of 1·65. It may also be remarked that, from the hard character of the osseous structure in the protuberance of *P. gambensis*, it is obvious that it has reached its maximum of development. The outlines of the two skulls are represented in the accompanying woodcuts.

Fig. 1.

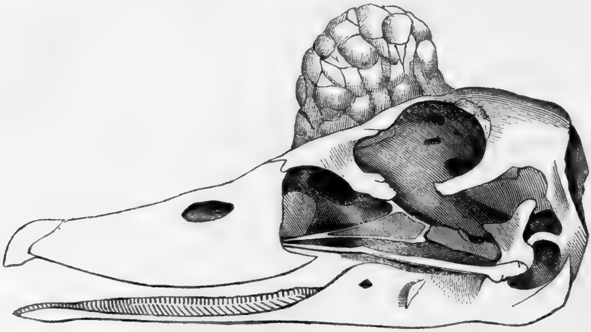


Fig. 2.

Their conformation is otherwise generally similar, that of *P. Rüppellii* being slightly narrower, and rather longer. It may be remarked, however, that the skull of *P. Rüppellii* is broader between the orbits; but that, drawing a vertical line from the middle of the space between the nostrils to a base-line joining the edges of the upper mandibles, and comparing them at this point, it is here narrower and more elevated,—the proportion of the vertical to the base being in *P. Rüppellii* about 3 : 5, in *P. gambensis* about 7 : 9. The depressed space between the protuberance and the naked part of the bill is also somewhat differently shaped in the two birds. In *P. Rüppellii* the outline of this space next to the protuberance forms a segment of a circle of which the centre is at the junction-point of the two other sides, so that the space enclosed is nearly a quadrant. In *P. gambensis* the corresponding outline is carried back much further towards the protuberance, and formed of two lines, which terminate in a central angle, so that the space enclosed is nearly a rhombus.

Dr. Günther has called my attention to the fact, that the orifices which commonly occur in the skulls of *Grallæ* and *Anatidæ,* situate in the occipital bone on both sides of the foramen magnum, are remarkably small in both these birds, particularly so in *P. Rüppellii.*

The sterna of the two birds, as far as the comparison can be made (that of *P. gambensis* being rather distorted by disease), do not present any material points for comparison. The foramina, which in both species are closed at the base, are rather longer and larger in *P. gambensis.*

The subjoined measurements in inches of the bones of the wings show that these organs are comparatively longer in *P. Rüppellii,* and the bones are likewise thicker and stronger :—

	P. gambensis.	*P. Rüppellii.*
Length of humerus	7·4	7·6
——— of ulna	6·5	6·9
——— of radius	6·25	6·6
——— of metacarpus	3·8	4·0

Comparing the posterior extremities, we find the tarsi and toes, again, longer in *P. Rüppellii,* as the following dimensions prove :—

	P. gambensis.	*P. Rüppellii.*
Length of femur	3·9	4·0
——— of tibia	6·8	7·1
——— of tarsus	4·5	4·6
——— of middle toe from base of tarsus to the end of the nail	4·45	4·6

The pelvis is rather narrower in *P. Rüppellii,* the distance between the trochanters measuring 1·9 in. ; in *P. gambensis* 2·1 in.

The vertebræ are, cervical 15, dorsal 10, sacral 13, caudal 8 ; total 40 ; the true ribs 8, the false 2, in both species.

The tracheæ of these two birds, though, as might have been ex-

Fig. 1.

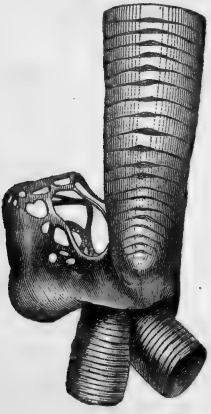
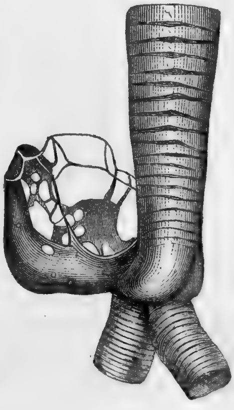


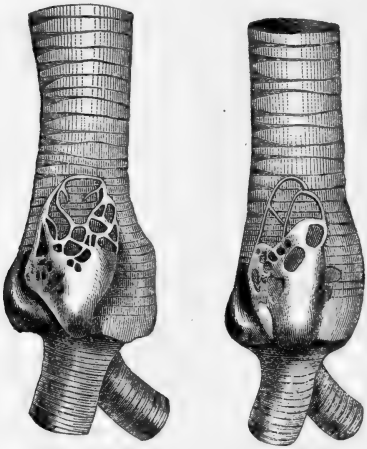
Fig. 2.



pected, showing a general resemblance, present the following differences, which are greater than such as are usually found in individuals of the same species.

When dried, they are of nearly the same length, viz. about 14·5 in.; but the bronchial rings are 151 in number in *P. Rüppellii*, and only 138 in *P. gambensis*. The tubes are flattened throughout the greater part, becoming cylindrical at 1·5 inch from the lower extremity. Here they are much compressed, and develope a large osseous bulb on the left side. The lower portion only of this bulb, as usual, is completely ossified, the upper part being covered with fine framework, which, as will be seen from the accompanying woodcut, assumes a different pattern in the two species. In *P. Rüppellii* (figs. 2 and 4) the bulb is wider, higher, and much compressed; in *P. gambensis* (figs. 1 and 3) shorter and comparatively much thicker. This is particularly observable in the side view, as shown in figs. 3 and 4.

Fig. 3. Fig. 4.



From Mr. Eyton's observations (Monogr. Anatidæ, p. 79) it is evident that the *trachea* of the female *Plectropterus* is, as is generally the case in this sex, destitute of the osseous bulb.

I have already pointed out the external characters by which the two Spur-winged Geese may be distinguished; and their synonymy will now stand somewhat as follows:—

1. Plectropterus gambensis.

Anas gambensis, Linn.—*A. spinosa*, Vieill.; Lath. Gen. Syn. iii. pt. 2, p. 452, pl. 102; G. H. x. 241. — *Anser gambensis*, Benn. Gard. Men. Zool. Soc. ii. p. 207, cum fig. — *Plectropterus gambensis*, Steph. in Shaw, Zool. xii. pt. 2, p. 7, pl. 36; Hartl. Orn. West-Afr. (partim); Eyton, Monogr. Anat. p. 79; Sclater, P.Z.S. 1859, p. 131, pl. 152. fig. 2.

Sp. diagn.—Minor: *protuberantia sincipitali maris parva: lateribus colli in utroque sexu plumosis.*

Hab. In Africa Occidentali, accidentaliter in Europa Meridionali.

Mus. Brit.

2. Plectropterus Rüppellii.

Cygnus gambensis, Rüpp. Orn. Misc. p. 12, fig. 1.—*P. gambensis,* Denham and Clapp. Travels, App. p. 204; Hartl. Orn. West-Afr. p. 246 (partim); Sclater, P.Z.S. 1859, p. 131, pl. 152. f. 1.

Sp. diagn.—Major: *protuberantia sincipitali maris maxima: area rhombea ad colli latera nuda, carneo-rubra.*

Hab. In Africa Orientali et Centrali, in Dongola et lacu Tchad.

Mus. Brit.

The second species of *Plectropterus,* given by Stephens (*P. melanonotus,* Shaw, Zool. xii. pt. 2, p. 8) and also met with by Denham and Clapperton (App. to Travels, p. 204), is *Sarcidiornis africana,* Eyton (Monogr. Anatidæ, p. 103).

January 24, 1860.—John Gould, Esq., V.P., in the Chair.

Description of a New Species of Opossum, obtained by Mr. Fraser in Ecuador. By Robert F. Tomes.

Didelphys Waterhousii, n. s.

Fur rather long, soft, and of a cotton-like texture; general colour dark brownish-grey, tipped with rufous on the sides; under parts brownish-buff, with a stripe of yellowish-white along the centre of the throat and breast. A black mark through the eye, to near the end of the nose.

Muffle of a broadly ovoid form, more deep than wide, the oval figure truncated at the bottom, where the upper lip constitutes its base; notch of the upper lip, occasioned by the mesial groove of the muffle, deep; on either side of it, in the edge of the lip, a double cleft. A horizontal depression passing through the centre of the muffle, serves, with the vertical groove, to divide it into four divisions or quarters, of which the two upper ones have a somewhat discoid form, and project laterally over the nostrils, partially hiding them. The two lower ones are marked, each with two oblique shallow depressions, passing from near the centre of the muffle to its outer margins, near the base.

Ears broadly ovoid, hairy on their hinder surface, at the base only, and of a dark brown colour, tinged with yellow at the auditory opening. Feet of a pale fleshy-brown colour, suffused with exceedingly fine short hairs, scarcely visible to the naked eye, but becoming thicker and longer on the upper surface of the fore feet. Nails small and nearly white, each with a tuft of straight hairs springing from their bases.

Tail of a uniform dark brown colour for the whole of its length *,

* Such is the appearance of the tail after being skinned and immersed in spirits; but Mr. Fraser's note of this animal is to this effect:—"Nose and feet pale flesh-colour, ears and tail a little darker." The young have the terminal two-thirds of the tail of this colour, after having been skinned and sent home in spirits.

and with the scales very indistinctly marked. Hairy portion at its base not exceeding half an inch in length.

The fur of the upper parts approaches to half an inch in length, and is of a dark grey colour, tipped with brown, which passes into a buffy-brown on the sides of the body. Outer surface of the limbs, the occiput, a space in front of the ear, and the fur on the base of the tail, of the same colour as the back. Around the eye a black mark, of small extent beneath and behind it, more extended above it, but most so in the direction of the snout, which it approaches very nearly. On the forehead the fur is pale brown, having the appearance of a pale streak between the two black marks. On all the under parts the hairs are unicolour, of a pale buff, palest on the mesial line, and on the throat and breast taking the form of a well-defined streak of pale yellow. Cheeks, chin, and lips buffy-brown.

	"	'''
Length of the head and body, about	6	0
——— of the tail, about	7	6
——— of the head	1	7
——— from nose to ear	1	2
——— from nose to eye	0	$5\frac{3}{4}$
——— of the ears	0	7
Breadth of the ears	0	7
Length of the humerus	0	9
——— of the fore arm	1	1
——— of the fore foot	0	7
——— of the femur	1	0
——— of the tibia	1	$4\frac{3}{4}$
——— of the hind foot	0	10
Total length of skull	1	$5\frac{1}{2}$
Breadth across the zygomatic arches	0	10
From front of foremost incisor to back of last molar	0	8
Length of the nasal bones	0	8
——— of the zygoma from its posterior root to the front margin of the orbit	0	8
Breadth of the palate between the canines	0	2
——— ——— between the two hinder molars	0	$3\frac{1}{2}$
Length of the lower jaw	1	0
Height from the posterior angle to the top of the coronoid process	0	5
Length of the dental series in the lower jaw	0	8

The young have all the under parts and inner surfaces of the limbs naked, and of a brownish flesh-colour. All the upper parts dark grey, almost black; the hairs short, shining, and adpressed. Basal third of the tail of the same colour, and similarly clothed with fine hairs; terminal two-thirds pale flesh-coloured, dusted with exceedingly fine white hairs, scarcely visible without the aid of a lens. Ears darkish flesh-colour, with both their surfaces well clothed with short and fine hairs of a silvery-grey colour. Nails white.

Length of the head and body, about	......	3″	6‴
——— of the tail, about	....	3	0
——— of the head	....	1	5

Hab. Gualaquiza. Collected by Mr. Fraser, Dec. 1857.

Obs.—This species was first described by Mr. Waterhouse in his excellent work on 'Mammalia'*, but without a name, and was compared with *D. cinerea,* from which it was observed to differ in having the hairy portion of the tail of much less extent, in having longer fur, and in being itself considerably smaller. The specimen examined was a male, and included in that section of Opossums characterized by a pouch "rudimentary or entirely wanting;" but the female obtained by Mr. Fraser (evidently of the same species) unquestionably possessed a complete pouch, as might be seen from an examinatiyn of the skin preserved in spirit; and Mr. Fraser's note accompanying the specimen informs us that there were "five young in her pouch, each 3 inches long."

This effectually disposes of the question as to its distinctness from *D. cinerea,* and in fact removes it to the other section.

To *D. noctivaga,* Tschudi, it bears some resemblance, in which species, as in *D. Waterhousii,* the fur on the base of the tail is of exceedingly limited extent, and both agree in having rather long fur, although of a different colour. But *D. noctivaga* is the larger species of the two, and is quite differently proportioned. Its muzzle is a great deal longer than that of *D. Waterhousii,* and the ears are much larger. Moreover the female is destitute of a pouch, and has in its stead "abdominal folds of the integuments." The eyes too, according to Dr. Tschudi's figure and Mr. Fraser's note, are of a different colour.

Mr. Fraser's note in full is as follows:—"♀ had five young in her pouch, each 3 inches long. Nose, chin, and latter half of the tail flesh-colour; ears black. Stomach contained bones of a small mammal, hair, and a pulp containing a vegetable substance. Eyes black. Xivaro name '*Juichma.*'"

I have named this animal after its original describer, as a tribute to a zoologist who has in such an eminent degree extended our knowledge in this branch of natural history.

Notes on Semioptera Wallacii, Gray, from a Letter addressed to John Gould, Esq., F.R.S., by A. R. Wallace, Esq., dated Amboyna, Sept. 30, 1859.

"The *Semioptera Wallacii* frequents the lower trees of the virgin forests, and is almost constantly in motion. It flies from branch to branch, and clings to the twigs and even to the vertical smooth trunks almost as easily as a Woodpecker. It continually utters a harsh croaking cry, something between that of *Paradisea apoda* and the more musical cry of *Cicinnurus regius.* The males, at short

* vol. i. p. 505.

intervals, open and flutter their wings, erect the long shoulder feathers, and expand the elegant shields on each side of the breast. Like the other Birds of Paradise, the females and young males far outnumber the fully plumaged birds, which renders it probable that the extraordinary accessory plumes are not fully developed until the second or third year. The bird seems to feed principally upon fruit, but it probably takes insects occasionally.

"The iris is of a deep olive; the bill horny-olive; the feet orange, and the claws horny.

"I have now obtained a few examples of apparently the same bird from *Gilolo*; but in these the crown is of a more decided violet hue, and the plumes of the breast are much larger."

Notes on the Young of Menura superba. By Ludwig Becker, Esq., in a Letter to John Gould, Esq., F.R.S., etc., dated Melbourne, Victoria, Sept. 24, 1859.

"In the month of October 1858 the nest of a Lyre-bird was found in the densely wooded ranges near the sources of the river Yarra-Yarra. It contained a bird, which seemed at first to be an old one in a sickly condition, as it did not attempt to escape; but it was soon discovered to be a young bird of very large size as compared with its helplessness. When taken out of the nest it screamed loudly; the note being high and sounding like '*tching-tching*.' In a short time the mother bird, attracted by the call, arrived, and, notwithstanding the proverbial shyness of the species, flew within a few feet of its young, and tried in vain to deliver it from captivity by flapping her wings and making various rapid motions in different directions towards the captor. A shot brought down the poor bird, and with its mother near it the young *Menura* was soon silent and quiet. It was taken away and kept at a 'mia-mia' erected in the midst of the surrounding forest. The following is as correct a description of the bird as I can give you:—

"Its height was 16 inches; the body was covered with a brown down, but the wings and tail were already furnished with feathers of a dark brown colour. The head was thickly covered with a greyish-white down of from 1 to 2 inches in length; the eyes were hazel-brown; the beak blackish and soft; the legs nearly as large as those of a full-grown specimen, but it walked most awkwardly, with the legs bent inwards. It rose with difficulty, the wings assisting, and when on its legs, occasionally ran for a short distance, but often fell, apparently from want of strength to move the large and heavy bones of its legs properly. It constantly endeavoured to approach the camp fire, and it was a matter of some difficulty to keep it from a dangerous proximity to it. Its cry of '*tching-tching*' was often uttered during the day time, as if recalling the parent bird; and when this call was answered by its keeper, feigning the note '*bullen-bullen*,' the native name for the Lyre bird, and which is an imitation of the old birds' cry, it followed the voice at once, and was easily led away by it. It soon became very tame, and was exceedingly voracious, refusing no kind of food, but standing ready with widely gaping bill awaiting the approaching hand which held the food, consisting principally of worms and the larvæ of ants, commonly called '*ants' eggs*;' but it did not refuse bits of meat, bread, &c. Occasionally it picked up ants' eggs from the ground, but was never able to swallow them, the muscles of the neck not having acquired sufficient power to effect the required jerk and throwing back of the head; it rarely, if ever, partook of water. It reposed in a nest made of moss and lined with opossum skin, where it appeared to be quite content; while asleep, the head was covered by one of the wings. When called '*bullen-bullen*,' it awoke, looked for several seconds at the disturber, soon put its head under the wing again, and took no notice whatever of other sounds or voices. That the young *Menura* remains for a long time in the nest is proved by the manner in which it disposes of its droppings: our young captive always went backwards before dropping its dung, as if to avoid soiling the nest. It is probable that it leaves the nest in the day time when the warmth of the weather invites it so to do, but that during the night it remains in the nest; and if the weather should become cold the mother shelters her young, the nest being large enough to contain both."

Description of a New Species of American Partridge. By John Gould, Esq., F.R.S., etc.

Eupsychortyx hypoleucus, Gould.

Forehead, stripe over each eye, throat and under surface creamy white, head and short crest reddish-brown, minutely freckled with darker brown; round the back of the neck a series of dark-brown feathers, tinted with rufous and spotted with creamy-white; general tint of the upper surface grey, mottled and finely freckled with rufous; the centre of the back marked with large blotches of black; wing-feathers freckled with black, and barred on their outer webs with black bounded posteriorly with white; tertiaries bordered with buff, lower part of the flanks and under tail-coverts dark brown spotted with white; tail brown, crossed by narrow, irregular, freckled, grey bars; bill black; feet light brown.

Total length, 7·5 inches; bill, 0·5; wing, 4·1; tail, 2·4; tarsi, 1·2.

Hab. Acajutla in Mexico.

Remark.—For a knowledge of this species I am indebted to the kindness of M. Jules Verreaux of Paris, who has entrusted it to my charge for the purpose of figuring and describing. M. Verreaux tells me he has seen a second example precisely similar in colour to the one here described, which latter circumstance has mainly induced me to consider it a distinct species. In its colouring it is one of the most remarkable members of the whole family; in size it is about equal to the *Eupsychortyx leucopogon*, but the crest is not so much developed as in that species; its white breast at once distinguishes it from that as well as from every other species.

On a New Snake from the Galapagos Islands. By Dr. Albert Günther.

The genus *Herpetodryas*, being composed of those *Dryadidæ* which have the maxillary teeth of equal length and entirely smooth, comprises snakes from America and from Madagascar. The following species comes from the Galapagos Islands, and appears to be the only Snake as yet known to inhabit that group *.

Herpetodryas biserialis.

Diagnosis.—Scales in nineteen rows; eight upper labials, three posterior oculars. Light brown, with a dark-brown dorsal band, serrated on the anterior portion of the trunk, and formed by a double series of spots on the middle and on the posterior part of the back. A dark-brown streak from the eye across the cheek. Belly irregularly dotted with brown.

Hab. In Charles Island (Galapagos). Typical specimen in the Collection of the British Museum.

Description.—The head is rather depressed, flat, and, like the trunk and tail, somewhat elongate; the eye is of moderate size, with the pupil round. The rostral does not reach to the upper surface of the snout; the anterior frontals are square, the posterior ones about twice the size and subquadrangular; the vertical is rather slender, twice as long as broad; the occipitals triangular and rather pointed posteriorly. The nostril is situated between two shields; the loreal nearly square; the anterior ocular extends to the upper surface of the head, and is in contact with the vertical. There are three posterior oculars, the middle of which is the smallest, the inferior forming a part of the lower portion of the orbit; the temporal shields are scale-like and rather irregularly arranged. There are eight upper labials, the fourth and fifth coming into the orbit. The median lower labial is triangular, and of moderate size; ten lower labials, the first of which is in contact with its fellow, behind the median shield. There are two pairs of elongate skin-shields of equal size. The scales are perfectly smooth, in nineteen rows, rhombic, those of the outer series being rather larger. Ventral plates 209; anal bifid; caudals 108.

The ground-colour is a light brownish-grey: a vertebral band, formed by dark brown spots, begins from the occiput, and is gradually lost on the middle of the tail; it is continuous anteriorly, and serrated on both sides, but gradually dissolved into two series of brown spots, the spots of each series being confluent on the end of

* The first mention of a Snake on these islands seems to be in Dampier's 'Voy. Round the World,' ed. 7. vol. i. 8vo. Lond. 1729, p. 103:—"There are some Green Snakes on these islands; but no other land-animal that I did ever see."

Darwin says in his Journ. of Research., p. 381, speaking on the Zoology of the Galapagos Islands:—"There is one snake which is numerous; it is identical, as I am informed by M. Bibron, with the *Psammophis Temminckii* from Chile." Although subsequently, in the 'Erpétologie Générale,' nothing is mentioned by Duméril and Bibron about the occurrence of *P. Temminckii*, or of any other snake, in these islands, that determination of Bibron may possibly be correct. If such be the case, there are two species of Snakes in that group of islands.

the trunk; there is a dark brown streak across the temple. The belly is greyish, and finely and irregularly speckled with brown.

	inches.	lines.
Total length	14	3
Length of the head	0	5
Greatest width of the head	0	3
Length of the trunk	10	0
Length of the tail	3	10

The maxillary teeth are of moderate size, of nearly equal length, in a continuous series, and entirely smooth.

MISCELLANEOUS.

Observations on the Corymbose Madrepores. By M. A. Valenciennes.

One of our most elegant forms of Madrepore is that called *Madrepora corymbosa* by Lamarck. Reducing the characters of the genus to those now fixed by Ehrenberg, and studying the fine specimens contained in the Museum at Paris, the author has found that Lamarck united, under the name of *Madrepora corymbosa,* at least three distinct species: one hollowed out into a very shallow cup, brought by Péron and Lesueur in 1803, for which he retains Lamarck's name; a second, spread out in the form of a fan, which was obtained by the celebrated Professor of the Garden of Plants at the sale of the collection of Madame de Bois-Jourdain, which came from the Caribbean Sea, together with the first specimen ever seen in France of the recent *Encrinus* (*Encrinus caput-Medusæ*). To this species the author gives the name of *Madrepora flabilis*: it is characterized by the shortness of the branches, which are less slender than those of *M. corymbosa,* Lamk. and Val. The third species, more spread out and spinose, is named *M. corymbitis,* Val.; it appears to be intermediate between the two preceding species.

M. Milne-Edwards, in his work on Corals, has added a fine species of these Madrepores, to which he has given the name of *Madrepora flabelliformis*: it is from the seas of Vanikolo; the specimen in the Paris Museum was obtained by MM. Hombron and Jacquinot in the voyage of Admiral d'Urville. This species is distinguished from the West Indian one by its closer and longer branches.

The Museum of Natural History has just acquired four new species of these corymbose Madrepores, obtained at Marseilles by M. L. Rousseau, one of the assistants in the Museum. These beautifully preserved corals show, in a more certain manner than could have been suspected from the specimens deposited in our collections from the time of Lamarck, that the species of these corymbose Madrepores obtained from the American seas are different from those of the great Indian Ocean, although preserving an analogous form in allied species. To establish this fact, the author first adduces the species to which he gives the name of *M. radicans,* of which the corymb is covered with a considerable number of little mammillated stalks like small radicles. It comes from Guadeloupe. The analogous species from the Straits of Malacca has its corymb a little inflated like a cushion, which has caused the author to call it *M. circinata*; its stalks are higher. A second Indian species, with the corymb perfectly flat, has the cells longer, which renders the stalks more spinose. The author names it *M. expansa*.

In conclusion, the author remarks that "the balancing or reproduction of the forms of different species of animals, from either side of the hemispheres, enters into the grand law which was already recognized and expounded by Buffon, who established the fact that the species of the same genus almost always differ under the same latitudes, eastern or western."—*Comptes Rendus*, June 4, 1860, p. 1008.

Note on some Parasites of Iulus terrestris. By M. d'Udekem.

The parasites met with by the author in *Iulus terrestris* are—an Infusorium, a Cryptogamous plant, and two Nematode worms belonging to the genus *Rhabditis*. It is to the latter that M. d'Udekem has particularly directed his attention. He has especially studied the generative organs,—an important subject when we consider the dispute which has arisen with regard to the reproductive system of the Nematoda, between Nelson, Meissner, Schneider, Bischoff, and Claparède. His results agree especially with those obtained in other Nematoda by Nelson, Thompson, and Claparède. As regards the fecundation of the eggs, the author refers it to an epoch when the egg is not surrounded by any membrane. There is therefore no occasion for the existence of a micropyle, an orifice which Meissner asserted that he had discovered in the ova of *Ascaris mystax*. M. d'Udekem succeeded in observing, in the spermatozoids of one of these *Rhabdites*, amœboid movements similar to those indicated by Schneider and Claparède in other Nematode worms.—*Bull. de l'Acad. Roy. de Belgique*, 2me série, vii. No. 8.

On a new Species of Bird (Chloronerpes sanguinolentus). By P. L. Sclater, M.A.

Olivascenti-brunneus: pileo coccineo: dorso toto aurescente, colore sanguineo perfuso: alarum superficie inferiore nigricante, albo tessellata: rostro et pedibus nigris.

Long. tota 5·8, alæ 3·4, caudæ 2·6.

Omoa.

Rare; frequents small, dense bushes.

This apparently unnamed *Chloronerpes* is closely allied to *C. oleagineus* of Mexico and *C. fumigatus* of S. America, but is distinguished by its blood-stained back and smaller size.—*Proc. Zool. Soc.* Jan. 25, 1859.

THE ANNALS

AND

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[THIRD SERIES.]

No. 32. AUGUST 1860.

XIV.—*On Recurrent Animal Form, and its Significance in Systematic Zoology.* By Cuthbert Collingwood, M.B., F.L.S., &c.*

No one conversant with Zoology can have failed to remark the fact of the recurrence of similar forms in different groups of the animal series. Not only do species of one family resemble species of an allied family, but group with group, order with order, and even class with class, and subkingdom with subkingdom, can produce instances of the most striking homomorphism. The resemblances to which I allude are those of external form, unaccompanied by homologies of internal structure; nevertheless I imagine that this peculiarity, instead of entirely destroying its interest, and rendering it valueless, as some have appeared to consider, only places the subject in a different category of scientific facts, and invests it with a value peculiar to itself. In the history of classification it has always naturally happened that external form, rather than internal structure, has been the mainspring of systems; the knowledge of structural homologies has been painfully accumulated, and the systems built upon the characters presented by external form have from time to time been corrected by increasing knowledge of structure, till in these days zoologists have agreed that *structure*, and not *form*, should be the basis upon which systems should be framed with the greatest claim to accordance with Nature. Nevertheless systems founded upon *homologies* are liable to be interfered with, and their symmetry affected by encroachments of form; so that eminent zoologists differ as to the position of animals, even in the present advanced state of zoology, owing to the fact that, while one regards *homologies of structure* as paramount, another allows

* Communicated by the Author, having been read before the British Association at its Meeting at Oxford (1860).

great weight to external and striking *resemblances in form*. Under these circumstances, therefore, it can be no waste of time to inquire what connexion exists between the two, and to attempt to point out a cause for *agreements of form*, in cases where corresponding *agreement in structure* is wanting.

Nature is inexhaustible in resources; and variety is one of her greatest charms. It is often said that no two things in Nature are alike, and with truth; for the resemblance, whether in outward form, or in internal organization, always partakes of the character of a *near approach*, and not of *distinct repetition*. This is particularly the case with *form*, which varies more, and is more simple in its variations than structure; and it is this which confirms my belief that *structure*, and not *form*, is at once the truest basis of Systems of Nature, and the safest criterion in cases of doubt and difficulty. Thus, an Archetypal animal may agree to a certain extent in *structure* with a vast group of animals, and yet may resemble none of them in outward *form*.

It cannot be a matter of surprise, considering the number of such resemblances existing throughout the animal kingdom, that while the study of homologies was making but slow progress, and the true affinities of animals were but little understood, the real nature of many aberrant forms should have been lost sight of in the contemplation of their homomorphic resemblances. Who can wonder if Pliny spoke of the Bat as "the onely bird that suckleth her little ones," in quaint old Holland's phraseology? What malacologist even can feel surprise that, up to recent times, the Polyzoan Molluscoids were mistaken for Zoophytes? or that Lhuyd, and at one time the illustrious Ellis, should have regarded them both in the light of "remarkable sea-plants," while his predecessor, Baker, had even looked upon them as the production of "salts incorporated with stony matter"? Who can wonder that, before the time of Savigny, the Tunicated *Botrylli* should have been regarded as Polypes? that Linnæus should have placed *Teredo* among the Annelides? that, before the Mémoire of Dujardin in 1835, the Foraminifera should have been classed with the Cephalopodous Mollusca? In all these cases (and others might be brought to swell the list), the animals have been raised, or have sunk, from one *subkingdom* to another.

But, although they were not always recognized as such, the existence of recurrent forms in Nature could not be overlooked by the framers of systems, inasmuch as they were stumbling-blocks, which almost seemed placed in their path to prevent the natural arrangement of animals from being too easy a task. A too cursory examination has not unfrequently resulted in the false location of an animal, only to be detected, and triumphantly exposed, by a succeeding zoologist.

Every one knows, whether he have thought about it or otherwise, that the four Vertebrate classes are homomorphically connected. Thus there are Flying Mammals, such as the Bats and Flying Squirrels (*Pteromys*), uniting them with the Class Aves; as well as that anomalous Monotreme, the *Ornithorhynchus*, or Web-footed Duck-bill. The Edentata among Quadrupeds connect them with Reptiles, by means of the Armadillos,—the Great Armadillo (*Dasypus gigas*), and preeminently the Mataco (*D. Apar*), being homomorphic of the Testudinata, while to the Saurian Reptiles they are united by the Scaly Pangolins (*Manis*), and to the extinct Pterosaurians (Pterodactyles), again, they are united by the Bats. With Fishes, the Mammalia are most singularly connected by the Cetacea; while a special resemblance appears between the Narwhal (*Monodon*) and the Swordfish (*Xiphias*).

The homomorphic resemblances between Birds and Reptiles are not striking; but the Draconine Saurians or Flying Lizards (*Draconis*, sp.) supply examples, and the extinct Pterodactyl once afforded another; while with Fishes the various species of Flying-fish (*Exocœtus*) among the soft-finned, and Flying Gurnards (*Dactylopterus* and *Pterois*) among the hard-finned, are good illustrations. It only remains to connect Reptilian forms with Fishes; and here the Snakes (*Ophidia*) may well be compared with the Eels; and less striking instances of resemblance occur between the Saurian reptiles, such as the Alligator, and the bony-cased Sturgeon, and between the Testudinata and the Trunk Fishes (*Ostracion*). Perhaps also that great Enaliosaur the Ichthyosaurus might be here mentioned.

Without extending my illustrations too far, I will select the Mammalia as an example of the recurrence of form within the limits of a single Class. The organic structure and affinities of one *Order* are dissimilar from those of another, just as the structure and affinities of one *Class* differ from those of another; the difference between Class and Order being one of *degree*, and not of *kind*; so that it is as remarkable to find resemblances of form in widely separated *Orders* as in still more widely separated *Classes*, although, of course, homomorphic resemblances are more striking between Orders than between Classes. In the Order Quadrumana, for instance, we shall find representative forms of various other Orders. Thus the genera *Midas* and *Iacchus*, known as Marmozets, true Platyrrhine Quadrumana, represent the Rodentia through the genus *Sciurus* (Squirrel); and the Dourougouli (*Nyctipithecus felinus*), in the same division, represents the Cat (*Felis*) in the Digitigrade Carnivora; while, among the Strepsirrhine Quadrumana, the Loris (*Stenops tardigradus*) represents the true Sloths in the Order Bruta, and the very aberrant animal, falsely called the Flying Squirrel (*Galeopithecus*), is the representative of the Order Cheiroptera, or Bats.

Among the Pachydermata are some no less striking examples of species homomorphic with those of other Orders. Thus the Hyrax, an animal in structure intermediate between the Rhinoceros and Tapir, a miniature Rhinoceros, as it has been called, yet so closely resembles the Rodentia in its outward form, that it was long classed with them; and Cuvier makes the following remark concerning it:—"There is no quadruped," he says, "which proves more forcibly than the Daman (*Hyrax capensis*) the necessity of having recourse to anatomy as a test by which to determine the true relationship of animals."

The general resemblance between the Cetacea and the Pinnigrade Carnivora (Seals) need only be referred to; it is made very distinct through the herbivorous family Manatidæ, especially the Dugong (*Halicore Dugong*).

We have seen how the Loris resembles the Sloth; and on the other hand, the Edentate genus *Bradypus* (Ai) bears a singular resemblance to Monkeys in general, even in that particular which is so characteristic of them, viz. their physiognomy, while it has a carnivorous homomorph in the Sloth Bear (*Ursus labiatus*), called by Pennant the Ursiform Sloth, and by Shaw, *Bradypus ursinus*.

The Insectivora are connected through the Hedgehog (*Erinaceus europæus*) with one of the most anomalous of animals, the singular Monotreme genus *Echidna*, which has, besides, other homomorphs, to be afterwards mentioned; and further through the Shrews (*Soricidæ*), with the Rodent genus *Mus*; and with the Carnivora by the Bulau (*Gymnura Rafflesii*), formerly described as a Viverra.

The Rodentia are united homomorphically with the Pachydermata by means of the Capybara (*Hydrochœrus Capybara*), formerly called, from its pig-like appearance, *Porcus fluviatilis* (Fermin), Thick-nosed Tapir (Pennant), Cochon d'eau (Desmarchais), and *Sus maximus palustris* (Barrère). By the Flying Squirrel (*Pteromys*) they claim some homomorphic affinity with the Cheiroptera; but their chief homomorphism is with the Marsupialia, and most striking are the resemblances. Not only do the Rodentia and Marsupialia bear a general mutual resemblance throughout, both Orders possessing that extraordinary development of the hinder extremities and tail which enables the Jerboas, in common with Kangaroos, to take such wonderful leaps, but there are particular animals in both Orders which bear a most remarkable resemblance to one another. Thus, the Rodent Jerboas (*Dipus*) are closely imitated by the Tufted-tailed Rat-Kangaroo (*Hypsiprymnus penicillatus*, Gould); and the true Kangaroos (*Macropus*) are equally nearly approached in form by the Cape Leaping Hare (*Pedetes capensis*, Ill.). There is also a considerable resemblance between the Wombat or Badger of the Australian colonists (*Phascolomys Wombat*, Pér. and Les.) and the Rodent Cavies and Lagomys; while a further homomorphism occurs between individuals belonging to aberrant groups in either Order, viz. the Brazilian Porcupine (*Synetheres*) among the Rodents, and the Echidna among the Monotremes, whose relation to the Insectivora has already been pointed out.

These external resemblances between Rodents and Marsupials are none the less remarkable when we learn that there is less true affinity between them than between the Marsupials and most other Orders; for Mr. Waterhouse, in his excellent 'History of the Marsupialia,' remarks that in them "we find representatives of most of the other Orders of Mammalia. The Quadrumana are represented by the Phalangers; the Carnivora by the Dasyuri; the Insectivora by the small Phascogales; the Ruminantia by the Kangaroos, and the Edentata by the Monotremes." He adds: "The Cheiroptera are not represented by any known Marsupial animals, and the Rodents are represented by *a single species only*"—the species referred to being the Wombat.

Lastly, the Marsupialia, besides their homomorphism with the Rodents, have, through the Ursine Opossum, or Native Devil of Van Diemen's Land (*Dasyurus*), a singular relationship to the Carnivorous genus *Ursus*, as well as, through the Squirrel Petaurus, to the Bats.

Space will not permit me to compare the forms of Invertebrata one with another. Among them many remarkable analogies of form may be observed; and even between the Vertebrata and Invertebrata they will be found to occur. Further illustrations of this subject may be found in a paper by the author in the 'Proceedings' of the Liverpool Literary and Philosophical Society for the past session.

On no principle of gradation of *form* can these resemblances, unaccompanied as they are by homologous relations, be accounted for. Some are *advances*, others *degradations* of form; and we must look for some deeper and more subtle cause which shall connect animals so widely separated as are the members of distinct subkingdoms. There is one circumstance, however, which cannot fail to strike the thoughtful inquirer, and which, I think, holds out a clue to the remarkable facts to which I have just now briefly alluded. The circumstance to which I refer is, that, in not a few cases, striking deviations from typical *form* are accompanied by no less striking modifications of typical *habits*; and further, that these *modified* habits have a strong tendency to assimilate with the habits naturally exhibited by those animals whose form they assume. It is not easy to compare the habits of animals essentially different in structure, and occupying widely separated positions in the animal kingdom; but a few examples taken from within a Class will illustrate my meaning, and give us an opportunity of carrying the arrangement forward to cases of greater complexity. Thus, the Ursine Opossum (*Dasyurus ursinus*), widely separated as it is from the Plantigrade Carnivora, not only agrees far more closely with *a Bear* in form than with its own congeners, having a short clumsy figure and Plantigrade step, but it is said of them, by their discoverers, that "they frequently sat on their hind parts, and used their fore paws to convey food to their mouths, and many of their actions, as well as their gait, strikingly resembled those of a Bear *."

The Quadrumanous Douroucouli (*Nyctipithecus felinus*) not only resembles a Cat in form, but is, like it, nocturnal in its habits, glides about with the stealthy movements of a cat, and "when irritated, in the posture it assumes, and the puffed state of the fur, it resembles a cat attacked by a dog." The pachydermatous Hyrax lives gregariously in burrows, like the Rabbits, which it so closely resembles in form. The Echidna rolls itself up into a ball when disturbed, like its homomorph the Hedgehog; the Lemurine *Galeopithecus* makes its flight with its young attached to the nipple, as do the true Bats. The habits and food of the Sea Eagle closely agree with those of the Albatros; and the Burrowing Owl is diurnal in its habits, and uses its feet more or less for purposes of scratching, in both which respects it differs from its congeners, and agrees with the Rasores, which it resembles in form.

In all these cases—and the list might be greatly swelled—the agreement between form and habit, independent of homological relations, is so striking that one is almost led to the conclusion that a certain external configuration necessitated certain habitual movements. I do not mean to say that this is the case; but I am inclined to think that a more careful review will lead us to the conviction that the converse of this proposition is the secret, not only of these, but of the other striking cases of *homomorphism*, as it has been called, to which reference has already been made.

The principle may be thus stated:—*That agreement of habit in widely-separated groups is accompanied by similarity of form.* Let us now see if we are not justified in deriving such a principle from instances such as those just adduced, added to what knowledge we possess with regard to the habits of animals in

* G. P. Harris, in Linn. Trans. ix. p. 174.

general; and commencing with cases of the greatest simplicity, let us pass on to those which are more complex.

Now, among all the Vertebrate Classes there are certain general homologies which structurally unite every animal contained within them, however it may differ in external form. In all, the diverging appendages are present in some form or other, except, indeed, in certain Ophidians, in which they are entirely absent. In Birds, the modification of the fore extremity is obvious, and in Fishes only somewhat less so; but, although the relative position of the pectoral and ventral fins is sometimes reversed (as in the Perch, for example), still the pectorals are *always* homologous with the fore, and the ventral with the hind limbs of other Vertebrata. There is therefore a great community of *plan* in Vertebrates, with respect to those parts which constitute the elements of external form.

Let us now glance at the media in which they move. Mammalia are, as a class, destined to tread the surface of the earth, birds to fly in the air, and fishes to swim in the sea: but neither is the air nor the sea devoid of Mammalian inhabitants; and both land and water, as well as air, afford a home for birds. Reptiles also occupy all three stations; and fishes alone, being essentially water-breathing animals, as well as of a decidedly inferior grade of organization, never quit that element. But in order that a mammal may be adapted to an aquatic existence, it must be fashioned more or less in the form of a fish; an elaborate hand or foot would be useless, and projecting appendages injurious. It is therefore piscine in form, covered with a smooth skin, and differs from a fish only in the position of the tail, which, being horizontal instead of vertical, is an index of its air-breathing habits. So also an aquatic bird has a smooth covering of close-set feathers, an attenuated head, fin-like wings, and feet situated so far back as to answer the purpose of a propelling tail when in the water; and could we see a Penguin in the act of swimming beneath the waves, it would undoubtedly have the aspect of a fish. Take, again, the Seals, in which these aquatic habits are not so complete as in the Cetaceans, and we find them modified in form to be something intermediate between a fish and a mammal; while an Otter, which is rather terrestrial than aquatic, has its quadrupedal character still less modified: in it we find the close-set fur, the depressed form, and the webbed feet; but the feet are not fins, nor is the tail.

With regard to flying quadrupeds, it is of course more or less necessary that the upper extremity should form a wing of some kind, which, however different in the homologies of its parts from the wing of a bird, must necessarily bear some general resemblance to it in form. A Bat is as purely an aërial animal as is a bird; but its wing, not being formed upon the type of that which exists in a true bird, must be inferior; nevertheless it is as truly and completely a wing as is the far more perfect, but less bulky, wing of a bird.

Further, if we select a single Class, such as the Mammalia, and bear in mind the same principle, we shall find it lead to the same results. Some quadrupeds of each Order are arboreal, some terrestrial, and others subterranean; some are carnivorous, some insectivorous, and some frugivorous; some are nocturnal, some diurnal, and some crepuscular. If, now, an animal belonging to one Order is, like an animal of a different Order, insectivorous, the former probably bears some remote analogy to the latter, by virtue of that fact. If the animals of two different Orders are not only *both* insectivorous, but also crepuscular, for example, the probability of their resemblance is increased; but if the two are insectivorous, crepuscular, *and* subterranean, then the great agreement of their habits must be accompanied by a considerable approximation of form.

Perhaps there are no facts in the natural history of animals which are simpler, or with which we are more familiarly acquainted in a general way, than the broad characteristics which differentiate the habits and modes of life of quadrupeds, birds, and fishes; and, on the other hand, the aberrant forms which are assumed by aquatic mammals and birds, and by aërial quadrupeds, and the homomorphism of these aberrant forms with those of the classes of Vertebrata which they most nearly approach in their habits and modes of life, are highly important questions, which thus admit of elucidation with a degree of probability commensurate with this exactness of our knowledge of those habits. The kind of homomorphism which obtains between members of a Class, such as among the various Orders of the Mammalia, requires a different kind of knowledge, viz. not a general aquaintance with broad facts, but a special familiarity with individual habits. Now, such a special knowledge is by no means always possessed, or even easily attainable; but when it is so, it is found that the greater the agreement of habit and modes of life between any two animals of distinct Orders, the more striking is the homomorphism which exists between them. Of this proposition several illustrations have already been given.

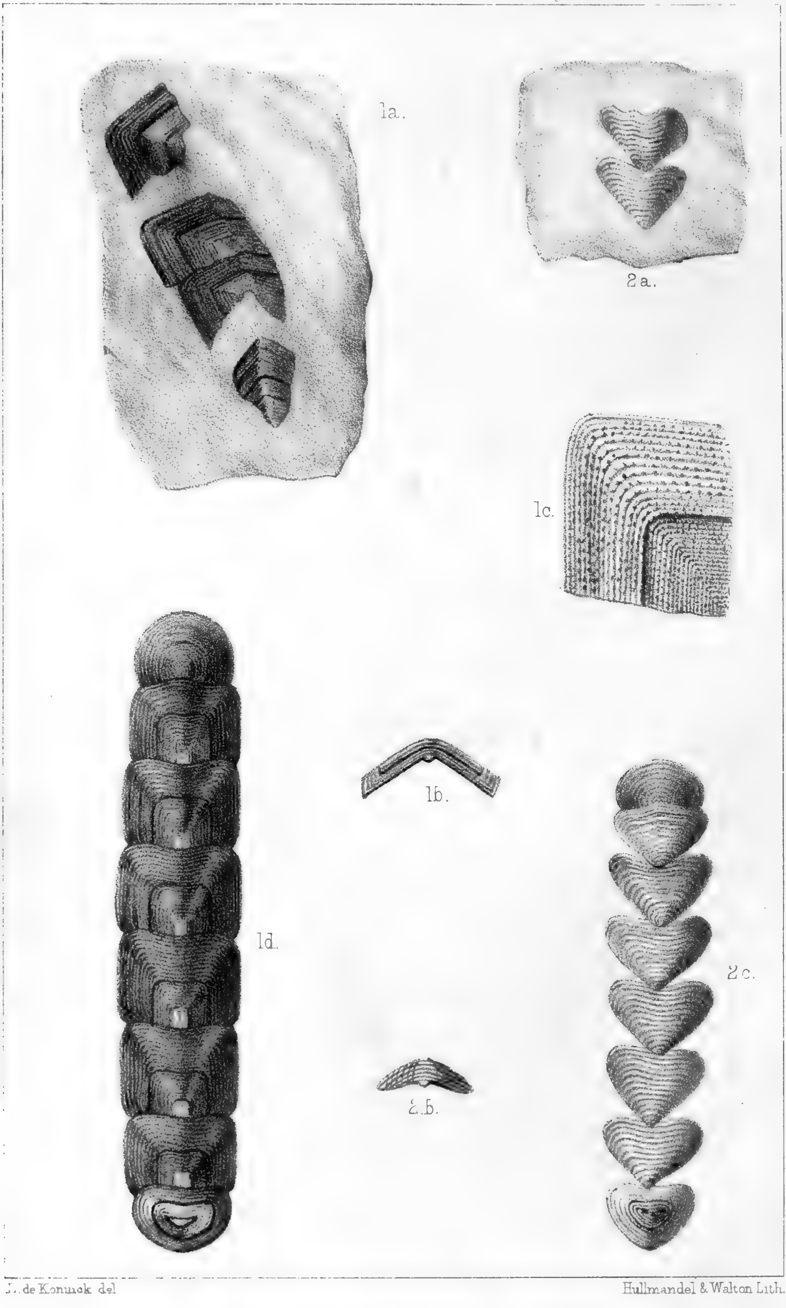
Taking now our stand upon these facts, and carrying the principle which I have laid down into the Invertebrate division of animals, the first thing which strikes us is the comparative artificiality of some of the resemblances which might be instanced as existing between them and the Vertebrate subkingdom. The habits of a Mollusc and a Fish can scarcely be compared; still less can those of a Tunicate and a Reptile, or of an Infusory and a Quadruped, and yet we perceive between them close resemblances of form; but between a Worm and a *Siphonops*, or between an Insect and a Bird, we can readily argue a community, because we at once estimate the narrow limits in the one case, and the wide extent in the other, of their analogical functions. It would be highly unphilosophical to suppose that these close resemblances were the effect of accident, and still more so to say that they result from accident in one case, and from profound design in another.

The homomorphisms existing between the Vertebrata and Invertebrata are not numerous; indeed, as might be expected in animals so widely separated, they are rare, and usually imperfect. I confess they present the greatest difficulty; and yet, where knowledge of habit assists us, the difficulty to a great extent vanishes. There is no Class of Invertebrata more familiarly known than the insects, and there are no clearer homomorphisms between these great subkingdoms than those between insects and birds; and who is there that does not perceive that the forms assumed by insects are as much the necessity of their habits, and that in habits, as in form, they assimilate to birds, just as a Bat does, or as a Whale agrees with a fish.

Again, how little do we know of the habits of the Invertebrate classes generally? The majority of them are marine; and it is only quite recently that they have even been *seen*, except through the medium of pictures, by the majority of persons. We are not on terms of familiarity with *them*, as we are with quadrupeds and birds; and seeing that our comprehension of their homomorphism is in direct ratio to our knowledge of their habits and modes of life, it is not a matter of surprise that we should be unable to penetrate the mystery of the similarity between the Foraminifera and the Mollusca, or between the Polypes and the Polypine Infusories. For here again the explanation of their homomorphism is measured by the amount of our knowledge. We see why a *Bombylius* resembles a *Bombus*, or a *Teredo* a *Sabella*, having some acquaintance with the similar habits of each, and seeing a degree of similarity between them. We know why a Caddis-worm resembles a Tubicolous Annelide, and this, again, a tube-inhabiting Rotifer; it is the common habit of forming a tube for their otherwise unprotected body which assimilates them; but we know not why a *Chiton* resembles an *Aphrodite*, because we are equally ignorant of the habits of either.

Let me now, in application of the foregoing principles, throw out some suggestions in relation to the most striking instance of homomorphism which occurs, perhaps, in the animal kingdom —viz. that existing between the Polyzoan Molluscoids and the Hydroid Polypes. In both these widely-separated groups, we have certain compound forms made up of numerous membranous or calcareous cells, upon a common axis or stem, which branches in a plant-like manner, each cell being the habitation of a distinct animal. These are their homomorphic characters; now let me state what are the special characters of each group. First, Hydroid Polypes: mouth with filiform, simple tentacula; stomach excavated in the cellular substance of the body; no distinct muscular apparatus; body contractile in all its parts, gemmiparous externally. Secondly, Polyzoa: body not contractile, symmetrical; mouth and anus separate; gemmiparous and oviparous. It therefore appears that the Polyzoa are minute Molluscs, differing in all their homologies from Polypes. Let us next inquire of which group the Polyzoary form is typical. Clearly not of the Mollusca, which are for the most part of very different form; and equally clearly it is typical of the Polypes, in which Class it assists their analogy with vegetable forms. The Polyzoary form, then, is aberrant from the Molluscan, and typical of the Hydroid Polypes. Why this form is best adapted for the life of Polypes I am not required to prove, but only why (that being granted) it is also the best form for the Polyzoa. Next, let us inquire what differences exist in the form of the animals themselves. In the Polype there is a gelatinous substance hollowed out into a stomach, a single aperture serving the purposes of taking in food, and passing out rejectamenta and ova, this common outlet being surrounded with a circlet of gelatinous contractile tentacles, armed with nettling capsules. But the Molluscoid has an œsophagus, stomach, gizzard, intestine, distinct anus, besides a liver and nervous system. In none of these particulars has it any relationship with Polypes; *but* the mouth is surrounded with a circlet of tentacles, not indeed like those of Polypes, simple and contractile, but uncontractile, and covered with vibratile cilia. They are probably the homologues of the labial palpi of other Molluscs. This circlet of tentacles then is the *great point of resemblance* between Molluscoids and Polypes —in the latter the common arrangement, in the former arising, as it were, from an accident or variety of organization; and yet is it not easy to perceive that the common possession of tentacles exhibited by Polypes and Polyzoa implies a very great similarity, nay, almost *identity*, in one of the most important of habits, namely the mode of procuring food?

Having so far established a community of habit between them, let us next refer to the grand organic distinction which is implied in the widely different form of the digestive apparatus. In the Polypes, the rejectamenta being passed out by the mouth, such animals are well fitted doubtless for living in cells with a single aperture; the Mollusca, however, have an intestinal canal,



L. de Koninck del.   Hullmandel & Walton Lith.

Fig 1. Chiton Grayanus. *de Kon.*
" 2 " Wrightianus. "

and anal aperture besides. But it must be borne in mind that the anus in the Polyzoon does not open at the extremity of the body opposite the mouth, as in the archetypal Mollusc, but, by a sudden bend of the intestine, the anal aperture is brought into the closest possible proximity to the mouth, so that, although separate, they both open at the same spot. And let it not be supposed that this detracts aught from their position as Molluscs; for in the highest Molluscs, viz. the Cephalopods, the same thing takes place in a somewhat less degree. Here, again, is a structure which implies great *community of general habit.* Lastly, there is another most important community of habit between the Polypes and Polyzoa, viz. that, although the Mollusca as a class are oviparous, the Polyzoan Molluscs are, in addition, *gemmiparous,* like the Polypes; and this power is evidently the secret of the production of those compound forms which the Polyzoa present in common with Polypes. Hence we see that, with scarcely anything in common except superficial characters, the habits of Polyzoa and Polypes are nearly identical; and to this fact I would look for an explanation of their identity of form.

XV.—*Observations on two new species of* Chiton *from the Upper Silurian 'Wenlock Limestone' of Dudley.* By M. L. De Koninck, Member of the Royal Academy of Sciences, Belgium, &c.*

[With a Plate.]

On my last visit to England I had the opportunity of studying a great number of new fossils, forming part of the magnificent collection of Mr. John Gray of Hagley, amongst which I observed two species of *Chiton,* obtained from the Upper Silurian beds of the neighbourhood.

Before entering into a detailed description of these species, it would perhaps be useful to give a *résumé* of the palæontological works which treat of species of a similar character to those forming the subject of these observations.

Genus Chiton, Linn.

Established by Linnæus in 1758 for a small number of living species, this genus for a long time had no representative amongst fossils.

It was not until the year 1802 that the first species of fossil

* Translated by W. H. Baily, F. G. S., Acting Palæontologist to the Geological Survey of Ireland, from the 'Bulletins de l'Académie Royale des Sciences, etc. de Belgique,' 26^{me} année, 2^{me} sér., t. iii. 1857.

Chiton was discovered by Defrance, and described by Lamarck* under the name of *Chiton grignoniensis,* that name being derived from a locality long celebrated for the great number of fossils found there in deposits belonging to the Calcaire grossier of Paris, that is to say, to the middle beds of the Tertiary formation.

In 1834 M. Conrad made known a species (*C. antiquus*) from the Tertiary formation of Alabama†.

In 1836 M. Puzos and M. le Comte Duchastel‡ found some remains of *Chiton* in the Carboniferous formation of the environs of Tournay; these fragments enabled Count Münster to establish a new species, which he described and figured in 1859§ under the name of *Chiton priscus.*

This discovery was considered of some importance by palæontologists, who were far from expecting to find species of this kind in palæozoic strata; nevertheless, in the latter part of the year 1840, M. Guido Sandberger announced the probable existence of the genus *Chiton* in the Devonian limestone of Villmar‖. In 1842 the same geologist added two new species, under the names of *C. subgranosus* and *C. fasciatus,* to the list which he then published of Devonian fossils from the same locality¶; one of these species is probably identical with that which M. F. Roemer has mistaken for *Bellerophon expansus,* Sow.**, and which was named *C. cordiformis* by M. Sandberger in 1845.

In 1843 I described three new species of *Chiton*††, procured from the Carboniferous formation of Belgium, to which in 1845 M. le Baron de Ryckholt added some others discovered by himself in the same formation‡‡. That *savant* made known at the same time the existence of a *Chiton* from the Tertiary formation of Italy—a species we owe to the researches of M. Cantraine, Professor in the University of Ghent; it is described by him under the name of *C. subapenninus* in the second part of the 'Malacologie Méditerranéenne et Littorale.' It may, however, prove identical with that from near Turin, published in 1847 by M. Michelotti under the name of *C. miocenicus* §§.

* Annales du Muséum, t. ii. p. 309.

† Morton, Syn. of Organic remains, Appendix, p. 6.

‡ This species is published by M. Deshayes in the new edition of the 'Histoire nat. des Anim. s. Vertèbres' of Lamarck, t. vii. p. 490.

§ Beiträge zur Petrefaktenkunde, i. p. 38.

‖ Neues Jahrb. für Mineral. und Geol. 1841, p. 240.

¶ Ibid. 1842, p. 399. These names were replaced in 1853 by those of *C. corrugatus* and *sagittalis,* without M. Sandberger having given a reason for so doing (G. & F. Sandberger, 'Die Versteiner. des Rhein. Schichtens. in Nassau,' pp. 238, 239).

** Neues Jahrb. für Mineral. und Geol. 1845, p. 439.

†† Descript. des anim. fossiles du terr. carb. pp. 322, etc.

‡‡ Bulletins de l'Académ. de Belg. t. xii. 2me partie, pp. 45, etc.

§§ Descript. des foss. du terr. mioc. de l'Italie, p. 132, pl. 16. f. 7.

Before the publication of the work of M. de Ryckholt, Mr. King had already announced the occurrence of a *Chiton* found by Mr. Loftus in the Permian formation near Sunderland*, and described later under the name of *C. Loftusianus*†,—on this side, M. Philippi having made known two other species (*C. siculus*, Gray, and *C. fascicularis*, Linn.) from the tertiary strata of Sicily‡.

After these discoveries, Mr. Salter in 1846 added another and much more remarkable example, that of a species of *Chiton* from the lower beds of the Silurian strata of Ireland. That author proposed on the occasion a new genus, under the name of *Helminthochiton*, for the purpose of receiving the palæozoic species§; but as it is not distinguished by any essential character from the ordinary genus *Chiton*, it can merely serve to denote a section of that genus.

In 1848 Mr. Searles Wood described and figured, in his magnificent Monograph on the Mollusca from the Crag of England, three fossil species of *Chiton*, one of them being new (*C. strigillatus*), and the two others identical with species living in our seas at the present day (viz. *C. fascicularis*, Linn., and *C. Rissoi*, Payr.‖).

About the same date M. Eudes Deslongchamps, to whom science is indebted for a great number of excellent works on the Jurassic fossils of the environs of Caen, discovered in the Bathonian beds of Langrune the posterior or anal plate of a species of *Chiton*, which he obligingly dedicated to me¶—this being the first discovery of the genus in Secondary strata, although their probable existence in strata of that age was some time before predicted by him**.

In 1852, M. Terquem added a new link to the chain uniting the palæozoic Chitons to those of the present epoch, by the discovery of a new species (*C. Deshayesii*) in the middle Lias of Thionville††.

Finally, M. F. A. Roemer described and figured in 1855 a new

* Ann. & Mag. of Nat. Hist. 1844, vol. xiv. p. 381.

† Monogr. of the Permian Foss. of England, Pal. Soc. 1849, p. 202.

‡ Enumeratio Mollusc. Sicil. t. ii. p. 85.

§ Synopsis of the Silur. foss. of Ireland by Sir R. Griffiths, p. 74; and Quarterly Journ. of Geol. Soc. of London, vol. iii. pp. 48, &c.

‖ Monog. of the Crag Mollusca, pt. 1. pp. 185, &c. Besides these three species, Mr. Wood had also announced three others, which he considered to be new, in his Catalogue of Crag Mollusca published in 1842 (Ann. & Mag. of Nat. Hist. vol. ix. p. 460); but these he appears to have since abandoned.

¶ Mém. de la Soc. Linn. de Normandie, t. viii. pp. 156, &c.

** Descript. des Anim. foss. du terr. carb., p. 321.

†† Bullet. de la Soc. Geol. de France, 2me sér. t. ix. pp. 386, etc.

species of Chiton (*C. lævigatus**), obtained from the upper part of the Devonian strata near Grund, and figured another to which he did not give a name, but which I propose to designate under that of *C. tumidus*†.

The following is a list of all the species of fossil Chitons known up to the present time, with an indication of the geological series in which they have been observed, and the locality from which they were obtained‡:—

Upper Tertiary.

1. Chiton siculus, *Gray*. Sicily.
2. —— fascicularis, *Linn*. Sicily; Sutton.
3. —— Rissoi, *Payraudeau*. Sutton.
4. —— strigillatus, *Wood*. Sutton.
5. —— { miocenicus, *Michelotti*. Turin. / subapenninus, *Cantr.*? }
6. —— subcajetanus, *Poli* (ex fide *D'Orb.*). Turin.
7. —— transenna, *Lea*. Virginia.

Lower Tertiary.

8. Chiton antiquus, *Conrad*. Alabama.
9. —— grignonensis, *Lamk*. Grignon.

Great Oolite or Bathonian.

10. Chiton Koninckii, *Eudes Deslongch*. Langrune.

Lias.

11. Chiton Deshayesii, *Terquem*. Thionville.

Trias.

12. Chiton? Cottai, *Geinitz*. Bunter Sandstone.
13. ——, sp. §

Permian.

14. Chiton Loftusianus, *King*. Durham.
15. —— Howseanus, *Kirkby*. Durham ||.

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* W. Dunker und H. v. Meyer, Palæontographica, t. v. p. 36, pl. 7. fig. 8 *a, b*.

† Ibid. pl. 7. fig. 9 *a, b*.

‡ To this list of M. De Koninck's I have added others since discovered, so as to make it complete up to the present time.—W. H. B.

§ When at the Aberdeen meeting of the British Association in September 1859, I was shown by Mr. Charles Moore, of Bath, some plates of *Chiton* obtained by him, with other very interesting fossils, from the Trias formation near Frome, Somersetshire. This will therefore add an additional species to the doubtful one included in the above list.—W. H. B.

|| In 1856 this Permian species was discovered at Tunstall and Humbleton Hill, Durham, and was described in 1857 by Mr. J. W. Kirkby; in March 1859 he also described, in the 'Proceedings' of the Geological Society of London, the four following additional species. One of these he doubtfully refers to *Chiton* proper; the others he considers to belong to

16. Chiton ? cordatus, *Kirkby*. Durham.
17. Chitonellus Hancockianus, *Kirkby*. Durham.
18. —— distortus, *Kirkby*. Durham.
19. —— antiquus, *Howse*, sp. Durham.

Carboniferous Limestone.

20. Chiton concentricus, *De Kon.* Visé.
21. —— gemmatus *, *De Kon.* Visé.
    —— ——, var. mosensis, *De Ryckh.*
    —— ——, Viseticola, *De Ryckh.*
    —— ——, legiacus, *De Ryckh.*
    —— ——, eburonicus, *De Ryckh.*
22. Chiton priscus, *Münster*. Tournay.
23. —— nervicanus, *De Ryckh.* Tournay.
24. —— turnacianus, *De Ryckh.* Tournay.
25. —— Mempiscus, *De Ryckh.* Tournay.
26. —— (Chitonellus), cordifer, *De Kon.* Tournay.
27. —— thomondiensis †, *Baily*. County of Limerick.
28. —— Burrowianus ‡, *Kirkby*. Settle, Yorkshire.
    And probably three or four other species from that locality.

Upper Devonian.

29. Chiton lævigatus, *Fr. Ad. Roemer*. Grund.
30. —— tumidus, *De Kon.* Grund.

Middle Devonian.

31. Chiton corrugatus, *G. & F. Sandberger*. Villmar.
    —— cordiformis, *G. Sandberger*.
    —— priscus, *G. Sandberger*; non *Münster*.
    —— Sandbergianus, *De Ryckh.*
32. Chiton sagittalis, *G. & F. Sandberger*. Villmar.
    ——, n. sp. Plymouth (Geol. Surv. Collection).

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the genus *Chitonellus*; the one he calls *Chitonellus antiquus*, having previously been mistaken by Mr. Howse for a *Calyptræa*, was named by him *Calyptræa antiqua*.—W. H. B.

* M. A. d'Orbigny, in his 'Prodrome de Paléontologie,' t. i. p. 127, has proposed to change this name into that of *subgemmatus*, under the idea that there already exists a Chiton of that name, described in 1825 by M. De Blainville. This, however, is an error.—L. De K.

† In April 1859 I made known, in a paper read before the Geological Society of Dublin, the discovery of the plates of a Chiton of larger dimensions than any previously met with (plates belonging to several individuals were obtained), from the Carboniferous Limestone of Lisbane; since then I myself collected other plates of a similar species in a cutting at Rathkeale, on the Limerick and Foynes Railway. This species I described by the above name of *Chiton thomondiensis* (vide Journ. of the Geol. Soc. Dublin, vol. viii. pt. 2. p. 167).—W. H. B.

‡ In a note to Mr. Kirkby's paper (Journ. of the Geol. Soc. of London, vol. xv. p. 610), and a further communication with which I was favoured by him, he mentions the fact of an additional discovery by Mr. J. H. Burrow, of an interesting series of plates of Chitons from the Carboniferous or Lower Scar Limestone of Settle in Yorkshire. These plates he believes to belong to five species, which he could not identify with any of the Belgian species described by Baron Ryckholt and Professor De Koninck; one of them he has named *Chiton Burrowianus*, after the discoverer.—W. H. B.

Upper Silurian.

33. Chiton Grayanus, *De Kon.* Wenlock Limestone, Dudley.
34. —— Wrightianus, *De Kon.* „ „ „

Lower Silurian.

35. Chiton (Helminthochiton) Griffithii, *Salter.* Cong, co. Galway.

On an inspection of this list the result is, that, notwithstanding the number is relatively small when compared with that of recent species, the existing genus *Chiton* is represented in almost all the series of sedimentary rocks, and that hitherto the Cretaceous and Triassic are the only formations in which there have not been discovered any traces*. I have no doubt that this gap will soon be filled, as it is not very probable that these animals, whose appearance on our globe dates so far back in geological time as the Lower Silurian, continuing through all the other formations up to the present day, should have been unrepresented in these two geological periods. The same list, again, demonstrates that, after the Tertiary, it is the Carboniferous strata which contain the greatest number of species, and that it is the intermediate strata which have furnished the fewest †.

I shall now proceed to give descriptions of the two new species of *Chiton* which form the principal subject of this notice. With the specimens of one I have been aided by Mr. John Gray of Hagley, by whom it was discovered, and of the other by Dr. Thomas Wright of Cheltenham, well known for his investigations upon the fossil Echinoderms of Great Britain.

1. *Chiton Grayanus,* De Koninck. (Pl. II. fig. 1 *a, b, c, d.*)

The dorsal cerames, or intermediate plates of this species, which are the only ones with which I am acquainted, are formed of two lateral parts, perfectly plane, of a nearly square form, and united together by an angle a little more than a right angle. The dorsal carina is most developed; the anterior part of each plate is slightly crenated; the test appears to have been very

* Mr. Charles Moore's discovery of Triassic Chitons in British strata was made since the publication of Professor De Koninck's paper. See note § on page 94.

† While this article was in the press, Mr. Charles Moore has favoured me with the additional information of his having found examples of the genus *Chiton* in the following formations in England, in which they had not hitherto been observed, viz. :—

Bradford Clay; Hampton, near Bath: a single plate.
Upper Lias; near Ilminster: about a dozen separate plates, all belonging to one species.
And in the Triassic beds near Frome, before alluded to, where the plates of a small and not uncommon species occur.—W. H. B.

thin. Their external surface is ornamented by a very great number of fine parallel striæ or lines of growth; on the lateral and anterior sides of each plate, and between them, there are extremely thin ribs covered with small granulations. Each of these plates appears to have undergone a suspension of development at about the middle of its growth; this interruption is indicated by a striation much larger and deeper than the others, which are all nearly equal in strength. The median and lateral areas are very nearly equal, and divide each side of the plate into two parts.

It is probable that, if this species was furnished with apophyses, they were very small, as I have not been able to discover any trace of them on the various specimens I had the opportunity of examining.

Relations and Differences.—This *Chiton* presents a greater similarity with *C. priscus*, Munster, and *C. Mempiscus*, De Ryckh. It differs from both, however, by the lateral margin of its plates being more even, by the slight thickness of its test, by the absence of apophyses, and especially by the fineness and great number of striæ covering its surface.

Dimensions.—Length of the dorsal plate about 12 millimetres; breadth of each side 10 mm., which gives for the complete animal an approximate length of from 80 to 90 millimetres, and a mean breadth of 16 to 18 mm.

Locality.—This species has been discovered by Messrs. Gray and Fletcher in the Upper Silurian 'Wenlock limestone,' near Dudley.

2. *Chiton Wrightianus*, De Koninck. (Pl. II. fig. 2 *a, b, c.*)

The form of the dorsal plates of this species is subtriangular, the posterior edges making very nearly a right angle. The lateral angles are rounded, and the anterior edge is very sinuous. All the plates are supplied with a well-marked median carina, and appear to have been without apophyses. The surface is covered with a small number of deep equidistant striæ. The test is slender. The median area is larger than the lateral one.

Relations and Differences.—This *Chiton* very much resembles *C. Loftusianus*, King, but differs from it in the regularity of the striæ of the median and lateral areas, and by the more marked sinuosity of the anterior edge of its plates.

Dimensions.—The length of each dorsal plate is about 8 millimetres, and the breadth 12 mm.

Locality.—This species was found by Mr. Gray with the preceding one; it is, however, scarcer than even that.

EXPLANATION OF PLATE II.

Fig. 1 *a, Chiton Grayanus,* De Kon., nat. size, with fragments of four dorsal plates, from the collection of Mr. Gray; 1 *b*, a plate, seen from the anterior side; 1 *c*, half plate, enlarged; 1 *d*, complete specimen, hypothetically restored and slightly enlarged.

Fig. 2 *a*, *Chiton Wrightianus*, De Kon., nat. size, showing two dorsal plates compressed; 2 *b*, dorsal plate, seen on the posterior side; 2 *c*, restored specimen, taking as a base the *Chiton Loftusianus.*

XVI.—*Notes on the Subgenus* Corilla, *H. & A. Adams*; *and on the Group* Plectopylis, *Benson*; *also on* Pollicaria, *Gould, and* Hybocystis, *Benson.* By W. H. Benson, Esq.

With reference to the group *Plectopylis*, published in the 'Annals' for April last, I have received from Mr. Augustus A. Gould of Boston, U.S., a sheet containing 'Shells of the North Pacific Exploring Expedition,' with a proposed amended description of Messrs. H. and A. Adams's subgenus *Corilla.*

"Subgen. *Corilla*, H. & A. Adams (emendatum).—Testa planorboidea, plerumque sinistrorsa, plus minusve distorta, arcte spirata, subtus concava; fauce in fundo denticulis compressis fere occluso, quorum uno sæpe ad aperturam producto; peristomate incrassato, reflexo."

Mr. Gould adds a new species from Hong Kong, *C. pulvinaris*, G., with "denticulis in fauce ad 9, haud productis" among the characters of the aperture. This shell he states to be "almost precisely of the size and shape of *H. refuga*, Gould; but that is reversed, and has a lamina running to the aperture."

Mr. Gould informs me that in a more extended paper he has gone more fully into individual peculiarities. This was published, he further states, in 1859. I have not had the good fortune to meet with it; and for more than six months have been in vain endeavouring to get a copy of a paper on Siamese shells, published several years earlier at Boston.

Now the subgeneric character, "fauce in fundo denticulis compressis *fere* occluso," seems to provide for the retention of *Helix Rivolii* and *H. erronea*, which the characters of *Plectopylis* absolutely exclude from my group, and leave in Messrs. Adams's original subgenus *Corilla*, as they are furnished only with spiral lamellæ, and have no pylaic barrier. On the other hand, the character "planorboidea" would ignore *H. plectostoma* and *H. Pinacis*, in which the pylaic barrier is present.

Messrs. Adams's typical species of *Corilla* are *H. Rivolii* and its congeners; and *Helix plectostoma* had been referred to a distinct group. *Plectopylis* was designed to unite shells previously referred to different subgenera (although allied by the presence of pylaic barriers), and to separate species destitute of that feature, and still belonging to *Corilla* with reference to its original typical characters.

The description of *Corilla*, with the addition of the pylaic plication, will only tend to confusion, and must necessitate the formation of another group for Messrs. Adams's typical forms; while it is evident, from Mr. Gould's description, that he had then no knowledge of the affinity of species not referable to the Planorboid group; and it would also appear that he was unacquainted with the existence of internal series of pylæ. In short, Mr. Gould's description of *Corilla* is calculated to include all Messrs. Adams's species, adding a feature characteristic of a portion only, and, thus altered, is still hampered with the accidental Planorboid character. Such a subgenus would comprise species not truly Plectopylaic; and others which are really so, but not Planorboid in form, would be inadmissible.

In the same paper is described a large and interesting species of the restricted genus *Alycæus*—*A. Pilula*, Gould, from Hong Kong. Another species has lately been described from Java—*A. Jagori*, Von Martens. The characters given of these two species will not permit their assignment with certainty to any particular one of the three sections proposed in the 'Annals' for March 1859. A third species, *A. exul*, Bl., assignable to the section *Charax*, was found during the past year in the Nilgherry range, by Mr. W. T. Blanford, as well as a singular new *Diplommatina*. Neither of these two genera had previously occurred to the southward of the Ganges. In the same rich locality, Mr. H. F. Blanford had, in a former year, discovered a most curious little Cyclostomaceous genus (*Opisthostoma*, Bl.), a specimen of which he has kindly communicated to me. These new Nilgherry shells were destined to appear in the 'Journal of the Asiatic Society of Calcutta'.

I may here note that I have lately ascertained that the shell which I published in the 'Annals' for March 1856, under the name of *Megalomastoma gravidum*, was described in the 'Proceedings of the Boston Society of Natural History' for July in the same year, as *Cyclostoma Pollex*, Gould. Mr. Gould proceeded, in the same paper, to propose for that shell, in conjunction with *Rhaphaulus Chrysallis*, Pfr., and *M.* (*Hainesia*) *Myersii*, Haines, a new group, "probably generic," with the designation of *Pollicaria*. This name, if published within a moderate period after its submission to the Boston Society, has priority in point of time to my generic term *Hybocystis*, proposed in the 'Annals' for August 1859 for *H. gravida* alone, after an examination of the animal and operculum. The true structure of the shell of *Rhaphaulus Chrysallis* (discovered by Mr. H. Adams) was made known in the 'Annals' for April 1856, in which year also

Pfeiffer proposed his section *Hainesia* in the 'Mal. Blätter' for September.

The following are the remarks published by Gould on *Cyclostoma Pollex,* with the characters of *Pollicaria* :—

"This singular shell may possibly be *Cyclostoma Chrysalis,* Pfr., but is larger and destitute of lines and indentations. That shell is said to come from Arva [probably Ava]. *Megalomastoma Myersii,* Haines, is another species of the same type, but less distorted and more cylindrical. These shells, coming from the same region, to which many others will doubtless hereafter be added, I regard as constituting a natural group, probably generic, for which I would propose the name *Pollicaria.* Shell subperforate, chrysalidiform, ventrally flattened; spire secund; aperture subcircular, truncate posteriorly within the peritreme."

Cheltenham, June 29, 1860.

XVII.—*On Additions to the Madeiran Coleoptera.* By T. Vernon Wollaston, M.A., F.L.S.

[Concluded from p. 54.]

(Subfam. Xantholinides.)

Genus Xantholinus.

Dahl, Encycl. Méthod. x. 475 (1825).

Xantholinus Hesperius ? Erich.

X. niger (vix subænescens), nitidus; capite utrinque parce punctato, ad basin truncato; prothorace punctorum serie laterali subcurvata impresso; elytris latera versus obsolete subseriatim punctatis, margine apicali testaceo; antennis tarsisque fusco-ferrugineis, illarum articulo primo (et interdum tertio), femoribus tibiisque piceis.

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

Habitat Maderam australem, a DD. Park et Moniz benigne communicatus.

Xantholinus Hesperius ?, Erichs., Gen. et Spec. Staph. 329 (1839).

X. like the *X. linearis,* but with the *head* a little more abruptly truncated behind (though not quite so suddenly as in the *X. punctulatus*), and much more sparingly punctured, and with the frontal sulci a little longer, wider, and deeper,—the inner ones, moreover, being a trifle less curved, and the outer ones carried further back on to the forehead, from the front margin of the eye. *Prothorax* with a longitudinal row of about nine punctures on either side of its disk, and with the lateral ones fewer than in the *X. linearis,* and with an evident tendency to be arranged in a curve (though not so decidedly so as those of the *X. punctulatus*). *Elytra* finely punctured, as in the *X. linearis*, but with a very obscure tendency to be disposed, towards the lateral margins, in longitudinal rows; their apical edge somewhat translucid and testaceous. *Antennæ* and *tarsi* brownish-ferruginous; the *basal joint* of the former (and sometimes, apparently, the third also), as well as the *femora* and *tibiæ*, piceous.

The present *Xantholinus*, which in some respects (as will be seen) combines the characters of the *X. punctulatus* and *linearis*, but which may be at once known from them by, *inter alia*, its more remotely punctured head and the testaceous apical margin of its elytra, appears to agree sufficiently well with the description of the *X. Hesperius* (from Spain and Portugal) as given by Erichson, to justify its being referred to that insect. Nevertheless I should state that it does not *precisely* accord with the diagnosis; and hence I have assigned it to the *X. Hesperius* with a query, being unwilling to multiply species unnecessarily in a somewhat obscure group. I have detected a single specimen of it amongst some old insects which were taken by Mr. M. Park, about two or three years ago, near Funchal; and a second was communicated to me by Senhôr Moniz, during the winter of 1859.

Genus Leptacinus.

Erichson, Käf. der Mark Brand. i. 429 (1837).

Leptacinus linearis, Grav.

L. niger, nitidus; capite utrinque dense et profunde punctato, ad basin recte truncato; prothorace seriebus dorsalibus circa 9-punctatis; elytris dilutioribus, latera versus seriatim punctatis; antennis piceis; pedibus piceo-testaceis.

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

Habitat Maderam; quinque specimina ad S. Antonio da Serra nuper deprehensit Dom. Bewicke.

Staphylinus linearis, Grav., Col. Micropt. 43 (1802).
Gyrohypnus sulcifrons (Kby.), Steph., Ill. Brit. Ent. v. 260 (1833).
Leptacinus linearis, Kraatz, Nat. der Ins. Deutsch. ii. 649 (1857).

L. black and shining. *Head* and *prothorax* highly polished: the *former* straightly truncated behind, deeply and distinctly punctured at the sides (but not roughly so, the punctures being well-defined), and with the frontal sulci deep and distinct: the *latter* with a longitudinal row of about eight punctures on either side of its disk, and with about five or six (besides some scattered ones near the anterior angles) arranged somewhat in a curve towards either edge. *Elytra* diluted in colouring (being more or less piceous, and still paler towards their outer apical angles), finely punctured, the punctures being disposed in rows towards the lateral margins. *Antennæ* brownish-piceous, being a little brighter at their base. *Legs* piceo-testaceous, with their *tarsi* pale.

Except in its comparatively diminutive size, the present insect bears a considerable *primâ facie* resemblance, in its general contour and posteriorly-truncated head, to the *Xantholinus punctulatus*. Nevertheless, apart from the great differences of its punctation (which may be gathered from the above diagnosis), the *generic* characters of the *Leptacini* will of course at once separate it; and amongst these, the subulated apical joint of the palpi is perhaps the most apparent. Its discovery in Madeira is due to Mr. Bewicke, who has recently forwarded me five specimens which he captured, during the past summer, beneath hay-stack rubbish, at S. Antonio da Serra. I should add that one of the Madeiran examples has likewise been carefully examined by Mr. Janson, who agrees with me in referring it to the *Staphylinus linearis*, Grav.

(Subfam. Staphylinides.)

Genus Philonthus.

(Leach) Steph., Ill. Brit. Ent. v. 226 (1832).

§ I. *Prothorax seriebus dorsalibus e punctis quatuor compositis.*

Philonthus thermarum, Aubé.

P. angustus, niger; capite subquadrato; prothorace picescentiore; elytris testaceo-piceis, apicem versus paulatim dilutioribus, parce et distincte punctulatis; antennis fuscis, basi pedibusque pallidis.

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

Habitat Maderam australem; duo specimina prope urbem Funchalensem tempore vernali A.D. 1859, a meipso detecta.

Philonthus thermarum, Aubé, Ann. de la Soc. Ent. de France (2ième série), viii. 316 (1850).

P. small, narrow, and black. *Head* and *prothorax* highly polished; the *former* rather long and subquadrate, being straightly truncated behind; the *latter* more piceous than the head, and with a longitudinal series of four (or sometimes, apparently, five) punctures down either side of its disk, and with a few scattered ones between them and the edges. *Elytra* paler than the head and prothorax, being more or less testaceo-piceous, and paler behind than in front; sparingly, but distinctly, punctulated. *Antennæ* brown; their *base* and the *legs* testaceous.

Two examples of the *P. thermarum*, Aubé, which agree precisely with British ones in my possession, were captured by myself, beneath vegetable refuse, near Funchal, during the spring of 1859. Their minute size, narrow outline, subquadrate head, and diluted elytra, in conjunction with the four (or sometimes five) punctures down either side of their prothoracic disk, will at once distinguish them from the rest of the Madeiran *Philonthi*. In more northern latitudes, the species generally occurs about hotbeds,—under which circumstances it was discovered by M. Rouzet in Paris; and I have myself taken it in similar positions in England.

(Subfam. PÆDERIDES.)

Genus SCOPÆUS.

Erichson, Gen. et Spec. Staph. 604 (1839).

Scopæus subopacus, n. sp.

S. angustus, nigro-piceus, subopacus; capite prothoraceque dense alutaceis, fere pilis carentibus, illo subrotundato-quadrato; elytris dense et minute punctulatis et pilis brevibus demissis cinereis vestitis; antennis rufo-testaceis, apicem versus fuscescentibus; pedibus infuscato-testaceis.

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

Habitat Maderam, una cum præcedente a Dom. Bewicke detectus.

S. narrow, blackish-piceous, and nearly opake. *Head* and *prothorax* densely alutaceous, but scarcely punctured, and almost free from pile: the *former* roundish-quadrate (being truncated behind, but not very abruptly so), and with the *eyes* rounded, and rather small: the *latter* oblong, and rather acuminated in front. *Elytra* closely and minutely punctulated all over, and (together with the abdomen) more evidently pilose than the head and prothorax—being clothed with a fine and very short, decumbent, cinereous pubescence. *Abdomen* concolorous, even the extreme apex being scarcely more diluted in colouring than the rest of the surface. *Antennæ* reddish-testaceous at their base, but browner towards their apex. *Legs* brownish-testaceous, being unequally infuscated all over.

The unique example from which the above description has been compiled was detected by Mr. Bewicke, who captured it (along with the last species) beneath hay-stack refuse at S. Antonio da Serra, during the summer of 1859. It has much the appearance of a small dark *Lithocharis*; but the *generic* characters of *Scopæus*, which mainly consist in its more robust legs (especially the anterior pair) and its small tricuspid *corneous* ligula, will, apart from the diminished bulk of the species which compose the group, readily distinguish it. Judging from the description, it seems somewhat allied (particularly in its opake surface) to the *L. infirmus*, Erichs., from Egypt; nevertheless its uniformly dark hue and the densely alutaceous (but apparently unpunctured) sculpture of its head and prothorax are of themselves sufficient to separate it therefrom.

Genus Lithocharis.

(Dejean) Boisd. et Lacord., Faun. Ent. des Env. de Paris, i. 431 (1835).

Lithocharis brevipes, n. sp.

L. fusco-picea, subopaca, densissime et subtilissime punctulata; capite subtriangulari piceo-nigro, oculis parvulis; prothorace subquadrato; elytris paulo magis fuscescentioribus; antennis pedibusque infuscato-ferrugineis, illis graciusculis, tarsis brevibus.

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

Habitat Maderam australem; in horto Bewickiano prope Funchal exemplar unicum deprehensi.

L. like the *L. ochracea*, but rather smaller and narrower, more opake, still more closely and minutely punctulated all over, and more densely pubescent. *Head* not quite so black as in that species (or a trifle more piceous); also rather smaller, less convex, and more triangular, and with the *eyes* not nearly so large. *Elytra* somewhat browner, or more diluted, than the rest of the surface, and very densely pubescent. *Limbs* darker than in the *L. ochracea*: the *antennæ*, also, more slender; and with the apical joint shorter, and less acuminated at its tip: and the *legs* more abbreviated, particularly the tarsi, which are (comparatively) very short.

The present insect is a good deal allied to the European *L. obsoleta*; nevertheless its rather shorter and more slender antennæ (with their smaller terminal joint), together with its more triangular head and more piceous hue, and the less broadly dilated front tarsi of its male sex, will, apart from minor differences, at once separate it therefrom. Judging from the diagnosis, it seems quite distinct, in many points, from the *L. obscurella*, Erichs., from Sardinia, though in its general size and aspect it may possibly approach that species. The only specimen which I have as yet seen of it was captured by myself, during the spring of 1859, from beneath vegetable refuse, in Mr. Bewicke's garden at the Palmeira, above Funchal.

Genus Sunius.

(Leach) Steph., Ill. Brit. Ent. v. 274 (1832).

Sunius æquivocus, n. sp.

S. piceo-ferrugineus; capite rotundato-oblongo; prothorace rufo-ferrugineo; elytris antennisque dilute testaceis; pedibus pallido-testaceis; scutello majusculo.

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

Habitat Maderam australem, a Dom. M. Park captus.

S. piceo-ferruginous. *Head, prothorax,* and *elytra* almost free from pubescence—the first and second being also subopake, and densely, roughly, but not very decidedly punctured: the *first* roundish-oblong; the *second* a little more rufescent than the head, being strictly *rufo*-ferruginous; the *third* a little less opake, more deeply, distinctly, and less closely punctured, and (together with the *antennæ*) of a dull diluted-testaceous hue. *Scutellum* rather larger than in the other Madeiran *Sunii*. *Abdomen* pubescent. *Legs* pale testaceous, but infuscated in parts.

The single specimen described above was captured, about two years ago, by Mr. M. Park, near Funchal. As will be gathered from the diagnosis, it differs from the other Madeiran *Sunii* in many important particulars, though combining to a certain extent the characters of them both; and, indeed, at first sight it has somewhat the general aspect and colouring of the *Mecognathus Chimæra*: nevertheless, apart from minor differences, its *comparatively* immensely developed elytra and scutellum, and less basally-constricted abdomen, will at once distinguish it from that insect.

(Subfam. Oxytelides.)

Genus Trogophlœus.

Mannerheim, Brachél. 49 (1831).

Trogophlœus exilis, n. sp.

T. angustus, niger, subnitidus; capite prothoraceque minutissime, creberrime et æqualiter subpunctulatis (an potius alutaceis?), hoc in disco postico obsolete longitudinaliter bi-impresso; antennis basi fusco-ferrugineis; pedibus dilute testaceis.

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

Habitat Maderam australem, a Dom. M. Park semel lectus.

T. minute, narrow, black or piceous-black, slightly shining, and delicately pubescent. *Head* and *prothorax* most closely, minutely, and equally subpunctulated all over, the punctules being very indistinct, and scarcely separable from minute granules (so that, perhaps, the surface might be almost regarded as subalutaceous instead of punctured): the *former* less prominent or thickened behind the *eyes* than in the *T. corticinus*, so that the latter project sensibly *beyond* the hinder rim (which is scarcely the case in that species); the *latter* of much the same shape as in the *T. corticinus* and *bilineatus*, but with the longitudinal foveæ more obscure, being subobsolete. *Elytra* a trifle more picescent than the head and prothorax, and a little more evidently punctulated (though much more finely so than in the other species). The basal half of the *antennæ* dull brownish ferruginous. *Legs* diluted testaceous.

The present insignificant little *Trogophlœus,* a single specimen of which I have found amongst some insects collected by Mr. M. Park near Funchal, is apparently as small as the minute *T. simplicicollis,* with which, in its very dense and fine sculpture, it nearly agrees. Nevertheless its paler limbs and totally different prothorax (which is not narrowed behind as in that species, nor free from longitudinal furrows) will of themselves at once separate it therefrom; whilst from its still nearer ally, the *T. corticinus,* it is easily distinguished by its smaller size and closer and very much finer punctation, as well as by its more obsolete prothoracic foveæ, and by the paler hue of its legs and the basal half of its antennæ.

(Subfam. Omaliades.)

Genus Philorhinum.

Kraatz, Nat. der Ins. Deutschl. ii. 966 (1858).

Philorhinum humile, Erichs.

P. lineare, depressum, pubescens, nigrum; capite, prothorace elytrisque paulo dilutioribus, dense æqualiter punctatis; antennarum basi pedibusque dilute testaceis.

Long. corp. lin. 1.

Habitat Maderam, a Dom. Bewicke ad S. Antonio da Serra æstate 1859 repertum.

Arpedium humile, Erichs., Gen. et Spec. Staph. 860 (1840).
—— *myops,* Haliday, Entomologist, 187 (1841).
—— *humile,* Redt., Fauna Austr. (edit. 2), 246 (1857).
Philorhinum humile, Kraatz, Nat. der Ins. Deutschl. ii. 966 (1858).

P. linear, depressed, black, slightly shining, and clothed with a short, decumbent, cinereous pile. *Head, prothorax,* and *elytra* rather more piceous, or diluted in colouring, than the abdomen, and densely, deeply, and equally punctured throughout: the *first* subtriangular, with the eyes prominent, and the *second* transverse-subquadrate, being nearly equally rounded at the sides. *Antennæ* fusco-ferruginous towards their apex; their base and the *legs* diluted testaceous.

The abbreviated elytra, leaving *five* segments of the abdomen visible, and the elongated basal joint of the hinder feet, will of themselves at once distinguish the genus *Philorhinum* from its immediate allies. The single individual described above, identified by Mr. Janson with the common European *P. humile,* with which it appears in every respect to agree, was detected by Mr. Bewicke at S. Antonio da Serra (in Madeira proper) during the summer of 1859. In the English specimens which I have examined, the males seem to have their antennæ a trifle longer than those of the females, and with the apical joint less abbreviated; and the Madeiran example (a female) seems to coincide in this respect with the corresponding sex of more northern latitudes.

Genus Anthobium.

(Leach) Steph., Ill. Brit. Ent. v. 335 (1832).

Anthobium torquatum, Marsh.

A. rufo-testaceum; scutello, pectore, abdomine antennarumque apice nigricantibus; elytris testaceis, amplis, ad apicem interiorem in fœminis singulatim acuminatis, in maribus postice truncatis.

Long. corp. lin. vix 1.

Habitat Maderam australem, a Dom. Bewicke prope Funchal semel lectum.

Silpha torquata, Marsham, Ent. Brit. i. 127 (1802).
Anthobium torquatum et mucronatum, Steph., Ill. Brit. Ent. v. 339 (1832).
—— *scutellare,* Erichs., Gen. et Spec. Staph. 895 (1840).

A. rufo-testaceous, slightly shining, and sparingly clothed with a short, decumbent, cinereous pile. *Head* very finely and minutely punctulated, and with a large, round, and deep puncture on either side of the forehead behind; its extreme posterior portion, or neck, slightly darker. *Prothorax* still more finely and lightly punctulated, the punctules being scarcely perceptible, even beneath a high magnifying power; transverse, and rather straightened at the sides, the hinder angles being nearly right angles, and the anterior ones rounded off; with a dorsal line down the centre. *Elytra* much more coarsely punctured; ample, and rather dilated posteriorly, covering nearly all the upper surface of the abdomen; a shade paler than the head and and prothorax, being testaceous; their apex truncated in the males; but in the females each elytron is separately produced, or acuminated, at its inner apex. *Scutellum* piceous, free from pile, and coarsely alutaceous. *Abdomen* black. *Antennæ* and *legs* testaceous; with the apex of the *former* darker.

The single specimen described above is, like the last species, due to the researches of Mr. Bewicke, who captured it in his garden at the Palmeira, above Funchal. I have no hesitation in referring it to the common European *A. torquatum,* with which in most respects it agrees precisely; its antennæ, however, are perhaps just perceptibly shorter than is the case in more northern latitudes, and the punctules of its prothorax (which is a *little* less rounded at the sides) are, if possible, even still more obscure. Such trifling differences, however, are scarcely worth noticing, since the insect bears all the essential features of the species with which I have identified it.

Such are the additions to the fauna—49 in all (exclusive, of course, of the *Apotomus Chaudoirii* and the *Chrysomela onychina*, which are merely old species under new names)—which our combined researches have brought to light during the past year and a half in Madeira. As may be gathered from the above statements, of these 49, 21 * were detected by myself, 16 by Mr. Bewicke, 4 by Senhôr Moniz, 4 by Mr. M. Park, 3 by Mr. E. Leacock, and one by the Rev. R. T. Lowe; and it may be interesting to remark that the families into which these accessions distribute themselves are as follows:—*Staphylinidæ* 13; *Curculionidæ* 8; *Lathridiadæ* 7; *Colydiadæ* and *Tomicidæ* 4 each; *Carabidæ* 2; and *Silphidæ, Trichopterygidæ, Mycetophagidæ, Dermestidæ, Bostrychidæ, Cissidæ, Attelabidæ, Bruchidæ, Halticidæ, Tenebrionidæ,* and *Opatridæ*, 1 each. In my last paper on the additions to our Catalogue, written in October 1858, and published in the 'Annals' for the following December, I brought up the list of then detected forms to 593; so that, when further augmented by the 49 of this present paper, the Madeiran Coleoptera, as hitherto observed, amount to no less than 642 well-defined species.

Before closing these remarks, I may just state that the names of the following 13 species, as cited in my last Catalogue, will have, in accordance with the law of priority, to be changed,—subsequent inquiries having proved them to be identical with species previously described. Thus, for *Dromius arenicola* Woll., read *D. patruelis*, Chaud.; for *Pristonychus alatus*, Woll., read *P. complanatus*, Dej.; for *Anchomenus pallipes*, Fab., read *A. albipes*, Fab. (the *Carabus pallipes* of the 'Mantissa Insectorum' being, as I am informed by Dr. Schaum, an American insect of the genus *Tarus*); for *Harpalus litigiosus*, Dej., read *H. tenebrosus*, Dej.; for *Dactylosternum Rousseti*, Woll., read *D. abdominale*, Fab.; for *Monotoma spinifera*, Woll., read *M. spinicollis*, Aubé; for *Microchondrus domuum*, Woll., read *Symbiotes domuum*, Woll. (the genus *Microchondrus* being identical with Redtenbacher's *Symbiotes*); for *Haltica subtilis*, Woll., read *H. procera*, Redt.; for *Haltica Salicariæ*, Payk., read *H. ventralis*, Illig.; for *Longitarsus lutescens*, Gyll., read *L. atricapillus*, Dufts.; for *Longitarsus excurvus*, Woll., read *L. Echii*, Meg.; for *Glæosoma velox*, Woll., read *Moronillus ruficollis*, Jacq.-Duv.; for *Autocera laticeps*, Woll., read *Cnemeplatia laticeps*, Woll.,—the genus *Autocera* being, according to Dr. Kraatz, identical with *Cnemeplatia* of Costa.

* Of these 21, however, there are two which cannot strictly be called recent discoveries, although necessarily treated as additions to our fauna,—namely, the *Longitarsus abdominalis* (which I had inadvertently mixed up amongst my specimens of the *L. nubigena*, collected in 1855), and the *Mycetoporus Johnsoni* (which I had hitherto regarded as a mere state of the *M. pronus*).

XVIII.—*Notes on the Animals of certain Genera of Mollusca.* By Arthur Adams, F.L.S. &c.

Genus Volutharpa, Fischer.

M. Fischer, in his 'Journal de Conchyliologie,' 1855, p. 85, describes a genus under the name of *Volutharpa*, from the shell only. When at Hakodadi, I found the *Bullia Perryi* of Jay, and refer it to M. Fischer's genus; and further north, at Aniwa Bay, Saghalien, I met with *Bullia ampullacea* of Middendorf, and believe it to form another species of the same genus. I procured by the dredge one living specimen of the latter species from a depth of 17 fathoms. The animal is like *Buccinum*, of a white colour sparsely sprinkled with black on the head, foot, and siphon. The tentacles are broad, close together at the base, and rather short, with the eyes on the outer side, near the middle. The siphon is thick and short, and the foot is fleshy, and simple behind. The operculum is subcircular, with concentric striæ of growth; and the nucleus is within the margin, at the fore part.

Thus the simple foot and the possession of eyes remove it from the genus *Bullia*, and the form and texture of the shell from *Buccinum*. The operculum is different from that of *Pseudoliva* or *Gastridia*, and the shell is without the tooth at the fore part of the outer lip. The natural position of the genus is between *Buccinum* and *Pseudoliva*.

Species of Volutharpa.

Deshayesiana, *Fisch.*
same sp. ampullacea, *Midd.* (Bullia).
Perryi, *Jay* (Bullia).
Limnæana, *A. Ad.* (Bullia).

Genus Naticina, Gray.

The animal of this genus resembles that of *Morvillia* or *Limneria*; and the genus should be removed from the family Naticidæ to that of Velutinidæ. The tentacles are short and rather flattened, with the eyes at their outer bases. The mantle lines the shell, and is thickened at the edge, but is not produced beyond, and does not cover the margin of the shell, as it does in *Marsenina* and *Velutella*. The foot is small and oblong, auriculate on each side in front; and there is no operculum. The male organ is large and compressed, and is situated at the outer base of the right tentacle. A fold of the mantle covers the columellar lip of the shell. The animal is timid, crawls very slowly, and is of a dead white colour. Dredged from 46 fathoms, in the Straits of Korea.

Genus Stenothyra, Benson.

The animal of *Stenothyra* or *Nematura* is similar to that of

Hydrobia and *Amnicola.* The rostrum is large, thick, and annulated, and, when the animal is crawling, is extended beyond the fore part of the foot. The tentacles are strong and subulate, and the eyes are large, prominent, and black, on the outer side of their bases. The foot is oblong and moderate, and strongly auriculate on each side in front; the sole and operculigerous lobe are simple. The operculum is subspiral; it is thick and shelly, and is composed of three rapidly enlarging whorls.

I discovered the species *S. punctostriata,* A. Adams, crawling slowly on the moist soil at the roots of grass, between high- and low-water marks, on the banks of the river Yang-tse. It appears to be very sluggish and inactive in its habits.

In Borneo I found another species, *S. olivacea,* A. Adams, adhering to the under surface of dead leaves, and crawling about the soft mud by the sides of ponds. The nature of the operculum places this genus in the same group as *Hydrobia,* and not in the family Viviparidæ, where my brother and myself have arranged it, judging from the similarity of the shell to that of *Bithynia.*

Associated with these little *Stenothyræ,* in considerable numbers, was a species of *Assiminia,* of large size, and, I believe, at present unnamed, if it be not *A. Francisca* of Gray, from India.

The animal of this species progresses very much in the same manner as *Truncatella,* by means of its broad muzzle and short rounded foot. Short cylindric peduncles arise from swollen conical bases, wide apart on the upper surface of a flattened head, beyond which a dilated muzzle, bilobed at the end and ringed with black-brown lines, extends far beyond the front edge of the foot. A line is conspicuous on the sides of the peduncles, indicating the union of the tentacles and eye-pedicels. The eye, with a pale iris and a large black pupil, is placed at the end of an oblong bulb. The sides of the foot are marked with lateral, wavy, light brown dotted lines; the sole is ovate, obtuse at both ends, and of a dull dirty white. The operculum is thin, horny, subspiral, and rather pointed behind.

Genus Umbonium, Link.

At Hakodadi I had an opportunity of examining the animal of *Umbonium giganteum* of Lesson, which occurs along the sands of the bay, but is extremely difficult to obtain alive without dredging for it. I found Dr. Gray's account of the creature to be very correct in the main; but I imagine the simplest view of the nature of the veil is to consider it a dilatation of the left tentacle. The lateral membrane in this species has four filaments on each side, whereas in *U. vestiarium,* Linn. (*Rotella lineolata,* Lam.), Dr. Gray mentions only three. The eye-peduncles are as long as the tentacles, and flattened; and the eyes are not well developed—less so on the right side than on the left. The absence of a rostrum, and other peculiarities, perfectly justified the learned Doctor in raising *Umbonium* to the rank of a family. Mr. Fairbank had evidently seen the animal alive; but, owing to his imperfect acquaintance with the nature or names of the organs of Mollusca, his description is not only obscure, but absurd.

Genus Photinula, H. & A. Adams.

In the animal of the species of *Photinula*, which I observed, the eye-pedicels are not so distinct from the tentacles as in most Trochidæ; the head-lobes are simple, the muzzle is broad, the neck-lappets are large, and there are four tentacular filaments on each side on the lower edge of the lateral membrane. From this description it will be seen that the position assigned to this genus by Dr. Gray, in his 'Guide to Mollusca,' is not correct, the animal differing very materially from that of the genera *Umbonium* or *Rotella*. It indeed belongs to the Trochidæ, and is most nearly allied to *Margarita*; but the shell differs in texture and form, and is not umbilicated. In *Gibbula* the number of the lateral vibracula is three on each side; the same appears to be the case in *Oxystele*, which genus *Photinula* most resembles; while in *Margarita* there are five filaments on each side—two on the lateral membrane, and three on the opercular lobe.

Genus Macroschisma, Swainson.

At Tabu-Sima, a small island about thirty miles from Niegata, in Niphon, Japan, I dredged, at 25 fathoms, and at a quarter of a mile from the shore, two living examples of *Macroschisma*.

The shell is not situated near the hinder end of the animal (as Mr. Cuming, to the best of his recollection, believes), but on the fore part; and the apex of the shell is not anterior, as Dr. Gray states, but subcentral and inclined backwards.

The animal is very large and elongated, bearing the shell in a sloping direction obliquely upwards on the fore part of the body. The tentacles are filiform and very long, with the eyes large, black, and conspicuous, on slight swellings at their outer bases. The front edge of the mantle is extended, and gives the appearance of a large veil over the head. The mantle is not developed, covering the shell, as in *Fissurellidæ*; and neither the mantle-margin nor anal tube is fringed. The edge of the mantle is furnished with short papillæ, four on each side and two behind, which are recurved over the edge of the shell. The anal tube is elongate and cylindrical, and is directed backwards and a little upwards through the fissure in the shell. The foot, large and fleshy, is produced behind, and tapering. In outline it is ovate; and there are no papillæ or cirrhi on the sides. In progression, the form of the foot varies considerably, sometimes being greatly dilated at the sides, and at others extended in front and contracted and pointed behind.

Genus TUGALIA, Gray.

The head in this genus, as in other *Fissurellidæ*, is rostriform and annulated; the tentacles are long and subulate; and the eyes, black and prominent, are placed on their outer bases. The mantle is double-edged; the upper edge is reflected over and covers a considerable portion of the margin of the shell; the lower edge forms a deep plicate curtain, simple on its free dependent edge. Over the head this free simple margin forms a fold, which is received into the emargination at the fore part of the shell. Under this curtain, on the side of the foot, is a row of tubercles. The foot is strong, of moderate size, ovate, and rather produced behind, and is margined along the lower edge.

The species I have observed is, perhaps, *Tugalia parmophoroides* or *Emarginula parmophoroides* of Quoy.

From the description it will be seen that the animal most nearly approaches that of *Scutus*; but the shell is more exposed, and the tentacular filaments on the side, seen in *Scutus*, are reduced in this genus to tubercles. In Rüppell's figure of *T. elegans*, Gray (or *P. australis*, Rüpp., not Quoy), the mantle is shown covering much more of the shell than in my Japanese species. There is an *Emarginula* figured by Savigny which is very similar to my *Tugalia*; but the fissure shown in the shell proves it to be a true *Emarginula*.

Genus TOMICHIA, Benson.

I have discovered two species of *Tomichia* in the Japan islands. In both these the animal is generically the same.

The rostrum is flattened, bilobed and dilated at the end, and conspicuously annulated on its upper surface. The tentacles are very short, flattened, and triangular. The eyes are large, black, and sessile on the upper surface and outer side of the bases of the tentacles, and are surrounded by a light-coloured areola. The foot is large, rounded in front and behind, and is divided a little before the middle by a transverse groove.

In crawling, the animal progresses, like *Pedipes*, by alternately advancing the fore part of the foot and bringing up the hind part; the muzzle is also used as an aid to progression, just as it is in *Truncatella*, which genus *Tomichia* seems most to resemble; in fact, judging from an allusion to the animal, I should imagine the *Truncatella dubiosa* of the late lamented Professor C. B. Adams to be a species of *Tomichia*.

On the side of the foot is seen a dark line, which indicates the position of the opercular lobe. In one species, from Matsumai, this dark-coloured lobe is more conspicuous than in the other, from Sado.

Both species are found on damp banks covered with vegetation, in rocky situations near the sea.

The colour of the long head and flattened rostrum is light blackish-brown; and the foot is pale brown, with the sole nearly white. The obtuse tips of the triangular tentacles are dark, and may have induced Mr. Benson to name *Diplommatina* (a genus not far removed in organization from *Tomichia*) the "double-eyed,"—the existence of two eyes on each side being extremely improbable.

Shanghai, Feb. 20, 1860.

XIX.—*Description of a new species of Cassowary living in the Menagerie of the Babu Rajendra Mullick at Calcutta.* By Edward Blyth, Curator of the Royal Asiatic Society's Museum, Calcutta*.

Casuarius uno-appendiculatus, nobis, n. s., is so named from its peculiarity of having but a single pendulous caruncle in front of the neck. Specimen apparently more than half-grown, and much paler in the colouring of its plumage than specimens of the same age of the common *C. galeatus*, two fine examples of which are associated with it in the same paddock. In lieu of the two bright-red caruncles of the latter, the new species has but a single, small oblong or elongate-oval, *yellow* caruncle; and the bright colours of the naked portion of the neck are differently disposed. The cheeks and throat are smalt-blue, below which is a large, wrinkled, yellow space in front of the neck, terminating in front in the oval button-like caruncle, and its lower portion being continued round behind; while on the sides of the neck the yellow naked portion is continued down to its base, the bordering feathers more or less covering and concealing this lateral stripe of unfeathered skin: on the hind part of the neck the bare yellow skin is not tumid and corrugated as in the common Cassowary, where also this part is bright red. The casque is about equally developed at this age in the two species. The legs of the new species are smaller, from which circumstance I doubt whether it attains to quite so large a size as the other†.

* From the Journal of the Royal Asiatic Society of Bengal (1860), vol. xxx. p. 113. Communicated by P. L. Sclater.

† It appears, by a letter from Mr. Westerman, that a living Casso-

XX.—*The Cyclostomas of Madeira belonging to the Genus* Craspedopoma *of Pfeiffer: with Descriptions of Four new Madeiran and One new Canarian Species.* By R. T. Lowe, M.A.

1. *C. lucidum*, Lowe.

T. globoso-conoidea abbreviato-obesiuscula læviuscula nitida solidiuscula obsoletissime angulato-carinata v. ecarinata subimperforata s. rima angustissima strictissima v. fere clausa; spira abbreviata, anfr. subtumido-convexis transverse inæqualiter substriatis, aliquando indistincte creberrime hinc inde transverse subtilissime striatis spiraliterque obsoletissime striolatis, ultimo majore latiore ventricoso, sutura valde impressa; apertura spiram fere æquante. —Prim. 66; Catal. Moll. Mad. in Proceed. Zool. Soc. 1854, 216; Pf. Mon. Pneum. 51. nº. 88.

a. polita; lævissima nitidissima plerumque major, striolis transversis inæqualibus exoletis, spiralibus nullis.—Prim. *l. c.* t. 6. f. 40; Küst. Mart. et Chemn. t. 13. ff. 26, 27.

Long. 6½–6¾, diam. 6–5¾ mill.; apert. 3, spira 4 longa; anfr. 4½–5.

β. rustica; sericeo-nitens paulo plerumque minor, striolis transversis creberrimis subtilissimis distinctiusculis, spiralibus exoletissimis obscuris paucis hinc inde obsoletissime punctulatim subdecussata.

Long. 5–6, diam. 5¼–5½ mill.; apert. 3, spira 3 longa; anfr. 4½–5.

Hab. in Maderæ declivibus sylvaticis dumosisve rupibusve humidis supra 1500 ped. ubique recens, necnon fossilis ad Caniçal, *β* vulg., *a* rara. Neque in Portu S^to^ neque in Desertis recens fossilisve occurrit; exemplar enim unicum Porto-sanctanum, ex quo in Catal. Moll. Mad. *l. c.* *C. lucidum* "In Portu S^to^ tantum fossile rariss." dicitur, ad *C. flavescens* v. *Neritoides* procul dubio potius spectat. In Canariis etiam *C. lucidum* omnino deest.

Extremely variable in colour: either dark olivaceous approaching to greenish black, chestnut, or coffee-brown of various intensity, with often a single light band on the last volution, or light-yellowish straw or olive horn-colour; and either plain, or varied with dark bottle-green or light yellowish spiral lines or longitudinal stripes or strigæ.

It is also variable in the prominency of the angle of the last volution, which is, however, mostly altogether obsolete or evanescent.

Traces of a few faint, obsolete, irregular, spiral striæ are usually discernible in *β* below the suture, on the last volution, towards the peristome, or in the neighbourhood of the umbilical cleft. Opercle reddish chestnut.

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wary, distinct from *C. galeatus*, and apparently of this species, has just been received by the Zoological Society of Amsterdam. Another new species has recently been described in the Proceedings of the Zoological Society of London (1860, pp. 211 & 250), from a bird in their Gardens, under the name *C. bicarunculatus*, making the fifth of the group.—P. L. S.

2. *C. Neritoides.*

T. *ovato-conoidea* nitida solidiuscula *distincte angulato-carinata* subimperforata s. rima angustissima strictissima v. fere clausa, griseo-fulva vel chalybeo-cœrulescens; spira conica subabbreviata, anfr. convexo-planatis spiraliter obsoletissime et transverse exilissime creberrimeque striolatis, ultimo majore subventricoso; sutura distincta haud impressa; apert. spiram subæquante.

Long. 5–5½, diam. 4½–5 mill.; apert. 2¾, spira 3 longa; anfr. 4½.

Hab. in Maderæ sylvaticis humidis ad alt. 2000 fere ped. loco "Lombo da Vaca" dicto ad S. Vicente oræ Septentr. Maderæ.

Possibly merely an extreme form of *C. lucidum β*, but peculiar in colouring and habit, as well as shape and contour. I possess only three examples, found by myself in July 1850.

Smaller than *C. lucidum β*. Spire more conical, with straight sides and flattened volutions. Colour very peculiar, dark fulvous-grey or purplish liver-brown approaching to black, with a metallic steely lustre, and suffused, or blotched and marbled, with pale straw-colour. Opercle bright sienna-red or reddish chestnut.

There is something in the colour, shape, and habit of this pretty little shell, reminding one of *Littorina Neritoides* (L.).

3. *C. flavescens.*

T. *pyramidato-conoidea sericeo-nitens tenuis* distincte angulato-carinata subimperforata s. rima angustissima strictissima v. fere clausa, pallide stramineo-flavescens v. virescens unicolor; spira subpyramidata subproducta, anfr. planiusculis spiraliter distinctiuscule tenuissimeque et transverse exilissime creberrimeque striolatis v. subtilissime reticulatim decussatis, ultimo vix majore subventricoso; sutura distincta haud impressa; apert. spira distincte breviore.

Long. 5½–6, diam. 4–5 mill.; apert. 2¾, spira 3½ longa; anfr. 5.

Hab. in Maderæ sylvaticis dumosisve humidis ad alt. 3000 fere ped. convallium Rib. Frio et Rib. da Metade, cum *C. lucido α* et *β* commixta.

Possibly a mere elongated form of *C. Neritoides*; but, besides the more produced spire and pyramidal shape, it also differs in its thinner, lighter shell, of a uniform pale brown or straw-colour, with sometimes a greenish tinge. The opercle is bright sienna-red or reddish chestnut.

About two dozen examples of this shell occurred in a bag containing many hundred specimens of *C. lucidum* (principally var. *β*), collected by me in August and September 1849, along the Levada in the above-named ravines. I had considered it to be the male of *C. lucidum*, on account of its more pyramidal or slender form; and, notwithstanding the obvious discrepancies expressed above in the diagnosis, I am by no means clear that it may not eventually prove to be so.

4. *C. Monizianum.*

T. subpyramidato-conoidea sericeo-nitens tenuiuscula omnino ecarinata laxiuscule rimato-perforata fusco-coffeacea; spira elevatiuscula subproducta, anfr. æquicrescentibus subdepressiusculis tumidis, striolis vel subtilissimis creberrimis æquissimis distinctis transversis alias spirales obsoletas valde indistinctas tenuissime reticulatim decussantibus, ultimo subdepresso haud ventricoso; sutura valde impressa profunda; apert. spira distincte breviore.

Long. 5–5½, diam. 4½–5 mill.; apert. 2¼, spira 3–3¼ longa; anfr. 5.

Hab. in Promontorio "Garajão" vel "Brazen Head" dicto Maderæ in scaturigine v. rupe madida.

The volutions are even more tumid, and the suture more deeply impressed, than in any form of *C. lucidum*, from which it differs also in its smaller size, elongate pyramidal shape, open rimal perforation, and regularly increasing, vertically slightly flattened or depressed, reticulately striolate volutions. Colour uniform plain dark coffee-brown. Opercle unknown.

Named in honour of my able and observant botanical friend Sr. J. M. Moniz, who found it last year on the Brazen Head, near Funchal, and who, supposing it to be distinct from the common *C. lucidum*, has most liberally furnished me with two out of his four or five specimens. On referring to my own collections, I find, however, four examples of precisely the same shell, collected by myself on the same spot in January 1851, and kept apart for ulterior examination. Thus a sufficiency of specimens exists to warrant some reliance on the constancy of the above-recorded characters.

I desire to commend, however, all the four preceding species to the close study and attention of observers on the spot, who alone will be able to decide by examination of the animals, and more numerous examples of the shells from the same or different localities, whether the above differences are merely sexual and varietal, or really good and valid. For myself, I must confess to having either overlooked or disregarded them as unimportant until very recently.

5. *C. annulatum.*

T. breviter subpyramidato-conoidea sericeo-nitens tenuiuscula largiuscule rimato-umbilicata omnino ecarinata fusco-coffeacea; spira elevatiuscula subproducta, anfr. æquicrescentibus valde tumidis depressis, intermediis costis æquidistantibus transversis concinniter annulatis ceterum omnino lævigatis vel aliquando tenuissime et obsoletissime spiraliter substriolatis, ultimo depresso haud ventricoso peristoma versus exannulato costis vel rarioribus v. evanescentibus v. nullis; sutura valde profunda inciso-impressa; apert. spira vix breviore.

Long. 4–4½, diam. 4–4½ mill.; apert. 2–2½, spira 2½ longa; anfr. 4½.

Hab. in declivibus rupibusve humidis sylvarum Insularum Canariensium Ferri (Hierro) ad locum "El Golfo" dictum, necnon Palmæ in convallibus "Barranco de Agua" et "Barr° de Galga" dictis.

Three examples of this very distinct little species were found first by Mr. Wollaston, when we explored together, in February 1858, for three or four days, the vast and magnificent sylvan amphitheatre of El Golfo, on the north-west coast of Hierro; and we each discovered a few more subsequently in two localities in Palma, where it appears, like several *Helices*, to have escaped the extensive, though by no means "exhaustive," researches of Herr Blauner.

Opercle (in a single Hierro example) pale yellowish horn-colour, thin, with membranous colourless edges, and obscurely spiral.

6. *C. Lyonnetianum*, Lowe.

T. conoideo-pyramidata trochoidea sericeo-nitens solidiuscula angulato-carinata anguste rimato-perforata fusco-coffeacea; spira elevato-producta pyramidata, anfr. æquicrescentibus convexo-planatis æqualiter et concinniter exilissime et creberrime spiraliter, inæqualiter et rudiuscule v. subgrossiuscule transverse striatis; sutura distincta impressa; apert. spira distincte breviore.—Syn. Diagn. 15. n° 70; Catal. Moll. Mad. 217; Pf. Mon. Pneum. 52. n° 89.

Long. 4–5, diam. 3–3½ mill.; apert. 1¾–2, spira 2¼–3 longa; anfr. 5–5½.

Hab. in rupibus declivibusque irriguis convallium (Rib. de S^ta Luzia et Rib. do Inferno) Maderæ recens, necnon fossilis ad Caniçal.

Opercle thin, obscurely spiral, pale yellowish or horn-colour, with whitish membranous edges.

7. *C. trochoideum*.

T. abbreviato-conoidea exacte trochiformis nitida tenuiuscula acute angulato-carinata imperforato-rimata, rima fere v. omnino clausa; spira conico-acuta, anfr. inæquicrescentibus planatis, striolis spiralibus creberrimis exilissimis æqualibus alias transversas tenues exoletas crebras subinæquales subtilissime decussantibus, ultimo subito majore antice sursum subdilatato abrupte ascendente, subtus fere planato; sutura distincta parum impressa antice subito ascendente; apert. spira vix breviore.

Long. 4¼–4½, diam. 4–3¾ mill.; apert. 2, spira 2¼–2½ longa; anfr. 5½.

Hab. in convalle "Rib. do Inferno" dicta oræ Septentr. Maderæ.

Described from three living examples (wanting the opercle), kindly lent me for the purpose by T. V. Wollaston, Esq., who received them from S^r. Moniz and Mr. T. S. Leacock. They were discovered in the locality above recorded in 1859 by a German naturalist, whose name, unfortunately, Mr. Wollaston does not precisely recollect, but which otherwise would have been deservedly commemorated by its employment as a designation for this most distinct and elegant little species, which, with the same sculpture, size, and general features as *C. Lyonnetianum,* yet differs from it markedly in its exactly trochiform, shorter, or more broadly conical shape, with a flat or flattened base, sharp keel, shorter, less pyramidal, straighter-sided spire, and flatter volutions: resembling a miniature *Trochus Niloticus* or *zizyphinus,* L. The colour is, in one example, pale straw, with spiral bands of dark fascicled hair-like lines; in another very dark brown, with narrow spiral yellowish- or greenish-white lines; and the third is uniform plain coffee-brown,—the flattened base, except the keel, being in all three of the latter colour.

Lea Rectory, July 12, 1860.

XXI.—*Mollusca Japonica: New Species of* Aclis, Ebala, Dunkeria, *&c.* By Arthur Adams, F.L.S. &c.

The genus *Aclis* of Lovén should, I believe, be distributed into four genera:—*Aclis,* or those "cingulis elevatis acutis obducti;" *Ebala,* Gray, of which *A. nitidissima* is the type; *Hyala,* H. & A. Adams, of which *A. unica* is an example; and *Dunkeria* of Carpenter, which has cancellated whorls, and is neither an *Aclis* nor a *Turbonilla.* I here indicate four species of *Aclis,* two of *Ebala,* and three of *Dunkeria,* all of which I believe to be new.

I add a notice of a very elegant little shell, which appears to me to be a subgenus of *Scala,* and different from the *Aciona* of Mörch, which is founded on *Scalaria borealis,* Beck (= *S. Eschrichtii,* Hold. & Möll. = *S. undulata,* Sow.), a species of which I obtained on the coast of Manchuria. I also add descriptions of a fourth species of *Isapis,* H. & A. Adams, and one of *Cranopsis,* A. Adams.

Genus Aclis, Lovén.

Testa turrita, rimata; anfractus numerosi, cingulis elevatis acutis obducti. Apertura ovalis.

Aclis labiata, A. Adams.

A. testa turrita, rimata, alba; anfractibus $7\frac{1}{2}$, convexis, cingulis tribus acutis prominentibus, in anfractu ultimo quatuor, interstitiis simplicibus, profundis; apertura ovali, expansa; labio simplici; labro expanso, antice subreflexo, margine integro, arcuato.

Hab. Off Mino-Sima; 63 fathoms.

Aclis cingulata, A. Adams.

A. testa turrita, rimata, alba; anfractibus $6\frac{1}{2}$, convexis, cingulis duobus acutis prominentibus, tribus in anfa ctu ultimo, interstitiis simplicibus profundis; suturis impressis; apertura rotundato-ovali; labio simplici; labro producto et arcuato.

Hab. Off Mino-Sima; 63 fathoms.

Aclis lirata, A. Adams. Am.

A. testa turrita, rimata, perforata, gracili, alba; anfractibus 13, convexis, lirulis transversis, subobsoletis obductis; apertura rotundato-ovali; labio simplici; labro acuto, integro.

Hab. Off Mino-Sima; 63 fathoms.

Aclis sulcata, A. Adams.

A. testa turrito-conica, anguste umbilicata, alba; anfractibus $4\frac{1}{2}$, tumidis, transversim valde sulcatis, sulcis quatuor, cingulis quatuor alternantibus, in anfractu ultimo circiter octo; apertura rotundato-ovali; labio simplici; labro margine recto, acuto, integro.

Hab. Mino-Sima; 63 fathoms.

Genus Ebala, Gray.

Testa elongato-turrita, gracilis, imperforata, lævis, subpellucida; anfractus numerosi. Apertura ovalis; labio rectiusculo, superne tortuoso, non plicato; labro acuto, margine recto.

Ebala virginea, A. Adams.

E. testa imperforata, turrita, gracili, alba, nitida; anfractibus $11\frac{1}{2}$, convexiusculis, ad suturas rotundatis; apertura ovali; labio rectiusculo, superne tortuoso; labro simplici acuto.

Hab. Off Mino-Sima; 63 fathoms.

Ebala vestalis, A. Adams.

E. testa imperforata, turrita, gracili, alba, nitida; anfractibus $11\frac{1}{2}$, planiusculis, lævibus, ad suturas angulatis; apertura ovali; labio rectiusculo, superne tortuoso; labro simpliciter acuto.

Hab. Off Mino-Sima; 63 fathoms.

Genus Dunkeria, Carpenter.

Testa elongato-turrita, imperforata; anfractus numerosi, cancellati. Apertura ovalis; labio arcuato, simplici; labro margine crenato.

Dunkeria fusca, A. Adams.

D. testa turrita, imperforata, fusca aut rufo-fusca; anfractibus $8\frac{1}{2}$, tumidis, liris circiter tribus, in anfractu ultimo plurimis, spiralibus et costellis longitudinalibus clathratis; apertura ovali; labio arcuato; labro margine crenulato.

Hab. Tabu-Sima, Sea of Japan; 25 fathoms.

Dunkeria asperulata, A. Adams. B.M. 1878.1.28.176

D. testa turrita, albida, imperforata; anfractibus $7\frac{1}{2}$, convexis, cingulis tribus transversis prominentibus et costellis longitudinalibus clathratis, costellis ad cingulos tuberculis acutis asperulatis; anfractu ultimo cingulis quatuor et aliis basalibus minoribus instructo; apertura ovali; labio simplici, labro margine valde crenato.

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

Dunkeria pulchella, A. Adams.

D. testa turrita, sordide alba, imperforata; anfractibus $7\frac{1}{2}$, convexis, cancellatis, cingulis quatuor tenuibus transversis, et liris lamellosis longitudinalibus numerosis ad cingula crenatis, anfractu ultimo cingulis quinque circumcincto; apertura ovali; labio simplici; labro margine crenulato.

Hab. Off Mino-Sima; 63 fathoms.

I have not described the nucleolar whorls of these shells, as they appeared to me in each case to be very similar; nor have I recorded any broken fragments of others, which were numerous.

Genus Scala, Klein.

Subgenus Scaliola, A. Adams.

Testa turrita, umbilicata; anfractus simplices, ultimus solutus. Apertura circularis, peritremate continuo, recto, margine acuto.

Scaliola bella, A. Adams.

S. testa turrita, umbilicata, alba; anfractibus $7\frac{1}{2}$, rotundatis, simplicibus, ultimo soluto; suturis profundis; apertura circulari, peritremate continuo, recto, margine acuto.

Hab. Sea of Japan; off Tabu-Sima; 25 fathoms.

Genus Isapis, H. & A. Adams.

Isapis lirata, A. Adams.

I. testa ovoidea, pallide fusca, rimata, solida, liris transversis, validis, interstitiis simplicibus ornata; anfractibus 3, ultimo magno, ovato; apertura oblonga, antice acuminata, subreflexa; labio crasso, arcuato, in medio dente acuto instructo; labro intus lævi.

Hab. Off Mino-Sima; 63 fathoms.

This genus is quite distinct from *Leucotina*, which is thin and has an oblique fold on the columellar lip, and not a distinct tooth as in *Isapis*.

Isapis now numbers four species: namely *anomala*, C. B. Adams; *maculosa*, Carp.; *ovoidea* (*Narica*), Gould; and *lirata*, A. Adams.

Cranopsis pileolus, A. Adams.

C. testa ovali, compressa, pileiformi, apice postice recurvo, revoluto, subspirali, ad marginem posticam inclinato; superficie liris radiantibus, interstitiis anguste clathratis, sculpta; fissura lineari, intus supra concamerata, extus lamellis lateralibus elevatis instructa; apertura angusta, oblongo-ovali, margine crenulato, postice expanso, reflexo.

Hab. Straits of Korea; 63 fathoms.

This species is smaller than *C. Pelex*, A. Adams, and is laterally compressed; and the vertex is subspiral, and posteriorly deflexed so as nearly to reach the hinder margin. The interstices of the radiating ribs or liræ are crossed by transverse or concentric bars placed close together, so as to produce a narrowly clathrate style of sculpture. Many specimens were obtained, all of the same size and character, in company with young and old specimens of *Emarginula*. When in the young state, the fissure extends as far as the front edge; and when very young, these shells resemble, in respect of the emarginate aperture, species of *Emarginula*.

Shanghai, Feb. 1, 1860.

XXII.—*A Synoptical List of the British Species of* Teredo, *with a Notice of the Exotic Species.* By J. Gwyn Jeffreys, Esq., F.R.S.

Teredo *Auctorum.*

A. *Having simple pallets* (claustra, operculi vice fungentia—"opercula," *Lovén*).

1. *T. Norvagica*, Spengler.

Bruma delle navi, Vallisnieri.
T. navium, Sellius.
T. navalis, Montagu, and all other British conchologists except Forbes and Hanley.
Fistulana corniformis, Lamarck.
T. nigra, Blainville.
T. Bruguierii, Delle Chiaje.
T. Deshaii, Quatrefages.
T. fatalis, ej.
T. Senegalensis, Laurent.
Var. *T. divaricata*, Fischer.

Habitat: Channel Isles, in submerged wood (Lukis); Budleigh Salterton, Devonshire, in the timbers of a steamer which was wrecked between two and three years ago, and is now partly uncovered at very low tides (Barlee).

2. *T. megotara* †, Hanley.

Bruma dell' oceano, Vallisnieri.
T. oceani, Sellius.
T. dilatata, Stimpson.

Habitat: in floating wood thrown up on the coast; Swansea

Bay (Jeffreys), Scarborough (Leckenby), Oban (Bedford), Guernsey (Lukis), Sussex (Dennis).

3. *T. nana* †, Turton.

Pholas Teredo, Müller (Zool. Dan. prodr.) and Fabricius?
T. navalis, Möller?
T. denticulata (Gray), Fischer.

Habitat: in floating wood thrown up on the coast; Carmarthen Bay (Jeffreys), Larne, County Antrim (Paterson), Guernsey (Lukis). It occurs with the next species, as well as with *T. megotara*, but it is by no means so gregarious or abundant as either of those species.

It differs from *T. megotara* in the valves being more compressed and solid, in the anterior auricle being much smaller and having a more obtuse angle and fewer striæ, in the posterior auricle being larger and higher, and especially in the very strong and prominent tubercle or false tooth. The tube of *T. nana* appears to be destitute of calcareous lining, except towards the entrance, while *T. megotara* forms a solid tunnel; and the lunule of the pallets is more incised in *T. nana*. Adult specimens measure 21 inches in length. The Turtonian types decidedly belong to this species, and not to *megotara*.

4. *T. subericola*, n. s. (Macgillivray, MS.)

Tube rather thin, and adherent to wood, short, of the form of an elongated cone, curved at the opening, with internal irregular transverse septa, which are close-set at the extremity. *Valves* oval, rather convex, thin; body smooth and somewhat glossy; anterior auricle short, angle obtuse, striæ rather numerous; posterior auricle narrow, falciform, reflected at the outer edge, with its apex raised above the crown; tubercle strong and prominent; fang long, narrow, and incurved; apophysis rather broad. *Pallets* short, pear-shaped, compressed, and expanded towards the anterior margin, with a semilunar depression in the middle and a longitudinal groove in front; stalk short and pointed.

Dimensions: length (of valves) $\frac{5}{20}''$, breadth $\frac{4}{20}''$.

Var. *minor*.

Habitat: Guernsey, in drift fir (Lukis); var. *minor*, Aberdeen, in cork (Macgillivray), Swansea and Carmarthen bays, in fishermen's cork net-floats (Jeffreys), Plymouth (Webster), Falmouth (Norman), in similar material. The embryonic state of some of the specimens which occur living in cork, as well as the nature of the material, induce me to consider this species indigenous. The posterior auricle is so small in comparison with that of *T. megotara*, that Dr. Lukis proposed the name of "microtara" for this species. Specimens in cork are frequently encysted.

5. *T. malleolus*†, Turton.

Habitat: in floating wood thrown up on the coasts of Carmarthen Bay (Jeffreys), Guernsey (Lukis), Sussex (Dennis).

6. *T. excavata*†, n. s. (Lukis, MS.)

Tube short, rather solid, and detached from the wood, slightly curved, jointed at intervals, with a very few internal transverse wrinkles at the opening, and an indistinct siphonal ridge. *Valves* roundish-oval, thin, compressed; body glossy, marked with distant, but regular and fine, striæ or impressed lines; anterior auricle placed nearly at a right angle with the insertion of the fang, striæ rather numerous and waved; posterior auricle dilated and somewhat reflected, apex nearly on a level with the crown or umbo of the valve, inner margin free and well defined; tubercle slight, and not visible when the valve is in a supine position; fang obtuse; apophysis thin and narrow. *Pallets* long and narrow, bifid in front to nearly half their length, with two corresponding tubular cavities which terminate in separate points like the prongs of a steel fork; underneath they are abruptly sloped towards the bifurcate points, and closely striated in a longitudinal direction; stalks nearly as long as pallets, pointed at one end and at the other merging into the pallets.

Dimensions: length (of valves) $\frac{5}{20}''$; breadth $\frac{4}{20}''$.

Habitat: in drift fir, Guernsey (Lukis), Sussex (Dennis); rare. In the shape of the pallets this species is allied to *T. elongata*.

7. *T. bipartita*†, n. s.

Tube ....? *Valves* oval, thin, compressed, covered with a brownish epidermis; body smooth and glossy; anterior auricle moderately developed, angle rather obtuse, striæ very numerous and crowded; posterior auricle rounded, small but prominent, appressed to body, apex placed below the crown, internal margin indistinct; fang narrow and pointed; tubercle small; apophysis narrow. *Pallets* resembling those of *T. pedicellata*, but longitudinally divided into two equal parts by a deep furrow; stalk cylindrical, rather longer than pallet.

Dimensions: length (of valves) $\frac{4}{20}''$; breadth $\frac{3}{20}''$.

Habitat: in *Cedrela odorata* (or "West India Cedar"), thrown ashore, perhaps by the gulf stream, at Guernsey, with *T. spatha* (Lukis).

8. *T. pedicellata*, Quatrefages.

Habitat: Channel Isles, in submerged wood (Lukis); in the piles of Yarmouth Pier, with the next species (Jeffreys); in fishermen's stakes, Herne Bay (Metcalfe).

Although the valves in adult specimens bear a close resemblance to those of the following species, the pallets are unmistakably different; and in the young the striæ on the anterior auricle of the valves are much fewer, and consequently more remote than in that species. Where both species occur together, the present occupies the outer layers of the wood, while the other penetrates into its recesses. Quatrefages discovered this species at Guibuscoa, on the north coast of Spain; and I noticed it in some wood which M. Deshayes had taken on the Algerine coast. The tube is a beautiful object, being jointed in an imbricated manner, like the stalk of an *Equisetum.*

9. *T. marina,* Sellius.

Serpula Teredo, Da Costa.
T. navis (Dentalium), Linn. in Fn. Suec.
T. navalis, ej. Syst. Nat.
T. Batava, Spengler.

HABITAT: in the piles of Yarmouth Pier, and too frequently in the Medway and lower part of the Thames (Jeffreys). Ramsgate Pier (Rev. Sir Charles Macgregor, Bart.). It is the Dutchmen's pest; and they do not appear to be favoured with any other kind.

Sellius used the binomial appellation throughout, although the date of his valuable and interesting monograph is long anterior to the time of Linnæus. It was Sellius, and not Adanson, who first indicated the affinity of *Teredo* to *Pholas.*

10. *T. spatha* †, n. s.

Tube rather long and flexuous, detachable, regularly jointed, increasing rapidly from the extremity, inside which there are a few transverse wrinkles and a sharp, but short, siphonal ridge. *Valves* triangular, compressed, rather solid; body smooth; anterior auricle large, angle about 50°, striæ exceedingly numerous and fine; middle area unusually large and broad, beading very minute; posterior auricle obtuse, small, rounded and appressed, internal margin indistinct; fang narrow and pointed; tubercle small and sunk; apophysis narrow. *Pallets* spade-shaped, in the young state calyciform; stalk of the same length as pallet.

Dimensions: length (of valves) $\frac{6}{20}''$; breadth nearly as much.

HABITAT: with *T. bipartita,* in *Cedrela odorata,* at Guernsey (Lukis).

A pair of pallets is in the British Museum, from Miss Saull; and another pair is in the Collections of Natural History at the

Jardin des Plantes. The localities of both the last-mentioned specimens are unknown.

11. *T. fusticulus*†, n. s.

Tube short and straight, with a slight calcareous lining, which is not easily separated from the wood. It is thickened internally at the opening, and has a few transverse wrinkles in that part. *Valves* round, thin, compressed; body smooth, glossy, white under a brown epidermis; anterior auricle of moderate size, angle about 50°, striæ numerous; posterior auricle round, expanded, and appressed to body, internal edge well defined; fang broad, obtuse; tubercle small and sunk; apophysis thin and narrow. *Pallets* club-shaped, formed of several transverse layers, and externally tuberculate; stalk twice the length of pallet.

Dimensions: length (of valves) $\frac{4}{20}''$; breadth nearly as much.

HABITAT: in *Cedrela odorata* from Leith (Jeffreys).

B. *Having compound pallets* (Xylotrya, *Leach*).

12. *T. cucullata*†, n. s. (Norman, MS.)

Tube long, thick, not easily detached from the wood, internally wrinkled near the opening. *Valves* roundish-oval, rather convex; body marked transversely, but regularly, with a few striæ or impressed lines; anterior auricle small, angle obtuse, striæ numerous; posterior auricle dilated and appressed, having its apex nearly on a level with the crown or umbo of the valve, inner edge free and overlapping the body; fang broad; tubercle small; apophysis sickle-shaped. *Pallets* composed of 20–30 calyciform joints or *cuculli*, which are broad on the outer surface, and slightly overlap one another in succession, lateral edges setaceous, with short filaments; stalk cylindrical, of same length as pallet.

Dimensions: length (of valves) $\frac{8}{20}''$; breadth $\frac{6}{20}''$.

HABITAT: in drift fir-wood, Guernsey (Lukis); Sussex coast (Dennis); in teak, with the next species, at Belfast (Thompson).

The pallets resemble those of *T. minima*, Blainville (*T. palmulata*, Philippi), in having the front margin quite plain; but they differ in the joints being of nearly equal breadth throughout, and (especially in the earlier stage of growth) being much more numerous and compact. The pallets of *T. cucullata* are also three or four times as long as those of *T. minima*. The tube and valves of each species are easily distinguishable.

13. *T. fimbriata* †, n. s.

T. palmulata, Forbes and Hanley, but not of Lamarck or Philippi.

Habitat : in teak-wood, Leith (Jeffreys).

The minute description of this species which is given in the 'History of the British Mollusca' makes it unnecessary to add anything to it; but I may remark that the front margin of the pallet is fringed, as in *T. pennatifera* and *bipennata*, and that the valves are more nearly allied to *T. fusticulus* than to the *T. palmulata* of Philippi.

14. *T. pennatifera* †, Blainville.

Habitat : in floating wood thrown up on the coast of Guernsey (Lukis); Beachy Head (Dennis). In France it has occurred under similar circumstances at Cherbourg.

15. *T. bipennata* †, Turton.

T. carinata (partim), Gray.

Habitat : with the last.

This species requires further investigation, because of the similarity of its valves to those of *T. malleolus*, and of its pallets to those of *T. pennatifera*. The former appear, however, to present a difference in being more arched and solid than in *T. malleolus*, with the anterior auricle larger and having more striæ, as well as in the posterior auricle being usually smaller; and the latter in having a much shorter and thicker stalk than in *T. pennatifera*, which is not annular or tracheiform as in that species, as well as in the lateral filaments being shorter and less slender.

Observation.—The species distinguished by a † may not be strictly indigenous, but occasionally or accidentally visiting these coasts. I have given only the localities which occurred to myself or were communicated to me by scientific friends, having in every instance examined and verified the species.

Exotic Species.

A.

16. *T. truncata*, Quatrefages.

17. *T. Senegalensis*, Blainville.

Taret du Sénégal, Adanson.

18. *T. elongata*, Quatrefages.

T. Petitii, Recluz.
T. Senegalensis, Fischer.

B.

19. *T. Stutchburyi*, Blainville.

T. campanulata, Deshayes in Brit. Mus.

20. *T. minima*, Blainville.

T. bipalmata and *bipalmulata*, Delle Chiaje.
T. palmulata, Philippi.
T. Philippii, Fischer.
T. serratus, Deshayes, MS.

This species is common in the Mediterranean; but it has not yet been noticed in this country.

21. *T. palmulata*, Lamarck.

T. bipalmulata, ej.
Taret de Pondichéri, Adanson.

Nothing is known of the valves or tube. The pallets, from which Lamarck described the species, are still preserved in the Collections of Natural History at the Jardin des Plantes; and I observed another pair in the cabinet of M. Petit de la Saussaye at Paris. They bear no resemblance to the pallets of *T. palmulata* of Philippi, except in being compound or jointed; but they are more nearly allied to the pallets of *T. bipennata*, although evidently distinct.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

February 14, 1860.—John Gould, Esq., F.R.S., V.P., in the Chair.

On the Occurrence of American Birds in Europe. By Herr H. Gätke of Heligoland.

The route by which American birds proceed to Europe is, as Yarrell justly terms it, "an interesting problem, of difficult solution." For years this solution has occupied my attention; and although I have myself always been convinced that such of these entirely American birds as occasionally visit Europe *do* reach us by a passage across the Atlantic, this remains a mere opinion, carrying no weight if unsupported by facts, or by at least sufficient argument to make good the question at issue.

The mere comparative review of the occasional visitors among the birds of Great Britain and of Germany will lead to the conclusion that the route of American birds to Europe must needs be a voyage across the Atlantic; for almost all the additions to the birds of Europe, of species *purely American*, have been obtained in Great Britain—which could not have been the case if they had proceeded in any other than an eastern direction—whilst the additions by Germany, furnished to the European Ornis, consist almost entirely of birds belonging to Asia.

However striking the result of such a comparative review may be, one question will always present itself, namely:—Whether it be possible for a bird to sustain an *uninterrupted* flight sufficient to carry it across the wide expanse of the Atlantic. I am convinced that this is possible, and shall endeavour to prove such possibility.

This purpose necessitates a measure for the rate of locomotion of a bird through the atmosphere. For a long time I vainly endeavoured to obtain reliable data upon which to found an estimation of the rate of flight of birds—when at last I hit upon a passage in Yarrell's 'British Birds,' ii. p. 295, where, speaking of the Carrier Pigeon, he mentions the fact of one of these birds having performed a flight of 150 miles in an hour and a half: it was on the 24th of June 1833; the Pigeon flew from Rouen to Ghent; sixteen others flew the same distance in two hours and a half.

Wonderful as this instance of swiftness of the flight of a bird may appear, it certainly is still surpassed by birds when on their periodical migrations; for the above feat was accomplished by an individual hatched and reared in at least semi-confinement, whose powers of flight consequently could not be nearly so well developed as in a bird grown up wild and free, which nearly every hour of its life has to depend on the utility of its wings, either for the purpose of overtaking its prey, or for that of escaping from being caught.

Laying down, therefore, 100 geographical miles per hour as the rate of flight of birds during distant migration, one keeps—after the above—quite within safe bounds; and at this rate the 1600 geographical miles from Newfoundland to Ireland would be effected in sixteen hours. No ornithologist will doubt for a moment the capability of a healthy bird to sustain a flight of that duration. During the long summer days, many of the *Hirundinidæ* are on the wing for as long a period; and although their flight may be interrupted by occasional rests of very short duration, it is performed in the lower, less buoyant atmosphere, and consists of so many evolutions, that most decidedly it must on the whole be much more tiresome than the straight path in the pure upper regions of a bird bent on the performance of one long pilgrimage.

Even supposing that birds become exhausted before accomplishing the passage across the ocean, observations I have made in the vicinity of this island have fully convinced me that small birds, such as Thrushes, Buntings, Finches, &c., are able to rest on the sea—even when a little in motion—and afterwards to resume and pursue their flight with fresh vigour. Of this I shall give the particulars further on, but for the present return to the above question, by giving an instance of endurance on the wing of a species which, with pretty good certainty, may be said every spring to perform in the period of one night a flight of more than 1200 geographical miles—namely, from Egypt to Heligoland,—the bird in question being a particular form of Blue-throated Warbler, *Sylvia cœrulecula*, Pallas.

This pretty little bird, noted not at all either for rapidity or great endurance of flight, has its summer quarters in the high northern latitudes of Sweden, Finland, and Siberia, whereas during the winter months it is staying principally in Egypt. On its spring migration, which takes place during the earlier half of May, the first place north of Egypt where it is to be found with certainty in pretty considerable numbers is Heligoland. Nowhere in the whole intermediate distance is it met with but as a great rarity—not even on the neighbouring north coast of Germany; whilst here in Heligoland I have oftentimes obtained it in such numbers that more than twenty of the finest adult male birds have been bought by me in one day, and perhaps the same number by the bird-stuffers of the island. The foregoing admits of one conclusion only: namely, that this little bird performs the passage from Egypt to Heligoland in one uninterrupted flight, travelling — as many of the other small *Insectivoræ* do—during the night, starting towards sunset and arriving here about sunrise, or a little later, the time occupied being from twelve to fourteen hours. The distance from Egypt to Heligoland being about 400 geographical miles less than that between Newfoundland and Ireland, the rate of flight of this delicate little bird may be put down the same as that of the above-mentioned Carrier-Pigeon, and consequently furnishes a further proof that a healthy well-flying bird is able to cross from the nearest point of America to Ireland without rest or any extraordinary support whatever.

In the foregoing I alluded to the ability of non-natatorial birds to rest, in case of exhaustion, on the sea, and of rising from it after having recovered sufficient strength to resume their flight; and that, too, at times when the water is far from being unruffled. This statement is based on the following observations. One day, when out in a boat shooting, about two or three miles from Heligoland, I observed a very small bird swimming on the water. Neither the boatman nor myself being able to discern what species it belonged to, we became very eager to secure the stranger—conjecturing that it would turn out to be some wonderful rarity. When preparing to fire, I fortunately discovered that the expected prize was nothing but a Song-thrush! Immediately our desire to kill was changed into compassion: the "*poor Thrush*" in so piteous a situation was to be "*saved.*" But how great was our astonishment when, upon the approach of the boat, the bird, without any apparent difficulty, rose from the water and flew towards Heligoland in first-rate style! Another time we saw a Snow-Bunting, evidently exhausted very much, because it was floating scarcely 500 yards from the island. At the approach of my boat, this bird also very lightly rose from the water, but it was so weak that it had to resume its unnatural resting-place after proceeding about thirty or forty yards towards the rocks. We went after it again, and for a third time, but with the same result, whereupon we refrained from all further attempts at forcing our well-intended assistance upon so obstinate a fellow—the more so, as we entertained no doubt that after a little rest he would obtain a more solid footing without any help of ours.

I will give one more instance of this propensity in birds—in all my experience the most striking: this time it was a Mountain-Finch which had been compelled to alight for rest on the water of the sea;

it was about three miles east of Heligoland. When this bird was approached by the boat, it rose very easily, mounted into the air to a great height—as birds do when starting for their migratorial excursions—and then struck out steadily in a southern direction, *without taking any notice whatever of the island.*

Although I believe the foregoing instances sufficiently prove the *possibility* of birds being able to cross on the wing from the United States of America to Great Britain, the greatest *probability* that they do so is still shown by the proportion the number of American birds obtained in Great Britain bears to that of those obtained in the whole of Europe. Yarrell, in his 'British Birds,' 1845, mentions more than forty instances of that description,—*Tringa rufescens* and *Scolopax grisea* having each been obtained six times! whereas Germany, Holland, and France together offer but very few instances, some of which scarcely rest on good authority.

Heligoland seems to form a happy centre. Here the Gulls of the Arctic Sea, *Larus Rossii* and *Sabinii,* meet the Numidian Crane (*Grus virgo*), *Lanius phœnicurus,* and other African birds; whilst the United States send *Mimus rufus* and *T. lividus, Sylvicola virens, Charadrius virginicus,* and others, to meet deputations from the far east of Asia consisting of *Turdus ruficollis* and *T. varius, Sylvia javanica, S. caligata,* and *S. Certhiola, Emberiza rustica, E. pusilla,* and *E. aureola, Pyrrhula rosea* and a great many others.

All these birds, together with a great number of acquisitions quite as valuable for the European Ornis, *all captured on this island,* are preserved in my collection—a collection which, although scarcely approaching to three hundred specimens, has, by Blasius, been pronounced to be "the most interesting between Paris and Petersburg."

Heligoland, January 1860.

February 28, 1860.—John Gould, Esq., F.R.S., V.P., in the Chair.

Note on the supposed occurrence of the Hirundo bicolor of North America in England. By Alfred Newton, M.A., F.Z.S., &c.

I venture to send for exhibition a skin of the North American *Hirundo bicolor* of Vieillot, which was formerly the property of my late very good friend Mr. John Wolley, and which there can be little doubt was obtained from a bird killed in this country, though Mr. Wolley, with that admirable caution which distinguished him in recording the reported occurrence ('Zoologist,' 1853, p. 3806), was careful to mention that there was "a possibility of mistake" in the matter.

I think that perhaps some members of the Society will view this specimen with a certain amount of interest; but, apart from this, my object in its exhibition is mainly to draw the attention of naturalists to a matter which is every day becoming of greater consequence to those ornithologists who chiefly occupy themselves with the Avifauna of any one district. I refer to the occurrence within particular limits of strong examples of exotic species. It is not only

"British-bird" students who find in these alien immigrants a great cause of perplexity. To whatever country we go, we are, perhaps before we have well ascertained the number of the *bonâ fide* species, puzzled by some wanderer turning up exactly where he was least wanted. In my own opinion, the ornithologist must accept his position with all its responsibilities; he chooses to study a class of beings, some of whom, for all sublunary purposes at least, are blest with almost infinite powers of locomotion. He must therefore not complain if in the course of a morning's walk here in England, an Australian Swift flies in his face, or he picks up a dead Crossbill of a Transatlantic species; and he must invoke no *Deus ex machina* in the shape of an auxiliary-screw clipper or a careless aviary-keeper to account for the incident. Facts like these hardly admit of a doubt, and force themselves day by day more and more upon the notice of the thoughtful naturalist. For some time, indeed, European ornithologists have been accustomed to regard the properly authenticated appearance of an exotic species, which there may be good reason to suppose to have reached our shores without intentional human aid, as sufficient ground for including it in the list of our birds. But as observers have of late so largely increased, so have these occurrences been more frequently noticed; and it seems absolutely necessary to prescribe some limit to prevent our really native species from being outnumbered by these foreigners. The difficulty is to know where to draw the line; and to this point I would invite the careful consideration of naturalists. It may be all very well to call *Thalassidroma Wilsoni* and *Mergus cucullatus* European birds; but because a single individual of *Regulus calendulus* or *Dendrœca virens* has reached the Old World, it is absurd to include either of those species in its Fauna. I cite these instances because they are all from that continent whence most of our occasional visitants arrive—so much so, that one is almost driven to the conclusion that there is no *primâ facie* reason why examples of the greater number of birds of Eastern North America should not, *favente zephyro* (the prevailing strong wind in Western Europe), make their appearance on our shores in course of time. Then, on the other hand, the last two additions to the list of so-called "British birds" have been from the opposite quarter. Are *Syrrhaptes paradoxus* and *Xema ichthyaëtus* to take their places in the books elucidating British Ornithology by the side of the Red Grouse and the Peewit Gull? It appears to me that we gain nothing by deferring a decision on the subject, and I trust that these remarks will not be deemed unnecessary by those who are competent to deal with the matter.

Elveden, 28 February, 1860.

Description of a New Genus of Boidæ discovered by Mr. Bates on the Upper Amazon. By Dr. J. E. Gray.

Fam. Boidæ.

Chrysenis, n. g.

Head rather large, rather depressed, covered with scales, the front half covered with small symmetrical shields, as follows:—two pair in an arched series behind the rostral and nasal, and four pair forming a ring round the pair of small central frontal shields; loreal shields two; eyes surrounded by a series of small shields, with a series of four or five small superciliary shields above them; forehead, crown, and cheeks covered with small granular scales; rostral plate with a pit on each edge; upper labial shields low, with a large deep pit on their hinder edge; front lower labial shields simple, high, the hinder short, with a very deep pit on the hinder edge of each of them; nostrils situate between two moderately sized, nearly equal nasal shields; pupils erect, oblong; body compressed, rounded above and below; tail conical, with a single series of subcaudal plates.

This genus resembles *Epicrates* as to the shields on the muzzle, but differs in the distinctness and form of the pits on the labial shields.

Chrysenis Batesii.

Pale brown, with a series of oblong subangular black-edged pale spots on the hinder part of the back, which become broader and more distinct as they approach the end of the tail, and with a series of distant small roundish black-edged spots on the lower part of the middle of the body, the hinder spot largest and nearest to the edge of the ventral shield.

Hab. Upper Amazon.

March 13, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

The following extracts from the 'Bermuda Royal Gazette' of Jan. 31st, 1860, relating to the recent capture of a large species of *Gymnetrus* in the Bermudas, were read to the Society:—

"*To the Editor of the 'Royal Gazette.'*

"My dear Sir,—As the ichthyological specimen captured by Mr. George Trimingham, at Hungary Bay, has attracted some public attention, perhaps a short description of the creature in question may prove interesting to your readers. I have therefore much pleasure in forwarding the following particulars.

"Believe me, very truly yours,

"J. Matthew Jones, F.L.S.

"The Hermitage, January 26th, 1860."

"Order Acanthopterygii. Family Cepoladæ.

"Genus *Gymnetrus*.

" —— ——?

"Body attenuate, compressed, naked, tuberculate; cuticle a silvery covering of metallic lustre; length from facial to caudal extremities 16 feet 7 inches; depth, at 14 inches from facial extremity, 9 inches, increasing gradually to near the ventral extremity of the stomach, where it attained its greatest depth of 11 inches, and then decreased by degrees to the caudal termination; width, at the same distance and through the spinal column, $2\frac{1}{2}$ to 3 inches. (These dimensions are the extreme.)

"From the frontal extremity of the caput (excepting a slight depression at the occiput) to the position at which the above dimensions of depth and width were taken, a gradual elevation of the dorsal ridge took place; and from the capital portion of this ridge arose at equal distances from each other a series of ten or eleven erect, quill-like, flexile filaments from 2 to 3 feet in extent, gradually tapering from base to apex, and possessing, in the case of the three longest, lanceolate points. From this series of lengthened filaments, all along the back, from head to tail, extended a series of intermittent fins so closely situate to each other as to present the appearance of a single fin, and having the spinose rays of each individual fin joined by the connecting membrane. Filaments and dorsal fin bright crimson. The ventral fins were entirely destroyed, save a portion of the *right* ventral, which is sufficient to show that it was composed of two consistent bony rays, which probably extended some distance from the body and must have formed a powerful engine of direction. The pectorals were also almost entirely destroyed, although the base of the *right* pectoral was sufficiently complete to enable me to state that it contained twelve spines. Anal and caudal fins absent.

"Head truncated, compressed; facial outline of a dark colour. Mouth so damaged as not to be positively determinable as regards form and appearance, but from the portions of jaw still remaining I should pronounce it malacostomous. Eyes, 14 lines in diameter, slightly depressed; irides, $3\frac{1}{2}$ lines in width, of a bright silver, encircling pupils of a somewhat oval shape, and in colour a light transparent blue. Stomach: intestinal chamber extending from beneath the gills to the anal extremity, 5 feet; unfortunately this chamber had been opened and its contents partially injured before I saw the specimen, but a large portion of milt, intestine, &c. has been preserved, including the major portion of the swimming bladder, which for so large a fish may be considered small; its colour a bright scarlet; this swimming bladder contained a large amount of oily matter, and a piece thrown on the ruffled surface of the water immediately stilled the agitation. Gill-rays eight in number, four to a side, crimson, flabellate; the anterior pairs furnished with double rows of flabels, having the internals white, and armed on their inner side with minute dart-like appendages. Gill-covers bony, radiate, not entirely covering the gills. Teeth, no appearance of any.

"In concluding the above description, I must not omit to state that it was a male fish, and from the extremely fragile nature of its various parts I may venture to express an opinion that it had by no means attained maturity.

"I may also remark that my measurements were taken twenty-two hours after death, during which time the specimen had remained exposed on the rocky shore.

"*Remarks.*—This genus of Acanthopterygious fishes is of a form so thin and flat in proportion to its length as to have obtained among the ancient ichthyologists the name of Riband Fish. Although several species are known to science, yet they are all of diminutive size in comparison with the individual now obtained. *Gymnetrus Hawkenii*, *G. Banksii*, and *G. Glesne* are occasionally found in the British Seas.

"So little appears to be known of this singular tribe of fishes, that, even in the present advanced state of marine zoology, their habits, haunts, &c. remain blanks in the book of Nature, and will probably long continue so, unless opportunities like the present should occur to enable us to add new facts to the history of these remarkable creatures.

"The most notable fact, however, in connexion with the capture of the present specimen will doubtless be the interest and attraction it will produce in the scientific world; for most assuredly we have in the specimen now before us many of the peculiarities with which the appearance of that hitherto apocryphal monster, the Great Sea Serpent, as detailed by navigators, is invested. The lengthened filaments crowning the caput, joined anteriorly by the connecting membrane and extending to the shoulders, would, viewed from a vessel's deck, present to the spectator the mane so accurately described as a singular feature in the gigantic specimen seen by Capt. M'Quhae, R.N., and officers of H.M.S. 'Dædalus.' Then, again, the rapidity with which that individual specimen moved through the water would coincide with the capabilities of a member of this genus; for the motive power produced by such an extent of tail, coupled with the extremely compressed form of body from the head throughout, must be immense.

"Here, then, we have a partial elucidation of the various statements which have at intervals appeared in the columns of the united presses of England and America, emanating from the pens of travellers, and usually headed 'Occurrence of the Great Sea Serpent,'—criticised, however, in an ungenerous manner, and always exposed to an unmerited ridicule at the hands of the many, but nevertheless firmly believed in by the few, who have patiently waited to see the day when the mystic cloud which has hitherto veiled the existence of the maned denizen of the deep should vanish with the suspicion of the sceptic, and exhibit more clearly the truth of the assertions of those ill-used men, who, endeavouring like useful members of society to extend the cause of natural knowledge by publishing candid accounts of what their eyes have seen, have always met with an amount of contempt and reproach sufficient to silence for ever the pen of many a truthful writer.

"I am sorry I have not the number of the 'Illustrated London News' at hand in which Capt. M'Quhae's graphic statement appeared, as it would have afforded me an opportunity of particularizing other features in connexion with his specimen and the present one. The facts, however, regarding the mane-like appendage, and the rapidity of motion to which I have alluded, are still fresh in my memory.

"My best thanks are due to Mr. George Trimingham, the capturer, for the generous manner in which he placed the fish at my disposal."

Description of a New Species of Estheria from Nagpoor, Central India. By W. Baird, M.D., F.L.S.

Since my paper containing a description of a species of *Estheria* (*E. Hislopi*) in the Proceedings of 1859, p. 231, was printed, I have received a short communication from Mr. Hislop, enclosing a second species of the same genus from the same locality. This species is considerably larger than *E. Hislopi*, and differs from it entirely in shape and markings. The carapace is oval, flat, and compressed, rounded in front, where it is most convex, and considerably attenuated posteriorly. The umbo is situated near the anterior extremity; the ventral margin of the shell is rounded, and the dorsal margin, from the umbo to the posterior extremity, slopes downwards and is nearly straight. The carapace is encircled with prominent ribs, which are few in number (about seven or eight) and of considerable size. The intervening spaces are smooth, rather broad, generally convex in the centre, and do not present any of that elaborate sculpture which the other species from India (described and figured in the Proceedings of the Zoological Society, 1849) —*Estheria polita, E. similis,* and *E. Boysii*—exhibit so distinctly; neither do they show the *excavated* punctations of *E. Hislopi*. They are merely very slightly punctate. The specimens sent being preserved dry, the animal has not been observed.

"The specimens now sent," says Mr. Hislop in his letter to me, "were obtained in shallow pools at Nagpür, Central India, about the middle of July, *i. e.* a month after the commencement of the rainy season there. If the pools dry up, as they frequently do, about the end of July, when there is a break in the Monsoon, the creatures perish, not to reappear that season, however copious may be the showers; but they are found in abundance at the beginning of the Monsoon in the following year. The orbicular species (*E. Hislopi*) is not obtained along with the one above referred to, but occurs about the end of August in a stream which communicates with the large tank on the west of the city of Nagpür."

The name I propose for this new species, the specimens of which unfortunately are not in a very good condition, is *Estheria compressa*.

Estheria compressa.

Carapax compressus, ovalis, convexus et rotundatus ad extremitatem anteriorem, ad extremitatem posteriorem attenuatus. Margo ventralis rotundatus, margo dorsalis obliquus, fere rectus. Testa costata, superficie vix punctata.

Length about 5 lines, breadth $2\frac{1}{2}$.

Hab. Pools of fresh water at Nagpoor, Central India. *Mus.* Brit.

March 27, 1860.—Prof. Busk, F.R.S., F.Z.S. &c., in the Chair.

Memoranda on the Hippopotamus and Balæniceps recently imported to England, and now in the Gardens of the Zoological Society. By John Petherick, F.R.G.S., H. M. Consul for the Soudan.

Since 1853 I have devoted from six to seven months of each year to the exploration of some of the unknown regions of Central Africa. My starting-point, Khartoum, at the junction of the Blue and White Niles, in lat. $15\frac{1}{2}°$ N., a town of about 60,000 inhabitants, is the capital of seven provinces dependent on Egypt, called the Soudan, consisting of the whole of that, for the most part, sandy district between the second Nile cataract at Wadi Halfa and the territories inhabited by the naked Negro in 13° N. lat.; whilst its breadth extends from the borders of Darfour on the west to Abyssinia and the shores of the Red Sea on the east.

Leaving Khartoum, and navigating the White Nile to between 9° and 10° of N. lat., a narrow channel, and for the most part overgrown with reeds, which by former Nile-navigators had been considered unnavigable, attracted my attention, and pursuing it, not without difficulty finding my way through some narrow openings in a forest of reeds, I found this to be the connexion between a large lake and the Nile, of which it is one of the most important feeders hitherto known.

This lake, according to the time it occupied me to sail in a well-appointed boat with three large latteen sails, from one extremity of it to the other, after making allowance for the windings of the open passages through the dense vegetation with which it is for the most part covered, I consider to be about 180 miles long, and perhaps some 60 miles wide.

Its waters, ornamented with several promontories and islands, more or less wooded with sycamores, acacias, and mimosas, and but little frequented by man, literally swarm with Crocodiles and Hippopotami.

The latter in particular made many rude and uncouth attempts to dispute the right of passage over their hitherto secluded home, by attacking my boat, battering-ram fashion, both under and on the surface of the water; and on one memorable occasion, to the surprise and horror of all on board, a huge beast, suddenly raising half its great carcass, with an agility hardly to be expected, out of the water, close under the bows, carried off my unfortunate cook from the gunwale on which he was sitting, one bite of the animal's powerful jaws sufficing to sever his body in two at the waist.

It was here, whilst returning in the month of April in the year 1858 from the regions of the equator, where I founded an establishment of twenty-five men (Arabs from the neighbourhood of Khartoum), for the barter of elephants' tusks with the aborigines, the Niam Niams, that the "look-out" at the mast-head, almost frantic with excitement, called out "A young Hippopotamus," pointing to the reeds within a few yards of which we were sailing. A dozen of my sailors leaped into the water, and, disappearing amongst the thick herbage, soon returned, one of them grasping in his arms a young animal about the size of a spaniel, and kept afloat and propelled towards the boat with shouts of delight by his companions.

Fortunately for the safety of the men, the old lady Hippopotamus was not at home, and so distant from her charge as not to hear the cries of her baby (similar to those of a young calf); or the affair might not have terminated so favourably. A piece of the navel-string, 15 inches long, was still dangling to its body, and did not detach itself for several days afterwards; from which I inferred that the time since its birth could not have extended over a day or two.

The unexpected but welcome guest was reared on milk, and in its absence with meal and water, being treated with all the attention we could bestow on it, and is now, judging from its thriving condition, as grateful as its owner for the hospitality it is enjoying at your splendid Gardens in the Regent's Park.

So large a sheet of water as the "Bahr il Gazâl" will naturally attract great numbers of the feathered tribe; and it was in this lake that I first made the acquaintance of a very handsome Stork (*Mycteria senegalensis*) and the *Balæniceps*.

Of both these rare birds I was fortunate enough to procure living specimens; the former of which, with numerous rare animals, such as the Elephant, Rhinoceros, two species of Ant-Bears, a rare Monkey, and I believe a new species of Antelope, unfortunately died during the long and arduous journey from Central Africa through Egypt to the Mediterranean.

The skin of the Stork, however, has been preserved, with a few other skins of birds, a remnant of a large collection made between the 5th and 15th degrees of N. latitude, but unfortunately lost in the Upper Nile cataracts of Nubia. The few skins alluded to as having been saved have been examined by your obliging Secretary, Mr. Sclater, to whom I am indebted for many acts of kindness since my return to England*.

Two living specimens of *Balæniceps* out of six shipped at Khartoum (but perhaps out of a score partially reared, the first, as you are well aware, imported into Europe) have, almost against hope, survived the apparently insurmountable difficulties of the trying journey across nearly one-half the continent of Africa, and are at length, I am proud to say, safely housed in your commodious Gardens.

The *Balæniceps*, although found only in or near water, is but rarely seen on the banks of the Nile, and then only during a short period of the year, when the interior is dried up, in the summer, during the short hot season preceding the rains.

It prefers the natural tanks and morasses of the interior, where

* Mr. Petherick's skins are in a condition which renders their specific determination rather difficult. The most noticeable are,—

Haliaëtus vocifer, juv.
Halcyon semicærulea (Gm.)?
Coracias abyssinica (Linn.).
Merops ægyptius?
Bucorax abyssinicus.
Lanius macrocercus, De Fil.
Prionops cristatus, Rüpp.
Laniarius chrysogaster, Sw.
—— *erythrogaster*, Rüpp.?
Lamprotornis purpuroptera, Rüpp.
Notauges superbus, Rüpp.
Colius senegalensis?
Schizorhis zonura, Rüpp.
Pœocephalus Meyeri, Rüpp.
Læmodon Vieilloti.
—— *leucocephalus*, De Fil.
Œdicnemus affinis, Rüpp.?
Cursorius, sp.?
Falcinellus igneus.
Ardeola bubulcus.
Nycticorax europæus.
Anastomus lamelligerus.
Mycteria senegalensis.
Parra africana.
Plectropterus Rüppellii, Sclater.
Sterna (2 sp.).

—(P. L. S.)

the shallowness of the water distributed over a large surface affords it greater facilities for wading than the banks of the Nile. These frequently shelve off into deep water more or less abruptly, and thus furnish but comparatively few spots favourable to the support and habits of the bird.

For this reason, at about 100 miles west of the Nile, in from 5° to 8° N. lat., at Gaba Shambyl, where I have a station of elephant-hunters, these interesting birds exist in greater numbers than on the Nile, or the comparatively deeper waters of the Bahr il Gazâl, the lake to which I have alluded, and of which I have the honour of being, if not, strictly speaking, the discoverer, at least the first navigator.

At Gaba Shambyl, striking off directly west from the Nile, the country for the first 30 miles rises with an almost imperceptible slope, when it again decreases in elevation for a distance of 60 to 70 miles. Here it becomes a large morass (with, occasionally, dry spots, which form so many islands in a sheet of water after the annual rains) that from north to south extends probably over 150 miles, having no outlet directly to the Nile, but, when the water is at a certain height, overflowing into a channel connecting it with the Bahr il Gazâl. This reservoir, which is more or less supplied with water all the year round, abounds in reeds and thick bush, and is the favourite retreat and home of the *Balæniceps*.

The birds here are seen in clusters of from a pair to perhaps one hundred together, mostly in the water, and when disturbed will fly low over its surface, and settle at no great distance; but if frightened and fired at, they rise in flocks high in the air, and, after hovering and wheeling around, will settle on the highest trees, and as long as their disturbers are near will not return to the water. Their roosting-place at night is, to the best of my belief, on the ground. Their food is principally fish and water-snakes, which they have been seen by my men to catch and devour. They will also feed on the intestines of dead animals, the carcasses of which they easily rip open with the strong hook of the upper bill. The breeding-time of the *Balæniceps* is in the rainy season, during the months of July and August; and the spot chosen is in the reeds or high grass immediately on the water's edge, or on some small elevated and dry spots entirely surrounded by water. The birds, before laying, scrape a hole in the earth, in which, without any lining of grass or feathers, the female deposits her eggs. As many as a dozen eggs have been found in the same nest. Numbers of these nests have been robbed by my men of both eggs and young; but the young birds so taken have invariably died. After repeated unsuccessful attempts to rear them, and more trouble than you can imagine, after two years' perseverance I at last succeeded in hatching some eggs under hens, which, at a considerable distance from Gaba Shambyl, I procured from the Raik negroes. As soon as I got the hens to lay, and in due time to sit, by replacing several of their eggs with half the number of those of the *Balæniceps*, as fresh as possible from the nest, the locality of which was previously known, I eventually succeeded in hatching several birds. These ran about the premises of my camp, and, to the great discomfort of the poor hens, *would* persist in performing all sorts of unchicken-like manœuvres with their large beaks and extended wings in a small artificial pool constantly supplied with water by several negresses retained in my service for their especial benefit. Negro boys of the tribe (the Raik) were also employed to supply their little pond with live fish, upon which, and occasionally the intestines of animals killed for our use, chopped into small pieces, they were reared.

As may be supposed, the birds became the pets of my "Bizouks," as I frequently called my Khartoumers; and as they grew up, with extended wings and a rattle-like noise produced by the snapping of their bills, they would follow them round the large enclosure of my camp.

During their journey to England, six months' confinement in a cage has greatly affected their health, and I dare say soured their tempers; at least, such to a certainty would be the effects on myself if placed in a similar predicament. But, in common with, I venture to say, every one connected with the Society, I trust that my attention and trouble, to say nothing of the expense which I have been put to—although perhaps a more important feature than most of you may be aware of—may be rewarded by their recovery and well-being; and I hope if, as there will be no difficulty on my part, they become the property of the Society, they will long live to adorn, and perhaps enhance, the merits of the rare collection amongst which they are at present, with their countryman the Hippopotamus, so hospitably received.

On some New Species of Cypridina.
By W. Baird, M.D., F.L.S.

Of the new species about to be described, one is a native of Europe, two of the Indian Ocean, and one of Australia.

1. Cypridina norvegica, Baird.

Carapace-valves oval, somewhat compressed, smooth and shining. The notch or sinus at the anterior extremity is not deep; the beaks are small and somewhat thickened round the margins. The dorsal margin is gently rounded; the ventral is slightly arched, projecting at its upper extremity immediately beneath the notch, and at its inferior extremity is rather sharply gibbous or prominent, which, seen from the internal surface, shows a duplicature of the shell. The surface is polished, not punctured, and is of a straw-colour. In shape it appears to resemble very much the *Cypridina luteola,* of Dana* from the Sooloo Sea. The shell, however, is *ovate,* not *ovoid*; and the inferior extremity, instead of being rounded, is gibbous or projecting anteriorly.

Length $1\frac{1}{2}$ line; breadth 1 line.
Hab. Coast of Norway (*R. M'Andrew, Esq.*). *Mus.* Brit.

2. Cypridina Godeevi, Baird.

Carapace-valves oval and ventricose, produced into a point at the

* United States' Exploring Expedition, Crustacea, vol. xiv. p. 1291, pl. 91. f. 1.

posterior extremity. The anterior extremity is rather narrower than the posterior; the sinus or notch is rather deep, the beaks are sharp-pointed and thickened along the margins. The surface is marked with numerous minute punctations, and is of a deep-yellow or saffron colour.

Length 3 lines; breadth 2 lines.

Hab. Madras, in 8 fathoms. *Mus.* Brit.

In the 'Mémoires des Savans Étrangers,' vol. iii. p. 269, there is an exceedingly interesting communication from M. le Commandeur Godeheu de Riville on the luminosity of the sea. In that paper he describes and figures a little creature which he found was the cause of this luminous appearance. The body of the animal, he says, was contained in a small, transparent shell, resembling in form that of an almond cleft down the side, and which was notched at its upper part. This shell, though roughly figured, pretty accurately represents this species of *Cypridina,* and I have little doubt our species is the same that Riville there describes and figures. The part of the ocean where he met with it was off the coast of Malabar.

3. Cypridina ovum, Baird.

Carapace-valves of a perfect ovoid shape, and very ventricose. Anterior extremity slightly narrower than posterior. The surface of the valves is marked with exceedingly minute punctations, with numerous round, quite smooth spots of a brownish-yellow colour distributed over it, appearing as if they were excavated out of the surface of the shell. The notch at the anterior extremity is rather deep; the beaks are somewhat pointed, slightly incurved and thickened along the margins; and the posterior extremity is rounded without any appearance of gibbosity.

Length $1\frac{1}{2}$ line; breadth $1\frac{1}{4}$ line.

Hab. Chinese Seas. *Mus.* Brit.

4. Cypridina albo-maculata, Baird.

Carapace-valves of an ovate-ventricose form, rounded on the dorsal and ventral margins, and slightly, but distinctly, produced into a point in the centre of the inferior extremity. The surface is marked with numerous small, distinct punctations, and conspicuously blotched with several large, bright white patches, which are slightly raised and strongly punctured. There are only two large ones on the right valve, and three on the left. The notch at the anterior extremity is rather deep, and the edges of the beak are incurved, pointed, and thickened along the margins. The anterior extremity is rather narrower than the posterior.

Length 4 lines; breadth 3 lines.

Hab. Swan River. *Mus.* Brit.

April 24, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Mr. Gould exhibited specimens of the Chough of the Himalayas, which he proposed to call *Fregilus himalayanus,* and pointed out the characters which distinguish it from the European bird (*F. graculus*)

Mr. F. H. Wilson exhibited four examples of a curiously-coloured variety of the Common Mole (*Talpa europæa*), and read the following note on them :—

"Nine of these Albinos were caught in the same meadow within a few days, on Mr. Gibbon's farm, Beckenham, Kent. The Mole in general has four or five young ones at a birth. It is possible that all these were the offspring of the same parent, but I should think they must have bred amongst themselves. They were caught February 20th, 1860."

Mr. Sclater announced the arrival of some interesting animals from British Honduras, presented by R. Temple, Esq., Chief Justice of the Colony, to the Society's Menagerie. These consisted of a pair of Guans (*Penelope purpurascens*), a pair of Curassows (*Crax globicera*), a Collared Peccary (*Dicotyles torquatus*), and specimens of a singular breed of the Domestic Fowl, remarkable for its bones being black.

Mr. Sclater observed that the following letter received from Mr. Temple seemed to indicate the presence in British Honduras of a second species of Peccary, called the 'Warree,' about which more information would be very desirable :—

"16 St. James' Square,
Notting Hill, April 20th, 1860.

"Sir,—The Warree, about which you wish me to give you some information, differs in some respects from the Peccary. The latter, as I said before, is never seen, except in couples; the former invariably appears in large flocks. The head of the Peccary is very large and clumsy in proportion to the body. That of the Warree is less disproportionate. The coat or skin of the Peccary is covered with long hairs, which are darkish at the roots, and lighter-coloured at the tips. The colour of the Warree is a dirty black, and the hair is long and tangled. The legs of the Peccary are shorter than those of the Warree. Both have the same orifice on the back, from which exudes a liquid having a very offensive odour. When either of these animals is shot for the purpose of being eaten (and they are excellent food), the orifice on the back must be instantly cut out, or the whole of the flesh will become so much tainted, that, so far from being able to eat it, you cannot tolerate its vicinity. But if the excisional knife has been applied in time, the flesh is sweet, white, short, and tender. The Warree is a far more ferocious animal than the Peccary; but his courage perhaps may arise from a principle not quite a stranger to the human breast—a consciousness of being well supported; for, as I have said, they are always seen in multitudes. If you meet a flock of Warrees in the bush, and you take no notice of them, it is probable that they will take no notice of you. But if your intentions are hostile, and your design is to transfer one of them from his native wilderness to your kitchen, you must take care to place yourself in a safe position before you carry your design into execution. A gentleman, not long since, shot a Warree without having taken the necessary precautions; the remainder of the flock instantly pursued him; and if he had not managed to climb into a tree, he would have been torn in pieces. But he was kept a prisoner in that leafy asylum for many hours, the surviving Warrees being bent on revenging the death of their companion. Even when the flock went a little distance to feed, they left two or three to stand guard at the foot of the tree. The hunter has no difficulty in tracing the Peccary and the Warree, by the strong odour which prevails wherever they have been.

"I am, Sir,

"Your obedient servant,

"R. TEMPLE."

ON THE RHEAS IN THE SOCIETY'S MENAGERIE, WITH REMARKS ON THE KNOWN SPECIES OF STRUTHIOUS BIRDS. BY PHILIP LUTLEY SCLATER.

In November 1858 the late Mr. Thompson purchased for the Society in Liverpool a young *Rhea*, which now seems to have nearly attained its adult growth. It proves to be so remarkably different from the Common Rhea (*Rhea americana*) and Darwin's Rhea (*Rhea Darwinii*), examples of which are kept in the same inclosure with it, that I have little hesitation in characterizing it as of a different species; and in so doing I believe I have the concurrence of Mr. Gould, Mr. Bartlett, and other naturalists, who have had an opportunity of examining the bird.

The Long-billed Rhea (*Rhea macrorhyncha*, as I propose to call it) is a much smaller bird than the Common Rhea. The example in the Gardens, a male, stands about 6 inches lower than the two females of the American Rhea, which are in its company, and we may reasonably suppose that the female is proportionately smaller. The bill is much longer than that of the Common Rhea, as may be seen from the drawings (figs. 1, 2, 3), which represent the heads of the three species; and the head-feathers are longer and more closely flattened down. On the other hand, the tarsi are much more slender and the toes much shorter. The thighs are less thickly clothed than in the Common Rhea; but the scutellation of the tarsi seems to be nearly the same in both these birds, and offers a marked contrast to that of *Rhea Darwinii*, in which the tarsi are for the greater part covered with reticulated scales. The feathers of the body are longer in the Long-billed Rhea, and curve round it, hiding the outline, in a manner not observable in the Common Rhea. With regard to colouring, the new species is also very different, being of a brownish-grey mixed with black, and altogether much darker than *Rhea americana*. The top of the head, and streak at the back of the neck in particular, are of a deep black.

The accompanying drawings represent (fig. 1) the head of the new Rhea (*R. macrorhyncha*) and the heads of the two other species, *Rhea americana* (fig. 2) and *Rhea Darwinii* (fig. 3), which are given for the sake of comparison.

I am told that this Rhea is already known to some of the dealers in living animals as a distinct species; and I hope it will not be long before we obtain further particulars concerning it, and discover what part of South America it inhabits.

Fig. 1.

Fig. 2.

I take this opportunity of bringing before the Society a short *résumé* of the present state of our knowledge of the species of *Struthio-*

Fig. 3.

nidæ, which appear to be more numerous than was formerly supposed.

I. Struthio.

The Æthiopian type of the *Struthionidæ* (the most perfect of the kind, as is its type of the Anthropoid Apes) requires our first attention. I have long suspected that the Ostrich of Southern Africa, when closely compared with the bird of the Sahara, will turn out to be a different species; and I know that many other naturalists share my views. The eggs, as Mr. Bartlett has shown in exhibiting his fine series of the eggs of *Struthionidæ* this evening, seem to present well-marked differences. That attributed to the Southern bird is smaller and very much smoother and less deeply pitted, the granulations in some specimens being nearly evanescent. But I have reason to believe that the Southern bird is the larger in size. Through the unfortunate loss of both the young Ostriches presented to the Society by Sir George Grey last summer, we have missed the opportunity which we should otherwise have had of comparing them with the noble examples of the Northern bird which grace our Menagerie. But as Sir George Grey, who is now returning to the Cape Colony, has promised to obtain for us other adult examples, there is every reason to believe that we shall ere long be able to make the desired comparisons*.

The Ostrich of the Syrian and Arabian Deserts, mentioned by Col. Chesney (Journ. Euphr. Exp. i. p. 588), Dr. Layard (Nineveh,

* Prince Bonaparte speaks of a *Struthio epoasticus*, Compt. Rend. xliii. p. 785; but I cannot make out that he refers to either the southern or northern species.

i. p. 324), and other writers, and frequently referred to in the Holy Scriptures*, should also be carefully examined. It is not improbable that it may turn out to be a third species or well-marked local variety.

In the interior of Africa there is said by some of the older writers to exist a diminutive Ostrich (*l'Autruchon*). I have lately received some information on this subject from Mr. J. Petherick, H.B.M. Consul for Sudan, who tells me that his hunters have actually had this bird alive, and I have requested him to endeavour to procure further evidence on this point.

II. Rhea.

I have already pointed out above the characters which distinguish *Rhea macrorhyncha*—the third species of the Neotropical type of the *Struthionidæ*—from the two previously known, *R. americana* and *R. Darwinii*. There are examples of all three living in the Society's Gardens.

III. Casuarius.

The Indian Region, like the two Northern Geographical Regions—the Palæarctic and Nearctic†—has no Struthious birds,—the genus *Casuarius* being confined to the northern portion of the Australasian Region, and represented in the main land of Australia by species of the nearly allied genus *Dromæus*. Of *Casuarius* we have indications of the existence of five species, as follows:—

1. *Casuarius galeatus*, the Common Cassowary. In the Leyden Museum are specimens of this bird from Ceram, the only certain locality I know for it. We have a very fine male example living in our Gardens.

2. *Casuarius Bennettii* (P. Z. S. 1857, p. 268, pl. 129; 1858, p. 271; 1859, p. 32), the Mooruk of New Britain, of which we have *three* examples in our Gardens.

3. *Casuarius australis* (P. Z. S. 1857, p. 268), discovered by the late Mr. Wall on Cape York, Northern Australia, and said to be distinguished by a "bright red helmet and blue and scarlet caruncles." The only example yet obtained of this bird has been unfortunately lost.

4. *Casuarius* ——, a species living in the menagerie of the Babu Rajendra Mullick of Calcutta, and mentioned by Mr. Blyth‡ as having "a yellow throat, a single yellow throat-wattle, and a long stripe of naked yellow skin down each side of the neck." I have not yet received Mr. Blyth's published description of this bird §.

5. *Casuarius bicarunculatus*, a name I propose to apply to a Cas-

* Isaiah, ch. xiii. v. 21: "*Habitabunt ibi Struthiones*," translated in our version 'doleful creatures!' Also Lamentations, iv. 3; Job, xxxix. 13 *et seq.*, and other passages. The Ostrich was unclean according to the Jewish law.

† Confer Journ. Proc. Linn. Soc. ii. p. 130 (1858).

‡ Ibis, 1860, p. 193.

§ [Mr. Blyth's description of this new species will be found at p. 113 of our present Number.—Ed.]

sowary of which I have recently obtained a young example for the Society in exchange from the Zoological Gardens at Rotterdam. It is easily distinguishable by the throat-caruncles being placed far apart on the sides of the throat, lighter colouring, &c. As the bird itself will shortly arrive in this country, I hope to be able to give full particulars concerning this new species at the next Meeting of the Society.

IV. Dromæus.

At a Meeting of this Society in May last*, Mr. Bartlett gave us some indications of the existence of a second species of Emeu in South Australia, and proposed to call it *Dromæus irroratus*. I have lately had the pleasure of examining two specimens of this Emeu in Holland. One of these, now in the Gardens of the Zoological Society of Amsterdam, was brought from Albany in Western Australia, and thus renders it probable that the Spotted Emeu is the western representative of the *D. Novæ Hollandiæ*. The second, now in the Zoological Gardens at Rotterdam, I have obtained by exchange for this Society; and as we may hope to see it in our own Gardens in a few days alongside the Eastern species, I reserve further notice of it until I have had a more satisfactory opportunity for its examination.

It thus appears that there are some grounds for supposing that the species of *Struthionidæ* now in existence may amount to not less than fourteen or fifteen in number.

On the Black-shouldered Peacock of Latham (Pavo nigripennis). By P. L. Sclater.

The species of the genus *Pavo* generally recognized by naturalists since the time of Linnæus have been two in number—the Common Peacock (*Pavo cristatus*), and the Javanese or Green Peacock (*Pavo muticus*). My present object is to call the attention of the Society to what seems to be a *third* distinct species, in some respects intermediate between these two, and which, though long since introduced into Europe and often bred in our aviaries, appears in some mysterious manner to have almost escaped the notice of naturalists, and to have been left unprovided with a specific name up to this time.

The bird I allude to is the Black-shouldered Peacock of Latham's 'General History' (vol. viii. p. 114), where its differences from the true *Pavo cristatus* are accurately pointed out. They are, indeed, very obvious on comparison of either sex of these two birds, as may be seen by any one who will take the trouble to inspect the fine series of Pea-fowl belonging to C. Clifton, Esq., now under the Society's care in the Regent's Park Gardens.

In the Black-shouldered Peacock of Latham (a term which I propose to Latinize into *Pavo nigripennis*), the metallic green of the back, which forms the centre of the train, when expanded, is of a more golden hue than in *P. cristatus*, which it otherwise most gene-

* See Annals for April 1860, p. 333.

rally resembles. The whole of the secondaries, scapulars, and wing-coverts are black with outer narrow edgings of green, which becomes bluish towards the carpal joint. In this particular it resembles *P. muticus*, and is very different from *P. cristatus*, in which all these feathers are cream-coloured crossed with black markings. The thighs of *P. nigripennis* are black, as in *P. muticus*. In *P. cristatus* they are always of a pale drab. The female of *P. nigripennis* is of a much lighter colouring than that of *P. cristatus*, being almost entirely of a pale cream-colour, mottled with dark colouring above, and readily recognizable at first sight. In this respect, it may be remarked that the Black-shouldered Peacock is not intermediate between the two others; since in *Pavo muticus* the female is much more like the male.

Now the question arises, What is the Black-shouldered Peacock? Is it a domestic variety, a hybrid, or a feral species? I cannot consider it a domestic variety, because the differences in both sexes appear to be constant, and to descend to the progeny, and, indeed, are not of that sort that would be induced by domestication. M. Temminck, in his 'Histoire Naturelle des Pigeons et des Gallinacés,' * considers the Black-shouldered Peacock as the true Wild Peacock, and the *Pavo cristatus* to be a domestic variety of *that*. But this we know is not the case,—the Common Wild Pea-fowl of Hindostan being the true *Pavo cristatus*, and the Black-shouldered Peacock being, as I believe, *unknown* in that country †. That the *Pavo nigripennis* is not a hybrid between *Pavo cristatus* and *P. muticus*, is evident from the fact that we have now in our Gardens birds produced by this cross, and that they bear different characters altogether, as may be seen by the stuffed specimen which I now exhibit. Besides, the fertility of the birds, and the permanency and invariability of the differences which separate it from its two allies, seem to be quite conclusive against this view. If, therefore, it is not a domestic breed nor a hybrid, we must adopt the third alternative, and consider *Pavo nigripennis* as a distinct feral species. And I have little doubt that when the range of the *Pavonidæ* is more accurately known, we shall find that *Pavo nigripennis* occupies a distinct geographical area, which will in all probability be intermediate in position, as the bird is in characters, between *Pavo cristatus* and *Pavo muticus*.

Attention having been now called to this subject, I hope that no opportunity will be lost of examining the eggs, the osteology, and the anatomy of these birds, in order to ascertain whether the external characters are supported by other grounds of differentiation.

* Vol. ii. p. 26, Paon sauvage: *Pavo cristatus primus.*

† Our Head Keeper, Mr. James Thompson, who was in Calcutta in 1857, informs me that the Babu Rajendra Mullick, who is the owner of a very fine collection of living animals, had never seen the Black-shouldered Peacock, though he had specimens both of the Common and Javanese species in his Aviaries, and had bred hybrids between these two.

Description of a New Species of Geoclemmys from Ecuador. By Dr. J. E. Gray, F.R.S., V.P.Z.S., etc.

Mr. Cuming has lately sent to the Museum two shells of a species of Freshwater Tortoise, and a younger specimen, in spirits, of the same animal, obtained by Mr. Fraser at Esmeraldas, on the western coast of Ecuador.

Geoclemmys annulata.

Shell oblong, subquadrangular, black, slightly and irregularly varied with yellow; the vertebral plates square, almost as long as broad, with a compressed flat-topped anterior keel, highest on the fourth vertebral plate, which is narrower behind; margin sub-entire, with a triangular yellow spot on the under side of each plate; nuchal plate distinct; sternum flat, rounded on the sides, black, with a broad yellow band, forming a ring round the margin.

Hab. Esmeraldas, Ecuador.

The adult shell has much the external appearance of a Land Tortoise of the genus *Testudo,* but it has the divided caudal plate of the *Emydæ.* The nuclei of the vertebral plates are posterior and submarginal; those of the costal plates are placed in the upper hinder angle; the horny shields of these plates are concentrically grooved. The sternum is flat, rather suddenly bent up and truncated in front, and slightly curved and with a deep triangular notch behind: the broad yellow ring on this part gives it a very distinct appearance.

The young specimen, with the animal preserved in spirits, is black like the adult, but the back is much lower and rather concave in the middle, with a very strong, yellow, rounded keel. The hinder margin is slightly, and the front lateral margin is strongly, turned up at the edge. The head is rather small and black, the crown, the temple, and the neck being varied with broad white streaks or spots. The limbs are black, with a few broad white streaks and some white spots. The front of the fore legs is covered with cross rows of large scales; the soles of the feet with larger scales; the rest of the legs is covered with small granular scales; the hinder edge of the fore feet with three or four acute shields; the outer edge of the hind feet, marking the rudimentary outer hind toe, is edged with larger shields. Toes 5–4, short, thick, conical, only very slightly webbed at the base, and covered above and on the sides with three series of rather large shields. Tail short, conical, with rings of small black scales.

Description of a New Species of Emys lately living in the Gardens of the Zoological Society. By Dr. J. E. Gray, F.R.S., V.P.Z.S., etc.

The British Museum has lately received from the Zoological Society a specimen of an *Emys* which has recently died in the Gardens. It is believed to have been one of five specimens brought from Egypt by C. W. Domville, Esq., in 1852; but this is not certain. It is quite distinct from any which have hitherto come under my observation.

Emys fuliginosus,

Depressed, flexible, black. Shields convex, rather irregular, with deep, irregular, subconcentric grooves of unequal depression. Underside black, with white blotches on the front margin of the sternum and on the inner edge of the central marginal plates near the sternocostal suture, and a small irregular white blotch on the middle of the under side of the front marginal plates. Head rather depressed; crown covered with a continuous, smooth, rather horny skin. Jaws mottled with sinuous white lines or spots; sides of the neck with narrow white lines; the chin and throat mottled with broader white streaks, often interrupted or coalescing, or short and sinuous; the temple with a distinct round white spot, with two or three small white dots in front of it; the tympanum with a central white spot, and edged with a white streak in front. Legs and feet black; the front of the fore legs varied with white irregular streaks or spots, especially on the inner side, and with a white streak down the centre of the upper side of each toe. Toes distinctly webbed; claws rather elongate, curved, acute, black, with pale edges; the toes with a single central series of larger scales above. Fore legs with four large conical scales on the outer part of the upper side, and with a cross series of three square scales on the under side of the wrist. The hind legs and feet covered with equal, small triangular scales. Tail conical, black, with two transverse streaks before the vent.

Hab. North Africa?

Description of Homalocranium laticeps, a new Snake from Carthagena. By Dr. Albert Günther.

A Snake presented by Capt. Garth to the British Museum proves to be a new species. It was procured at Carthagena.

Homalocranium laticeps.

Diagnosis.—Scales in fifteen rows. Head broad, depressed as in *Elaps*. Seven upper labial shields, the third and fourth of which enter the orbit; two posterior oculars. Above black, with about twenty-three narrow brownish-yellow rings, the first forming a collar; belly brownish-yellow.

Description.—This Snake much resembles an *Elaps* in general habit; but there is no fang anteriorly, and the last maxillary tooth is longer than the others, and *appears* to be grooved. The rostral shield is rather low, triangular, and somewhat bent backwards on the upper surface of the head; the anterior frontals are much broader than long, and only one-fourth of the size of the posterior; the vertical is six-sided, not much longer than broad; occipitals moderate. The nostril is between two shields, the anterior of which is the largest; loreal none; one anteorbital. Seven upper labial shields, the second of which is in immediate contact with the posterior frontal;

the third and fourth form the lower part of the orbit; the fourth and fifth touch the lower postorbital; the sixth and seventh are equal in size. Two posterior oculars; two temporals, one behind the other. The median lower labial is triangular; six lower labials, the first pair forming a suture behind the median shield; two pairs of chin-shields, the anterior pair being twice the size of the posterior; there are four pairs of scales between the chin-shields and the first ventral. The scales are smooth, rhombic, in fifteen series. Ventral shields 172; anal bifid. The posterior quarter of the tail is mutilated. The ground-colour of the upper parts is shining black; the anterior part of the snout, a spot on the fifth upper labial, the rings of the body, and all the lower parts, are brownish-yellow. The rings, in this specimen, are one-fourth or one-fifth of the width of the black interspaces, and occupy two or three transverse series of scales; they are sometimes irregular and interrupted; all those on the tail are interrupted, the halves of one side alternating with those of the other; the first ring forms a collar, crossed by a narrow black streak.

	inches.
Length of the head	$0\frac{1}{2}$
——— of the trunk	17
——— of the tail (restored)............	4

MISCELLANEOUS.

On Alepidosaurus, *a Marine Siluroid Fish.* By Dr. Albert Günther.

In his Family *Scomberoidei* Cuvier has brought together many dissimilar fishes, whilst he has omitted others which approach very closely to the typical forms. Other species discovered by subsequent zoologists, and exhibiting some agreement with a Scomberoid fish, went to increase the unnatural group. Amongst the latter is *Alepidosaurus ferox*, described by Lowe (Proc. Zool. Soc. 1833, p. 104; Trans. Zool. Soc. i. p. 124, pl. 19, and p. 395, pl. 59; vol. ii. p. 181). This profound naturalist, to whom we are indebted for our best information upon the fauna of Madeira, deceived himself in this case as to the structure of the rays of the dorsal fins. These are not the inarticulate bones of the Acanthopterygii, but they are soft, and their division into joints appears indistinct only because the individual joints are separated from each other by great spaces, and each ray, notwithstanding its length, only consists of a few joints. It is true the absence of the spiny fins would be of itself no proof of the position of our fish amongst the Malacopterygii: this is wanting in several true Acanthopterygii; but then other characters aid us in recognizing their natural position, and the place where the spiny fin should stand is not occupied by the soft dorsal, as is the case in *Alepidosaurus*; in them the spiny fin is merely reduced to a rudimentary condition (*Brama*). If to this we add the presence of the adipose fin in *Ale-*

pidosaurus, and the abdominal position of its ventrals, which consist of one simple and nine branched rays, we cannot but come to the conclusion that this fish is a true Malacopterygian. The swimming bladder is wanting, as in many other Physostomi.

I have obtained evidence to which family of Physostomi *Alepidosaurus* is to be referred, by the examination of its skeleton*. 1. *The suboperculum is wanting*; it is replaced by the interoperculum, which equals the operculum in size. 2. *The margin of the upper jaw is formed entirely by the intermaxillary bone*; it is armed throughout its length with a row of small teeth; it is very weak, and dilated only in front into a nearly transparent lamella. 3. *The maxillary bone is rudimentary*: whilst in freshwater Siluroids with a short skull it is diminished in length, in *Alepidosaurus* it certainly imitates the cranial bones in its elongated form, but is not thicker than a needle, and can only be retained by careful preparation of the skull.

These osteological characters distinctly indicate a near alliance of our fish with the *Siluroidei*, notwithstanding any difference of form; and to this we may add that it is destitute of scales, and predatory; that, like most species of this family, it has an adipose fin, and that, like all of them, it is destitute of cæca. The relationship betrays itself even in some less important characters,—for example, in the outer ray of the pectoral fins, which is thickened and toothed. We have thus in *Alepidosaurus* the first example of a marine Siluroid fish; and if there be an objection to destroy the unity of the freshwater *Siluroidei* by the interpolation of *Alepidosaurus*, we may form for it a peculiar family (*Alepidosauridæ*) with the characters of the genus, which will then take its place in the immediate vicinity of the *Siluroidei*.

It is to be expected that *Alepidosaurus ferox* will not remain the sole species of this group. The fish described by Richardson, from the fragment of a cranium from Van Diemen's Land, as *Alepisaurus* sp. (Voy. 'Erebus' and 'Terror,' Ichthyol. p. 34, pl. 22. figs. 1–4), is identical with that from Madeira, as I have convinced myself by personal examination of the specimen, as far as the characters can be ascertained from the existing materials. His assertion that *Alepidosaurus* belongs to the *Sphyrænidæ* rests upon a very superficial investigation. But Mr. Lowe has told me of another species, very similar to our fish, which the fishermen in Madeira not unfrequently take with the hook at great depths. The union of the vertebræ, of the bones of the skull, and of the muscular segments is, however, so loose that, by its own efforts to free itself, the fish breaks up into fragments, and those portions which can be brought up to the surface become broken up in the air as though they had been dissolved by boiling.—*Wiegmann's Archiv*, 1860, p. 121.

* I will give a detailed description of the skeleton in the course of my 'Catalogue of Fishes.' It is remarkable in general for the singular deficiency of earthy constituents, as the muscles are for the extremely small development of the ligamentous tissue.

On the Origin of Species. By J. Gwyn Jeffreys, Esq.

At the last Meeting of the British Association, held at Oxford, Mr. Gwyn Jeffreys exhibited in the Natural History Section several specimens of *Buccinum undatum*, each of which had a double operculum,—in one instance a second or supplementary operculum being piled on the usual one, and in the others there being two separate opercula, instead of one, in each Whelk. Mr. Jeffreys adverted briefly to the different kinds of monstrosity which occur in animals and plants, and said he believed this to be the first case of a similar monstrosity in the Mollusca. He observed that the monstrosity under consideration appeared to be congenital, and not to have arisen from an accidental loss of the original organ, because in some of the specimens both opercula were cases of hypertrophy, and in the others of atrophy; and he mentioned that all the specimens came from the same place (Sandgate, in Kent), showing a repetition, and perhaps a hereditary transmission, of the same abnormal phænomenon; and he suggested that thus permanent varieties might in course of time be formed, and constitute what some naturalists would call "distinct species." He adduced, in support of this view, the case of a reversed monstrosity of the common Garden Snail (*Helix aspersa*) having been bred for many years in succession by the late M. d'Orbigny, in his garden at Rochelle, as well as many instances of a reversed form of Almond Whelk (*Fusus antiquus*) having occurred in the same localities on the coasts of England and Portugal, such being the normal form in the Crag.

On the Habit of Notopteris Macdonaldii, *Gray.* By John MacGillivray, Esq.

This curious Bat, which does not correspond sufficiently with the characters of any genus I have access to—coming nearest, however, to *Macroglossus* or *Kiodotus*—inhabits a deep, narrow, and very high cavern communicating with the sea, at the south-east corner of this island. I twice paid visits to this spot, but could not effect an entrance either by land or water: this can only be done during a dead calm, at low water, spring tides. A few days ago the specimen in the bottle was brought me: it had been found dead that morning under a banana in blossom, where it had probably been feeding during the night. The natives had previously told me that the Negrei Putegêtho (as they call it) is fond of resorting at night to the banana blossoms.

Aneiteum, July 1859.

PENTACRINUS FISHERI,

described by Mr. Baily in our last Number, was erroneously stated to have been found in the Kimmeridge Clay: it should have been the *Oxford Clay* of Weymouth.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[THIRD SERIES.]

No. 33. SEPTEMBER 1860.

XXIII.—*Some Account of the "Chaparro" of Fuerteventura, a new Species of* Convolvulus. By the Rev. R. T. Lowe, M.A.

During a few days' visit to Fuerteventura, with Mr. Wollaston, in our friend Mr. Gray's yacht the 'Miranda,' in January 1858, I received accounts of the existence in the island of a small shrubby spinous plant, called "Chaparro," the wood or root of which, like that of the "Leña noel*" (*Convolvulus scoparius*, L. fil.) of Grand Canary, was reported to possess a fragrance rendering it an object of supposed commercial interest. The plant was said to grow chiefly, or perhaps solely, towards the south of the island, on the desolate and desert promontory of Jandia; and it was stated to have been occasionally collected and exported into France and Spain on account of its alleged perfume.

At the moment, I had unfortunately no opportunity of verifying this information on the spot by a visit to Jandia. But specimens of *Asparagus pastorianus*, Webb, collected in the neighbourhood of Agoa Bueyes and of Rio Palmas, were hastily affirmed by some of my informants to be the plant in question, though possessing evidently none of the properties, beyond the spinous shrubby habit, which had been ascribed to it.

Revisiting Fuerteventura in March 1859, with my friend Mr. Wollaston, I reapplied myself, during a few days' stay at Betancuria, to a more satisfactory solution of this problem. At that place I learned not only that the "Chaparro" was certainly not the above-named *Asparagus*, but that it was to be found within the distance of six or eight hours' ride in a southerly direction, at a place called the Plaga Biocho, along the west coast of the island, towards the neck or origin of the great promontory of Jandia.

* A corruption, doubtless, of *Lignum aloes*, the "lign aloes" of Scripture (Num. xxiv. 6, &c.), which is, however, the produce of quite a different plant, viz. *Aloexylon Agallochum*, Lour.

Furnished by the kind and princely hospitality of Don Pedro Manrique de Lara y Cabrera with horses, guides, provisions, and every appliance for the expedition, I set out from Betancuria at 8 A.M. on the 6th of April, 1859; and after a long and weary ride of eighteen or twenty miles parallel with the coast, in a south-westerly direction from Rio Palmas, across an apparently endless succession of arid, stony, pathless wastes and dry Barrancos, attained at last the object of my search. We had just crossed, a little way above its mouth, the bed of a dry Barranco, called the Barranco Gastey, two or three leagues beyond a place called Mésque; and weary and despairing of success, as we were now, at 2 P. M., entering upon another seemingly interminable, hot, barren, sandy waste, sloping westward down to the sea, without apparent trace of either animal or vegetable life, I was about to give the order to turn our horses' heads homewards, when all at once one of my guides exclaimed, "Mira, Señor, el Chaparro!" ("Look, sir, the Chaparro!"). On horseback I could perceive nothing but the usual loose grey stones that lie scattered everywhere on these sun-burnt, ever parched-up, dull, and dreary wastes; but jumping off, I found that some at least of what appeared such were really plants, and presently the discovery of flowering examples completed my surprise and satisfaction. Much of what had appeared so like round-headed stones covered with grey lichen, that on horseback it was scarcely possible to discern the difference, proved at once to be a plant, the object of my search, and a *Convolvulus*.

Although the day was so far spent, and we had at least some twenty miles to retrace our steps, I remained more than half an hour examining the locality and taking descriptive notes from the plants *in situ*. They were pretty thickly scattered on the spot, but did not extend far, occupying a space of perhaps half a mile in breadth, and ending as abruptly as they had begun. Whilst I was thus exploring their characters and the limits of their place of growth, my guides were occupied in rooting up a few plants for specimens,—a work of no small difficulty, owing to the excessive toughness and hardness of their stems and roots, though, warned of this peculiarity beforehand, we had brought a sort of pick-axe for the purpose.

I rode on about a mile further, crossing another dry Barranco, remarkable for being lined on each side near the sea with fine tamarisk trees or bushes—the only green thing that I had seen for miles. On the sloping plain beyond this ravine, called the Plaga Biocho, I found a still larger patch of finer Chaparros. This spot could not be more than two or three leagues in a north or north-west direction from Chilegua, and near the origin or neck of the Jandia promontory.

The flowers at once proclaimed the plant to be a true *Convolvulus,* alien otherwise in aspect as it is entirely from the majority of species of the genus. It belongs, however, to a remarkable group of species similar in habit and locality (*C. spinosus,* Desh., *hystrix,* Vahl, *Forskahlii,* Del., *sericeus,* Burm. &c.), found only in the desert plains or wastes of Syria, Persia, and Arabia. It is therefore a matter of considerable interest to find a representative of so peculiar a group in the Canaries, where it is, however, in some degree linked on to the more ordinary twining shrubby forms by the intervention of the scarcely less anomalous *C. scoparius,* L. fil.

I could not discover in the plant itself, either on the spot or subsequently, any confirmation of the notion of its being available as a perfume. Both root and wood, leaves and flowers, were equally devoid of fragrance fresh or dry; nor was there any trace of resin, or essential oil, or glandular exudation perceptible in any part of the plant.

My attention was directed, however, by my guides to its property of catching fire instantly, and burning readily, whilst green, or even growing,—which would seem to indicate the existence of some inflammable essential oil or principle. This property I verified upon the spot; and it seemed to be the only character which gave it any value in the estimation of the few country people in the neighbourhood who were at all acquainted with the plant.

Convolvulus caput-Medusæ.

C. dumosus humilis nanus pulvinato-cæspitosus ramosissimus durissimus spinosus cinereus; ramulis abbreviatis lignosis densissime glomerato-intertextis, novellis strictis rigidis acutis spinescentibus; foliis parvis lineari-oblongis v. anguste spathulatis obtusis crassiusculis sericeo-cinereis; floribus axillaribus solitariis breviter pedicellatis parvis extus sericeis, antheris (purpureo-lilacinis) in fauce apparentibus subexsertis; stylis 2 distinctis filiformibus antheras paulo excedentibus.

Hab. in sterilibus arenosis saxosisque aridis apricis regionis submaritimæ oræ occidentalis Insulæ Fuerteventuræ, Promontorium Jandiæ versus, ad alt. 200–500 fere ped.—Florentem die 6^to^ Aprilis 1859 inveni.

A most remarkable and (for its genus) paradoxical species, so excessively dwarfed down and stunted that it has more the appearance, when growing, of a rounded convex stone, covered with a grey Lichen, or of some Madreporiform mass, such as the Brain-coral (*Meandrina,* Lamk.), than of a phænogamous plant; though, when torn up by the root, it presents rather the form and aspect of some enormous grey fungus (*Boletus*), being a stipitate, pulvinate, often hemispherical or turbinate, hard, woody, spinous mass of densely interwoven, rigid branches, with quite small and inconspicuous leaves and flowers in proportion to its size, like some closely-browsed or clipped-down thorny bush, and of the shape exactly of a miniature Stone-Pine (*Pinus Pinea*, L.). Root woody, very hard and stiff, nearly or quite simple and tap-shaped, covered with a rugged, longitudinally-striated, brown bark, and from the thickness of the little finger to that of the thumb at the crown, where it immediately divides into a dense mass of very short, stiff, woody, closely interlacing and entangled branches, forming a very hard, rigid, spinous, cushion-like, grey, flattened head, convex in the centre, from 3 or 4 to 18 inches in diameter, and from 1 to 6 inches thick in the middle; so hard, compact, and woody, that it will often bear the weight of a man standing or even stamping on it, without yielding or sensible disfigurement. Young shoots originating chiefly from within or beneath the roof-like cushion or *pileus* formed by the older, outwardly-knobbed, spurred and stunted, interlacing branches; straight, hard, stiff, rigid, spine-like, seldom more than 1 or 2 inches long, round, terete, sharp, and hard-pointed, finely and evenly striate longitudinally, very finely and minutely cinereo-puberulous. Leaves 2 to 5 or 6 lines long, and ½–1 line broad, thickish in substance, subconduplicate, clothed with adpressed silky-grey hairs, linear-oblong, subspathulate, obtuse. Flowers pretty, but small and rather inconspicuous, solitary, axillary, subsessile in the axils of the leaves on the young shoots, light rose-pink or purple, much resembling those of *C. arvensis*, L., but very much smaller, being only 4 or 5 lines in diameter. Calyx bracteolate; sepals and the adpressed bractlets oblong, short, one-third or one-fourth the length of the corolla, silky grey. Corolla 5 or 6 lines in diameter, three or four times the length of the bracts and sepals, funnel-shaped, 5-angular, and outwardly silky-pubescent in five longitudinal rays or narrow acuminate stripes.

The flowers continued to expand successively for several weeks after the plants had been deposited in a basket kept in a dry place,—deriving probably, whilst growing in those arid wastes, their chief supply of moisture from the air, and depending only secondarily upon the soil. Indeed, at this moment, though more than a year and a half has elapsed since they were rooted up, they look very much the same as when actually growing.

I was informed by a Spanish gentleman in the house of my kind and hospitable friend Don Ramon Paez, at Puerto de Cabras, in Fuerteventura, that in Spain the name "Chaparro" designates some species of dwarf shrubby oak.

Specimens of entire plants of *Convolvulus caput-Medusæ* have been placed in the Banksian and Hookerian herbaria.

Lea Rectory, Aug. 6, 1860.

XXIV.—*On a New Species of* Agelacrinites, *and on the Structural Relations of that Genus.* By E. J. Chapman, Professor of Mineralogy and Geology in University College, Toronto.

Agelacrinites Billingsii.

Introductory Notice.—The accompanying figure represents, on a somewhat enlarged scale, the upper side of an undescribed species of Vanuxem's rare and interesting genus *Agelacrinites,* discovered amongst some Lower Silurian fossils from the Trenton Limestone of Peterborough, Canada West. It is dedicated to the able palæontologist of the Geological Survey of Canada, whose researches have so greatly added to our knowledge of the obscurer organisms of the Silurian age, and who has done so much, in all respects, for the advancement of Canadian palæontology.

The present communication is subdivided into two short sections. The first contains a detailed description of the new species. This description, however, it should be remarked, is founded on a single example. The second section comprises an analytical review of the genus *Agelacrinites* in general, more especially with regard to its structural relations and affinities.

1. *Description of* Agelacrinites Billingsii.—Body circular, or nearly so. In the specimen on which this description is based, its diameter is exactly half an inch. It is slightly convex above, and flat, or apparently somewhat concave below. From the centre of the upper side, five rays, composed each of a double series of alternating or interlocking plates, radiate towards the margin of the disk, and terminate in well-defined points at about the twelfth of an inch from this margin. The rays, in the specimen under examination, exhibit no traces of pores, even when strongly magnified. Nevertheless pores may have been, and probably were, originally present. It is easy to conceive how minute orifices of this kind might become obliterated during fossilization; whilst, on the other hand, the object of the rays is altogether inexplicable, unless we look upon them as really representing ambulacral areas. Moreover, poriferous ray-plates have actually been discovered in certain examples of *Agelacrinites*; and analogy, consequently, would lead us to infer that they existed originally in all. These rays, at their origin, leave a small central space covered by larger and somewhat rhombic plates. The latter appear to be five in number, and to constitute the first ray-plates, one being common to two adjacent rays. Very possibly, however, each of these rhombic plates may be divided through the centre, longitudinally; for the specimen is much broken at this spot, and the plates are pressed, more or less, one over the other. The

interradial spaces and the margin of the disk are covered by numerous irregularly disposed, scale-like and partially imbricating plates. At the margin these are very small, exceedingly numerous, and arranged in three or four irregular rows, with their longest diameter pointing towards the centre of the disk. To these succeed a series of larger plates, having their greatest diameter in a direction at right angles to that of the border plates, or, in other words, parallel with the circumference of the disk. To these succeed, again, other and somewhat smaller plates, all partially overlapping. This arrangement of the surface plates seems to be an extreme modification of that which obtains in *A. Hamiltonensis* of Vanuxem, and *A. Bohemicus* of F. Roemer; but the larger plates merge gradually, as it were, into the others, and thus there is no defined circle of large plates separating (as in the latter types) the border plates from those of the centre. Finally, in one of the interradial spaces, at a distance of about one-sixth of an inch from the centre of the disk, a well-marked "pyramidal orifice" is situated. This, in the specimen under examination, is about one-twentyfourth of an inch in diameter, and is made up, apparently, of ten plates, in two sets of five—one set alternating within the other, as in Hall's *Hemicystites parasitica*. The under side of our species remains unknown; but, in the specimen examined, it is not attached to a shell or other organic body, and hence, as shown moreover by examples of other species, the genus cannot properly be considered a parasitic one.

Agelacrinites Billingsii differs essentially from the Canadian *A. Dicksoni* of Billings (and also from the *Edrioaster Bigsbyi* of that palæontologist) by the possession of *short* and *straight* rays, and by its numerous marginal plates. It is also at once distinguished by its straight rays, independently of other characters, from the typical Devonian species, *A. Hamiltonensis* of Vanuxem, and the more recently discovered Carboniferous species, *A. Kaskaskiensis* of Hall. It agrees, on the other hand, somewhat closely with Hall's *Hemicystites parasitica*=*Agelacrinites parasiticus* from the Niagara Limestone of New York; but in this latter species the rays are very narrow at their orgin, and are connected there (in the centre of the disk) by a small tubercle or rounded plate. In place of becoming narrower also towards the margin (as in *A. Billingsii*) and terminating in well-defined points, they become rapidly broader, "coalesce with the plates of the body" (Professor Hall), and are altogether undefined at their extremities. These characters, as given in the 'Palæontology of New York' (vol. ii. p. 245, and plate 51. figs. 18–20), from an examination of several specimens, are exactly the reverse of those which obtain in our new species. Whilst, also (although this character is probably somewhat indefinite), the small border plates in *A. Billingsii* form two or three circles, in *A. parasiticus* they appear to occur only in a single row.

2. *Analytical Review of the Genus* Agelacrinites *and its included Species.*—The generic characters of *Agelacrinites* may be thus defined:—Form circular; stemless; flat or concave below, and somewhat convex above; and covered by numerous small plates, arranged in part irregularly, and in part in regular order. The definitely arranged plates form five rays (ambulacral areas?), which originate at the centre of the upper side of the body. These rays are either short and straight or long and curved. They are also composed of a double series of small polygonal plates, interlocking along the central line of ray; or, otherwise, of a single (?) series of plates (Roemer's *A. Rhenanus*). The irregularly arranged plates are elliptical or circular, variable in size, very numerous, thin, scale-like, and imbricating; or imbricating at and around the margin of the disciform body, and joining by their edges in the more central part of the disk. The marginal plates are commonly very small, and, in some species, are separated from the more central plates by a circle of comparatively large pieces. In the centre of one of these (interambulacral?) spaces, and about midway between the apex of the body and the margin, is situated an orifice covered by a pyramid of five or more (moveable?) plates. The apex itself, or centre and origin of the rays, is covered by a single circular plate, or is surrounded by five or ten angular plates—these latter constituting the first plates of the rays. Characters of the under side of the body, position of mouth, &c., not definitely known.

From this definition, it is clear, as, indeed, is universally allowed, that *Agelacrinites* belongs to the Echinodermata. In the present state of our knowledge, however, it is impossible to refer it satisfactorily to any one of the admitted orders or families of that class. With the Crinoids proper, and the Blastoids, it appears to have only general affinities; but with the Cystideans it is evidently closely connected: more especially by the possession in common of a pyramidal orifice or so-called anal pyramid. It differs from the Cystidean structure, nevertheless, in many important respects: the peculiar rays, the imbricating plates, the absence of a stem, for example, are essential points of difference. The imbrication of the plates serves to connect it, through the genus *Protaster*, with the Euryales or the Ophiurians; and the conformation of the rays, in certain species, appears to afford another link in support of this view. But is it not equally related to the Echinida? After a careful consideration of the subject, I cannot refrain from hazarding an opinion that the position of the mouth, as usually given, is erroneous. In several species, as in *A. parasiticus* and *A. Kaskaskiensis* of Hall ('Geology of Iowa,' vol. i. part 2. pl. 25), the centre or origin of the rays is a simple disk or rounded tubercle—incontestably, no mouth: and hence we may fairly assume that, in other species also, the mouth must be situated elsewhere. The question then arises as to the real nature of the pyramidal orifice. This is usually looked upon either as an anal orifice or as an ovarian aperture. Neither of these views is by any means certain, nor, indeed, apparently susceptible of proof. To consider this orifice as the mouth, however, appears a still less satisfactory conclusion. In the Crinoids proper, the true position of the mouth is still, strictly speaking, unknown. It is considered in some genera to be in the centre of the "vault," or upper surface, and in others to occupy an excentric position, as between two of the arms, &c. This latter view is unsustained by any proof, beyond the mere occurrence of an orifice at the points in question. The excentric orifice may or may not be the mouth. But if we omit these forms from consideration, and turn to those types of Radiata in which the position of the mouth is no longer doubtful, that organ, it will be seen, is invariably situated in the centre of the body, except in the Family of the *Spatangidæ*, the highest family or natural group of the entire series. In the other families of the Echinida, in the Asterida, Ophiurida, and other orders in which the position of the mouth is truly known, the mouth is always central. This is evidently its normal position in the radiated type of structure, and one, consequently, that we should scarcely expect to see departed from, except in the case of those forms which stand at the higher limit of the series. Unless this view be adopted, we must almost necessarily assume that in the Radiata there are certain natural groups (not yet thoroughly worked out) which are perfectly unconnected with each other, and in which, respectively, the higher forms foreshadow an advanced type of structure, whilst the lower forms present the normal type. The higher forms of a low group, however lowly organized as to their entire structure, will be thus, in certain respects, in advance of the lower forms of a higher group. Whatever grounds there may be to believe that some law of this kind really holds good in Nature, its application in the present place would be evidently forced. Discarding, therefore, the idea that in the pyramidal orifice of the Cystideans and *Agelacrinites* the mouth is represented, this latter organ must be sought for in another place. Reasons have already been stated against this being the centre of the rays. Its true position will be found, I believe, in the centre of the under side of the body. But, it may be urged in objection to this, the genus *Agelacrinites* is sessile—is attached by its under surface to shells and other foreign bodies; and hence the mouth cannot be situated there. Several examples, it is quite true, have been met with attached in this manner to Brachiopod shells; but this is by no means a general condition of occurrence, and, rightly considered, is no proof of an original *permanent* attachment. It is just as exceptional a mode of occurrence, indeed, as that from which Vanuxem derived the name of the genus.

This suggestion as to the true position of the mouth cannot, of course, be satisfactorily adopted until confirmed by the examination of more perfect specimens than those hitherto discovered, or until the proper functions of the pyramidal orifice, in this genus and in the Cystideans, are clearly ascertained. But, under any view, it seems obvious that, without a forced collocation, these peculiar forms cannot be placed in any existing group. In the present restricted state of our knowledge at least, they must form a group apart. Mr. Billings (Decade III. of 'Canadian Organic Remains,' under description of *Agelacrinites Dicksoni*) appears inclined to regard them as constituting a suborder of Star-fishes; and he proposes to arrange them in this connexion under the term of *Edrioasteridæ*. This name seems objectionable, however, on two grounds: first, because the supposed sessile (*i. e.* parasitic) condition of *Agelacrinites* is by no means proved; and secondly, because the relations of the genus to the Star-fishes—in so close a way, at least, as the name would imply—is not yet established. For these reasons I would suggest the term Thyroidea, in allusion to the valved aperture, as the name of the special group or order framed for the reception of these forms. The following scheme will then represent the probable relations of the various leading groups belonging to the Echinodermata generally:—

Crinoidea.
Blastoidea.
Cystidea.—
Thyroidea—
Asterida.
Ophiurida.
Euryalida.
Echinida.
Holothurida.

In the group Thyroidea we have, at present, but one family—that of the *Agelacrinitidæ*, comprising, probably, but one known genus: *Agelacrinites.* The recognized species of this genus are enumerated in the annexed tabular view:—

Subkingdom **RADIATA.**

Class *ECHINODERMATA.* Order **THYROIDEA.**

Fam. **Agelacrinitidæ.**

Genus Agelacrinites.

Synopsis of Species.

A.—Lower Silurian Species.

(Rays curved):—

1. *A. Buchianus,* E. Forbes.
2. *A. Cincinnatiensis,* Roemer.
3. *A. Dicksoni,* Billings.
4. *A.* (*Edrioaster*) *Bigsbyi,* Billings.

(Rays straight):—

5. *A. Bohemicus,* Roemer.
6. *A. Billingsii,* Chapman.

B.—Upper Silurian Species.

(Rays straight):—

7. *A. parasiticus,* Hall.

C.—Devonian Species.

(Rays curved):—

8. *A. Hamiltonensis,* Vanuxem.
9. *A. Rhenanus,* Roemer.

D—Carboniferous Species.

(Rays curved):—

10. *A. Kaskaskiensis,* Hall.

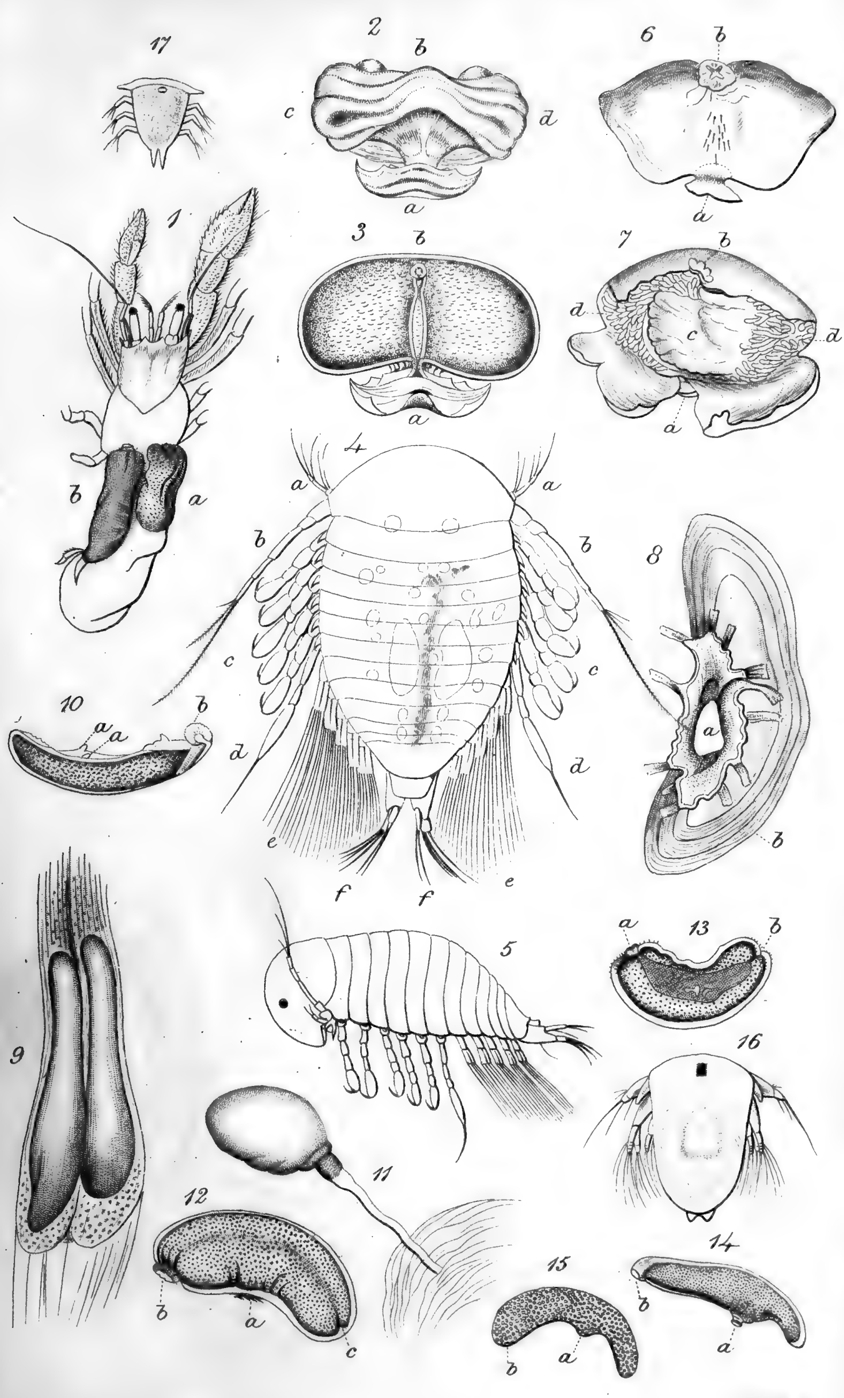
XXV.—*On the Genera* Peltogaster *and* Liriope *of Rathke.* By W. Lilljeborg.

[With a Plate.]

Professor Lilljeborg of Upsal has published, in the 'Transactions of the Royal Academy of Sciences' of that place, a memoir containing detailed descriptions of the animals to which the above generic appellations were given by Rathke. As it forms an interesting supplement to the memoirs by Steenstrup and Leuckart which have already appeared in this Journal*, we here give an abstract of its contents.

In the historical portion of his memoir, the author goes over the same ground as his predecessors; so that there is no occa-

* See Ann. Nat. Hist. 2nd ser. vol. xvi. p. 153, and 3rd ser. vol. iv. p. 422.



J. Basire, sc.

sion to refer to it. Professor Lilljeborg considers that Rathke's *Peltogastri* belong to the group of Cirripedes, and admits the generic divisions established in them by Diesing.

Genus Pachybdella, Diesing, Syst. Helm. i. p. 435.

Of this genus, which, as Leuckart has shown, is identical with *Sacculina* of Thompson, the author gives the following character:—

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

Animal adultum crassum, sacciforme, transverse ellipticum, cute (pallio) lævi, molli, sed firma, corpus crassum, carnosum, intus glanduliforme et sine cavitate digestionis distincta, instar pallii circumdante, vestitum. Os in organo adfigendi, vel acetabulo, subinfundibuliformi, corneo perforatum, et in œsophagum transiens. Anus nullus? Ovaria externa numerosa, ramosa, cæciformia, circa corpus adfixa et membrana tenui involuta. Ovaria interna in corpore carnoso sita. Cavitas inter ovaria externa et pallium per foramen sat magnum, ori oppositum et plicis cutis circumdatum, aperta. Organa masculina ignota.

Pullus entomostraciformis, pullo Cirripediorum processibus ad latera partis anterioris corporis similis.

The form of the young proves that these animals belong to the Cirripedes. The mature animal is a sac without segments, eyes, or limbs (Pl. IV. fig. 6). This sac presents two prominent parts, of which the first, situated on the side by which the creature is attached to the animal on which it lives as a parasite, is a funnel-shaped organ of attachment (fig. 6 *a*), supported by a short neck and perforated in the middle by the mouth. At the opposite side there is a short tube, formed by folds of the skin, and surrounding an aperture of considerable size; the latter leads into the cavity containing the external ovaries, and appears to be intended to give exit to the young.

The œsophagus is small and short; in the individual examined by the author it was curved in a spiral form, and fixed to the lower side of a large fleshy part. The latter had a glandular appearance internally, and had no distinct digestive cavity; the author regards it as the transformed body probably occupied for the most part by the generative organs. The voluminous racemose interior ovaries were seen distinctly, but no male organs were observed. This body was continued to the superior aperture, where, however, it presented no anal opening, but its thick outer coat forms the large folds which surround that orifice. At one side the membrane enveloping the body appears to be more compact, and furnished with several distinct folds, and here it is attached to the inner surface of the skin (*pallium*). Except at this point, the body is everywhere surrounded by the external ovaries, resembling ramose cæca (fig. 7 *d*). The structure of these resembles that of the external band-like ovaries described by Leuckart (Annals, ser. 3. vol. iv. p. 428, pl. 7. fig. 6): according to Lilljeborg, they are contained in one, or perhaps two sacs formed of a delicate transparent membrane, which presents the appearance of an epithelium with irregular cells. The figure of the young animal given by Cavolini (copied in fig. 17) presents a closer resemblance to that of a newly-hatched larva of a Cirripede than that of *Peltogaster*, as observed by the author and Lindström.

Sp. 1. *Pachybdella Carcini*, Rathke. (Pl. IV. figs. 6 & 7.)

Animal supra et infra leviter sinuatum; partes laterales obtusæ; acetabulum rhomboideum, marginibus simplicibus, non multum expansis. Color rufescenti-flavidus. Latitudo circ. 17–20, et crassitudo 9–12 millim.

Peltogaster Carcini, H. Rathke, Beiträge zur Fauna Norwegens, Acta Leop. xx. p. 247, tab. 12. figs. 18, 19.
Pachybdella Rathkei, Diesing, Syst. Helm. i. p. 435.

It is found under the abdomen of *Carcinus Mænas*, attached over the intestinal canal, usually singly, sometimes two together. Also met with on *Portunus marmoreus*, and, according to Steenstrup, on *Portunus hirtellus* in the Mediterranean. Lovén has met with it on the abdomen of a *Hyas*.

The author adds that it is probable there may be several species of the genus, and, judging from Cavolini's figures, that he had more than one species under his eyes.

[As Leuckart has indicated (*l. c.* p. 424), the generic name *Pachybdella* must be changed to *Sacculina*, Thompson, and the species above described will stand as *Sacculina Carcini*, Thompson. We have also to add the species, *Sacculina inflata*, described by Leuckart.]

Genus Peltogaster, Rathke.

Reisebemerkungen, Neueste Schrift. der Naturforsch. Gesellsch. in Danzig, ii. p. 195; Beitr. z. Fauna Norw., Acta Leop. xx. p. 244.

From his observations on several new species of this genus, the author gives the following character for it:—

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

Animal adultum. Corpus sacciforme, elongatum, teretiusculum, vel depressiusculum, cute (pallio) plus vel minus pellucida sed firma obtectum, minime segmentatum, et partibus appendicularibus articulatis destitutum. Os in organo adfigendi subinfundibuliformi vel acetabuliformi plus vel minus corneo, absque appendicibus buccalibus, in latere inferiore corporis situm. Ad extremitatem unam (anteriorem) corporis apertura, interdum magna, interdum parva, cavitatem generalem corporis internam aperiens adest*. Nullum corpus internum carnosum adest nullusque ventriculus a cavitate corporis distinctus, quare hæc cavitas, quæ intus, sub cute firma et transverse fibrosa, membrana tenui pellucida sat vero firma est vestita, et ad alimentum digerendum vel saltem adservandum, et ad ovaria complectanda servit. Genitalia bisexualia? Partes duæ subclavatæ vel sacculiformes (? testes vel vesiculæ seminales), pedunculo vel canali ad membranam internam cavitatis corporis sub ovariis adfixæ†. Ovaria duo, in principio in fundo cavitatis corporis supra et inter partes illas duas sacculiformes adfixa, juxta sese posita, extus sacciformia, intus acinosa, membrana cellulosa circumdata, et demum totam cavitatem corporis explentia, et inter se ita coalescentia, ut vix disjungi possint.

Pulli iisdem antecedentis similes, entomostraciformes, cum Cirripediorum pullis processibus lateralibus a parte anteriore et inferiore corporis exeuntibus congruentes, sed tamen etiam formam pullorum Lernæidarum referentes.

From their more simple internal structure, the deficiency of a fleshy internal body, and the sacciform ovaries which occupy the whole cavity, the author considers that these animals form not only a distinct genus, but even a distinct family. This presents some analogies with Darwin's order Apoda. The structure of the larva and of the mature animal, which is probably hermaphrodite, appears to prove that both *Peltogaster* and *Pachybdella* belong to the Cirripedia.

The form of the body in *Peltogaster* is cylindrical, sometimes a little flattened, and the aperture leading into the cavity of the body is placed at one of its extremities. These characters distinguish *Peltogaster* from *Pachybdella*. In other respects the two genera are similar. The body in *Peltogaster* is sacciform, enveloped in a soft and smooth, more or less compact and transparent skin, which has externally a very fine, transparent, structureless, chitinous epidermis, and under this a thicker and less transparent dermis, of fibrous structure, and furnished with transverse fibres. The thickness and opacity of this skin vary in different species, and even apparently in individuals of the same species, according as the internal parts are more or less developed. Within the dermis is a delicate transparent membrane without epithelium, slightly attached to the dermis by an

* Rathke regarded this orifice as a mouth.

† Rathke, perhaps correctly, regards these as male sexual organs, and therefore believes the animals to be hermaphrodites, which is also the case in the Cirripede which approaches them most closely, although it is still very different—namely, Darwin's *Proteolepas*.

areolar tissue; this lines the internal cavity, and consequently embraces the ovaries. It is probably this membrane that Rathke regards as a stomach (*ventricule*); and when he found eggs in it, he was led to believe that the stomach of these animals also performed the function of a matrix.

The two parts which both Rathke and the author regard as male organs (*vesiculæ seminales*?) form, in *Peltogaster sulcatus*, opake sacs filled with a cellular matter and furnished with a long neck (figs. 10 *a* & 11). This neck is fixed, beneath and to one side of the primary ovaries, to the inner surface of the lining membrane of the body-cavity. These parts are attached beneath the organ of adhesion, as mentioned by Rathke. Their cæcal extremities are directed forwards, as described by Rathke. As the author's specimens were preserved in spirit, he could not ascertain whether these sacs contained spermatozoids. He hints that they may be cement-glands, but, as they do not appear to be connected with the ovaries, from which, as asserted by Darwin, the cement-glands originate, and as he could not discover any connexion between them and the organ of adhesion, which ought to be formed by their secretion, he does not regard this function as probable. That *Peltogaster* possesses cement-glands is indicated by the structure of its organ of adhesion and the mode in which this organ is fixed to the skin of the abdomen of the *Pagurus*. On comparing the dilated disk of *Peltogaster Paguri* (fig. 8) with that of the basal membrane of *Coronula balænaris* figured by Darwin (Mon. Cirrip. ii. pl. 28. fig. 1 *a*), there appears to be a considerable resemblance between them. The margins of the organ of adhesion are more or less united to the skin of the *Pagurus*, so that, in separating them, fragments of the skin, or at least of the epidermis, remain attached to the margins of the organ*.

The ovaries at first present the appearance of two sacs placed very close together; they are elongated, opake, and a little thickened behind (Pl. IV. fig. 9). They are situated on the inferior wall of the body-cavity, immediately behind the organ of adhesion, upon the tegumentary membrane, which is much thicker in this spot. They are separately enveloped by a cellular membrane with different formative materials. Their walls are thick and opake. The structure of the contents is acinose. When compressed and magnified 200 diameters, the ovules, with their germinal vesicle, are clearly seen enveloped in a tenacious matter, which is probably a future cement, as this, according to Darwin, issues in a similar form from the primitive ovaries of

* According to Darwin, the cement of *Coronula balænaris* penetrates the epidermis of the Whales, and becomes confounded therewith in the way above described.

the Cirripedes. During the development of the ova the ovaries become enlarged, until at length they fill the whole cavity of the body, and at the same time they unite so closely, or even become so confounded, that it is sometimes impossible to discover their original limits. They then present the appearance of a single sac surrounded externally by the inner membrane of the body-cavity. When the skin is removed, the sacs of eggs appear as a single sac, the walls of which are formed by the membrane which lines the cavity of the body, but beneath this they are found to possess their own proper coats. These walls are less transparent and solid, cellular in structure, and contain formative substances, from which it follows that the sacs themselves act as matrices, and not the cavity of the body as supposed by Rathke. When the membrane enveloping the ovisacs bursts anteriorly, the young escape directly by the anterior aperture of the body-cavity. Probably the existence of the parent terminates with the accomplishment of its propagative destiny, as in other parasites; and thus we may explain the transformation of the ovaries into such enormous sacs. The author found two specimens of *Peltogaster sulcatus*, dead and completely empty, but still attached to the abdomen of *Pagurus chiracanthus*, Lillj. He has also found in the same matrix ova and newly-hatched young; it therefore appears that the development of the eggs does not take place simultaneously, although the difference is not great.

The organ of adhesion, being generally in the form of a funnel with a neck of greater or less length, is always of a harder texture than the surrounding skin, and more or less horny according to the age of the animal. Young individuals, in which the secretion of cement has been less, have the organ softer and lighter in colour; in older specimens it is hard and solid, at least in part, and its colour is then brown*. It has always an aperture in the middle (fig. 8), through which the *Peltogaster* probably sucks its nourishment from its host. This orifice is continued through the neck of the organ of adhesion, and also through the epidermis and dermis. Rathke denies the existence of this aperture, believing that the orifice at one extremity leading into the cavity of the body was the mouth. But the form of the organ of adhesion and the mode in which it is attached to its host appear to prove that it is formed, as in the other Cirripedes, at least partially, by the secretion of cement†. As in the other Cirripedes, it appears that this organ is also formed by a transformation of the outer or second pair of antennæ, formed in the

* The substance of which it is formed is probably chitinous.

† In a specimen of *P. Paguri*, the author once observed a portion of a canal attached by one of its extremities to the inner part of the epidermis; this might have been a cement-canal.

larvæ in the lateral apophyses of the anterior part of the body; and as the mouth is situated in this organ, it appears that it also has been formed by the transformation of the tubular mouth of the larva. It presents different forms in the different species, and may furnish distinctive characters. Where it is fixed, the epidermis is always firmer and thicker, and it sometimes even extends over the epidermis like a shield (fig. 8 *b*). Sometimes there is only a ring of firmer tissue on the epidermis round its base. When the *Peltogastri* which have the organ of adhesion rounded, and not ramose, are separated from the skin of the *Pagurus*, the latter exhibits a round hole at the point where the organ of adhesion was fixed; through this aperture they no doubt suck their nourishment.

The newly-hatched larva (fig. 16) is less elongated than the larvæ of other Cirripedes. The posterior part of the body is not pointed, but rounded and obtuse, as in the larvæ of the Lernæidæ and Copepoda. But the larva of *Peltogaster* differs from the latter by an apophysis projecting from each side of the front of the body, and issuing from the lower surface. In the very young larvæ this is attached to the body in such a manner that it is difficult to see it; but as the second pair of antennæ are formed in these apophyses, and it is with these that the Cirripede afterwards adheres, it is evident that the apophyses are of the greatest importance, and their presence may be regarded as characterizing the animal. The larvæ of Cirripedes are distinguished from those of the Lernæidæ and Copepoda by the early presence of the first pair of antennæ not in the form of legs. The author has been unable to discover these antennæ in newly-hatched larvæ or in those still contained in the eggs*.

No specimen of this genus has hitherto been discovered except upon species of the genus *Pagurus*. They are usually fixed upon the left side of the abdomen, in such a way that the aperture leading into the cavity of the body is turned towards the anterior part of the *Pagurus*, and consequently towards the aperture of the shell in which the *Pagurus* resides. This is probably to enable the young to escape as rapidly as possible. The

* According to Claus (Archiv für Naturg. 1858, p. 1, and "Ueber den Bau und die Entwickelung parasitischer Crustaceen," Cassel, 1858, p. 5), the parts of the mouth in the Copepoda are formed from the third pair of feet of the larvæ, and the antennæ from the first and second pairs. As, according to Darwin, the feet in the larvæ of the Cirripedes have no significance as future antennæ, the appendages of the mouth of the Cirripedes, by analogy with the order of development of parts in the Copepoda, should be formed from the first pair of feet of their larvæ. But Darwin thinks that this pair of feet corresponds with the second pair of feet or cirri in the developed animals. There is here, at any rate, a great difference in the development of the Cirripedia and Entomostraca.

size of the parasites is in direct relation to that of the *Paguri*. On the smallest species of the genus *Pagurus* (*P. chiracanthus*), which is sometimes met with in shells as small as *Cerithium reticulatum*, the author has found specimens of *Peltogaster microstoma* only two millimetres in length. These contained no ova; but close to their organ of adhesion, which was but slightly developed, there were some long and fine filaments, apparently hollow canals, perhaps belonging to the cement-apparatus. Rathke also found similar filaments placed in two tubercles on the membrane of the "digestive sac," and probably in communication with the parts described above as male organs. Perhaps these, as well as the female organs, assist in the production of cement.

Besides Rathke's *P. Paguri*, the author describes two new species. The following table gives the distinctive characters of the three:—

Peltogaster	Organum adfigendi, sive acetabulum	ramosum		*Paguri*.
		simplex. Apertura corporis antica	magna, marginata	*sulcatus*.
			minima, neque marginata	*microstoma*.

1. *Peltogaster Paguri*, Rathke. Pl. IV. fig. 12.

Diagn. Acetabulum in medio latere ventrali situm, ramosum.—Longit. maxim. circ. 16 millim.

Peltogaster Paguri, Rathke, Reisebemerkungen, p. 105, tab. 6. figs. 12–16; Beitr. z. Fauna Norw. p. 245, tab. 12. fig. 17.

This is the largest known species. It is subject to variations both in its form and in the structure of the envelope of the body; even the structure of the organ of adhesion and of the aperture at the anterior extremity of the body varies to a certain extent. The form of the two individuals seen by the author is represented in Pl. IV. fig. 1 *b*. But these were small specimens, one measuring 8 and the other 4 millim.; the latter contained ova, the former did not. The form is more clumsy than in the other species, and nearly cylindrical, with the anterior part much thicker than the posterior. The body is much curved in a direction parallel to the curvature of the abdomen of the *Pagurus*; the skin is smooth, except a few longitudinal and transverse folds; it is generally thick and but slightly transparent, especially in young individuals. The epidermis, which is particularly transparent, appears to be generally raised a little above the dermal layer. On the lower surface is an elongated area in which the skin is less transparent, probably in consequence of the thickness and opacity of the inner skin. The four older and larger specimens lent to the author by Prof. Lovén were filled with ova, and had the posterior part of the body a little less narrowed than the other specimens. In three of them there were little spines at each extremity of the body (fig. 13); but these were wanting in the fourth and largest specimen, so that they cannot be regarded as characteristic of the species. In other respects the four specimens were exactly alike, and they were found upon the same species of *Pagurus* (*P. cuanensis*), and in the same locality. The organ of adhesion (fig. 8) is larger in this species than in the others, and also differs greatly in two respects: in the first place, it is fixed in this species upon a dilated corneous and elongated shield, having the two extremities obtuse and placed upon the middle of the lower part of the body; secondly, its margins are more dilated, and become dispersed in several branches, which are by degrees confounded with the external skin of the *Pagurus*. The shield extends only a little upon the lower surface of the body. In older individuals, the corneous matter of which this organ is formed is found to be more solid and darker in colour; the shield in these is also larger. In young individuals the central solid and dark part of the shield is surrounded by some clear concentric streaks, which, although they differ from the epidermis, have not yet acquired the solidity of the central part. The shield is therefore formed by an addition of new concentric layers of cement round the central layers, as well as by an addition of cement to the latter. There is also a small hollow neck between the shield and the acetabulum, of the same substance and colour as those parts (fig. 8 *a*). This neck is visible above the skin of the *Pagurus*.

The orifice at the anterior extremity of the body leading into the internal cavity is placed nearly in the middle of that extremity, which is the most obtuse. The size of this aperture and the number of folds of skin surrounding its tube are subject to variation. The same membrane which lines the cavity of the body also lines the interior of the tube.

The colour is variable: in some it is yellowish-green; in others, filled with well-developed eggs, reddish.

This species has been found on *Pagurus Bernhardus*, *P. pubescens*, *P. cuanensis* and *P. chiracanthus*, on the coasts of Norway and Sweden. It usually occurs singly on the abdomen of the *Pagurus*.

2. *Peltogaster sulcatus*, n. sp. Pl. IV. fig. 14.

Diagn. Acetabulum pone medium situm, simplex, margine expanso, radiato. Infra inter acetabulum et aperturam corporis anteriorem magnam et marginatam bisulcatus.—Longit. circ. 7–8 mill.

This species is much smaller than the preceding, and has a more cylindrical form. It generally appears to be thicker at the part where the organ of adhesion is situated. The two extremities of the body are curved downwards, though not much. The part behind the organ of adhesion is shorter and more slender than the anterior part. There are some transverse folds in the vicinity of the organ of adhesion, and between this organ and the anterior aperture there are two longitudinal parallel furrows. Sometimes there are in this part several longitudinal folds in the skin, which is rather thick and scarcely transparent.

The organ of adhesion is well developed, though much smaller than that of the preceding species. The neck is very distinct, and the margins are turned outwards and present radiating furrows. In the middle there is an elevation, in which a small orifice (the mouth) is visible, surrounded by a brown horny ring. The rest, although apparently of more solid consistence than the skin, is of the same colour; there is no shield at its base, which is surrounded by a harder raised border of epidermis, and beyond this there is in the epidermis a streak of a more solid and more opake substance.

The anterior part of the body presents a short tube, curved downwards and provided with longitudinal folds; this surrounds the large aperture of that part. Above this aperture the author has found a small empty space between the skin and the sac of eggs which fills the body. Specimens preserved in spirits are of a yellowish-white colour.

This species has been found upon *Pagurus cuanensis* and *P. chiracanthus*, on the coasts of Norway. Dr. G. Lindström met with as many as seven upon the same individual of *P. cuanensis*. The anterior part of the body is usually directed a little to the right above the abdomen of the *Pagurus*.

3. *Peltogaster microstoma*, n. sp. Pl. IV. fig. 15.

Diagn. Acetabulum pone medium situm, minimum, margine vix expanso et radiato. Apertura anterior minima, vix visibilis, neque marginata.—Long. 5–6 mill.

This species is smaller than the preceding, and is distinguished from both the others by the smallness of the organ of adhesion and of the anterior aperture. Its form is very variable: it is sometimes cylindrical (fig. 15), sometimes much flattened, probably owing to the varying pressure of the surrounding shell.

The skin is very delicate, smooth, and very transparent. The organ of adhesion is placed behind the middle of the body. It is very small, furnished with a very short neck, and with margins which are but little folded outwards, and scarcely radiated. The colour is the same as that of the skin, which forms, as in the preceding species, an elevated ring round the organ of adhesion. The anterior opening is scarcely visible; it is not placed at the middle of the extremity of the body, nor surrounded by a a raised and folded margin. The colour is whitish-yellow or light red.

The young animal or larva (fig. 16), while enclosed in the egg or just escaped from it, greatly resembles that figured by Lindström. It is not yet sufficiently developed to enable the germ of the antennæ to be seen in the apophyses of the anterior part of the body. Here we see only a streak formed of the same material as the antennæ. These apophyses were applied against the margin of the body, and were visible only after strong pressure. As found by Messrs. Spence Bate * and Darwin in the larvæ of the Cirripedes, they certainly issue in this larva from the lower side of the body, as do also the antennæ which are formed in them; so that they do not belong to the dorsal buckler. The posterior part of the body usually wanted the two little prominent parts of the lower surface which occur in the specimen figured. They might therefore be regarded as a mark of a more advanced development. The spot of pigment in the place of the eye, being of a reddish-brown colour, can only be a rudimentary eye. It has much resemblance to the eyes of the larvæ of the Copepoda.

This species has been found on *Pagurus chiracanthus* and *P. lævis* on the coasts of Norway. It does not appear to be rare.

With regard to the relation between *Pachybdella* and *Peltogaster*, and between these and those Crustacea most nearly allied to them, the author remarks that his descriptions prove that the animals differ from each other so much as to belong not only to distinct genera, but also to two distinct families. *Pachybdella* is far higher in point of development than *Peltogaster*; and in its structure the former presents more analogy with the ordinary Cirripedes than the latter. On examining the opened *Pachybdella* (fig. 7), it is found to have a mantle or sac like the other Cirripedes; this sac surrounds the thick and fleshy body, which, although much metamorphosed, presents some resemblance in its form to that of the body (*thorax*) of a Balanide when all the

* On the Development of the *Cirripedia*, Ann. and Mag. of Nat. Hist. 2nd series, vol. viii. p. 324.

appendages (which have completely disappeared in *Pachybdella*) are removed. In *Pachybdella,* as in the Cirripedes in general, there are external and ramose "ovarian cæca" situated between the mantle and the body (*thorax*). In external form it does not differ much from the male *Cryptophialus* of Darwin*. The state of *Peltogaster* is quite different. The external covering of the body, or the skin, may be compared with the mantle of the ordinary Cirripedes, having a second aperture as in *Pachybdella.* But this mantle does not surround a separate fleshy body, and it only contains a cavity lined with a delicate membrane. In this cavity are sometimes accumulated the food which the animal has probably sucked from its host; and on the bottom of it there are the two sacciform primitive ovaries, which become inflated as they are developed, until they present two sacs of eggs completely filling the cavity. As there are analogies between *Pachybdella* and the normal Cirripedes, others may be found between *Peltogaster* and the abnormal Cirripedes, such as Darwin's *Proteolepas.* The external form of the latter has much resemblance to that of *Peltogaster,* except that it has the body segmented. Like *Peltogaster,* it has no distinct stomach; and almost the whole cavity of the body is occupied by a large sac of eggs (perhaps by two). Outside this sac there are also two sacciform ovaries, resembling the two primitive ovaries of *Peltogaster.* From these comparisons it is evident that if *Pachybdella* and *Peltogaster* are to be regarded as inferior to all the other Cirripedes, and consequently to all other Crustacea, *Peltogaster* is the lowest of all.

They appear generally to show the greatest affinity with the order *Apoda* of Darwin; but the segmentation of the body, the appendages of the mouth, and the certain degree of permanence of the prehensile antennæ in the *Apoda,* distinguish them from *Peltogaster* and *Pachybdella.* To the latter the author gives the name of *Cirripedia Suctoria,* from their sucking their nourishment from the animal to which they are attached. If the Cirripedia be placed in a line parallel with the other Crustacea, the *Cirripedia Suctoria* must be regarded as analogous to the *Lernæidæ* amongst the latter.

* The internal structure of *Cryptophialus* appears to have more resemblance to that of *Peltogaster.* As Darwin says of certain males (vol ii. p. 23), that they merely represent "bags of spermatozoa," it may be said of the perfectly developed Peltogasters that they are only bags of eggs.

[To be continued.]

XXVI.—*On the* Calyceraceæ. By John Miers, F.R.S., F.L.S. &c.

The small order of the *Calyceraceæ* is little known : it is, however, of great interest to the systematic botanist, because it constitutes the connecting link between the extensive family of the *Compositæ* and the contiguous orders of the *Dipsaceæ* and *Valerianaceæ*. It exhibits also many points of structure which are exceedingly curious.

It was first instituted as a distinct family by Mr. Robert Brown, under the title of the *Calycereæ*, in a memoir read before the Linnæan Society in Feb. 1816, when, with his extraordinary acumen, that most distinguished of botanists was able to determine, from very incomplete specimens, its principal and most essential characters. Nearly about the same time, Cassini, while engaged in numerous investigations in the family of the *Compositæ*, noticed, in the genera *Calycera* and *Boopis*, a considerable difference of structure; he therefore separated them into a small order, for which he proposed the name of *Boopidæ*. This memoir was read before the French Academy in August of the same year.

From the admirable remarks of Mr. Brown on this subject *, and the subsequent very complete analysis by M. Richard, in 1820†, of the whole family, which then consisted of only five species, representing three genera, we possess nearly all the information hitherto published respecting the structure of the order. A few years later (in 1831) Lessing described two new species from Sellow's Brazilian collections, and also two others brought from Chile by Pöppig: the characters of these last were afterwards given in fuller detail by Pöppig himself in 1835 ‡.

These descriptions added nothing to our previous knowledge of the structure of the order. DeCandolle, in the following year (1836), gave, in his 'Prodromus,' a monograph of the whole family, and in a very succinct manner gave the characters of the ten species (all then known), which he arranged under four genera. Some years ago, I proposed the genus *Nastanthus*, the type of which I found in the Cordillera of Chile in 1825, and of which I then made a drawing with structural details; since then I have added ten other species to this genus. I also indicated the existence of another new genus, *Anomocarpus*, which I had long before founded upon a plant of Cuming's collection in Chile, to which I now add six other species. The genus *Leucocera* of Turczaninow§ is inadmissible, as it rests

* Linn. Trans. xii. p. 135. † Mém. Mus. vi. p. 75.
‡ Nov. Gen. et Spec. i. p. 21, tab. 33 & 34.
§ Bot. Zeitung, xxxi. p. 712.

only upon a species of *Boopis* previously described by Pöppig and Lessing. In the same manner, the *Acarpha* of Dr. Grisebach * must be referred to *Boopis*, and the *Gymnocaulus*† of Dr. Philippi to *Calycera*, upon grounds that will presently be shown.

The *Calyceraceæ* have many characters in common with the *Compositæ*. Their flowers, often intermixed with setaceous paleæ, are aggregated upon a general receptacle, which is enclosed within an involucre of bracteiform leaflets more or less combined in one series: the ovary is constantly inferior; the calyx, which is adnate to it, has a free, generally 5-toothed border; the corolla is tubular, the lobes of its border being valvate in æstivation, and possessing the same peculiar system of nervation as the *Compositæ*; their anthers, in like manner, are syngenesious; their ovary is also inferior, 1-celled, and 1-ovular; and the fruit is a dry achænium surmounted by the indurated and enlarged teeth of the calyx. They differ essentially, however, in the structure of the ovary, the ovule being suspended from the apex of the cell (not erect); in their achænia being crowned by the calycine teeth, often elongated into rigid spines (not surmounted by a pappus); in their seeds containing a copious albumen, and a terete embryo, the radicle of which usually exceeds the cotyledons in length, the radicle pointing to the apex of the cell (not to its base); their anthers, too, are deficient of the apical expansion of the connective, usually found in *Compositæ*. They are all herbaceous plants, natives of South America, mostly growing in elevated and arid situations in the Andes of Chile; two species extend into the Cordillera of Peru; three are found near the Straits of Magellan; seven others on the eastern portion of the continent, bordering on the Rio de la Plata and the Rio Grande; and another extending beyond the line of the Southern Tropic, growing along the sea-shore of Rio de Janeiro, and as far to the northward as Bahia.

Some points of their structure are yet considered to be ambiguous, opposite views in regard to them having been held by Brown and Richard, which I will endeavour to reconcile and explain. The stamens, always equal in number to, and alternate with the segments of the corolla, have their anthers free at their summits, but confluent by their margins towards their base into a syngenesious ring: the summits of the five filaments are quite free, but are combined below into a cylinder, which is adnate to the tube of the corolla above its middle, while the base of this tube is seated upon a prominence which crowns the summit of the ovary, and bears the style. Upon the tube of the corolla, just below the apparent attachment of the free portion

* Diagn. Pl. Lechler, p. 38. † Linnæa, xxviii. p. 705.

of the filamentous ring, are seen five coloured fleshy glands, alternating with the stamens. Mr. Brown remarks * that this and other peculiar characters distinguish the *Calyceraceæ* from the hermaphrodite flowers of the whole order of the *Compositæ*: viz. "*the accretion of the base of the style* with the tube of the corolla," "*the absence of the epigynous disk* or nectarium," and the perfectly unilocular space of the anther-lobes; besides these, the corolla is continuous with, and not jointed to, the ovarium; the anthers are deficient of any membranaceous expansion of their summits, and the stigma is constantly undivided. Mr. Brown further remarks that, in *Calyceraceæ*, "the absence of an epigynous disk is a necessary consequence of the accretion of the base of the style with the tube of the corolla;" and it appeared to him that "a modification of the same organ may be traced in the five thickened areolæ observable within and near the base of the tube formed by the filaments in *Acicarpha spathulata*, and much more distinctly in *Boopis balsamitæfolia*, where they have the appearance of five adnate fleshy bodies alternating with the filaments †:" he adds that the condition above alluded to "may be considered as formed of a series of modified stamina."

M. Richard, in his admirable memoir before mentioned, combated with great ingenuity the opinion of Mr. Brown, and maintained ‡ that this "accretion of the base of the style with the tube of the corolla," and "the absence of an epigynous disk or nectarium," are contradictory definitions. He endeavoured to show that the apical protuberance in question is a true epigynous disk; or, if it be not rigorously demonstrated to be a true disk, it bears at least the closest analogy with that organ, for it appears to supply its place §.

Whatever be the nature of the glandular areoles, a careful examination of the whole structure leads me to conclude that they belong to the region of the staminal tube, and not to that of the corolla, as Richard was inclined to believe, referring to *Echinops*, by way of analogy, where similar areolar glands exist in the bottom of the border of the corolla. In *Calycera* and *Boopis*, as examined by Brown and Richard, where these bodies appear on the tube of the corolla, below the point of apparent insertion of the filamentous ring, we easily ascertain the truth by laying hold of any portion of this ring, and tearing it away downwards from the corolla: we find the areolar glands come away with the filaments, showing that they form no part of the corolla. This fact is further established beyond doubt in *Nastanthus* and *Anomocarpus*, where the same glands are found

* Linn. Trans. xii. p. 137.
† Linn. Trans. xii. p. 140.
‡ Mém. Mus. vi. p. 67.
§ Mém. Mus. vi. p. 72.

seated upon the free portion of the filamentous ring, above the point of its insertion upon the corolla.

In regard to the prominent tubercle which crowns the ovary in all the *Calyceraceæ*, which Richard held to be a disk, all that I have seen tends to a conclusion at variance with the precept of Mr. Brown, which attributes to the flower in this family, as its essential character, "the absence of an epigynous disk," and, as "a necessary consequence" of this character, "the accretion of the base of the style to the base of the corolla." We have strong presumptive evidence of the actual presence of an epigynous disk, analogous to that in *Compositæ*; and it may be inferred that the "accretion" above mentioned arises from its intervention and confluence, both with the base of the style which it surrounds, and with the tube of the corolla, over the inner surface of which it is spread to a considerable extent, so that when the corolla falls off we always find the bottom of the tube closed, as if by a plug, owing to its presence. The nature of the five areolar glands is somewhat connected with this consideration: they are always alternate with the stamens; and their origin may be attributed to two sources: either they may be viewed, as Mr. Brown regarded them, as a row of additional abortive stamens; or they may be considered as glandular protuberances appertaining to a disk extended, in the manner above mentioned, over the inner surface of the tube of the corolla. The former view will not stand the test of analogy, when compared with the numerous and varied developments seen in the neighbouring order *Compositæ*; and the latter suggestion may be adopted without having recourse to the idea that the glands are "a series of modified stamens." In regard to the existence of such a disk as I have suggested, we have some evidence in *Nastanthus*, where we find the usual confluence of the lower half of the staminal filaments into a monadelphous tube (*tubillus* of Richard), which soon becomes adnate to the tube of the corolla: we find in the mouth of this "tubillus" an internal row of minute, free, linear hyaline teeth, alternating with the upper or free portions of the filaments, rounded at their apex, and connected together by an acute sinus; they evidently form an inner whorl with the filaments, and do not intervene between them. These teeth bear more the semblance of abortive stamens than the areolar glands; but the same reasoning which leads to the rejection of such a nature for the one will deny it to the other. We may with greater probability consider these teeth as constituting the margin of such an adnate disk as I have suggested, the presence of which is supported by much collateral evidence; and we may moreover, with great reason, attribute to the existence of this disk the cause of the confluence of a portion of the filaments into a "tubillus," or monadelphous ring, while all the portions of the same filaments beyond the limit of the disk remain free. In *Acicarpha*, where the disk appears to be carried up to the extremity of the filaments, so that they are entirely monadelphous, there is seen a thickening, called by Richard an "*epinema*," which may be conceived to be the margin of the disk, and which gives the anthers the appearance of being articulated upon the filaments; but this does not occur in the other genera of the family, where the filaments are free at their apex.

Although in *Calyceraceæ* the corolla at length falls off from the summit of the apical tubercle of the seed, the fact cannot be denied (as was demonstrated by Richard and confirmed by Brown), that the tube of the corolla, in all stages, is continued downwards over the entire surface of that tubercle. If we cut through any *Calyceraceous* achænium before the fall of the corolla, by a longitudinal section, we find that this tubercle consists externally of such a continuation of the corolla, lined with an intermediate fibrous stratum, having in the centre a thickish white cylindrical cord, continuous with the style, and all three are agglutinated into one body. It is from the bottom of this cord that the seed is suspended, by a short funicle, in the summit of the cell. This cord can neither be considered as a portion of the funicle, which is continuous with it, nor as a part of the style, although it is articulated with the latter and also continuous with it; it is, in truth, the placentary development destined to give origin to the suspended ovule.

The seed in *Nastanthus* is deeply 5-grooved, its salient lobes corresponding to and continuous with the round and concave teeth of the calyx. If we make a transverse section across the achænium, we find in the bottom of these grooves no mesocarpic space between the thin endocarp and epicarp; so that the external diameter of the seed in that part little exceeds that of the apical tubercle; but the salient lobes or wings, which extend from the calycine teeth to the base, are often more than thrice that diameter; and the space between the epicarp and endocarp in these wings is filled with a pithy medulla, no trace of which exists in the intervals of the grooves. There are seen in this section ten very distinct longitudinal nerves upon the endocarp, five of which are opposite the grooves, the other five being alternately placed opposite the wings, all of them at equal distances: in the longitudinal section these ten nerves are seen to run parallel to one another from the base to the apex, and to pass through the apical tubercle, forming the intermediate fibrous stratum above mentioned. At the summit they all seem combined in a plexus, whence are thrown out the nourishing threads to the placental cord for the support of the ovule and for the production of the raphe; while other portions branch off through the style and the epigynous disk, thus giving rise to the nervures of tracheal vessels destined to assist in the growth of the stamens, and also furnishing the longitudinal nervures of the corolla. We thus perceive the nature and function of the apical tubercle, and can well imagine how the corolla falls away at a very late period, by a circumscissile line across the plexus, and also why it carries away the disk with it.

In the *Calyceraceæ* the segments of the corolla always alternate with the lobes of the calyx, and the stamens, again, reciprocate with those segments. The tube of the corolla is furnished with ten parallel nervures, originating at the base, as above described, five running through the median line of the segments and terminating in a gland at their apex, the other five alternating with them, and nearly reaching the angle of each sinus, before which they bifurcate and throw off on each side a nervure, which run parallel with each margin of the segments, and which anastomose with the median nerves at their termination. I have mentioned that the "tubillus," consisting of the united filaments and the disk, though agglutinated below to the tube of the corolla, may be separated throughout the whole length of this confluence by laceration, when it appears furnished with five longitudinal nervures, which run from the base and through the free portions of the filaments to the anthers: these nervures are therefore opposite to the five shorter nerves of the corolla which lead to the sinus between every two segments; but, though apparently confounded, they are distinct from them, as shown when the "tubillus" is drawn away from the corolla.

There is a peculiarity of structure in *Nastanthus* and *Anomocarpus*, and, in a less degree, in most genera of the family, which is most distinctly visible in the polliniferous flowers of the two genera just mentioned:—the tube of the corolla and the segments of its border appear to consist of two distinct parallel laminæ, with a vacant space between them, as if the entire substance of a very thick mesoderm had disappeared by absorption or desiccation, leaving only a small quantity of cellular tissue consolidated in the apex of the segments, under the form of a glandular callus, which apical callus is a constant feature throughout the family. This separation of the two surfaces is greater in the segments than in the tube; the outer face is very convex, forming a prominent gibbous hood about the inner face, which is nearly flat: these two laminæ are perfectly united at the edges of the segments; the outer one is very thin, hyaline, reticulated, and contains no nervures; the inner one is more opake, coloured, and is furnished with the nervures above described. This structure is confirmed by the observation of Dr. Philippi (Linnæa, xxviii. 709) in his diagnosis of *Boopis* (*Nastanthus*) *Gayana* and of *Boopis* (*Nastanthus*) *compacta,* wherein he describes the corolla as being "breviter subcylindrica, membrana externa hyalina ab interiori viridi remota."

Another character of the *Calyceraceæ,* which serves to distinguish this family from the *Compositæ,* is deserving of some notice. Throughout the latter order, the style is bifid at its apex, and each branch is furnished towards its extremity with a stigmatic surface, and frequently also with collecting hairs, that assist in the transmission of the pollinic influence. On the contrary, in *Calyceraceæ* the style is undivided, clavate, and solid at the extremity, and, though here covered with a rugose surface, is quite deficient of any collecting hairs. Although the ovary in both cases is 1-locular, the inference may be drawn from the above circumstances, that the normal condition of the ovary in the one case is to be 2-ovular, and in the other 1-ovular; and though we have no positive proof of this conclusion, many circumstances tend to favour the opinion of the biovular tendency of the ovary in *Compositæ.* The placentary point of attachment of the solitary erect ovule is always upon one side of the base of the cell; and hence it may be assumed that, as there are two stigmata, another placentary point normally existed, which has been suppressed *: this idea is again confirmed by the fact that in many of the achænia of *Compositæ* two parallel grooves or longitudinal lines are seen upon the face opposite to the axis of the capitulum, which probably indicate the line of junction of two carpels, united there by their margins, without any introflexure or tendency towards forming a dissepiment; and it is probable that branches of the corda pistillaris from each stigmatic lobe run along these sutural edges of the carpels, as in the *Capparidaceæ* for instance. From the same circumstance we may also infer that the normal condition of the ovary is not 2-locular with an intervening dissepiment; for in such case the suppressed cell and the axis would be represented by a single longitudinal line. This inference is of course only hypothetical, but the suggestion is worthy of being kept in view.

In *Calyceraceæ* the flowers in the same capitulum are not all fertile; for many of them are sterile and polliniferous, which are promiscuously mixed with the fertile or hermaphrodite ones. In *Acicarpha,* however, there is some exception to this rule; for the superior or more central florets are all sterile, while the more external series are hermaphrodite and fertile.

I have observed in *Nastanthus,* where the florets are promiscuously intermixed, that the flowers first produced are not per-

* A similar view has been advocated by Mr. B. Clarke (Ann. Nat. Hist. 2 ser. xi. p. 456).

fect; the tube of the corolla is considerably elongated into a very slender tube, on the outside of which are seen five prominences indicating the five transparent areolar glands, the tubillus within being very short, the filaments distinct, and the anther-cells, which are almost void of pollen, being almost, if not quite, free; the segments of the border are of much thinner consistence, and of a much greener hue: in these cases the globose stigma is fully developed on the summit of the clavate extremity of the long style, and the achænium yields a perfect seed. In the flowers last produced, and intermixed with the former, the tube of the corolla is thick, only half the length of the others, and so much thickened that the areolar glands become wholly immersed, and are not perceptible; and the segments of the border here exhibit the appearance of the gibbous double laminæ before described; the anthers, almost obsoletely polliniferous, are nearly free; the style is only slightly swollen at the apex, and deficient of the globose stigmatic expansion; the achænium, though attaining its full growth, does not always produce perfect seed; the corolla, in such instances, generally persists upon the achænium. Other flowers, again, are produced in an intermediate state, the achænium maturing its seed; but then the stigma is always fully developed, as well as the anthers, which are half united at their base into a syngenesious ring, and the corolla usually falls off soon after the period of impregnation.

In *Boopis*, *Gamocarpha*, and *Nastanthus*, the calycine lobes are deeply concave or semi-navicular, owing to their involution round the salient angles of the ovary, by which they become more or less hollow or tubular within, their median nervures being decurrent along the extreme angles of the ovary. When the seed is matured, these lobes, being acute in *Boopis*, become rigid at the point and acicular; in *Nastanthus* they remain rounded, thick, and obtuse; in *Calycera* and *Acicarpha*, where the lobes are flatter, they greatly enlarge, becoming subulate and rigid, and assume the form of very long, sharp, divaricate spines, of unequal length; in *Anomocarpus*, in the same capitulum, some of the achænia become spinescent, as in *Calycera*, while others retain the form of short rigid teeth, as in *Boopis*, both producing in like manner perfect seeds. In *Nastanthus* and *Anomocarpus*, and sometimes in *Boopis*, the surface of the epicarp is reticulated between the nervures with transverse, crowded, parallel and almost scalariform venations, the intervals often becoming swollen and assuming the appearance of transverse rugæ.

In *Calyceraceæ* the florets are all crowded upon a broad fleshy receptacle surrounded by an involucre, the leaflets of which are in a single series almost free from one another, in *Acicarpha*;

accreted at the base upon a large fleshy receptacle in *Calycera* and *Nastanthus*; and confluent for the greater part of their length into a campanulate form in *Boopis* and *Anomocarpus*—thus remaining free from the receptacle, which is small and seated in its centre. In the five last-mentioned genera the receptacle is flat or slightly convex; in *Acicarpha* it is conical, globular, or cylindrical; in *Boopis* and *Anomocarpus* it is small and greatly reduced in size. Each capitulum is furnished with numerous crowded flowers; and in most of the genera, each floret is furnished at the point of its origin with a narrow elongated palea, as in *Compositæ*; but in *Anomocarpus* the receptacle is almost epaleaceous, each floret being inserted in an alveolar depression. In *Gamocarpha* the paleæ are conjoined in numerous circles, from their base half-way up their margins, the upper portions remaining free, and these again are united together by other paleæ, thus forming a kind of honeycomb structure, with deep cells or nests spread all over the receptacle, several florets being affixed to the bottom of each nest. There is some analogy in this respect with the structure in *Gundelia* among *Compositæ*, where there is a large capitulum, provided with a general involucre, which capitulum is composed of a great many tubular involucels with a spinosely dentate border, each containing 3–7 florets; the greater part of these involucels are agglutinated together in a honeycomb-like cylindrical head, and fixed upon an elongated central receptacle; these involucels may be considered as composed of two or more paleæ united by their margins into a dentate tube, as is shown in the last whorls, where these tubes are quite free from one another. In *Calycera* the capitulum is seated upon a long scape, the leaves being radical; in *Acicarpha*, and frequently in *Boopis*, where the plant has many branching leafy stems, a capitulum issues from each alternate axil, upon a rather short peduncle. In *Anomocarpus*, in three species, the capitula are nearly sessile in the remote dichotomy of the branchlets; while in another species the axis of the plant is so completely depressed that all the leaves become radical, with its numerous sessile capitula interspersed between them, so that the whole grows into a pulvinate shape with a crowded mass of flowers. In *Nastanthus* all the species assume a somewhat similar form, from an aggregation of its numerous capitula, each supported upon a very thick fleshy peduncle, which bears a single leaf near its summit, a little below the level of the involucre.

In regard to the natural affinities of the *Calyceraceæ*, nearly all systematic botanists are agreed in following the indications first suggested by the illustrious founder of the order, who showed that its closest alliance is with the *Compositæ*; it has consequently been regarded as holding an intermediate position between that family and the *Dipsaceæ,* with which it also accords in its capitate involucrated inflorescence, its monopetalous corolla, its inferior 1-celled ovary with an adnate calyx, its undivided style and simple stigma, and its solitary suspended ovule, —its fruit being likewise a monospermous achænium, crowned by the persistent teeth of the calyx, and the embryo of its seed imbedded in an ample albumen. It differs, however, from the *Dipsaceæ* in the peculiar venation of the corolla, in having its filaments united at the base into a monadelphous ring, and in its combined half-syngenesious anthers.

Mr. B. Clarke * first proposed to separate these families, by some distance, in a natural system founded principally on the normal position of the carpels and the relation of the raphe to the placenta. Under his arrangement, in the monopetalous proterocarpous division of Exogens, he places the *Calyceraceæ* in his *Tetragonal* alliance with *Valerianaceæ* and *Dipsaceæ,* while *Compositæ* appear in his *Myrtal* alliance, the *Onagrarial* alliance being interposed between them. It is needless to say that the grounds of arrangement in this system are most feeble, as the more important considerations of floral and carpological structure, as well as general habit, are completely placed out of view. As no other reason is adduced to justify the separation of the two families in question, the validity of their close affinity still remains unimpeached.

Prof. Agardh has likewise proposed the separation of the *Calyceraceæ* from the *Compositæ,* under a still more singular system of arrangement, also founded principally upon the mode of development of the ovules in different plants. He places *Compositæ* at the end of an alliance which embraces *Cycadaceæ,* all the *Coniferæ, Ephedraceæ, Proteaceæ,* and *Bruniaceæ,* and places *Calyceraceæ* in another alliance of the most heterogeneous kind, comprising *Plantaginaceæ, Primulaceæ, Dipsaceæ,* and *Gunneraceæ,* the latter family interposing between *Calyceraceæ* and *Compositæ.* The principal reason given for this approximation of *Gunneraceæ* with *Calyceraceæ* is the fact of the single ovule being in both cases suspended from the very apex of the cell, while in *Dipsaceæ* the point of its suspension is somewhat lateral. The view of natural affinities expounded in his work † will not stand the test of investigation; when applied to the case under consideration, we see that *Gunnera,* with its monochlamydeous, often diœcious flowers, which are spicate or racemose and ebracteated, its two simple stamens, its divided style with plumose stigmata, its drupaceous fruit and very minute embryo in copious albumen, offer a combination of characters that place it at a great

* Ann. Nat. Hist. 2 ser. xi. 454–456. † Theoria Syst. Plant.

distance from *Calyceraceæ* in the system. Very similar reasons may be adduced in objection to the alliance of this family with the *Primulaceæ* and *Plantaginaceæ**.

Bearing in view the very numerous features of analogous structure in the *Calyceraceæ* and *Compositæ*, notwithstanding the difference in position of the ovule and seed, we must conclude that a very close affinity exists between these two families. So intimate, indeed, is this relationship, that should any new system of arrangement be proposed, whether it be linear or circular, which should compel their becoming parted among separate groups on account of the different structure of their carpels, they will naturally take positions that will still touch one another.

Conspectus generum.

A. Lobi calycini imo amplexi et concavi.
- *a.* Lobi rotundati incrassati. Capitula magna, subscaposa. Receptaculum magnum, carnosum. Involucrum polyphyllum .... 1. Nastanthus.
- *aa.* Paleæ inter se accretæ; lobi obovati integri. Capitula minora et subscaposa. Involucrum polyphyllum .... 2. Gamocarpha.
- *aaa.* Paleæ omnino liberæ. Involucrum gamophyllum.
  - * Lobi lanceolati, scariosi, denticulati. Achænia consimilia .... 3. Boopis.
  - ** Lobi oblongi, aristati, in nonnullis immutati, parvi, in aliis demum excrescentes et spiniformes. Achænia hinc dissimilia ... 4. Anomocarpus.

B. Lobi calycini subplani et fere subulati, demum elongati et spiniformes.
- *b.* Achænia libera. Receptaculum magnum, latum et depressum .... 5. Calycera.
- *bb.* Achænia sæpius agglutinati. Receptaculum parvum, sæpius cylindricum .... 6. Acicarpha.

1. Nastanthus.

In my last journey over the lofty range of the Cordillera of Chile, in 1825, I noticed a very singular plant, of which I then made detailed drawings; these, together with others of much interest, I showed to several botanists during my visit to London in that year: the plant alluded to is the *Calycera Andina* mentioned in my 'Travels,' ii. p. 531. On my return to England in 1838, I proposed it as a new genus, under the name of *Nastanthus*, which genus was adopted by Prof. Lindley in his 'Ve-

* If anything were wanting to show the little practical value of the affinities thus suggested, we have before us the results of two systematists who, starting upon almost identically the same basis, have arrived at conclusions nearly diametrically opposed to each other, and at variance with the established views of relationship universally acknowledged by botanists.

getable Kingdom,' p. 701. Many circumstances have prevented the publication of these details till the present moment.

Nine species are here enumerated, all being of a similar and very distinct habit, somewhat resembling our alpine *Cirsium acaule* in their cespitose hemispherical shape. They all grow in very elevated situations, in dry rocky soil, much exposed to rough weather, in the lofty Cordillera of the Andes of Chile, on both the eastern and western slopes.

The generic name is derived from *ναστὸς*, *confertus*, *ἄνθος*, *flos*, because of the densely aggregated flowers and achænia in each of its capitula, which, again, are so closely crowded as to give to the plant the appearance of a cauliflower-head half imbedded in the ground.

Nastanthus, nob.—*Involucrum* gamophyllum, ex foliolis plurimis (10–12) uniserialibus, oblongis, obtusis, sinuato-subtrilobis, crassiusculis, imo in tubum brevem confluentibus constans, et margini receptaculi adnatum. *Receptaculum* magnum, carnosum, subconvexum, *paleolis* lineari-spathulatis, inter flores exteriores, paucis aut sæpe abortivis. *Flores* dissimiles. *Calycis* adnati *dentes* 5, æquales, rotundati, concavi, carnosi, imo saccati.—*Flores fertiles: corolla* tubo brevi, crassiuscula, infundibuliformis, limbo campanulato, 5-partito, lobis carnosis, oblongis, subcucullatis, erectiusculis. *Stamina* 5, inclusa; *filamenta* imo in tubum brevem monadelphum cum glandulis totidem fauci insertum coalita, superne libera: *antheræ* in tubum 5-dentatum syngenesium connatæ. *Stylus* longe exsertus, filiformis, apice incrassato-cylindraceus. *Stigma* globosum, papilloso-rugosum. *Ovarium* cylindraceum, 5-sulcatum, calycis tubo arcte adnatum, et ejus lobis coronatum. *Achænium* oblongum, profunde 5-lobum, lobis obtusis spongiosis, in umbone apicale breviter conicum, 1-loculare, monospermum. *Semen* ordinis, pendulum.—*Flores steriles: corollæ* tubo gracillime elongato, 2–3-plo longiore, fauce infundibuliformi, limbo campanulato, 5-partito, lobis tenuibus, oblongis, acutis, 3-nerviis, erectiusculis. *Stamina* inclusa; *filamenta* fertiliorum; *antheræ* vix connatæ et polline destitutæ. *Stylus* subexsertus cylindraceo-clavatus, apice vix stigmatosus. *Achænium* semi-inferum, consimile.

Herbæ *Chilenses Andicolæ cæspitosæ*, radice *fusiformi*; folia *radicalia plurima, pluriserialia*, exteriora *petiolata, oblonga, inciso-dentata vel laciniata, carnosa aut submembranacea, glaberrima*, 1–3-*nervia*; scapi *plurimi folio æquilongi, monocephali, carnosi, late compressi, extus convexi, sæpissime ad medium extus folium solitarium sessile gerentes*; capitula *magna in* caput *magnum* *hemisphæricum creberrime aggregata.* Flores *albi vel pallide virescentes.*

1. *Nastanthus agglomeratus;*—Calycera Andina, *nob. olim, Trav. Chile,* ii. 531;—acaulis, e scapis numerosissimis radicalibus pluriserialibus in massam hemisphæricam confertissime aggregatis cæspitosa, radice fusiformi, scapis monocephalis, carnosis, late compressis, intus planis, extus convexis, et hinc ad medium folium solitarium gerentibus, seriei externæ folio altero radicali donatis; foliis oblongis, obtusis, imo cuneatis, valde carnosis, sicco submembranaceis, sinuato-laciniatis, laciniis paucis, breviter ovatis, subobtusis, imo in costam latam crassissimam decurrentibus, hinc subsessilibus, capitula vix superantibus; capitulis majusculis paulo convexis, carnosis; involucri foliolis circiter 12, uniseriatis, rotundis, erectiusculis, apice obsolete 3-lobis, imo ad receptaculum connatis.—In Andibus Chilensibus, costa orientali, altit. 10,000 ped.

Hanc speciem anno 1825 inveni in ascensu viæ excelsioris inter Mendozam et Aconcaguam ad stationem "Las Cuevas" nuncupatum, locis apertis et asperis gaudentem. Radix fusiformis 5–6 poll. long. Planta integra, humo prona, formam hemisphæricam 6–8 poll. diam. e scapis confertissimis aggregatis æmulans. Scapus 3–4 poll. long. interne planus, extus convexus, summo latitudine fere capituli, et pallide virescens, hinc ad imum gradatim angustior, extus folio unico donatus. Capitulum hemisphæricum, 1–1¼ poll. diam., involucrum e foliolis circiter 12 subtriangularibus, obtusis, summo bisinuatis, imo ad marginem receptaculi uniserialiter connatis, erectiusculis. Folia in scapis exterioribus radicalia, 5 poll. long. in centralibus medium versus scapi affixa, 3½ poll. long.; lamina carnosa penninervis ad marginem petioli crassissimi late decurrens. Receptaculum carnosum convexum, 1 poll. diam., flores numerosissimos creberrime fulciens, quorum plurimos abortivos; denique achæniis numerosis densissime compactis tectum. Ovarium 1½ lin. long. Corolla pallide virescens florum sterilium 2 lin. long., fertilium 6 lin. long., tubo ultra medium gracillime contracto, superne campanulato, limbi laciniis 5 subcucullatis, erectis; stamina inclusa, e contractione corollæ enata; stylus longe exsertus. Achænium oblongum 2½ lin. long., 1 lin. diam., 5-angulatum, inter angulos rotundatos profunde sulcatum; angulis dentibus calycinis rotundatis concavis coronatis, hinc apice umbilicatum, et in centro processu conico porrecto corollam persistentem ferente donatum, nitens, angulis medulla cellulari farctis, 1-loculare, 1-spermum; endocarpio nitente 10-nervio. Semen funiculo brevi pendulum, teres, 1¾ lin. long., ⅛ lin. diam.*

* A drawing of this plant in its entire state, and of the scape separately,

2. *Nastanthus laciniatus*, n. sp.;—acaulis, e scapis plurimis aggregatis cæspitosus, radice fusiformi; foliis ovali- vel oblongo-cuneatis, obtusis, grosse et irregulariter laciniato-dentatis, 5-nerviis, in petiolum latum et elongatum attenuatis, exterioribus majoribus, radicalibus, scapis longioribus, aliisque gradatim brevioribus e basi scaporum enatis; scapis congestis, subcompressis, carnosis, sicco rubiginosis, sæpius nudis, centralibus brevioribus; capitulo majusculo, involucri foliolis 6–8, triangularibus, acutis, serratis, uniserialiter ad receptaculum accretis; paleis foliaceis, exterioribus majoribus et latioribus, centralioribus minoribus, imo attenuatis.—In Andibus Chilensibus.—*v. s. in herb. meo et Hook.*, Los Palomares (Gillies); Cordillera Chile (Cuming 326); Ojos de Agua (Bridges).

Radix fusiformis, 3 poll. long.; caules scaposi, numerosi, patentim radiantes, aggregati, monocephali, $1\frac{1}{2}$–$3\frac{1}{2}$ poll. long. (sicci), 3 lin. lati, subpatentes, plantam cæspitosam pronam 8 poll. diam. efformantes; folia exteriora (incluso petiolo) $2\frac{1}{2}$–$3\frac{1}{2}$ poll. long.; lamina oblonga, imo cuneata, 1–$1\frac{1}{4}$ poll. long. et 4–11 lin. lat. utrinque dentibus 4 incisa; petiolus crassus, margine membranaceus, 2 lin. lat., caulina 1–2 poll. long., profundius laciniata, 3–5 lin. lat.; capitulum 9–11 lin. diam.; involucri foliola 3-angularia, margine integro vel sinuato-dentato *.

3. *Nastanthus pinnatifidus*, n. sp.;—acaulis, e scapis numerosis radicalibus subbrevibus cæspitosus; foliis longe petiolatis, radicalibus, lamina oblongo-lanceolata, sinuato- et pinnato-partita, laciniis lineari-ellipticis, enervi, crasso-carnosa, costa media lata, subtus prominente; petiolo cum lamina æquilongo vel 2-plo longiore, dilatato, intus concavo, extus convexo; scapis latis, carnosis, petiolo dimidio brevioribus, imo monophyllis; involucri foliolis 3-angularibus circiter 8.—In Andibus Chilensibus.—*v. s. in herb. Hook.* (Cuming, 325); *in herb. Mus. Paris*, Cordillera de Coquimbo (Gay).

Radix crassa; scapi plurimi, aggregati, 1 poll. long., 4 lin. lat., intus plani, extus convexi, simplices, imo foliiferi, in caput hemisphæricum 3 poll. diam., aut cum foliis radiatim expansis 8 poll. diam. compacti; capitulum in flore 6 lin., in fructu 10 lin. diam.; involucri foliola 2–3 lin. long. et lat. Folia exteriora 3–4-serialia, $3\frac{1}{2}$ poll. long., patentissima; lamina 1 poll. long., cum laciniis 6 lin. lat., profunde laciniata, laciniis utrin-

as well as copious analytical details, will be given in the 'Contributions to Botany,' vol. ii. pl. 43.

* A scape of this species is represented in the 'Contributions,' Plate 44 A.

que 6–7, 2 lin. long., 1 lin. lat.; petiolus 1½–2½ poll. long., superne 1½ lin. lat., imo amplexicaulis 3 lin. lat.: alia e basi scaporum enata gradatim capitis centrum versus breviora*.

4. *Nastanthus Gilliesii,* n. sp.;—acaulis, e scapis radicalibus cœspitosa; foliis radicalibus lanceolato-oblongis, carnosis, enerviis, profunde pinnato-laciniatis, laciniis utrinque 4, lineari-oblongis, obtusis, obliquis, margine revoluto, capitulum paulo superantibus; petiolo lamina 2–3-plo longiore, scapo monophyllo, capitulo majusculo.—In Andibus Chilensibus.—*v. s. in herb. meo et Hook.,* Los Palomares (Gillies).

Scapus (siccus) 2¼ poll. long., 2 lin. lat., intus planus, extus convexus, infra capitulum ampliatus, ubi 3–5 lin. lat. Capitulum 12 lin. diam.: involucri foliola circiter 10, obsolete sinuato-dentata, 1-serialia. Folium ad basin scapi adnatum (incluso petiolo), 2¼ poll. long., lamina 12 lin. long., 6 lin. lat., laciniis obliquis, marginibus revolutis, 5 lin. long., 1½ lin. lat.; petiolus marginibus membranaceis, intus planus, extus convexus, 2 lin. lat.

5. *Nastanthus ventosus*;—Calycera ventosa, *Meyen, Nov. Act.* 19, *Suppl.* i. 251; *Remy, in Gay, Chile,* iii. 256; Calycera scapigera, var. ventosa, *Weddell, Chl. And.* iii. 7;—radice crassa, vesiculoso-inflata; foliis ovatis, obtusissimis; apice paucidentatis, dentibus obtusis, carnosis, 3-nerviis, in petiolum longum attenuatis; scapis pollicaribus, centralibus aphyllis, exterioribus 1–2–3-phyllis; involucro 5–7-partito.—Chile ad Rio Maypù.

Planta mihi incognita, evidenter ex descriptione hujus generis inter *N. pinnatifidum* et *N. scapigerum* intermedia.

6. *Nastanthus scapigerus*;—Boopis scapigera, *Remy, in Gay, Chile,* iii. 250; *Weddell, Chl. And.* ii. 7;—radice fusiformi; caule brevi, scapos plurimos monocephalos confertim aggregatos gerente; scapis superioribus foliis minoribus donatis, inferioribus radicalibus, liberis, et cum foliis majoribus e basi ortis; foliis rotundo-ovalibus, e medio cuneato-spathulatis, et hinc in petiolum 2-plo longiorem utrinque decurrentibus, crenatis vel grosse dentatis, dentibus obtusis, margine revoluto, lamina infra medium integra, pallide glaucis; involucri foliola 7–9, foliolis parvis, triangularibus, acutis, subintegris; floribus confertissimis involucro longe superantibus; paleis exterioribus dilatatis, foliaceis, aliis gracile attenuatis.—In Andibus Chilensibus. — *v. s. in herb. meo,* Cordillera de Maule (Germain).

Radix fusiformis, 1½ poll. long.; caulis 1 poll. long., scapis

* This plant is also represented in the same work, Plate 44 B.

circiter 24, crebriter confertis munitus; scapi superiores 6–15 lin. longi, inferiores 20 lin. long., compressi, $1\frac{1}{2}$ lin. lati, 5 lin. diam.; folia radicalia longiora (incluso petiolo) 2 poll. long., lamina ovata, imo cuneata, 9 lin. long., 7 lin. lat.; petiolus compressus, $1\frac{1}{2}$ lin. lat., imo amplexicaulis; capitulum florescens 5 lin. diam., in fructu 9 lin. diam.; involucri foliola $1\frac{1}{2}$ lin. long.; 2 lin. lat.; receptaculum in fructu auctum ad 5 lin. diam., convexum; achænium ut in *N. agglomerato**.

7. *Nastanthus compactus*;—Boopis compacta, *Philippi, Linn.* 28. p. 709;—"acaulis, glaberrima, cæspitosa; foliis rosulatis, lineari-spathulatis, integerrimis, coriaceis; capitulis in apice radicis sessilibus, confluentibus; involucris inde irregularibus; paleis paucissimis, setaceis; dentibus calycinis (dum floret) obsoletis; tubo corollæ brevi cylindrico, membrana exteriore tubi hyalina ab interiore viridi remota."—In Andibus Chilensibus, Prov. Maule, Depart. Liñares (Germain).

"Folia 26 lin. longa, 3 lin. lata, obtusa, sensim versus basin attenuata. Capitula in massam diametri fere 2 poll. aggregata, exteriora separata, interiora vero confluentia. Ovarium $1\frac{1}{4}$ lin. long., fructus non suppetunt."

Species mihi invisa, sed ex char. supra transcriptis manifeste videtur, ob habitudinem suam peculiarem, ad hoc genus pertinere. Sic explicatur:—caule perbrevi, scapos plurimos brevissimos fere obsoletos monocephalos fulciente; scapis exterioribus liberis, longioribus, e basi enatis; foliis radicalibus lineari-spathulatis, integris, coriaceis.

8. *Nastanthus spathulatus*;—Boopis spathulata, *Philippi, Linn.* 28. p. 708;—"cæspitosus, caule brevi, crasso, scapis plurimis fastigiatis monocephalis munito; scapis interioribus brevissimis, et fere confluentibus; foliis coriaceis, spathulatis, dentatis, caulinis confertissimis; involucri foliolis 5, ovato-triangularibus, acutis; floribus viridibus, involucrum superantibus; paleis subnullis."—In Andibus Chilensibus, Prov. Maule, Depart. Liñares.

"Caulis 4 poll. alt., 5 lin. crassus, radicem versus attenuatus; folia $2\frac{1}{2}$–3 poll. long., 8 lin. lat., grosse inciso-dentata; capitulum circa 9 lin. diam.; corolla $3\frac{1}{2}$ lin. long., tubo filiformi, superne ampliore."

Species mihi ignota, clare ad *N. scapigerum* accedens.

9. *Nastanthus Gayanus*;—Boopis Gayana, *Philippi, Linn.* 28. p. 709;—dense cæspitosa, scapis subaphyllis, centralibus confluentibus; foliis radicalibus, coriaceis, linearibus, pinna-

* A drawing of this plant is given in the 'Contributions,' Plate 44 D.

tifidis, ultra medium nudis, laciniis oblongis, obtusis; involucri foliolis imo connatis, lato-linearibus, obtusis; corolla brevi, subcylindrica, membrana exteriore tubi hyalina et ab interiore viridi remota; paleis setaceis.—In Andibus Chilensibus, Santa Barbara, Prov. Arauco (Gay).

Folia radicalia $2\frac{1}{2}$ poll. long., lamina 1 poll. long., cum lobis $4\frac{1}{4}$ lin. lat., lobis utrinque 4–5. Scapi exteriores liberi, 1 poll. long., $2\frac{1}{2}$ lin. crassi, alii sæpe folio sub capitulum donati; capitulum 9 lin. diam.; involucri foliola brevissima, nonnulla longiora; corolla alba, vix 2 lin. long.; dentes calycini distincti.

[To be continued.]

XXVII.—*Characters of new Land-Shells from Burmah and the Andamans.* By W. H. Benson, Esq.

1. *Helix ochthoplax*, B.

Testa profunde et anguste subobtecte umbilicata, depressa, superne convexa, subtus convexiore, solidiuscula, oblique rugoso-striata, obsolete granulata, rugis nonnullis obsoletis spiralibus distantibus subtus confertioribus decussata, rufo-castanea; spira valde obtusa, sutura lineari, demum impressiuscula; anfractibus 5 planiusculis, ultimo antice convexiusculo; peripheria carinata, carina antice mitiore; apertura obliqua, quadrato-lunari, peristomate expanso, albido, marginibus callo tenui arcuato junctis, basali reflexiusculo, incrassato, antice arcuato, columellari brevi, declivi, reflexo, sinuato, umbilicum subtegente.

Diam. major 54, minor 46, axis 26 mill.

Habitat in regione Pegu.

A single specimen of this fine *Helix*, which is the largest known Burmese form, exceeding in size *H. Saturnia*, Gould, and distinguished from it by the umbilicus and sculpture, was forwarded to me for identification by Mr. W. Theobald. The shell is slightly weathered, and has received injuries which the animal has partially repaired. Near the suture and below the periphery there is a tendency to angulation in one of the spiral rugæ, as in *H. casta*, Pfr.; but this may be an individual character, and cannot be considered specific without an examination of other specimens. The granulated surface, visible under the lens, may be more prominent in a perfectly fresh example. It holds an intermediate place between *H. Cycloplax* and *H. Chevalieri*.

2. *Helix consepta*, B.

Testa subperforata, orbiculari, subdiscoidea, nitida, radiatim striatula, superne obsolete spiraliter striata, pallide cornea; spira depresso-conoidea, apice elevatiusculo, obtuso, sutura impressa, marginata; anfractibus 8, angustis, convexiusculis, lente accrescentibus, ultimo ad peripheriam rotundato, subtus medio excavato; apertura subverticali, late lunari, peristomate albido, intus late incrassato-marginato, superne recto, margine basali expansiusculo, undulato, crassiusculo, columellari brevissime reflexo.

Diam. major vix 18, minor $15\frac{1}{2}$, axis 7 mill.

Habitat ad Damathá, prope Moulmein. Detexit Capt. J. C. Haughton.

A single specimen is in the collection of Mr. Theobald.

3. *Helix Helferi*, B.

Testa profunde et anguste perspective umbilicata, orbiculata, subdepressa, oblique striatula, foveolis conspersa, sub epidermide rufescente, sparsim hispida, albida, fascia rufa angusta superne ornata; spira depresse conoidea, apice valde obtuso, sutura impressa, submarginata; anfractibus $4\frac{1}{2}$ convexiusculis, angustis, lente accrescentibus, ultimo antice descendente, supra peripheriam obsolete angulato, circa umbilicum subito excavatum compressiusculo; apertura obliqua, transverse ovato-lunata, peristomate undique expanso, marginibus approximatis, callo tenui junctis.

Diam. major 12, minor 10, axis 6 mill.

Habitat in Insulis Andamanicis sinûs Bengalensis.

This little shell, named after Dr. Helfer, who lost his life in an attack made by the savage inhabitants while he was attempting to investigate the natural history of the Andamans, is nearly related to *H. asperella*, Pfr., and *H. fallaciosa*, Fér. It is, however, deficient in the peculiar granulate sculpture of those species, has a more closely-wound spire, a broader aperture, and the umbilicus is suddenly and deeply excavated, instead of being encroached on by the protuberance of the penultimate whorl occasioned by the partial deviation of the anterior portion of the last whorl. The granulate sculpture observable in the two shells cited above is replaced in *H. Helferi* by scattered shallow indentations, the seat of the hairs, which are to be detected on the portion of the caducous epidermis remaining in the single specimen received for examination.

4. *Helix Pilidion*, B.

Testa anguste umbilicata, subgloboso-conoidea, tenuissima, lævigata, leviter striatula, striis remotiusculis elevatioribus corneo-fuscis, alteris confertissimis spiralibus decussantibus, translucente, albida, fascia unica peripherica rufa ornata; spira conoidea, apice obtusiusculo, sutura leviter impressa; anfractibus $4\frac{1}{2}$, sensim accrescentibus, convexiusculis, ultimo antice vix descendente, subtus convexo; apertura obliqua, quadrato-lunata, peristomate acuto, tenui, undique expansiusculo, marginibus remotis, subconniventibus, callo tenui junctis, columellari latiore triangulato-expanso.

Diam. major 16, minor 13, axis 9 mill.

Habitat in regione Peguensi.

5. *Helix Peguensis*, B.

Testa anguste umbilicata, globoso-depressa, solidiuscula, oblique rugoso-striatula, nitidiuscula, translucente, rufo-cornea, obscure unifasciata; spira conoidea, apice obtuso, sutura profundiuscula, rugose submarginata; anfractibus 5, vix convexis, lente accrescentibus, ultimo rotundato, supra peripheriam obtuse angulato, antice leviter descendente, circa umbilicum compressiusculo; apertura obliqua, rotundato-lunari, peristomate expansiusculo, livide albido-violaceo, marginibus remotis subconniventibus, columellari expanso, reflexiusculo, umbilicum leviter occultante.
Diam. major 20, minor 18, axis 13 mill.
Habitat ad Sheoay-Gheen, Pegu. Detexit Capt. J. C. Haughton.

The umbilicus is wider in some specimens than in others, and the angle above the periphery is variable, and occasionally more pronounced. In dead specimens the livid violaceous colour of the aperture and lip is changed into white, and the obscure fuscous band at the periphery is scarcely to be detected.

6. *Streptaxis Andamanica*, B.

Testa rimato-umbilicata, depresse ovato-oblonga, oblique arcuatim costulato-striata; spira laterali, obtuse conoidea, sutura profunda; anfractibus 6, convexiusculis, prope suturam angulatis, primis regularibus, antepenultimo gibbo, ad peripheriam non angulato, duobus ultimis lateraliter longe divergentibus, ultimo lævigato; apertura perobliqua, truncato-oblonga, lamella 1 parietali intrante, peristomate tenui, acuto, expansiusculo, marginibus subparallelibus, dextro antrorsum valde arcuato, sinistro reflexiusculo, margine umbilicali compressiusculo.
Long. 7, diam $4\frac{1}{2}$ mill.
Habitat in Insulis Andamanicis.

A single specimen was found by Mr. Theobald in a dead *Cyclophorus* received from the Andamans. The form is more obliquely elongate and slender than that of *S. Petiti*, and is less depressed in the conoid portion of the spire; it has a deeper suture, angulate at the outer edge, and the last of the regular whorls is rounded, not angular, at the periphery on the left side; the edge of the umbilicus is angular, and the aperture is narrower than in *S. Petiti*.

7. *Pupina Peguensis*, B.

Testa imperforata, subgloboso-ovata, lævigata, polita, pellucida, cornea; spira convexo-conica, apice acutiusculo, sutura callosomarginata; anfractibus $4\frac{1}{2}$, ultimo spiram superante, antice breviter ascendente, ad basin foveato; apertura subverticali, sursum spectante, circulari, angulo acuto superne adjecto, callo parietali superne et lamella intrante munita; columella profunde incisa, canalem extus progredientem lingua lata superiore obtectum callisque

duobus extus divergentibus marginatum exhibente; peristomate expansiusculo; margine dextro, supra medium arcuato, basalique crassiusculo obtusis.
Long. 6, diam. $3\frac{1}{2}$ mill.
Habitat in regione Peguensi. Mus. Soc. Asiat. Calcuttensis.

Closely related to the Tenasserim *Pupina Arula*, B., but, independently of its smaller size, differing in form, proportions, translucence, and absence of sculpture.

8. *Cyclophorus flavilabris*, B.

Testa umbilicata, subgloboso-turbinata, suboblique striata, striis confertis spiralibus decussata, castanea, fascia saturatiore, sub altera angustiore albida peripherica, ornata, periomphalo pallidiore; spira elevato-turbinata, apice vix acutiusculo, sutura impressa, superne marginata; anfractibus 5, convexis, ultimo antice sensim leviter descendente; apertura subobliqua, circulari, peristomate breviter adnato, superne extus angulato, expanso, crassiusculo, flavo; margine columellari latiore, subrevoluto, umbilicum angustum leviter celante. Operc. —— ?
Diam. major 51, minor 43, axis 36 mill.
Habitat in Provincia Pegu.

A single specimen of this fine species, submitted for examination by Mr. Theobald, is remarkable for its clear yellow peristome, the colour of which extends some way into the aperture; and for the margination of the suture above, bounded by a strongly impressed line; this margination appears to be a continuation of the pale band of the lower whorl.

9. *Hydrocena Frustrillum*, B.

Testa imperforata, ovato-oblonga, solidiuscula, spiraliter confertissime tenuisulcata, succinea (?); spira subpyramidata, apice obtusiusculo, sutura impressa; anfractibus 5, convexis, ultimo $\frac{2}{5}$ testæ subæquante; apertura obliqua, truncato-ovata, superne necnon ad latus sinistrum angulata, peristomate tenui, non continuo, pariete calloso. Operc. —— ?
Long. $2\frac{1}{2}$, diam. $1\frac{3}{4}$ mill.
Habitat in Regno Ava. Teste Prof. Oldham.

The specimens received were taken in a dead state. It is probable that they have an amber hue when in a fresh condition. The shell differs from the Thyet Myo *H. Illex*, B., in the absence of the very elongate slender spire of that species, in the want of an umbilicus, and in the form of the aperture, which presents internally an angle at the junction of the columellar lip.

10. *Hydrocena Rawesiana*, B.

Testa imperforata, subgloboso-conica, solida, confertim spiraliter striata, luteo-albida; spira conica, apice obtuso, sutura profundiuscula; anfractibus 4, valde convexis, ultimo spiram subæquante; apertura vix obliqua, semicirculari, superne et ad latus sinistrum angulata, peristomate tenui, margine parietali calloso, intus recto, stricto; loco umbilicali subfoveato. Operc. —— ?

Long. 2; diam. $1\frac{1}{2}$ mill.

Habitat prope Moulmein, ad cavernas "Farm Caves" dictas.

Named in compliment to Dr. Rawes, to whose kind assistance in collecting at the locality mentioned I am much indebted. A single specimen occurred to me, with the curious little genus *Clostophis*, in a decayed specimen of *Sophina* taken by Major R. H. Sankey during the rainy season of 1859. The shell is more globose than that of *H. Pyxis*, B., and the sculpture is altogether different. In the formation of the aperture there is an approach to that of *H. Frustrillum*, but it exhibits a straight knife-like edge at the internal parietal margin. The discovery of this species increases the number of Burmese *Hydrocenæ* to four, two of which belong to the region of the Irawadi River, and two to the province of Tenasserim.

11. *Helicina Andamanica*, B.

Testa sublenticulari, solidiuscula, striis confertissimis sub lente decussata, rugis spiralibus obsoletis, subtus magis conspicuis, munita, albida, superficie citrina, linea peripherica rubente suturam sequente ornata; spira convexo-conoidea, apice obsolete mucronato, sutura lineari, marginata; anfractibus $4\frac{1}{2}$ planulatis, ultimo acute compresso-carinato, subtus convexiusculo; apertura obliqua, triangulari, albida, peristomate acuto, expansiusculo, margine columellari brevi, sinuato, callum subcircularem emittente, calli basi elevatiore, versus marginem aperturæ obtuse angulata. Operculo tenui, albido, medio obsolete granulato, intus lutescente.

Diam. major 9, minor $7\frac{1}{2}$, axis 5 mill.

Habitat in Insulis Andamanicis.

A larger species than *H. Nicobarica*, Philippi, to which it is related. Some characters exhibit a tendency towards *H. Merguiensis*, Pfr. The single specimen received from Mr. Theobald is considerably weathered; and it is possible, from certain appearances, that the spiral rugæ may be less prominent in a perfect specimen, and that they have become more developed by the decay of the surface. In this specimen the coloured band is to be discovered only on close inspection, and a very minute portion remains of the shining decussated surface. The state of the callus does not permit of its description either as smooth or granulate.

A small variety of *Cyclophorus speciosus*, Ph., the habitat of which was unknown to its describer, is stated by Haines to occur in Siam. The typical shell was found in Pegu by Capt.

Haughton, and a large and splendid example of it is in Mr. Theobald's collection.

Pfeiffer mentions that a small unbanded variety of my *Bulimus Sinensis* ('Annals,' April 1851), of which the original specimen was obtained by the lamented Dr. Theodore Cantor * from Southern China, occurs at Mergui. Capt. Haughton obtained the larger 2-banded variety at Sheoay-Gheen in Pegu.

Cheltenham, July 31, 1860.

XXVIII.—*On the Bitentaculate Slug from Aneiteum.* By Dr. J. E. Gray, F.R.S., V.P.Z.S. &c.

In the 'Annals and Magazine of Natural History,' ser. 2. vol. xviii. p. 41, Mr. J. D. Macdonald describes and figures a bitentaculate Slug from the island of Aneiteum, which Mr. Macgillivray thought might be a species of *Janella*. Mr. Macdonald clearly proves that his Slug can have but very little affinity with that genus.

The distinction between them has been further proved by the publication of figures of the living *Janella*, with its jaw, tongue, teeth, and other organs, by Mr. Knight, in the 'Linnæan Transactions,' vol. xxii. p. 381, t. 66.

We have lately received several specimens of a Slug from New Caledonia, which so closely resembles the one described and figured by Mr. Macdonald, that I am induced to believe it is the same species.

I may state that it has no relation with my genus *Janella* further than belonging to the same Phytophagous group of the order, and that I am inclined to regard it as the type of a new family nearly allied to *Limacina*.

This family (*Aneiteadæ*) may be distinguished from *Limacina* by the small size of the mantle, which is most dilated on the right side, and in the front end being attached to the body, and not a free flap as in the true Slugs; in the entire absence of tentacles, there being only two elongated retractile eye-peduncles; in the head being furnished with a deep groove on each side above, arising from the sides of the front end of the mantle, diverging to the outer side of the eye-peduncles, and continued to the swollen upper edge of the mouth.

It also differs from the Slug (*Limax*) in the back having a central longitudinal groove, from each side of which diverge lateral

* Dr. Cantor died at sea, whither he had been sent from Calcutta for change of air, in March last. He was indefatigable in his profession; and his researches have added largely to our knowledge of the natural history of Asia.

grooves extending to the edge of the foot, these grooves being opposite to each other at their origin.

As I believe the animal has not yet had a name applied to it, I would suggest that it should be called, in recollection of the island where it was first discovered, and also of its first discoverer, *Aneitea Macdonaldii*; and the observations above given will form its generic character. In other characters it agrees with *Limax*.

I may add that the description and figures of the tongue and teeth of *Janella* given in the interesting paper of Mr. Knight show that *Janella* forms a most distinct family of terrestrial Mollusks.

Mr. Knight observes that he has termed the covering of the whole upper surface of *Janella* "the mantle," in deference to my views; but he thinks that it ought "more probably to be regarded as quite *naked*." The study of the genus *Aneitea* and the examination of Mr. Knight's paper have induced me to change my views. I now believe that the mantle is confined to the upper surface of the small respiratory cavity of both these animals; and this is confirmed by Mr. Knight having discovered "four small semitransparent calcareous (?) granules in the anterior wall of the pulmonary sac," showing that this part must be a "secretory organ;" but I do not understand how animals having such plates can be "regarded as quite naked."

XXIX.—*On the Nudibranchiate Mollusca inhabiting the Estuary of the Dee.* By Cuthbert Collingwood, M.B., F.L.S. &c.*

In a former paper I described the species of Nudibranchiata which up to that time had become known to me as inhabiting the estuary of the Mersey; I propose in the present communication to make some remarks upon those which are found in the neighbouring estuary of the Dee. I will not here dwell upon the species which are common to both rivers, having already made special reference to them as existing in the Mersey, while the table at the end of this article will sufficiently indicate their comparative rarity or profusion in both situations. The Mersey species which have not hitherto been detected in the Dee are *Embletonia pallida*, peculiar to the Mersey, and *Eolis concinna* and *E. despecta*. Of these, *Embletonia* has not been taken for some years; and it is to be feared that the locality in which Mr. Price first discovered it has been destroyed by the formation of the Birkenhead Docks. During the past spring, I have found a third small species of *Eolis* in the Mersey at Egremont, in com-

* Communicated by the author, having been read before the British Association at its Meeting at Oxford (1860).

pany with *E. concinna* and *E. despecta*: this is *E. exigua*, which inhabits the same fronds of *Laomedea gelatinosa* as the other two, being found in rock-pools considerably above low-water mark; but it appears to be much less numerous than *E. despecta*. There are thus four species existing in the Mersey which have not hitherto been met with in the Dee; and it will presently appear that the Dee possesses five species which have not yet made their appearance in the Mersey. The *Polycera Lessonii*, recorded as dredged off the Mersey, was taken about midway between the two estuaries, and can hardly be claimed, therefore, as the especial property of either.

Among those species common to both estuaries, one, however, deserves especial mention, viz. *Doris proxima*, from the fact that although found both in the Mersey and Dee, I am not aware of its having been taken anywhere else. In external characters it closely resembles *D. aspera*; but it is not a little remarkable that *D. aspera* has not yet been detected on these shores. I have searched in vain for it myself, nor can I hear that any one else has taken it *. It appears to be *replaced* by its ally *D. proxima*. This fact would lead one to suppose it to be a mere local variety, were it not that the tongue differs so widely in the two species that Mr. Alder remarks, "some naturalists might be disposed to consider them generically distinct."

I had the satisfaction of adding to the local list, in the autumn of 1859, *Eolis rufibranchialis*, characterized as one of the most slender and delicate forms of the genus. This beautiful species I first met with in July, at Hilbre Island, in the Dee, where it was of large size, and in some numbers. Visiting the Egremont shore of the Mersey in March of the present year, I was surprised to find as many as two dozen specimens of this brilliant creature where I had never seen it before. They were very brightly coloured, but not so large as the examples taken in the Dee.

The hunting-ground for these little animals in the estuary of the Dee is of very limited extent. On the Cheshire side, long before the time of low water, the tide runs out, leaving a vast and bare expanse of sand, most unproductive of animal life. The river is six miles wide at its mouth; and with the Welsh side I am unacquainted, owing to its distance and inaccessibility. But about a mile and a half from Hoylake, at the north-west angle of the Cheshire shore, commences a ridge of New Red Sandstone, nearly parallel with the coast, extending up the river

* In a note now before me, from Mr. Price, he says, "Every *Doris* (*aspera*) I ever suspected and sent to Mr. Alder, he pronounced to be *D. proxima*. They were sometimes pure white; their spawn dull yellow and inconspicuous, forming a squarish spiral."

for about a mile and a half, and rising at intervals into three small islands, called respectively Hilbre, Middle Island, and Little Eye. Hilbre is the largest and most seaward of these; nevertheless at low water three sides of it are left uncovered by the tide, and it is only a portion of the north-western side which is sufficiently steep and rocky to harbour marine animals. The other two islands are left high and dry at low water. Two miles higher up the river are some rocky prominences named Caldy Blacks, which are seldom visited, partly from their distance, and partly because the tide rushes up the Dawpool Deeps so rapidly and so insidiously, that, without great caution and some experience, the visit is not unattended with danger. Still it is necessary that these rocks should be mentioned, because at least one Nudibranch of rarity and interest has been obtained there. It is the north-west corner of Hilbre Island, however, which is the el Dorado of Liverpool marine zoologists; and it is really, for its extent, a spot of singular richness, but at the same time sufficiently difficult of access to render a visit to it an event of interest and importance. The low-water mark is fringed with a conspicuous belt of *Alcyonium digitatum*, interspersed with numerous specimens of *Sagartia sphyrodeta* (Gosse) and *Actinoloba dianthus*, with here and there an individual of *Sagartia viduata*; while immense and beautifully coloured *S. crassicornes* are clustered in masses higher up the rock, together with the ever-varying tints of the little *S. troglodytes*. Elsewhere the rocks are encrusted with sponges, such as *Halichondria panicea* and *H. oculata*; and in the little rock-pools are abundance of Polyzoa and Zoophytes, such as the delicate *Crisia eburnea* and the screw-like *Bugula avicularia* among the former, and *Laomedea gelatinosa*, *Sertulariæ*, *Campanulariæ*, and *Plumulariæ* &c. among the latter, mingled with the flower-like clusters of *Tubularia indivisa*. Beneath nearly every stone may be found numbers of brittle-stars (*Ophiocoma rosula* and *O. texturata*), which harbour there with the two species of Porcelain Crabs, *Porcellana platycheles* and *P. longicornis*, particularly the latter, and various species of *Terebella*, *Nereis*, and *Phyllodoce*. In other spots are thickly-planted colonies of the beautiful Fan-Amphitrite (*A. ventilabrum*), whose variegated and spiral gills often measure as much as 2½ inches across. Besides the Crustacea just referred to, there are always to be met with *Stenorhynchus phalangium*, *Hyas araneus*, *Cancer pagurus*, *Portunus depurator*, abundance of Hermits (*Pagurus Bernhardus* and other species) inhabiting shells which vary in size from the largest *Buccinum* and *Fusus* to the smallest *Mangelia*, the Æsop Prawn (*Pandalus annulicornis*), and a number of minute Crustaceans, such as *Nymphon gracile*, *Pycnogonum littorale*, *Lygia*, &c., while every weed is alive with the grotesque bowing forms of *Caprella Phasma* and *C. linearis*. In addition to this host of animals, the rocks are occupied with an abundance of boring Mollusks, particularly *Pholas crispata*, with here and there specimens of *Saxicava arctica*; and their slippery surfaces afford to the special searcher several Tunicates, such as *Ascidia, Clavellina*, and *Botryllus*; while *Tapes pullastra, Chiton cinereus, Trochus cinerarius, Purpura*, and *Buccinum* are among the shelled Mollusks, as well as occasionally some less common. Even fish are sometimes entangled in the pools, and may be taken by the hand, such, for instance, as the Spotted Gunnell (*Murænoides guttata*), and the Three-bearded Rockling (*Motella vulgaris*) frequently, and occasionally the Father Lasher (*Cottus bubalis*), the Black Goby (*Gobius niger*), the Fifteen-spined Stickleback (*Gasterosteus spinachia*), and the Power Cod (*Morrhua minuta*).

Such is the hunting-ground at Hilbre Island; and when it is borne in mind that all these and many more, and often rarer, animals are found in a space which might be traversed from end to end, but for the impeding rocks, in five minutes, it will be conceded that it is a singularly rich locality. Moreover, I have not yet alluded in this sketch to that tribe which is the especial subject of this paper (the Nudibranchiata), of which no less than twenty-two species have been found in this contracted spot, some of them being of the highest rarity and interest.

The second known specimen of the exquisite *Eolis Landsburgii* was taken by my friend Mr. Byerley at Hilbre Island in 1849. In August 1859 I met with a specimen at the same spot, having, as previously stated, found it in the Mersey in April of the same year.

Tritonia Hombergii is more frequently met with at Hilbre Island than in any part of the Mersey; indeed, although considered a deep-sea species, the island is seldom visited without a specimen being taken. I refer to it particularly here, because in August 1859, Mr. Moore the curator of the Liverpool Museum, visiting the spot, brought home a pure white specimen, a very beautiful and extremely rare variety. Mentioning the circumstance to Mr. Alder, he writes, "We have got *Tritonia Hombergii* nearly colourless, but not pure white; generally a little inclined to flesh-colour." That this was not a mere sickly individual, is proved by the remarkable fact that it, together with some specimens of *Eolis papillosa*, which were taken at the same time, lived under Mr. Moore's care for four months. It is generally difficult to keep the Nudibranchiata alive in confinement for more than a week or two, or at most a month; and indeed, if placed in an aquarium, the larger species at least usually perish in a few days. The secret of the present success lies, I think, in the fact that these specimens were placed in a shallow glass dish, and in a situation constantly exposed to draughts of fresh air, which kept the water well aërated.

The five species of Nudibranchiata which have been met with in the Dee only, and not in the Mersey, are the following:—

1. *Doris depressa.* This scarce little Doris, remarkable for the great relative size of the spicula, was once taken by Mr. Byerley at Hilbre Island.

2. *Doris subquadrata.* Only two specimens of this rare Doris appear to have been yet seen. The first was discovered by Mr. Alder, in deepish water at Torbay, in 1845; and the second was found by Mr. Byerley at Caldy Blacks, in the Dee. This specimen was forwarded to Mr. Alder, who confirmed the fact of its being *D. subquadrata.* I believe it has never been taken since. It was in company with *Doris pilosa,* to which species it is closely allied, but yet differs from it in several points, and particularly in the degree of development of the pallium, which in *D. subquadrata* is so scant as to leave the head and posterior part of the foot uncovered, when the animal is extended.

3. The third peculiar Dee species is the *Eolis olivacea.* The last excursion of the Liverpool Naturalists' Field Club was to Hilbre Island, on which occasion, notwithstanding that the day was hopelessly wet, it was not sufficiently so to damp the ardour of ninety-five members and friends of this flourishing Club. A few only landed; but among the captures I was glad to number *Clavellina lepadiformis,* new to our local list of Tunicata, while, among some Zoophytes brought from the island by Dr. Edwards, there appeared a specimen of the above *Eolis* not hitherto known in this locality. It was a small specimen, very brilliantly coloured, and altogether a very elegant addition to our fauna.

4 & 5. But the most interesting genus of all is perhaps that to which the remaining two species belong. I refer to *Antiopa,* the history of which is not a little remarkable. In 1844, M. Verany of Genoa described a species of Nudibranch inhabiting the shores of Southern Europe, under the name of *Janus Spinolæ.* The name *Janus,* however, having been already occupied by a genus of Hymenopterous insects, Messrs. Alder and Hancock proposed to call it *Antiopa,* in order to avoid confusion of generic terms. The animal in question appeared to approach very near in its characters to *Proctonotus mucroniferus*; but a remarkable crest between the dorsal tentacles, added to the lamellated form of the tentacles, and the terminal branching of the biliary cells of the papillæ, appeared to warrant its separation from the genus *Proctonotus*; and for seven years it constituted the sole species of the genus, under the name of *Antiopa splen-*

dida; and perhaps it is one of the most beautiful of this beautiful tribe. It inhabits the Mediterranean Sea, the south coasts of Europe and England,—the Menai Straits being the only northern locality known when the Ray Monograph was published. In July 1851, however, my friends Messrs. Byerley and Price, when on a visit to Hilbre Island, each picked up a specimen of a new species of *Antiopa* possessing the crest of that genus, but in the tuberculated papillæ approaching still more closely to *Proctonotus* than did the first *Antiopa*. One of these was sent to Mr. Alder, but died before it reached him; still, being a unique specimen, it was figured, and appeared in the Monograph under these adverse circumstances. Much as it resembled *Proctonotus*, the crest was with reason considered sufficient to distinguish it, and it was described under the name of *Antiopa hyalina*, the original species having in the mean time been renamed *A. cristata*—as I think, unfortunately, since the crest constituted a generic, and not a specific distinction. In August 1854 Mr. Byerley again met with a specimen of *Antiopa hyalina* within a few yards of the original spot. This was the first Mr. Alder saw alive, and it was a much superior specimen, more mature, and in altogether better condition than that figured, from which it differed in the greater length and more pointed character of the dorsal tentacles, the superior attenuation of the papillæ, and greater length of the tail. A careful drawing of it was made by Mr. Hancock, but too late to replace the one engraved for the Monograph.

This remarkably local species has hitherto eluded search in every other spot, and is peculiar to Hilbre Island in the Dee; and there, until the summer of 1859, it was the sole representative of the genus. In July of that year, however, I was so fortunate as to discover some fine specimens of *Antiopa splendida* (or *cristata*). These were such beautiful objects that I sent the largest to Mr. Alder, who informed me that even finer specimens occur in the Mediterranean. I look upon it, however, as the most lovely of the tribe, but one which has met with scant justice in that, for the most part, exquisitely-illustrated work. But it would perhaps be scarcely possible to delineate it satisfactorily: it deserves the name of *hyalina* even more than its congener. Mr. Moore, who visited Hilbre about a month after I had discovered *Antiopa cristata*, and who was with me on that occasion, upon looking into the rock-pool in which I had found them, saw an individual of that species, and, with it, one with which he was not familiar. He brought it to Liverpool; and on examination, it turned out to be another specimen of *Antiopa hyalina*. Thus this rare Nudibranch has been taken in the same spot at intervals of three and five years, and at last in company with its congener, exhibiting the curious and interesting spectacle of a small rock-pool containing an entire genus, the species of which are—one a widely-distributed animal, whose geographical range extends from there to the Mediterranean Sea, the other apparently one of the most localized animals upon the face of the earth.

The value of local lists is now fully recognized; and although they can never be deemed perfect, inasmuch as enlarged research and process of time may always be expected to bring to light additional species, nevertheless the collection of such carefully prepared lists is undoubtedly the best means of illustrating the Fauna of a country, as well as of elucidating the geographical range and distribution of animals. The following Catalogue of the Nudibranchiate Mollusca of the Mersey and Dee may be regarded as accurate and complete up to the present time.

Catalogue of the Nudibranchiata of the Mersey and Dee.

1. *Doris tuberculata.* Mersey and Dee; common.
2. —— *Johnstoni.* Mersey and Dee; once or twice.
3. —— *proxima.* Mersey and Dee; common (found nowhere else).
4. —— *bilamellata.* Mersey and Dee; abundant.
5. —— *pilosa.* Mersey and Dee; not uncommon.
6. —— *subquadrata.* Dee; once (the second known specimen).
7. —— *depressa.* Dee; once.
8. *Polycera Lessonii.* Between Mersey and Dee; once.
9. —— *ocellata.* Mersey and Dee; occasional.
10. *Ancula cristata.* Mersey and Dee; common.
11. *Tritonia Hombergii.* Mersey and Dee; occasional.
12. —— *plebeia.* Mersey and Dee; occasional.
13. *Dendronotus arborescens.* Mersey and Dee; common.
14. *Doto coronata.* Mersey and Dee; very common.
15. *Eolis papillosa.* Mersey and Dee; common.
16. —— *coronata.* Mersey and Dee; common.
17. —— *Drummondi.* Mersey and Dee; very common.
18. —— *rufibranchialis.* Mersey and Dee; not uncommon.
19. —— *Landsburgii.* Mersey and Dee; rare.
20. —— *concinna.* Mersey; common (the second known locality).
21. —— *olivacea.* Dee; once taken.
22. —— *aurantiaca.* Mersey and Dee; common.
23. —— *picta.* Mersey and Dee; not uncommon.
24. —— *exigua.* Mersey; apparently rare.
25. —— *despecta.* Mersey; common.
26. *Embletonia pallida.* Mersey (the only known locality); very rare.
27. *Antiopa cristata.* Dee; occasional.
28. *Antiopa hyalina.* Dee (the only known locality); very rare.

15 Oxford St., Liverpool,
August 1860.

XXX.—*On two new Species of Shells from Cambojia.* By Lovell Reeve, F.L.S. &c.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

Will you do me the favour to publish in your September Number the following descriptions of two very superb and striking new land-shells just received by Mr. Samuel Stevens from the south-eastern corner of the Asiatic continent? They were collected by an enterprising French traveller and naturalist, M. Mouhot, in the interior of the kingdom of Cambojia, lying between Siam and Cochin China. No European had hitherto reached the locality; and M. Mouhot relates how he accomplished the journey amidst savage tribes at great personal risk.

Helix Mouhoti.

Shell sinistral, deeply umbilicated, conoidly globose, rather inflated; upper portion of the whorls of a rich-toned transparent chestnut-colour, edged at the sutural margin with purple-black; lower portion of the whorls white, turning to a delicate straw-colour by the overlying of a shining, transparent, horny epidermis, encircled below the periphery and around the umbilicus with two very decided, broad, rich purple-black bands; whorls six, corrugately puckered throughout at the sutural margin, the first four whorls very densely granosely wrinkle-striated in the direction of the lines of growth, the striæ gradually disappearing on the fifth whorl; aperture lunar-orbicular; lip simple, reflected partly round the umbilicus.

Out of two thousand species of *Helix* at present known, the only one of the same type as *H. Mouhoti* is the large *H. Brookei,* collected by Mr. Arthur Adams, in company with Sir Edward Belcher, on the mountains of Borneo, during the voyage of the 'Samarang,' and described by Mr. Arthur Adams and myself in the 'Zoology' of that expedition. *H. Mouhoti,* of which Mr. Stevens has received a few specimens in various stages of growth, is even larger and more inflated than *H. Brookei.* In adult specimens, the last whorl measures $6\frac{1}{2}$ inches in circumference, 3 inches in diameter, and the shell is about 2 inches high. It differs from *H. Brookei* in being conspicuously, but not broadly, umbilicated, and in the mature lip not being in the least degree reflected at the margin. The lip itself (not the margin) is reflected at its junction with the body-whorl, partly round the umbilicus, as in the *Nanina* form of the genus. But the most striking feature of the species is the colouring. In *H. Brookei* the lower half of the whorls is of a uniform dark chestnut-colour; in *H. Mouhoti* it is pure white, turned to a bright straw-colour by the overlying of a shining horny epidermis, encircled immediately below the periphery by a broad, rich, purple-black band, somewhat like the bands of the large Philippine *Bulimus Reevei*, but even broader and more defined on the white ground. The region of the umbilicus is also deeply and as definitely stained with the same purple-black colour. As in *H. Brookei*, all the specimens of *H. Mouhoti* are sinistral, or what is more commonly called reversed.

Bulimus Cambojiensis.

Shell either sinistral or dextral, cylindrically ovate, thick, stout and pupoid in the spire, bluish-white, tinged with a watery fawn-colour, and clouded throughout with oblique zigzag flames of the same colour, darker, but very undefined and washy; whorls seven, smooth, rather bulbous, faintly impressed concavely below the suture; aperture ovate, of rather moderate dimensions, overlaid in a very conspicuous manner across the body-whorl, and over a very thickly reflected lip, with a callous, opake, milk-white deposit, which in the interior is stained with a beautifully iridescent violet-rose.

This fine species, of which Mr. Stevens has received several specimens, measuring nearly 3 inches in length by 1½ inch in width, is a most characteristic example of a type of the Malayan province of the genus, represented by the old *Bulimus citrinus* of Bruguière; and I name it after its well-authenticated place of habitation, because the species is, in all probability, confined to that locality. The islands adjacent to Cambojia have been pretty well ransacked; and we have nothing like it in species, either from them or from the contiguous mainland of Siam on the west, or Cochin China on the east. This particular type of the genus appears, however, abundantly at the Moluccas, in *B. citrinus*; and at Mindanao, the southernmost of the Philippine Islands, in *B. maculiferus*. Like these two species, *B. Cambojiensis* occurs with the shell convoluted either to the right or to the left. The shell is both larger and stouter than that of *B. citrinus*, differently painted, and especially characterized by its mouth of iridescent violet-rose, or what is now fashionably termed "Solferino" colour.

I am, Gentlemen,

Your obedient Servant,

LOVELL REEVE.

Hutton, near Brentwood, Essex,
Aug. 16, 1860.

BIBLIOGRAPHICAL NOTICE.

Archaia; or, Studies of the Cosmogony and Natural History of the Hebrew Scriptures. By J. W. Dawson, LL.D., F.G.S. &c. Montreal, 1860.

Amongst the numerous cosmogonists, and quasi-cosmogonists, who have attempted to reconcile the supposed "inconsistencies" of the Mosaic and geological records, there are not many who have possessed that accuracy of judgment and thought, or who have combined a sufficient amount of scientific with theological acumen, to make any permanent impression on the minds of either philosophers or biblical critics. The consequence is, that, practically, each particular inquirer has taken up, more or less, an independent position,—oftentimes caring but little, or even almost unconscious, whether or not the investigators of truth by different, but converging, lines of argument have arrived at conclusions in harmony with his own! And thus it is that, in some departments, much valuable information which might have been found explanatory of facts obscurely hinted at in others, has been either entirely lost sight of or else regarded as worthless,—and all through the want of that "happy balance" of unbiassed discernment which can detect the golden thread of truth throughout its countless ramifications, not merely in Nature, but equally also in the immaterial and moral worlds.

Whatever may be the results arrived at by the author of the clever and ingenious volume now before us, it will at least be admitted that he has executed his task with a greater amount of ability and judgment than perhaps any writer on the same subject who has preceded him. At once an accomplished geologist, a scholar, and a sound biblical critic, and possessing (which is more important still) a thorough knowledge of Hebrew and a power of unprejudiced perception rarely to be met with, it is not surprising that he should have thrown some new light on many points which have been hitherto but imperfectly discussed: and we feel sure that all who are interested in the study of a subject which yields to none other in importance (though it has lost much by the injudicious handling of shallow sceptics and the rampant speculation of literary dabblers) will thank Dr. Dawson for so able an exposition of his views.

There is a class of reasoners on the Continent (happily not very numerous in this country) who believe the Mosaic narrative of creation to be simply a well-composed myth. They think that the mind of England is not yet sufficiently advanced to accept so bold a doctrine, but that, nevertheless, "for some beautiful moral purpose, Moses tried to palm off upon his credulous countrymen a poetic fiction drawn from what he had learnt in Egypt,"— forgetting that he inserted in the selfsame book which contains this "fiction" the Ten Commandments, and the heaviest denunciations against forgery and deceit! To "philosophers" of that school Dr. Dawson's work does *not* appeal; but those who, on other and more substantial grounds than that which their own hasty and imperfect judgment may supply, already believe in the integrity of Holy Scripture, and who can conceive it possible that statements are not necessarily untrue simply because they themselves do not at once intuitively understand them, will find a fund of valuable information and suggestions scattered throughout this pleasantly written volume.

To enter into the general plan of the 'Archaia' would require far greater space than that which is here afforded; but we cannot better describe it than as a "running commentary" on the early announcements of Genesis, in which a close collation is made of the Hebrew original with the modern discoveries of science. Separate chapters are devoted to the "days," or æons, of creation, and to an inquiry into the nature of the actual facts to which allusion is made in the Mosaic history of the Cosmos. In his sixth chapter Dr. Dawson inclines strongly towards La Place's theory, commonly known as the Nebular Hypothesis, as most in accordance with the scriptural account of the existence of light before any mention is made of the luminous centre of our system: "What, then, was the nature of the light which on the first day shone without the presence of any local luminary? It must have proceeded from luminous matter diffused through the whole space of the solar system, or surrounding our globe as with a mantle. It was 'clothed with light as with a garment,'—

'Sphered in a radiant cloud; for yet the sun was not.'

We have already rejected the hypothesis that the primeval night proceeded from a temporary obscuration of the atmosphere; and the expression 'God said, Let light be,' affords an additional reason, since, in accordance with the strict precision of language which everywhere prevails in this ancient document, a mere restoration of light would not be stated in such terms. If we wish to find a natural explanation of the mode of illumination referred to, we must recur to one or other of the suppositions mentioned above, that the luminous matter formed a nebulous atmosphere slowly concentrating itself towards the centre of the solar system, or that it formed a special envelope of our earth, which subsequently disappeared" (p. 88).

The various points which are usually supposed to be antagonistic to each other in the two records are examined *seriatim,* and, as it seems to us, in most instances answered satisfactorily. According to the Hebrew narrative, "all the earth's physical features were perfected on the fourth day, immediately before the creation of *animals*" (p. 196); and geological discovery, in which animals play the first part, carries us back to an epoch corresponding with the beginning of the fifth day, which "day," or æon, would appear "to include the whole of the Palæozoic and Mesozoic epochs of geology." But in the Mosaic epitome it will be remembered that *plants* are stated to have made their appearance on the third day, and thus to have preceded animals in the order of succession; so that "we are shut up to the conclusion that the flora of the third day must have its place before the Palæozoic period of geology." "But that there *were* plants," continues our author, "before this period, we may infer almost with certainty from the abundance and distribution of carbonaceous matter in the form of graphite in the Azoic or Laurentian rocks of Canada; but of the form and structure of these plants we know nothing" (p. 168).

Many interesting suggestions bearing on controverted points might be adduced from the pages of this treatise, did space permit. Thus, in discussing the exact meaning of the Hebrew word "*min,*" Dr. Dawson remarks, "A very important truth is contained in the expression 'after its kind,' *i. e.* after its *species*; for the Hebrew '*min,*' used here, has strictly this sense, and, like the Greek *idea* and the Latin *species,* conveys the notion of form as well as that of kind. It is used to denote species of animals in Leviticus i. and xiv., and in Deuteronomy xiv. and xv. We are taught by this statement that plants were created each by itself, and that creation was not a sort of slump-work to be perfected by the operation of a law of development, as fancied by some modern speculators. In this assertion of the distinctness of species, and the production of each by a distinct creative act, revelation tallies perfectly with the conclusions of natural science, which lead us to believe that each species is permanently reproductive, variable within narrow limits, incapable of permanent intermixture with other species, and a direct product of creative power" (p. 163). And, again, whilst drawing a distinction between the expression to "create" and simply to "form" or "make," he adds: "We may again note that the introduction of animal life is marked by the use of the word 'create,' for the first time since the general creation of the heavens and the earth. We may also note that the animal, as well as the plant, was created 'after its kind,' or 'species by species.' The animals are grouped under three great classes,—the Remes, the Tanninim, and the Birds; but, lest any misconception should arise as to the relations of species to these groups, we are expressly informed that the species is here the true unit of the creative work. It is worth while, therefore, to note that this most ancient authority on this much controverted topic connects species on the one hand with the creative fiat, and on the other with the power of continuous reproduction" (p. 192).

In like manner, in his 16th chapter (on the "Unity and Antiquity of Man"), Dr. Dawson once more reverts to the same subject: "The species is not merely an ideal unit; it is a unit in the work of creation. No one better indicates than Agassiz does the doctrine of the creation of animals; but to what is it that creation refers? Not to genera and higher groups: *they express only the relations of things created*;—not to individuals as now existing: *they are the results of the laws of invariability and increase of the species*;—but to certain original individuals, protoplasts, formed after their kinds or species, and representing the powers and limits of variation inherent in the species,—the 'potentialities of their existence,' as Dana well expresses it. The species, therefore, with all its powers and capacities for reproduction, is that which the Creator has made,—His unit in the work, as well as ours in the study.. . . . The limits of variability differ for every species, and must be ascertained by patient investigation of large numbers of specimens, before we can confidently assert the boundaries in some widely distributed and variable species; but in the greater number this is not difficult, and in all may be ascertained by patient inquiry" (pp. 285, 289).

With the above quotation we must conclude our brief notice of Dr. Dawson's able and interesting work, merely remarking that, if he has not in all instances succeeded in entirely satisfying the minds of critics, he has at least offered more intelligible solutions of the greater mass of supposed "difficulties" than have been hitherto arrived at—and such, we might add, as may be readily accepted without doing unnecessary violence to either Scripture or science.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

June 14, 1860.—General Sabine, R.A., Treasurer and V.P., in the Chair.

"Researches on the Foraminifera."—Part IV. By W. B. Carpenter, M.D., F.R.S., F.G.S., F.L.S. &c.

The author in this communication brings to a conclusion that series of inquiries into the structural and physiological characters of *typical forms* of Foraminifera, which he had been induced to work out for the sake of turning to the account of Zoological science the valuable collections made by Mr. Jukes in the Australian Seas and by Mr. Cuming in the Philippine.

The first genus now treated of is *Polystomella*, the smaller and simpler forms of which have long been known, and of which the structure, so far as it can be elucidated by the examination of such specimens, has been already described with great care and accuracy by Professor W. C. Williamson. But in the comparatively gigantic and highly developed *Polystomellæ* of the Australian and Philippine series, a feature exists which is scarcely discernible in the humbler forms previously examined—that feature being the extraordinary development of the canal-system. A spiral canal runs along the inner margin of either surface of every whorl; from this canal a series of arches is given off, of which one passes down between every two adjacent segments, uniting it with the other spiral canal; whilst another set of straight branches passes directly towards the surface of the shell, through the thick calcareous deposit which covers in the depressed centre of the spire, and which extends as far as the last-formed spire. From the connecting arches, successive pairs of diverging branches proceed at frequent intervals; these, in the last whorl, make their way to the surface of the shell, and (when the shell is newly formed) open close on either side of the septal band, though, as the shell increases in thickness by subsequent deposit, the increased divergence of the branches separates their mouths from each other, and it very commonly happens that the two contiguous branches diverging from different arches meet and open by a single external pore half-way between the septal bands. When, however, one whorl has been surrounded by another, this radiating canal-system of the inner whorl does not usually continue itself directly into that of the outer (though such a continuation is not unfrequently seen), but the diverging canals for the most part terminate in the stolons of communication between the segments of sarcode that occupy the chambers of the outer whorl.

The evidence afforded by the distribution of the canal-system in *Polystomella* is decidedly confirmatory of the view expressed by the author on a former occasion, that this peculiar set of inosculating passages is related to the formation and nutrition of those solid calcareous layers which strengthen and connect the proper walls of the chambers, and to which he has given the designation of the "intermediate skeleton."

This view derives strong confirmation from the still more extensive distribution and greater importance of the canal-system of *Calcarina*, a genus of which Mr. Cuming's Philippine collection affords a most remarkable series of illustrations. This type may be considered as closely allied to *Polystomella* in the disposition and mode of communication of its chambers, save that the spire is generally more or less inequilateral. Its "intermediate skeleton" is, however, much more developed; and it extends itself into a variable number of prolongations, sometimes simply club-shaped, sometimes more or less ramifying, which radiate in different directions from the central body, giving it somewhat the appearance of a spur-rowel, whence its generic designation. (An approach to this configuration is occasionally presented by the common *Polystomella crispa*, as also by some other species of *Polystomella*.) Now the independence of the intermediate skeleton and of the spiral system of chambers is curiously shown by the disproportionate development which they respectively exhibit the one to the other, and by their occasional complete disconnexion,—the spire altogether departing from its usual course, and (as it were) running wild, whilst the intermediate skeleton with its prolongations still presents its ordinary configuration. The nutrition of the intermediate skeleton seems to be provided for by a system of large canals, freely inosculating with each other, which originate on the sides of the chambers, and are continued through the whole thickness of the intermediate skeleton, some of them passing directly to its nearest surface, whilst others are continued to the terminations of its radiating prolongations.

It is not a little remarkable that a Foraminiferous organism should present itself so extremely resembling the preceding as to be easily mistaken for it, and yet essentially differing from it in its plan of structure. This is the case with a type of which some remarkable specimens occur in Mr. Cuming's collection, and of which some smaller examples have been kindly put into the author's hands by Dr. J. E. Gray. As it seems to be identical with the body described by Montfort under the designation *Tinoporus baculatus*, it may be right to retain that name, although it had been abandoned under the impression that it was a mere synonym of *Calcarina*. The structure of this body will be better understood after the description of a simpler form, which seems to be generally diffused through the seas of warmer latitudes, but of which the most remarkable examples present themselves in Mr. Jukes's Australian dredgings. Its shape is extremely variable, being sometimes an almost perfect sphere, in other cases resembling the lower half of a sugar-loaf, whilst in other cases again it is a very irregular depressed cone. It seems originally to have grown attached to zoophytes, corals, &c., since it frequently presents indications of such former attachment, though it is rarely to be met with otherwise than free. It is, moreover, very closely allied in structure to the body which has been termed *Polytrema miniaceum*, under the belief that it was a Polyzoan Coral, but whose Foraminiferous affinities have been already perceived by Dr. Gray, who has proposed for it the generic name of *Pustulipora*.

In the commencement of its growth, this organism seems closely to resemble *Planorbulina*, being formed of an assemblage of chambers arranged on one plane, spirally towards the centre, but irregularly clustered towards the circumference; each chamber communicating by single large septal orifices with the two contiguous chambers of the same row, whilst its walls are perforated with numerous large pseudopodian foramina. This first-formed plane, however, is afterwards covered-in above and below by numerous successive layers of similar cells, which are piled one upon another in very regular rows; the original spiral type of growth being altogether lost in these superposed layers. In this mode the organism comes to present a near relationship to the fossil genus *Orbitoides**,—the principal difference being that the superposed layers are not so completely differentiated from the original median layer in *Tinoporus* as they are in *Orbitoides*. Now in *Tinoporus baculatus* we often find columns of solid shell-substance interposed between the angular partitions of the piles of superposed cells, just as they are in *Orbitoides*, their summits being visible on the surface as projecting tubercles; these columns are perforated with pseudopodian canals, which are extensions of the pores in the walls of the chambers over which they lie. And the peculiar stellate projections which give to this species so much the aspect of a *Calcarina* are for the most part formed of a similar growth; for though the chambered structure is continued for a short distance as a conical protuberance into the base of each, yet this cone is invested and extended by a sheath of solid shell-substance, which is perforated by pseudopodian tubes extending through it from the chambers.

The last type of Foraminiferous structure described in this communication is one which appears to furnish a highly interesting link of connexion between *Foraminifera* and *Sponges*. Its nature was at first entirely misunderstood, the specimens in Mr. Cuming's collection having been supposed, not only by Mr. Cuming, but by other conchologists, to be shells of a sessile Cirripede. Their external resemblance might readily justify such an inference, since they are irregular cones, apparently composed of distinct valves, attached by a spreading base to the surface of shells or corals, and having a single

* See the author's account of the structure of that genus in the Quarterly Journal of the Geological Society, vol. vi. 1850, p. 32.

orifice at their apex. A careful examination of the interior structure, however, makes it evident that the shell is multilocular, and that it is formed upon the type of the *Helicostègue* Foraminifera, closely resembling *Globigerina* in the commencement of its growth; the supposed 'valves' being the walls of the outer whorl, the chambers of which are very large, and are partially subdivided by incomplete septa. All the principal chambers communicate by orifices of their own with a sort of central funnel which leads to the external orifice; and thus their relation to it is very much that of the separate orifices of the chambers of *Globigerina* to its umbilicus. The cavities of the chambers are occupied by a spongeous tissue, which contains siliceous spicules; and although the possibility that this spongy substance may be parasitic must not be lost sight of, yet reasons are given which seem to render it almost certain that this is the proper body of the organism, on which Dr. Gray, who first discerned its true affinities, has conferred the generic name of *Carpenteria*.

The author concludes with some general observations upon the mutual affinities of the "typical forms" of Foraminifera whose structure he has now elucidated; and he sums up the evidence which his examination of them has furnished in regard to the very wide range of variation which seems especially to characterize this group,—avowing his conviction that the only classificatiou of it which can approach to a really natural arrangement, will be one founded upon the idea of "descent with modification" as the means by which an almost infinite variety of special forms has been evolved from a few fundamental types.

ZOOLOGICAL SOCIETY.

May 8, 1860.—E. W. H. Holdsworth, Esq., F.L.S., in the Chair.

On an apparently New Species of Paradise-Bird. By William Goodwin.

I beg permission to introduce to your notice a Bird of Paradise, which I believe to be either altogether unknown, or at least hitherto undescribed.

I have interested myself for many years in this branch of Ornithology, and possess in my own collection twenty-nine specimens, representing all the different species known up to the present time, with the exception of *Semioptera Wallacii*. I have had opportunities of inspecting the fine collections of these birds sent to England by that energetic and able naturalist Mr. Wallace, and have searched in vain for any specimen similar to that which I have now the honour of introducing to the meeting. I therefore conclude it to be in all probability an entirely new and undescribed species.

The bird now before you, which I believe to be the female, came into my possession about twenty years ago, together with another, which I have no doubt is the male bird. This latter specimen is now in the British Museum.

I received them both from Mr. Bartlett, and we then agreed in considering them as a young male and female of the *Paradisea papuana* ; but the numerous specimens which I have examined in the collections of Mr. Wallace, consisting of males, females, and young of the latter bird, have now convinced me that they belong to an entirely distinct species.

The male (now in the British Museum) is smaller than the *Paradisea papuana*, the length from head to end of tail being about 9 inches, bill $1\frac{1}{4}$ inch, wings from shoulder to tips barely $7\frac{1}{2}$ inches, tail $5\frac{1}{2}$ inches. Feathers on the head and shoulders yellow; back, tail, and wings dark chestnut-brown; the coverts of the wings edged with yellow; the two central tail-feathers have naked shafts 15 inches in length, terminating with elongated webs 3 inches long; the throat has a small patch of golden green, which surrounds the base of the bill; the lower parts, with the exception of a small patch of brown under the throat, white; side feathers somewhat elongated and soft.

Female: length from head to end of tail about 9 inches, bill $1\frac{1}{4}$ inch. Forehead, throat, sides and top of the head dark chocolate-brown, shading to a dingy yellow and cinnamon colour; tail-coverts tinged with yellowish-brown; tail cinnamon-brown, $4\frac{5}{8}$ inches long, the two middle feathers narrow, pointed and curved, $4\frac{1}{2}$ inches in length; the whole of the under parts from the throat white; side feathers soft; *legs and wings imperfect.*

Mr. Bartlett informed me that these birds came to England with other skins of Birds of Paradise, viz. the Clouded (*P. magnifica*), Golden-breasted (*P. aurea*), and the *Ptilorhis magnifica.*

The locality was unknown to him, and is probably one which Mr. Wallace has not yet visited. Should he continue his researches, he may yet be fortunate enough to meet with this species.

In conclusion, I beg to propose that the bird now brought under your notice be named *Paradisea Bartlettii*, in recognition of the valuable services rendered by Mr. Bartlett to the lovers of ornithological science by his very careful researches and numerous observations.

Notes on Two Struthious Birds now living in the Society's Gardens. By Philip Lutley Sclater, M.A., Secretary to the Society.

At the last meeting of this Society I announced that we were expecting to receive two additional examples of Struthious birds for the Menagerie, which I had reason to believe would prove to be distinct from any of the seven then existing in it. I now have the pleasure of informing the meeting that these birds have arrived in good health and condition, and that an accurate examination of them has convinced me, as well, I believe, as every one who has paid them a visit, that they really belong to independent species. We are now therefore the fortunate possessors of no less than nine different species of this important group, of which, until lately, but four were known to exist in the whole world in a recent state.

The newly arrived birds I allude to are examples of the Emeu of Western Australia (*Dromæus irroratus*, Bartlett), and the Cassowary with the throat-wattles divided and far apart, which I have proposed to designate *Casuarius bicarunculatus.*

The Emeu of Western Australia may, as was pointed out by Mr. Bartlett, when he first described it at a meeting of this Society in May 1859, be easily distinguished from the well-known Eastern bird by its spotted plumage. On comparing the feathers of the two species together, the mode in which this spotting is produced is clearly apparent. The feathers of *D. irroratus* are barred alternately with silky white and darkish grey throughout their length, terminating

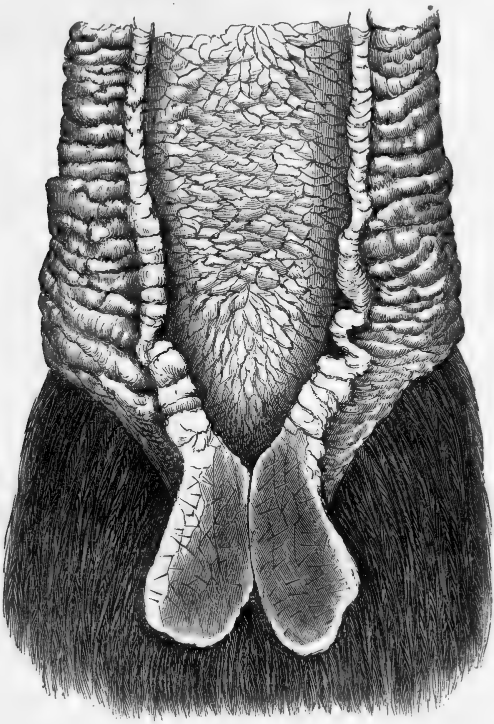


Fig. *a.*

in a black tip margined posteriorly with rufous. Those of *D. Novæ Hollandiæ* are uniform blackish grey from the base to the extremity, which is black with a broad subterminal band of rufous. On comparing the two living birds together, we find *D. irroratus* generally of a much more slender habit. The tarsi are longer and thinner, and the toes longer and much more slender. The tarsal scutes are smaller. The irides are of a pale hazel, instead of a reddish brown as in *D. Novæ Hollandiæ.*

The example of *D. irroratus* in the Gardens of the Zoological Society of Amsterdam was brought by a Dutch vessel from Albany, King George's Sound. I have reason to believe that our specimen is from the same locality. As Mr. Bartlett's original skin of *D. irroratus* was obtained in the interior of Southern Australia, the range of this Emeu must be supposed to extend over the western portion of Australia into the latter colony, where it probably inosculates with *D. Novæ Hollandiæ* *.

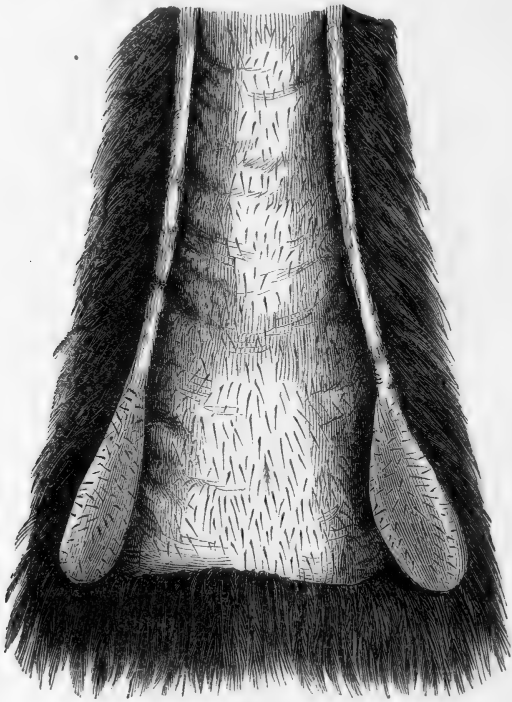


Fig. *b*.

With regard to the *Casuarius bicarunculatus*, I am unable at present to give any particulars concerning its true *habitat*, though in all probability it is the representative of the Common Cassowary of Ceram (*Casuarius galeatus*) in one of the Molucca group or adjoining islands. The specimen which we possess is still quite young. The casque is not developed. Except as regards the complete separation of the two neck-wattles, as indicated in the drawings now exhibited, of which fig. *a* represents the front view of the fore-neck

* Two additional specimens of the Spotted Emeu (both immature) have since been received by the Society from Swan River. In this stage of plumage the bird is decidedly darker than its near ally, *D. Novæ Hollandiæ*.

of the Common Cassowary, and fig. *b* the corresponding part of the new species, this bird might well pass as a rather bright-coloured variety of the *Casuarius galeatus*. But I have little doubt that the bird, as it grows older, will develope further differences, and that, when adult, it will be readily distinguishable by other characters from the common species.

May 22, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Characters of Eleven New Species of Birds discovered by Osbert Salvin in Guatemala. By Philip Lutley Sclater, M.A., Secretary to the Society; and Osbert Salvin, M.A., F.Z.S.

1. Polioptila albiloris.

Cærulescenti-cinerea, pileo nigro, loris albis: remigibus alarum nigricantibus; primariis cinereo, secundariis albo latiore marginatis: caudæ rectricibus tribus utrinque lateralibus albo, gradatim decrescente, terminatis, ceteris nigris, quarta utrinque extima albo terminata: subtus alba, cinerascente lavata: rostro nigro: pedibus obscure plumbeis.

Long. tota 4·3, alæ 1·9, caudæ 2·0.

Hab. In rep. Guatimalensi in valle fl. Motagua.

Obs. Affinis *P. leucogastræ* ex Brasilia, sed loris albis facile notabilis.

2. Dendrœca chrysoparia.

Supra nigra, dorsi plumis ad margines aurescentibus: superciliis et capite toto laterali læte aureo-flavis, vitta angusta per oculos transeunte nigra: alis nigricantibus, albo bifasciatis, secundariis quoque albido limbatis: cauda nigra, rectricum trium utrinque lateralium pogonio interno partim albo: subtus alba gutture toto et maculis laterum utrinque nigris: rostro pedibusque obscure corneis.

Long. tota 4·5, alæ 2·5, caudæ 2·4.

Hab. In reip. Guatimalensis provincia Veræ Pacis, inter montes.

Obs. Inter *D. virentem* et *D. Townsendi* media, ab utraque dorso nigro, abdomine pure albo et capite laterali fere omnino aureo distinguenda.

3. Hylophilus cinereiceps.

Flavicanti-olivaceus: pileo toto et nucha cinereis: ciliis oculorum et corpore medio subtus albis: lateribus et crisso pallide flavicanti-viridibus, rostro corneo, mandibula inferiore albicante: pedibus plumbeis.

Long. tota 4·1, alæ 2·1, caudæ 1·8.

Hab. In prov. Veræ Pacis regione calida.

Obs. Affinis *H. thoracico*, Temminckii, ex Cayenna, sed fronte pileo concolore et pectore albo distinguendus.

4. GLYPHORHYNCHUS PECTORALIS.

Brunneus, secundariis extus, uropygio et cauda rufis : superciliis, lateribus capitis et gula pallide ochracescenti-rufis, plumarum marginibus angustis brunneis : subtus dilutior, pectore maculis elongatis, plumarum scapos cingentibus, notato : remigibus nigris, macula magna quadrata in pogonio interiore pallide ochracea occupatis : rostro nigricanti-plumbeo, pedibus nigris.

Long. tota 5·5, alæ 2·8, caudæ 2·7.

Hab. In prov. Veræ Pacis regione calida.

Obs. Assimilis *G. cuneato* ex Brasilia, sed statura majore et maculis pectoralibus dignoscendus.

5. THAMNISTES ANABATINUS.

Thamnistes genus novum ex familia *Formicariidarum, Thamnophilo* generi affinis: characteres generales *Thamnophili* habet, sed rostro crassiore, basi latiore, et ptilosi anabatina differt.

Typus. T. anabatinus.

♂. *Vix olivascenti-brunneus, subtus dilutior : cauda ferrugineo-rubra unicolore : alis extus rufescentibus : macula magna interscapulari plumarum basin occupante læte aurantiaco-rubra, margine subapicali nigra : superciliari striga indistincta et corpore subtus pallide ochraceis, unicoloribus : rostri mandibula superiore nigricante, inferiore pallide cornea : pedibus nigris.*

♀. *Mari similis, sed macula interscapuli nulla.*

Long. tota 5·6, alæ 2·7, caudæ 2·3, tarsi 7·5.

Hab. In prov. Veræ Pacis regione calida.

6. PLATYRHYNCHUS CANCROMINUS.

Platyrhynchus cancroma, Sclater, P. Z. S. 1856, p. 295, et Ibis, 1859, p. 445.

Similis P. cancromati *ex Brasilia, et ab illo vix satis diversus, sed gula pure alba et cauda breviore distinguendus.*

Hab. In prov. Veræ Pacis regione calida, et in Mexico Merid. statu Veræ Crucis.

7. TYRANNULUS SEMIFLAVUS.

Olivaceus: pileo cinerascente: fronte et superciliis albis: alis caudaque fuscis olivaceo limbatis : subtus pure flavus : rostro et pedibus nigris.

Long. tota 3·2, alæ 1·8, caudæ 1·2.

Hab. In prov. Veræ Pacis regione calida.

Obs. Affinis *Tyrannulo elato* et *T. nigricapillo,* et plerumque eadem forma, sed corpore subtus flavo, maculis alaribus nullis et cauda paulo breviore distinguendus.

8. HETEROPELMA VERÆ-PACIS.

Olivaceum unicolor, supra infraque ad medium pectus rufo aut *ochraceo lavatum: alis caudaque fuscescentibus, extus rufescentibus: rostro corneo: pedibus plumbescentibus.*

Long. tota 6·3, alæ 3·5, caudæ 2·5.

Hab. In prov. Veræ Pacis regione calida.

Obs. Affine *H. virescenti* ex Brasilia, et statura eadem; colore *H. turdino* magis appropinquans; attamen ab utroque sane diversum.

9. Lipaugus holerythrus.

Rufescenti-brunneus unicolor, subtus clarior: remigum parte interna et primariorum apicibus fuscescentibus: rostri pallide cornei basi albicante: pedibus obscure corylinis.

Long. tota 8·3, alæ 4·2, caudæ 3·8.

Hab. In prov. Veræ Pacis regione calida.

Obs. Affinis *L. unirufo* ex eadem patria, et pictura eadem, sed crassitie minore facile dignoscendus.

10. Pionus hæmatotis.

Viridis: pileo rubiginoso-flavo: hujus plumarum marginibus angustis et regione auriculari coccineis: gutture obscure plumbeo: subtus viridis, pectore aureo lavato: lateribus sub alis late coccineis: remigibus nigris, primariis supra fulvo anguste limbatis; secundariis supra et alis omnino subtus cærulescentibus: rectricum basibus intus coccineis, caudæ apice cærulescente: rostro flavescenti-albo: pedibus rubellis.

Long. tota 8·5, alæ 5·8, caudæ 3·6.

Hab. In prov. Veræ Pacis regione calida.

Obs. Species lateribus coccineis ab aliis hujusce generis speciebus primo visu diversa.

11. Corethrura rubra.

Læte rufa, subtus medialiter dilutior: gula albicantiore: pileo toto et lateribus capitis saturate cinereis: remigibus et rectricibus cum uropygio obscure fusco-nigris: rostro nigro: pedibus olivaceis.

Long. tota 9·0, alæ 3·25, caudæ 1·7, rostri ab angulo oris 0·8, tarsi 1·3.

Hab. In provincia Veræ Pacis.

MISCELLANEOUS.

On some new Species of Mammalia and Tortoises from Cambojia. By Dr. John Edward Gray, F.R.S., V.P.Z.S.

Tupaia frenata.

Brown, minutely dotted with yellow; chin, inner side of limbs, and and under side of body and tail yellow-brown. Head rather elongate, with a black streak from the end of the nose to the ear, enclosing the eye, edged above and below with a distinct yellow line to the upper and lower side of the ear, and the lower streak having a very narrow black streak beneath it; shoulder-streak none. Length of head and body 5 inches, of tail 4 inches.

Hab. Cambojia (M. Mouhot).

Trionyx ornatus.

Back (of 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, but nearly symmetrically disposed yellow spots. Legs olive yellow, spotted in front. Sternum and under side of margin yellow; sternal callosities not developed.

Hab. Cambojia (M. Mouhot).

The species is very distinct in its colouring from the young of any of the other Indian species; and the colouring of the young animal forms one of the best characters of the species of the genus. It is most like the young of *T. gangeticus*; but the dorsal spots are solid, not rings, and the head is olive, dotted with black.

Geoemyda grandis.

Shell oblong-elongate, dusky brown. Back keeled. Vertebral plates elongate; the first urn-shaped, bluntly keeled; the fourth and fifth sharply keeled. Hinder edges strongly serrated. Nuchal plate distinct. Sternum truncated in front, deeply notched behind (of male very deeply concave). Head large. Claws very sharp and strong. Length of shell 16 inches, width 11 inches.

Hab. Cambojia (M. Mouhot).

M. Mouhot sent also specimens of *Testudo elongata, Geoemyda spinosa, Emys crassicollis,* and of three other species of *Emydæ*; but the three latter are so young as not to be fit to describe, or to determine if they are the young of already known species.

On Rusa Japonica, *a new Species of Rusa Deer from Japan.* By Dr. J. E. Gray, F.R.S., V.P.Z.S.

Mr. J. Wilks has lately presented to the Zoological Society a pair of Deer from Kanegawa in Japan; they are widely different from any species that has hitherto come under my observation, and may be entered in the Catalogues as

Rusa Japonica (Japan Rusa Deer).

Size of a small Axis Deer. Both male and female are dark brown with unequal and rather irregularly disposed round white spots; the series of spots on each side of the dark vertebral line close and regular, forming two parallel lines. Legs, shoulders, and thighs brown, not spotted. Anal disk and tail, and back edge of thighs, white; disk moderate, black-edged, especially above; the tarsal gland, three-quarters up the leg, large, dark yellow. Horn small, normal. The male with a dark ashy-brown neck, with a mane of longer, more rigid, standing-out hair. Female hornless.

Like *Hyelaphus porcinus*, but more slender and graceful in all its parts, and higher on its legs, like an Axis Deer; much darker than the Axis; it has no oblique white streak on the haunches, and the male is maned like the Indian *Rusa*.

The male has shed his horns since his arrival in the Gardens. They are short, not more than 10 or 12 inches long, and in form rather like those of the Axis Deer, but they scarcely seem the full-sized horns of the species. Perhaps they were developed in confinement.

It may be *Rusa lepida* of Sundevall, but that is described as being scarcely as large as a Roe-buck; the tail black, white beneath, and with a white spot on the face, which I cannot see in this Japanese species. The male is not described as maned.

Prof. Agassiz *on the Origin of Species.*

We copy from the advance sheets of Agassiz's third volume of 'Contributions to the Natural History of the United States' the following paragraphs relating to the origin of species, which has lately attracted much attention, in consequence of the publication of Darwin's book on that subject.

Individuality and Specific Differences among Acalephs.

The morphological phænomena discussed in the preceding section naturally lead to a consideration of individuality and of the extent and importance of specific differences among the Acalephs. A few years ago the prevailing opinion among naturalists was, that while genera, families, orders, classes, and any other more or less comprehensive divisions among animals were artificial devices of science to facilitate our studies, species alone had a real existence in nature. see Whether the views I have presented in the first volume of this work (p. 163), where I showed that species do not exist in any different sense from genera, families, &c., have had anything to do with the change which seems to have been brought about upon this point among scientific men, is not for me to say; but, whatever be the cause, it is certainly true that, at the present day, the number of naturalists who deny the real existence of species is greatly increased. Darwin in his recent work on the 'Origin of Species,' has also done much to shake the belief in the real existence of species; but the views he advocates are entirely at variance with those I have attempted to establish. For many years past I have lost no opportunity of urging the idea that while species have no material existence, they yet exist as categories of thought, in the same way as genera, families, orders, classes, and branches of the animal kingdom. Darwin's fundamental idea, on the contrary, is that species, genera, families, orders, classes, and any other kind of more or less comprehensive divisions among animals, do not exist at all, and are altogether artificial, differing from one another only in degree, all having originated from a successive differentiation of a primordial organic form, undergoing successively such changes as would at first produce a variety of species; then genera, as the difference became more extensive and deeper; then families, as the gap widened still further between the groups, until in the end all that diversity was produced which has existed or exists now. Far from agreeing with these views, I have, on the contrary, taken the ground that all the natural divisions in the animal kingdom are primarily distinct, founded upon different categories of characters, and that all exist in the same way, that is, as categories of thought, embodied in individual living forms. I have attempted to show that branches in the animal kingdom are founded upon different plans of structure, and for that very reason have embraced from the beginning representatives between which there could be no community of origin; that classes are founded upon different modes of execution of these plans, and therefore they also embrace representatives which could have no community of origin; that orders represent the different degrees of complication in the mode of execution of each class, and therefore embrace representatives which could not have a community of origin any more than the members of different classes or branches; that families are founded upon different patterns of form, and embrace representatives equally independent in their origin; that genera are founded upon ultimate peculiarities of structure, embracing representatives which, from the very nature of their peculiarities, could have no community of origin; and that, finally, species are based upon relations and proportions that exclude, as much as all the preceding distinctions, the idea of a common descent.

As the community of characters among the beings belonging to these different categories arises from the intellectual connexion which shows them to be categories of thought, they cannot be the result of a gradual material differentiation of the objects themselves. The argument on which these views are founded may be summed up in the following few words:—species, genera, families, &c. exist as thoughts, individuals as facts. It is presented at full length in the first volume of this work (pp. 137–168), where I have shown that individuals alone have a definite material existence, and that they are, for the time being, the bearers not only of specific characteristics, but of all the natural features in which animal life is displayed in all its diversity,—individuality being, in fact, the great mystery of organic life.

Since the arguments presented by Darwin in favour of a universal derivation, from one primary form, of all the peculiarities existing now among living beings have not made the slightest impression on my mind, nor modified in any way the views I have already propounded, I may fairly refer the reader to the paragraphs alluded to above as containing sufficient evidence of their correctness, and I will here only add a single argument, which seems to leave the question where I have placed it.

It seems to me that there is much confusion of ideas in the general statement of the variability of species so often repeated lately. If species do not exist at all, as the supporters of the transmutation theory maintain, how can they vary? and if individuals alone exist, how can the differences which may be observed among them prove the variability of species? The fact seems to me to be, that, while species are based upon definite relations among individuals which differ in various ways among themselves, each individual, as a distinct being, has a definite course to run from the time of its first formation to the end of its existence, during which it never loses its identity nor changes its individuality, nor its relations to other individuals belonging to the same species, but preserves all the categories of relationship which constitute specific or generic or family affinity, or any other kind or degree of affinity. *To prove that species vary, it should be proved that individuals born from common ancestors change the different categories of relationship which they bore primitively to one another.* While all that has thus far been shown is, that there exists a considerable difference among individuals of one and the same species. This may be new to those who have looked upon every individual picked up at random, as affording the means of describing satisfactorily any species; but no naturalist who has studied carefully any of the species now best known can have failed to perceive that it requires extensive series of specimens accurately to describe a species, and that the more complete such series are, the more precise appear the limits which separate species. Surely the aim of science cannot be to furnish amateur zoologists or collectors with a *recipe* for a ready identification of any chance specimen that may fall into their hands. And the difficulties with which we may meet in attempting to characterize species do not afford the least indication that species do not exist at all, as long as most of them can be distinguished, as such, almost at first sight. I foresee that some convert to the transmutation creed will at once object that the facility with which species may be distinguished is no evidence that they were not derived from other species. It may be so. But as long as no fact is adduced to show that any one well-known species, among the many thousands that are buried in the whole series of fossiliferous rocks, is actually the parent of any one of the species now living, such arguments can have no weight; and thus far the supporters of the transmutation theory have failed to produce any such facts. Instead of facts we are treated with marvellous bear, cuckoo, and other stories. "Credat Judæus Apella!"

Had Mr. Darwin or his followers furnished a single fact to show that individuals change, in the course of time, in such a manner as to produce at last species different from those known before, the state of the case might be different. But it stands recorded now, as before, that the animals known to the ancients are still in existence, exhibiting to this day the characters they exhibited of old. The geological record, even with all its imperfections, exaggerated to distortion, tells now, what it has told from the beginning, that the supposed intermediate forms between the species of different geological periods are imaginary beings, called up merely in support of a fanciful theory.

The origin of all the diversity among living beings remains a mystery as totally unexplained as if the book of Mr. Darwin had never been written, for no theory unsupported by fact, however plausible it may appear, can be admitted in science.

It seems generally admitted that the work of Darwin is particularly remarkable for the fairness with which he presents the facts adverse to his views. It may be so; but I confess that it has made a very different impression upon me. I have been more forcibly struck by his inability to perceive when the facts are fatal to his argument, than by anything else in the whole work. His chapter on the Geological Record, in particular, appears to me, from beginning to end, as a series of illogical deductions and misrepresentations of the modern results of Geology and Palæontology. I do not intend to argue here, one by one, the questions he has discussed. Such arguments end too often in special pleading; and any one familiar with the subject may readily perceive where the truth lies, by confronting his assertions with the geological record itself. But since the question at issue is chiefly to be settled by palæontological evidence, and I have devoted the greater part of my life to the special study of the fossils, I wish to record my protest against his mode of treating this part of the subject. Not only does Darwin never perceive when the facts are fatal to his views, but when he has succeeded by an ingenious circumlocution in overleaping the facts, he would have us believe that he has lessened their importance or changed their meaning. He would thus have us believe that there have been periods during which all that had taken place during other periods was destroyed,—and this solely to explain the absence of intermediate forms between the fossils found in successive deposits, for the origin of which he looks to those missing links; whilst every recent progress in geology shows more and more fully how gradual and successive all the deposits have been which form the crust of our earth.—He would have us believe that entire faunæ have disappeared before those were preserved, the remains of which are found in the lowest fossiliferous strata; when we find everywhere non-fossiliferous strata below those that contain the oldest fossils now known. It is true he explains their absence by the supposition that they were too delicate to be preserved; but any animals from which Crinoids, Brachiopods, Cephalopods, and Trilobites could arise, must have been sufficiently similar to them to have left, at least, traces of their presence in the lowest non-fossiliferous rocks, had they ever existed at all.—He would have us believe that the oldest organisms that existed were simple cells, or something like the lowest living beings now in existence; when such highly organized animals as Trilobites and Orthoceratites are among the oldest known.—He would have us believe that these lowest first-born became extinct in consequence of the gradual advantage some of their more favoured descendants gained over the majority of their predecessors; when there exist now, and have existed at all periods in past history, as large a proportion of more simply organized beings, as of more favoured types, and when such types as *Lingula* were among the lowest Silurian fossils, and are alive at the present day.—He would have us believe that each new species originated in consequence of some slight change in those that preceded; when every geological formation teems with types that did not exist before.—He would have us believe that animals and plants became gradually more and more numerous; when most species appear in myriads of individuals in the first bed in which they are found.—He would have us believe that animals disappear gradually; when they are as common in the uppermost bed in which they occur as in the lowest or any intermediate bed. Species appear suddenly, and disappear suddenly, in successive strata. That is the fact proclaimed by palæontology. They neither increase successively in number, nor do they gradually dwindle down; none of the fossil remains thus far observed show signs of a gradual improvement or of a slow decay.—He would have us believe that geological deposits took place during the periods of subsidence; when it can be proved that the whole continent of North America is formed of beds which were deposited during a series of successive upheavals. I quote North America in preference to any other part of the world, because the evidence is so complete here that it can only be overlooked by those who may mistake subsidence for the general shrinkage of the earth's surface in consequence of the cooling of its mass. In this part of the globe, fossils are as common along the successive shores of the rising deposits of the Silurian system as anywhere along our beaches; and each of these successive shores extends from the Atlantic States to the foot of the Rocky Mountains. The evidence goes even further; each of these successive sets of beds of the Silurian system contains peculiar fossils, neither found in the beds above nor in the beds below, and between them there are no intermediate forms. And yet Darwin affirms that "the littoral and sub-littoral deposits are continually worn away as soon as they are brought up, by the slow and gradual rising of the land, within the grinding action of the coast-waves" ('Origin of Species,' p. 290).—He would also have us believe that the most perfect organs of the body of animals are the product of gradual improvement, when eyes as perfect as those of the Trilobites are preserved with the remains of these oldest animals.—He would have us believe that it required millions of years to effect any one of these changes; when far more extraordinary transformations are daily going on, under our eyes, in the shortest periods of time, during the growth of animals.—He would have us believe that animals acquire their instincts gradually; when even those that never see their parents perform at birth the same acts, in the same way, as their progenitors. —He would have us believe that the geographical distribution of animals is the result of accidental transfers; when most species are so narrowly confined within the limits of their natural range that even slight changes in their external relations may cause their death. And all these, and many other calls upon our credulity, are coolly made in the face of an amount of precise information, readily accessible, which would overwhelm anyone who does not place his opinions above the records of an age eminently characterized for its industry, and during which that information was laboriously accumulated by crowds of faithful labourers.

It would be superfluous to discuss in detail the arguments by which Mr. Darwin attempts to explain the diversity among animals. Suffice it to say that he has lost sight of the most striking of the features, and the one which pervades the whole, namely, that there runs throughout Nature unmistakeable evidence of thought, corresponding to the mental operations of our own mind, and therefore intelligible to us as thinking beings, and unaccountable on any other basis than that they owe their existence to the working of intelligence; and no theory that overlooks this element can be true to Nature.

There are naturalists who seem to look upon the idea of creation (that is, a manifestation of an intellectual power by material means) as a kind of bigotry, forgetting, no doubt, that whenever they carry out a thought of their own, they do something akin to creating, unless they look upon their own elucubrations as something in which their individuality is not concerned, but arising without an intervention of their mind, in consequence of the working of some "bundles of forces" about which they know nothing themselves. And yet such men are ready to admit that matter is omnipotent, and consider a disbelief in the omnipotence of matter as tantamount to imbecility; for what is the assumed power of matter to produce all finite beings, but omnipotence? And what is the outcry raised against those who cannot admit it, but an insinuation that they are *non compos*? The book of Mr. Darwin is free of all such uncharitable sentiments towards his fellow-labourers in the field of science; nevertheless his mistake lies in a similar assumption, that the most complicated system of combined thoughts can be the result of accidental causes; for he ought to know, as every physicist will concede, that all the influences to which he would ascribe the origin of species are accidental in their very nature, and he must know, as every naturalist familiar with the modern progress of science does know, that the organized beings which live now, and have lived in former geological periods, constitute an organic whole, intelligibly and methodically combined in all its parts. As a zoologist, he must know in particular, that the animal kingdom is built upon four different plans of structure, that the reproduction and growth of animals take place according to four different modes of development, and that unless it is shown that these four plans of structure and these four modes of development are transmutable one into the other, no transmutation theory can account for the origin of species. The fallacy of Mr. Darwin's theory of the origin of species by means of natural selection may be traced in the first few pages of his book, where he overlooks the difference between the voluntary and deliberate acts of selection applied methodically by man to the breeding of domesticated animals and the growing of cultivated plants, and the chance influences which may affect animals and plants in the state of nature. To call these influences "natural selection" is a misnomer which will not alter the conditions under which they may produce the desired results. Selection implies design; the powers to which Darwin refers the origin of species can design nothing. Selection is no doubt the essential principle on which the raising of breeds is founded, and the subject of breeds is presented in its true light by Mr. Darwin; but this process of raising breeds by the selection of favourable subjects is in no way similar to that which regulates specific differences. Nothing is more remote from the truth than the attempted parallelism between the breeds of domesticated animals and the species of wild ones. Did there exist such a parallelism as Darwin maintains, the difference among the domesticated breeds should be akin to the differences among wild species, and afford a clue to determine their relative degree of affinity by a comparison with the pedigrees of well-known domesticated races. Again, if there were any such parallelism, the distinctive characteristics of different breeds should be akin to the differences which exist between fossil species of earlier periods and those of the same genera now living. Now let any one familiar with the fossil species of the genera *Bos* and *Canis* compare them with the races of our cattle and of our dogs; and he will find no correspondence whatever between them, for the simple reason that they do not owe their existence to the same causes. It must therefore be distinctly stated that Mr. Darwin has failed to establish a connexion between the mode of raising domesticated breeds and the cause or causes to which wild animals owe their specific differences.

It is true Mr. Darwin states that the close affinity existing among animals can only be explained by a community of descent, and he goes so far as to represent these affinities as evidence of such a genealogical relationship; but I apprehend that the meaning of the words he uses has misled him into the belief that he had found the clue to phænomena which he does not even seem correctly to understand. There is nothing parallel between the relations of animals belonging to the same genus or the same family and the relations between the progeny of common ancestors. In the one case we have the result of a physiological law regulating reproduction, and in the other, affinities which no observation has thus far shown to be in any way connected with reproduction. The most closely allied species of the same genus, or the different species of closely allied genera, or the different genera of one and the same natural family, embrace representatives which at some period or other of their growth resemble one another more closely than the nearest blood relations; and yet we know that they are only stages of development of different species distinct from one another at every period of their life. The embryo of our common freshwater turtle (*Chrysemys picta*) and the embryo of our snapping turtle (*Chelydra serpentina*) resemble one another far more than the different species of *Chrysemys* in their adult state; and yet not a single fact can be adduced to show that any one egg of an animal has ever produced an individual of any species but its own. A young snake resembles a young turtle or a young bird much more than any two species of snakes resemble one another; and yet they go on reproducing their kinds, and nothing but their kinds. So that no degree of affinity, however close, can, in the present state of our science, be urged as exhibiting any evidence of community of descent, while the power that imparted all their peculiarities to the primitive eggs of all the species now living side by side could also impart similar peculiarities with similar relations, and all degrees of relationship, to any number of other species that have existed. Until, therefore, it can be shown that any one species has the ability to delegate such specified peculiarities and relations to any other species or set of species, it is not logical to assume that such a power is inherent in any animal, or that it constitutes part of its nature*. We must look to the original power that imparted life to the first being for the origin of all other beings, however mysterious and inaccessible the modes by which all this diversity has been produced may remain for us. The production of a plausible explanation is no explanation at all, if it does not cover the whole ground.

All attempts to explain the origin of species may be brought under two categories: viz. 1st, some naturalists admitting that all organized beings are created, that is to say, endowed from the beginning of their existence with all their characteristics; while, 2nd, others assume that they arise spontaneously. This classification of the different theories of the origin of species may appear objectionable to the supporters of the transmutation theory; but I can perceive no essential difference between their views and the old idea that animals may have arisen spontaneously. They differ only in the modes by which the spontaneous appearance is assumed to be effected; some believe that physical agents may so influence organized beings as to modify them; this is the view of De Maillet and the 'Vestiges of Creation.' Others believe that the organized beings themselves change in consequence of their own acts, by changing their mode of life, &c.; this is the view of Lamarck. Others, still, assume that animals and plants tend necessarily to improve, in consequence of the struggle for life, in which the favoured races are supposed to survive; this is the view lately propounded by Darwin. I believe these theories will, in the end, all share the fate of the theory of spontaneous generation so called, as the facts of Nature shall be confronted more closely with the theoretical assumptions. The theories of De Maillet, Oken, and Lamarck are already abandoned by those who have adopted the transmutation theory of Darwin; and unless Darwin and his followers succeed in showing that the struggle for life tends to something beyond favouring the existence of certain individuals over that of other individuals, they will soon find that they are following a shadow.

* The difficulty of ascertaining the natural limits of some species, and the mistakes made by naturalists when describing individual peculiarities as specific, have nothing to do with the question of the origin of species; and yet Darwin places great weight, in support of his theory, upon the differences which exist among naturalists in their views of species. Some of the metals are difficult to distinguish, and have frequently been mistaken, and the specific differences of some may be questioned; but what could that have to do with the question of the origin of metals, in the minds of those who may doubt the original difference of metals? Nothing more than the blunders of some naturalists in identifying species, with the origin of species of animals and plants. The great mischief in our science now lies in the self-complacent confidence with which certain zoologists look upon a few insignificant lines, called diagnoses, which they have the presumption to offer as characteristics of species, or, what is still worse, as checks upon others to secure to themselves a nominal priority. Such a treatment of scientific subjects is unworthy of our age.

The assertion of Darwin, which has crept into the title of his work, is, that favoured *races* are preserved, while all his facts go only to substantiate the assertion that favoured *individuals* have a better chance in the struggle for life than others. But who has ever overlooked the fact that myriads of individuals of every species constantly die before coming to maturity? What ought to be shown, if the transmutation theory is to stand, is that these favoured individuals diverge from their specific type; and neither Darwin nor anybody else has furnished a single fact to show that they go on diverging. The criterion of a true theory consists in the facility with which it accounts for facts accumulated in the course of long-continued investigations, and for which the existing theories afforded no explanation. It can certainly not be said that Darwin's theory will stand by that test. It would be easy to invent other theories that might account for the diversity of species quite as well, if not better than Darwin's preservation of favoured races. The difficulty would only be to prove that they agree with the facts of Nature. It might be assumed, for instance, that any one primary being contained the possibilities of all those that have followed, in the same manner as the egg of any animal possesses all the elements of the full-grown individual; but this would only remove the difficulty one step further back. It would tell us nothing about the nature of the operation by which the change is introduced. Since the knowledge we now have, that similar metamorphoses go on in the eggs of all living beings, has not yet put us on the track of the forces by which the changes they undergo are brought about, it is not likely that by mere guesses we shall arrive at any satisfactory explanation of the very origin of these beings themselves.

Whatever views are correct concerning the origin of species, one thing is certain, that as long as they exist they continue to produce, generation after generation, individuals which differ from one another only in such peculiarities as relate to their individuality. The great defect in Darwin's treatment of the subject of species lies in the total absence of any statement respecting the features that constitute individuality. Surely, if individuals may vary within the limits assumed by Darwin, he was bound first to show that individuality does not consist of a sum of hereditary characteristics combined with variable elements not necessarily transmitted in their integrity, but only of variable elements. That the latter is not the case, stands recorded in every accurate monograph of all the types of the animal kingdom upon which minute embryological investigations have been made. It is known that every individual egg undergoes a series of definite changes before it reaches its mature condition; that every germ formed in the egg passes through a series of metamorphoses before it assumes the structural features of the adult; that in this development the differences of sex may very early become distinct; and that all this is accomplished in a comparatively very short time, extremely short, indeed, in comparison to the immeasurable periods required by Darwin's theory to produce any change among species; and yet all this takes place without any deviation from the original type of the species, though under circumstances which would seem most unfavorable to the maintenance of the type. Whatever minor differences may exist between the products of this succession of generations, all are *individual peculiarities,* in no way connected with the essential features of the species, and therefore as transient as the individuals; while the specific characters are for ever fixed. A single example will prove this. All the robins of North America now living have been for a short time in existence; not one of them was alive a century ago when Linnæus for the first time made known that species under the name of *Turdus migratorius*; and not one of the specimens observed by Linnæus and his contemporaries was alive when the Pilgrims of the 'Mayflower' first set foot upon the Rock of Plymouth. Where was the species at these different periods? and where is it now? Certainly nowhere but in the individuals alive for the time being; but not in any single one of them, for that one must be either a male or a female and not the species; not in a pair of them, for the species exhibits its peculiarities in its mode of breeding, in its nest, in its eggs, in its young, as much as in the appearance of the adult; not in all the individuals of any particular district, for the geographical distribution of a species over its whole area forms also part of its specific characters*. A species is only known when its whole history has been ascertained; and that history is recorded in the life of individuals through successive generations. The same kind of argument might be adduced from every existing species, and with still greater force by a reference to those species already known to the ancients.

Let it not be objected that the individuals of successive generations have presented marked differences among themselves; for these differences, with all the monstrosities that may have occurred during these countless generations, have passed away with the individuals, as individual peculiarities, and the specific characteristics alone have been preserved, together with all that distinguishes the genus, the family, the order, the class, and the branch to which the individual belonged. Moreover, all this has been maintained through a succession of repeated changes, amounting in each individual to the whole range of transformations through which an individual passes, from the time it is individualized as an egg, to the time it is itself capable of reproducing its kind, and perhaps with all the intervening phases of an unequal production of males and females, of sterile individuals, of dwarfs, of giants, &c. &c., during which there were millions of chances for a deviation from the type. Does this not prove that while individuals are perishable, they transmit, generation after generation, all that is specific or generic, or, in one word, *typical* in

* We are so much accustomed to see animals reproducing themselves, generation after generation, that the fact no longer attracts our attention, and the mystery involved in it no longer excites our admiration. But there is certainly no more marvellous law in all Nature than that which regulates this regular succession. And upon this law the maintenance of species depends; for observation teaches us that all that is not individual peculiarity is unceasingly and integrally reproduced, while all that constitutes individuality as such constantly disappears.

them, to the exclusion of every *individual peculiarity*, which passes away with them, and that therefore, while individuals alone have a material existence, species, genera, families, orders, classes, and branches of the animal kingdom exist only as categories of thought in the Supreme Intelligence, but, as such, have as truly an independent existence and are as unvarying as thought itself after it has once been expressed?

Returning, after this digression, to the question of individuality among Acalephs, we meet here phænomena far more complicated than among higher animals. Individuality, as far as it depends upon material isolation, is complete and absolute in all the higher animals, and there maintained by genetic transmission, generation after generation. Individuality, in that sense, exists only in comparatively few of the Radiates. Among Acalephs it is ascertained only for the Ctenophoræ and some Discophoræ. In others, the individuals born from eggs end by dividing into a number of distinct individuals. In others still, the successive individuals derived from a primary one remain connected to form compound communities. We must therefore distinguish different kinds and different degrees of individuality, and may call *hereditary individuality* that kind of independent existence manifested in the successive evolutions of a single egg, producing a single individual, as is observed in all the higher animals. We may call *derivative* or *consecutive individuality* that kind of independence resulting from an individualization of parts of the product of a single egg. We have derivative individuals among the Nudibranchiate Mollusks, whose eggs produce singly, by a process of complete segmentation, several independent individuals. We observe a similar phænomenon among those Acalephs the young of which (Scyphistoma) ends in producing, by transverse division (Strobila), a number of independent free Medusæ (Ephyræ). We have it also among the Hydroids which produce free Medusæ. Next, we must distinguish *secondary individuality*, which is inherent to those individuals arising as buds from other individuals, and remaining connected with them. This condition prevails in all the immovable Polyparia and Hydraria: and I say intentionally, in the immovable ones; for, in the movable communities, such as *Renilla*, *Pennatula*, &c., among Polyps, and all the Siphonophoræ among Acalephs, we must still further distinguish another kind of individuality, which I know not how to call properly, unless the name of *complex individuality* may be applied to it. In complex individuality a new element is introduced, that is not noticeable in the former case. The individuals of the community are not only connected together, but, under given circumstances, they act together as if they were one individual, while at the same time each individual may perform acts of its own.

As to the specific differences observed among Acalephs, there is as great a diversity between them as between their individuals. In some types of this class the species are very uniform,—all the individuals belonging to one and the same species resembling one another very closely, and exhibiting hardly any difference among themselves, except such as arises from age. This identity of the individuals of one and the same species is particularly striking among the Ctenophoræ. In this order there are not even sexual differences among the individuals, as they are all hermaphrodites. In the Discophoræ proper a somewhat greater diversity prevails. In the first place, we notice male and female individuals; and the difference between the sexes is quite striking in some genera, as, for instance, in *Aurelia*. Next there occur frequent deviations among them, in the normal number of their parts,—their body consisting frequently of one or two spheromers more than usual, sometimes even of double the normal number, or of a few less. And yet, year after year, the same Discophoræ reappear upon our shores, with the same range of differences among their individuals. Among Hydroids polymorphism prevails to a greater or less extent, besides the differences arising from sex. Few species have only one kind of individuals. Mostly the cycle of individual differences embraces two distinct types of individuals, one recalling the peculiarities of common Hydræ, the other those of Medusæ; but even the Hydra type of one and the same species may exhibit more or less diversity, there being frequently two kinds of Hydræ united in one and the same community, and sometimes even a larger number of heterogeneous Hydræ. And this is equally true, though to a less extent, of the Medusa type. Yet among Siphonophoræ there are generally at least two kinds of Medusæ in one and the same community. But, notwithstanding this polymorphism among the individuals of one and the same community genetically connected together, each successive generation reproduces the same kinds of heterogeneous individuals, and nothing but individuals linked together in the same way. Surely we have here a much greater diversity of individuals, born one from the other, than is exhibited by the most diversified breeds of our domesticated animals; and yet all these heterogeneous individuals remain true to their species, in one case as in the other, and do not afford the slightest evidence of a transmutation of species.

Would the supporters of the fanciful theories lately propounded only extend their studies a little beyond the range of domesticated animals, would they investigate the alternate generations of the Acalephs, the extraordinary modes of development of the Helminth, the reproduction of the Salpæ, &c., they would soon learn that there are in the world far more astonishing phænomena, strictly circumscribed between the natural limits of unvarying species, than the slight differences produced by the intervention of man among domesticated animals, and perhaps cease to be so confident as they seem to be that these differences are trustworthy indications of the variability of species. For my own part, I must emphatically declare that I do not know a single fact tending to show that species do vary in any way, while it is true that the individuals of one and the same species are more or less polymorphous. The circumstance that naturalists may find it difficult to trace the natural limits of any one particular species, or the mistakes they may make in their attempts to distinguish them, has nothing whatsoever to do with the question of their origin.

There is another feature of the species of Acalephs which deserves particularly to be noticed. All these animals are periodical in their appearance, and last for a short period in their perfect state of development. In our latitude most Medusæ make their appearance as Ephyræ, early in the spring, and rapidly enlarge to their full size. In September and October they lay their eggs, and disappear; the young hatched from the eggs move about, as Planulæ, for a short time, and then become attached, as Scyphistomes, and pass the winter in undergoing their Strobila metamorphosis. The Ctenophoræ appear also very early, and lay their eggs in the autumn, passing the winter as young, and growing to their full size towards the beginning of the summer. Among the Hydroids there is more diversity in their periodicity. Hydraria are found all the year round; but the Medusa-buds, the free Medusæ, and the Medusaria make their appearance in different seasons in different species. Some bring forth Medusa-buds and free Medusæ or Medusaria during winter; others (and, in our latitude, this is the case with by far the largest number of the Hydroids) produce their Medusa-brood in the spring; a few breed later, in the summer or in the autumn; so that, notwithstanding the regularity of their periodical return, Acalephs may be studied, in some condition or other, during the whole year.

When considering Individuality and Specific Differences as manifested in the class of Acalephs, I have taken an opportunity of showing, upon general grounds, how futile the arguments are upon which the theory of transmutation of species is founded. Having now shown that that class is circumscribed within definite limits, I may be permitted to add here a few more objections to that theory, based chiefly upon special grounds connected with the characteristics of classes. If there is anything striking in the features which distinguish classes, it is the definiteness of their structural peculiarities; and this definiteness goes on increasing, with new and additional qualifications, as we pass from the class characters to those which mark the orders, the families, the genera, and the species. Granting, for the sake of argument, that organized beings living at a later period may have originated by a gradual change of those of earlier periods, one of the most characteristic features of all organized beings remains totally unexplained by the various theories brought forward to explain that change—the definiteness of their respective groups, be they ever so comprehensive or ever so limited, combined with the greatest inequality in their numeric relations. There exist a few thousand Mammalia and Reptiles, and at least three times their number of Birds and Fishes. There may be twenty thousand Mollusks; but there are over a hundred thousand Insects, and only a few thousand Radiates. And yet the limits of the class of Insects are as well defined as those of any other class, with the single exception of the class of Birds, which is unquestionably the most definite in its natural boundaries. Now, the supporters of the transmutation theory may shape their views in whatever way they please to suit the requirements of the theory instead of building the theory upon the facts of Nature; they never can make it appear that the definiteness of the characters of the class of Birds is the result of a common descent of all birds; for the first bird must have been brother or cousin to some other animal that was not a bird, since there are other animals besides birds in this world, to no one of which any bird bears as close a relation as it bears to its own class. The same argument applies to every other class; and as to the facts, they are fatal to such an assumption, for geology teaches us that among the oldest inhabitants of our globe known, there are representatives of nine distinct classes of animals, which by no possibility can be descendants of one another, since they are contemporaries.

The same line of argument and the same class of facts forbid the assumption that either the representatives of one and the same order, or those of one of the same family, or those of one of the same genus, should be considered as lineal descendants of a common stock; for orders, families, and genera are based upon different categories of characters, and not upon more or less extensive characters of the same kind, as I have shown years ago (vol. i. pp. 150–163), and numbers of different kinds of representatives of these various groups make their appearance simultaneously in all the successive geological periods. There appear together Corals and Echinoderms of different families and of different genera in each successive geological formation; and this is equally true for Bryozoa, Brachiopods, and Lamellibranchiata, for Trilobites and the other Crustacea, in fact for the representatives of all the classes of the animal kingdom, making due allowance for the period of the first appearance of each; and at all times and in all classes the representatives of these different kinds of groups are found to present the same definiteness in their characteristics and limitation. Were the transmutation theory true, the geological record should exhibit an uninterrupted succession of types blending gradually into one another. The fact is, that throughout all geological times each period is characterized by definite specific types, belonging to definite genera, and these to definite families, referable to definite orders, constituting definite classes and definite branches, built upon definite plans. Until, therefore, the facts of Nature are shown to have been mistaken by those who have collected them, and to have a different meaning from that now generally assigned to them, I shall consider the transmutation theory as a scientific mistake, untrue in its facts, unscientific in its method, and mischievous in its tendency. — *Silliman's American Journal* for July 1860.

Note on the Fox of Japan. By Arthur Adams, F.L.S.

The Fox of Japan is quite a distinct species from that of China, specimens of which I procured on the banks of the Wusung River, near its junction with the Yang-tze-kiang. The Japanese species, four skins of which were obtained by Mr. Bedwell from Niegata in Niphon, has black ears lined with white, and a black spot on the upper surface near the base of the tail. The fur on the neck and back is ferruginous, and is much softer and longer than that of the Foxes of Europe and China; and the brush is also longer and thicker. —*Proc. Zool. Soc.* March 27, 1860.

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XXXI.—*On the different Animals known as Wild Asses.* By Edward Blyth *.

At least four distinct species—if the Dshiggitai or Kyang (*Equus hemionus* of Pallas) be considered to differ specifically from the Koulan or Ghor-khur (*E. onager* vel *E. asinus onager* of Pallas)—have been confounded under the general denomination of "wild Asses;" and two of the four have likewise been designated "wild Horses"—a name to which they are less entitled, as all agree in exhibiting the few structural distinctions that characterize the Asinine sub-group apart from the Equine or Caballine.

The systematic names bestowed by Pallas are so far unfortunate that they do not apply to the particular species which were known by them to the ancient Greeks and Romans—one of which latter has only recently been discriminated by Professor Isidore Geoffroy St.-Hilaire, by the name *Equus hemippus*. This (from its habitat) is necessarily the *Hemionus* vel *Hemippus*, or "wild Mule" of the ancients; whilst their *Onager*, as the name implies, refers as clearly to the veritable wild *E. Asinus*, which to this day, as formerly, exists in numerous troops in north-east Africa, if not also in the southern parts of Arabia and the island of Socotra. The *Hemippus* of modern nomenclature is the representative of the present group in Syria, Mesopotamia, and the northern portion of Arabia, where it is designated by Col. Chesney the "wild Horse," as distinguished from his "wild Ass" of Southern Arabia; and it is the species figured in Wagner's 'Säugethiere' (1856), pl. 33, by the erroneous name of *Equus asinus onager* of Pallas, from a living individual formerly in the Knowsley menagerie.

It should be especially noted that the great naturalist Pallas described his *E. hemionus* from personal observation of the ani-

* From the Journal of the Asiatic Society of Bengal, 1859.

mal; whereas he describes his *E. onager* only at second-hand, having never seen a specimen. Had he personally inspected the latter, it is exceedingly doubtful if he would have recognized the two as distinct species, or have considered the western animal to be the real *Onager* or aboriginal wild Ass. In his account of the Dshiggitai he remarks:—"On ne doit pas le confondre avec l'âne des steppes nommé Koulan par les Kirguis occidentaux; *les détails que je me suis procurés sur ce dernier* m'ont convaincu qu'il étoit l'âne sauvage, l'Onagre des anciens. Le Koulan se tient par troupeau dans les landes montagneuses de la Tatarie occidentale, comme le Dshiggitai dans les déserts de la Mongolie*." Curiously enough, we at present know the Dshiggitai or Kyang more as a mountain animal, in the elevated wilds of Tibet, and the Koulan or Ghor-khur more as an inhabitant of the sandy desert.

The late Professor H. Walker referred the Tibetan Kyang to *Equus hemionus* of Pallas; and the Ghor-khur of this country is even more satisfactorily referable to *E. onager* of Pallas, figured by Gmelin; but Professor Walker committed the extraordinary mistake of figuring and describing an Indian Ghor-khur for a Kyang†, so that the alleged distinctions which he has pointed out are valueless. However this mistake originated, there is no doubt whatever of the fact. The animal was procured and sent down to Calcutta by the late Mr. Thomason, Governor of the N. W. Provinces, who was just in the position to obtain a Ghor-khur from the western deserts, but scarcely a Tibetan Kyang. No doubt it was sold to him as a Puháriá or "mountain" Ghor-khur; for this epithet is continually applied by the natives of India to any creature foreign to their own province, as the experience of readers who have been in the habit of purchasing animals in this country will readily testify. By what route it reached Mr. Thomason we are uninformed, as also how it came to be accompanied by a Himalayan pony, from which it was inseparable; but having compared Dr. Walker's figure and description with stuffed specimens of undoubted Kyangs, and with three living undoubted Ghor-khurs now in Calcutta, the conclusion here arrived at is irresistible.

* Voyages de Pallas, iv. p. 305 (French edition, 1793). In p. 309 I observe a statement which is worthy of especial notice, as being made by Professor Pallas. The existence of the pouch of the Great Bustard (*Otis tarda*) is denied by Professor Owen, though asserted by the Hon. Walter Elliot to be a characteristic of the Great Bustard of India (*Eupodotis Edwardsii*). Of the former, however, Pallas thus writes: "Cet animal a un petit trou sous la langue, qui sert d'ouverture à une bourse aqueuse, qui est de la grosseur d'un œuf d'oie, et qui pèse souvent plus de trente livres. On ne connoît point ici la Petite Outarde."

† Journ. Asiat. Soc. xvii. pt. 2. p. 1, pl. 1.

While identifying the Kyang with the Dshiggitai, however, Professor Walker little imagined that he was making the same mistake that he considered M. Frédéric Cuvier and others to have done, in referring the Ghor-khur also to *E. hemionus.* I find that the Ghor-khur accords to the minutest particular with the Koulan or *E. onager* of Pallas, figured by Professor Gmelin from an occasional variety bearing a short humeral stripe (which is not rare also in Indian specimens of either sex*), from the presence of which the identity of this animal with the true Ass has been generally, but erroneously, inferred. Of the two individuals then at St. Petersburg, which are described by Professor Gmelin, it may be remarked that his male only had the shoulder-stripe, and his female not a trace of it; and he was informed that individuals had been seen with a second shoulder-stripe. This I have myself observed in the domestic Ass, and even a third and fourth, more or less developed—the additional ones being of variable length, and given off along the back as far as the loins,—though it is very rarely that more than a single stripe occurs, and I have seen only one domestic Ass without the shoulder-stripe. Many of our Indian donkeys have also well-defined transverse bars on the limbs, which are permanent for life (not, as described by Professor T. Bell, peculiar to the foal); they are often black and strongly contrasting, placed rather distantly apart, and they vary much in length. It is remarkable that some races of horses also have the same markings. The well-known "eel-back dun" of England is so named from its black dorsal stripe bearing a supposed resemblance to an eel; the Indian Káttyáwar (or rather, Cutch Horse) has generally, in addition, the shoulder-stripe and Zebra-markings on the limbs black and very distinct and conspicuous; and the same may be observed of many of the Shán ponies from the independent states north of Burma, many of which are brought annually to Maulmein, and not a few thence to Calcutta. I have seen one of these, of the pale drab colour usual in the Ass, with the cross and the stripes on the limbs deep black and most conspicuous, the dorsal stripe being continued down the tail just as in the *Asinine* series; yet in all other respects it was a handsome robust pony, with copious equine mane and tail, showing no approximation whatever to the Asinine group in its structure or voice. Those who believe that the domestic Horse is a compound species derived from a plurality of aboriginal races may

* Jacquemont notices such a specimen, which he saw in Barrackpore Park (Voyage dans l'Inde, i. 170; *vide* also Journ. Asiat. Soc. xxvi. 240). In Pallas's 'Zoographia Rosso-Asiatica,' which I have seen since penning the above, there is a coloured figure of *E. onager*, but much too rufous in the particular copy to accord with the description.

well infer that they perceive, in the markings described, indications of certain of those races*.

In some examples of the Ghor-khur (as that figured by Dr. Walker, from a drawing from life by Dr. Cantor†), there are no traces whatever of markings on the limbs; others show slight traces, more or less distinct, chiefly at the joints; and others, again, have the entire limbs strongly marked: but the stripes do not resemble those often seen in domestic donkeys, or in the races of Horse referred to; in general they are wavy lines of fawn, often more or less crossed or reticulate, but in some more regular and Zebra-like, upon observing which I remembered the description in Bell's 'Travels in Tartary' (i. p. 224) of the "wild Asses" found in the country of the Tzulimm Tartars, "the hair of which is waved, white and brown, like that of a tiger:" he "had seen many of their skins." So far as the limbs are concerned, this description is quite intelligible with reference to many Indian examples of the Ghor-khur.

It would appear that these limb-markings are never seen in the Kyang; but a narrow black ring adjoining the hoof would seem to be constant in this animal, as was first pointed out to me by Major Robert C. Tytler, the proprietor of the three Ghor-khurs now in Calcutta. This mark is also more or less developed in the Ghor-khur, but is by no means conspicuous in either race. In two stuffed specimens of the Kyang, old and young, in the Society's museum, there is no black shoulder-stripe, but in place of it the coat is there distinctly of a deeper shade of hue, so that the stripe is faintly indicated, as is best seen from a moderate distance. The same is observable, when especially looked for, in an unmounted skin. In one only of Major Tytler's three Ghor-khurs there is a small narrow black

* It does not follow, because the hybrid offspring of the Horse and Ass is mostly infertile (the male mule perhaps always), that distinct species of the Equine or Caballine group, or of the Asinine group, respectively, should not produce a prolific intermediate race, hybrid with hybrid. In the London Zoological Gardens there was formerly a triple hybrid, the sire of which was a Quagga, and the dam a cross between the Ass and Zebra.

The curious animal figured by Col. C. H. Smith, in his volume on the *Solidungula* in the 'Naturalist's Library,' under the name *Asinus hippagrus* (vel *equuleus*), appears to me to be a Chinese *hinny*, or offspring of the Horse and she-Ass. Its stripes might have been derived from either parent, if not (and very probably) from both of them. Col. Smith also figures what he terms an "eel-back dun" from the Ukraine, with the humeral cross-stripe, but no limb-markings; in the text, however, he repeatedly alludes to those markings as occurring sometimes in the "eel-back dun" race.

† Journ. Asiat. Soc. xvii. pt. 2. p. 1, pl. 1. This published figure is bad, whatever the drawing may have been. There is no anatomy about it, and the grace and beautiful contour of the creature are not at all pourtrayed. The head in particular, and the haunch, are exceedingly ill-represented.

line, on one side only of the animal, where the cross occurs in some individuals. In another Ghor-khur, which I saw in the Surrey Zoological Gardens, there was an incipient cross-stripe about an inch long, on one side, and still less (the merest indication of it) on the other side. In the individual which Jacquemont saw in Barrackpore Park, he remarks that there was "une ligne noire transversale sur les épaules." Whether this cross-stripe is ever seen in the *Hemippus* remains to be ascertained.

Sir R. Kerr Porter describes a "wild Ass" without even the dorsal stripe; and as he completed his sketch of it from a second individual which he killed, our incredulity should therefore abate somewhat, even though his account remains uncorroborated to this day. All other observers seem to agree in describing the Persian wild Ass to have the usual longitudinal dorsal streak. Thus in Morier's 'Second Journey through Persia' (ii. p. 201) we read, "The wild Ass is of a light mouse-colour, with *a dark streak over its shoulder* and down its back," which may imply that a cross-stripe was also observed. Porter, however, states, "The mane was short and *black*, as was also a tuft which terminated his tail; *no line whatever ran along his back, or crossed his shoulders*, as are seen in the tame species." Such an animal does not appear to have been met with by any other person! Prof. St.-Hilaire suspects that it will yet prove to be a distinct species. As an example of the vague misuse of names in which many authors indulge, it may here be remarked that in Kinneir's 'Geographical Memoir of the Persian Empire' (p. 42) these animals are actually styled "Zebras or wild Asses!"

The voice of Major Tytler's Ghor-khurs is *a loud, shrieking bray.* It is decidedly different from that of an animal which I heard in the Zoological Gardens, Regent's Park, which also was a distinct *bray*, but much less harsh and discordant than that of a donkey. This animal was probably a *Hemippus*; and Prof. Is. St.-Hilaire remarks that the voice of the *Hemippus* is notably different from that of the "Hémione," meaning the Ghor-khur. Also that "le *braire* de nos Hémiones indiens, si l'on veut se servir pour eux de ce mot, diffère considérablement du *braire* de l'Ane, soit domestique, soit sauvage*." When and where the distinguished Professor heard the bray of the *wild* Ass does not appear on the record; but the probability is that it differs little, if at all, from that of the domestic animal.

The Kyang, according to Major A. Cunningham, "neighs like a horse;" and I suspect that it was upon his authority that Dr. Walker asserted the same, and that he had never heard the

* Comptes Rendus, December 31, 1855, p. 1224.

voice of the Ghor-khur which he described. Again, M. Huc remarks of the Kyang's voice, that "le *hennissement* qu'ils font entendre est vibrant, clair et sonore*." On the other hand, Moorcroft asserts that "his cry is more like braying than neighing†;" and in an admirable letter, signed "Norman Leslie," which appeared in a late No. of the 'Friend of India' newspaper, giving an account of a Tibetan tour and of the sport obtained in the course of it (including the "bagging" of a noble specimen of the wild Yak), the following passage occurs relative to the Kyang, which is well worthy of citation:—

"As the spectator stands on the elevated land by the water-shed, he sees to the north the course of the Sutlej running from east to west through a table-land which is 14,000 feet high and intersected with ravines; the Himalayas to the south look but an ordinary range of hills, scarcely so elevated in appearance as the range beyond the Sutlej which bounds the view, and in which to the eastward the peak of Kylas rises conspicuous. On the plains between the ravines herds of Kyang feed; they are more *asinine* than *equine* in appearance, are of a light red colour, with white belly and legs, and have the hog-mane stripe down the back, and tail of an ass; the head is disproportionately large; and *they bray instead of neighing.*"

I have also been assured by actual observers, familiar with the voice of the Kyang, that it is "as much like neighing as braying;" but this I do not comprehend. It must surely be either one or the other. A *neigh* is a tremulous expiration only; a *bray* consists of alternate expirations and inspirations. And there can be little doubt that the Kyang will prove to resemble the other asinine quadrupeds in braying and not neighing, notwithstanding the highly respected testimony of Major Cunningham‡.

The resemblance of the two animals is indeed exceedingly close, again notwithstanding the assertion to the contrary by Major Cunningham, Dr. Hooker, and others—greater even than that of either of them to the *Hemippus*, which has a conspicuously smaller head and shorter ears. The size and figure of the two

* Souvenirs d'un Voyage dans la Tatarie, le Thibet, et la Chine, ii. 221.

† Moorcroft's Travels, i. 443.

‡ I have never heard the voice of the Quagga from which that species derives its name. That of the Ghor-khur is considered by Major Tytler to resemble exceedingly the cry of a mule. The truth might, indeed, be anatomically determined. Thus Cuvier remarks of the Ass: "Sa voix rauque (appelée *braire*) tient à deux petites cavités particulières du fond de son larynx." (R. A. i. 253.) Pennant, following Pallas, remarks of the Tshiggetai, that "their *neighing* is deeper and louder than that of the Horse,"—a description which most assuredly cannot be reconciled with the *shrieking bray* of the Ghor-khur.

would seem to be absolutely alike, with a heavy but well-formed head, longish ears, rather a short neck, and body and limbs of exquisite *tournure*, indicative of extraordinary fleetness. I have not seen the living Kyang or Djiggetai; but the croup is distinctly higher than the withers in the living Ghor-khur or Koulan. The colour of the Kyang is much deeper and more rufous than that of the Ghor-khur, and there is considerably more of white about the latter. The Ghor-khur is of the isabelline or sandy hue of most animals of the desert, but with a distinct rufescent tinge; its dorsal stripe would seem to be generally much broader than in the Kyang, though varying in breadth in different individuals; but it may be remarked that this stripe varies much in width in the domestic Donkey, at least in the diminutive Indian race of Asses, being in some individuals of the latter quite as broad as in any Ghor-khur: this mesial stripe, however, seems to be broader down the tail in the Kyang, and is continued down to the black terminal tuft; whereas in the Ghor-khur (perhaps with exceptions) the line is narrow on the tail, and terminates at some distance above the tuft. Again, in the Ghor-khur the dorsal stripe (which in both is of a dark chocolate-colour rather than black) is more or less conspicuously bordered with white (as likewise in the *Hemippus*), and this white extends broadly and very conspicuously towards the tail and along the hind margin of the buttocks, where, in the Kyang (as also, I since find, in some Ghor-khurs), the hue of the upper parts is only moderately diluted. Again, there is a much stronger tendency in the Ghor-khur for the white of the under parts to extend upwards from the flanks, in some so much as to join that bordering the broad dorsal streak, thus insulating the isabelline hue of the haunch; and the zebra-markings of the limbs, common (though not invariably present) in the Ghor-khur, have been denied to be ever traceable in the Kyang, and they certainly are not so in three skins of the latter under examination. In conformity with the general tendency to the extension of the white, as before remarked, that of the muzzle also reaches higher in the Ghor-khur than in either the Kyang or *Hemippus*; and lastly, the humeral cross, when apparent, shows itself differently, being faintly visible in full development and placed very forward in the Kyang, while in the Ghor-khur, when it does occur, it is a black cross more or less developed, though never probably to so great an extent as in the true Ass.

Moorcroft, alluding to the Quagga, remarks that the Kyang is "without stripes" (evidently meaning such as the Quagga exhibits), "except a reported one *along each side of the back* to the tail. These were distinctly seen in a foal, but were not distinguished in adults*." In the Asiatic Society's stuffed specimens, especially when viewed from some distance, the dull ruddy-brown or rufous-chestnut hue (approaching to bay, especially on the head) of the upper parts becomes gradually but distinctly darker on the flanks, to where it abruptly contrasts with the white of the belly; and in an adult the jowl and sides of the neck are white, reaching nearly up to the mane at the setting-on of the head, whence the brown above gradually widens backward to the shoulder; the white of the under parts also ascends above the *elbow-joint*, and posterior to the very dull indication of the shoulder-cross, which is not darker than where the body-hue contrasts with the white of the flanks. The stuffed foal is generally a trifle darker, and a little different in the relative extension of its shades,—the dorsal stripe being also less sharply defined, though only in consequence of the hair being longer. No doubt individuals vary more or less, like individual Ghor-khurs.

Comparing the hoofs together, the only difference that I can perceive consists in the fact that the Kyang-skins before me are those of *wild* animals, with the hoofs duly worn by constant action; whereas those of a Ghor-khur, belonging formerly to a captive individual, are much less worn, and accordingly are not so shapely. The limb-bones present no difference whatever. In the skulls the only diversity that I can perceive may be fully accounted for by disparity of age. We have the skull of a mature female Kyang, with its last molars long in wear; and this corresponds with Major Cunningham's figures of the skull of a male Kyang†. With these I compare that of an adolescent male Ghor-khur, with the penultimate molars just coming into wear, the last being enclosed within their sockets, the two foremost deciduary præmolars (on each side above and below) about to be replaced, and a medial pair of permanent incisors (above and below) just passing through the gums. A Horse at this stage of development would be reckoned as 2½ years old. At this particular age, I can perceive no further difference than can be accounted for by incomplete development on the part of the immature Ghor-khur‡.

Having thus elaborately compared them, it is impossible to

* Travels in the Himalayan Provinces, i. 443.

† Ladák, &c., pl. 6, p. 195.

‡ Since the above was in type, the Asiatic Society has received from Major Lumsden, late in charge of the Kandahar Mission, an imperfect skin and a skull of an adolescent male Ghor-khur from the vicinity of Kandahar. Its last molars were just coming into wear, corresponding to about four years old in the Horse. The skin shows the short summer vesture, and is of the same cream-colour or light isabelline hue as Major Tytler's three living specimens—the true *desert colouring*; and this hue

agree with Dr. J. D. Hooker when he asserts that the Kyang "differs widely from the 'wild Ass' of Persia, Sindh, and Beluchistan," although "undoubtedly the same as the Siberian animal." He adds that "it resembles the Ass more than the Horse, from its size, heavy head, small limbs, thin tail, and the stripe over the shoulder [!]. The flesh is eaten, and much liked. The Kyang-lah mountains are so named from their being a great resort of this creature*." Trebeck's remarks on the figure of the Kyang, as quoted by Cunningham, apply alike to either race. The accomplished botanist cited would most assuredly not recognize as distinct species two plants from different regions which differed so very slightly from each other as the Ghor-khur and the Kyang differ in the animal kingdom. Indeed, so far as I can discover, the difference is only in colouring, and this merely a difference of shades of hue and the relative extension of them †!

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suffuses the caudal region, which in Major Tytler's animals is conspicuously much whiter: the mesial dark line is very slight, almost evanescent, down the tail, in which respect all the Ghor-khurs differ from all the Kyangs under examination; and this stripe is not broader upon the croup than in an ordinary Donkey: there are no traces of markings on the limbs. The skull is unfortunately abnormal, being unsymmetrical and curiously deviating from the straight line—to the left at the occiput, and to the right at the muzzle. The nasal bones are more compressed than in the Kyang-skull; but this difference does not exist in Major Tytler's younger Ghor-khur-skull, nor certainly in his three living animals, so far as a judgment can be formed on careful examination of them. There is an obvious deformity in the shape of the lower jaw, the rami of which approximate almost to contact underneath for a considerable portion of their length, and not quite symmetrically.

The only equine skull in the Calcutta Medical College is catalogued as that of a Horse; but it exhibits the true *asinine* contour, and is nearly as large as that of the adult Kyang. I do not think that it is a mule-skull, but rather that it belonged to a fine specimen of the large Levantine race of domestic Asses, which is occasionally met with in the north-west of India, chiefly beyond Delhi. Had it been the skull of a wild animal, it would probably have been registered as such; and moreover, as a general rule, there is a considerable quantity of dark incrustation on the teeth of wild grazing animals, which I think is never very observable on those of domestic beasts: in the present instance, this is exhibited by the skull of a wild Kyang and that of a wild Ghor-khur under examination, and in no skull of domestic Horse or Ass, nor in the dubious Medical College specimen.

* Himalayan Journal, ii. 172.

† *Vide* a subsequent notice of the Ghor-khur, p. 242, where individuals are noticed *of a very dark colour*! But the Dshiggetai, as described by Pallas and Pennant, does not quite satisfactorily agree in colouring with the Tibetan Kyang! "Le poil est d'un jaune rembruni, assez clair. Le nez et l'intérieur des membres sont d'un jaune roux" (Pallas, Voyage). Pennant also, translating from the German, writes: "The colour of the upper parts of the body a light yellowish-grey, growing paler towards the sides. *Buttocks white,* as are the inside of the limbs and belly." This colouring really applies better to the Ghor-khur.

As regards the geographical distribution of the Kyang or Djiggetai, it does not appear that aught has been added to our knowledge since the time of Pallas; and the same may be remarked of the distribution of the Ghor-khur or Koulan, excepting that the proper habitat of the *Hemippus* has to be subtracted from that of the Koulan, and the supposed migratory habits of the latter are not confirmed by subsequent observation. In the depth of a Khiva winter, this animal was observed in numerous herds near the western extremity of Lake Aral, by Major James Abbott, who remarks that he "ascended some high land covered with snow. Wind scarcely endurable. We every day see herds of wild Asses, and flocks of the Saiga Antelope. I counted 800 wild Asses in a single herd *." According to Lieut. Irwin, it is "common in Persia, the western parts of Khorassân, and the plains of Turkistân, from which he extends north into the Russian dominions and the centre of Asia. A few are kept by the Ymacks, more for curiosity than use †." Southward, they are still numerous in the parched and rugged deserts of Beluchistân, which, however, are scarcely hotter than the country about the Aral in summer: there are many of them in the *Pât* or desert between Asni and the hills, west of the Indus, above Mithur-kote. "In this desert," remarks a recent writer, "they are to be found wandering pretty well throughout the year; but in the early summer, when the grass and the water in the pools have dried up from the hot winds (which are here terrific), the greater number (if not all) of the Ghor-khurs migrate to the hills for grass and water. Some are probably to be found in the hills throughout the year, for among them are sandy plains of greater or less extent. The foaling season is in June, July, and August, when the Beluchis ride down and catch numbers of foals, finding a ready sale in the cantonments for them, as they are taken down on speculation to Hindustan. They also shoot great numbers of full-grown ones for food, the ground in places in the desert being very favourable for stalking. . . . Some are beautifully striped on the legs; many are mottled. *I have seen one or two of a very dark colour.* They have not generally the stripe on the shoulder, though I think I have seen some with it slightly marked ‡." Eastward of the Indus, this animal appears to be fast verging on extermination; and I am assured that one herd only is left in the Bikánir desert, where the foals are often run down; and Major Tytler's specimens are from this locality. There are still a few also in the Runn of Cutch §. "The wild

* Narrative of a Journey from Herat to Khiva, &c., i. 23.

† Journ. Asiat. Soc. viii. 1008.

‡ India Sporting Review, n. s. iii. 172.

§ From information obtained by Major Tytler, it appears that the

Ass of Cutch and the north of Guzrât," remarked Col. Sykes in 1835, "is not found further south in India than Deesa, on the banks of the Bunnas river, in lat. about 23° 30′; nor have I heard of it to the eastward of the 75° of longitude on the southern side of the Himalaya. In Cutch and northern Guzrât it frequents the salt deserts and the open plains of the Opur, Jaysulmir, and Bikánir." Again, Masson, in his 'Narrative of a Journey to Kalát' (published in 1843), remarks that "the Ghor-khur, or 'wild Ass,' was formerly to be found on the Dasht Gúrân, and in Ghurgh'ina, but has disappeared of late years. It is still occasionally seen about Khárân. It also ranges the plain of Dâlbanding, on the road from Núshké to Jálk. South-easterly of Kalât, it is said to be found on the Pât of Shikárpúr, between Tambú and Rojân."

To the west of the range of the Ghor-khur lies that of *Asinus hemippus*, or true *Hemionus* of ancient writers,—the particular species apostrophised in the book of Job, and, again, that noticed by Xenophon. There is a recent account of it by Dr. A. H. Layard, in 'Nineveh and its Remains' (p. 324). Returning from the Sinjar, he was riding through the desert to Tel Afer, and there he mistook a troop of them for a body of horse, with the Bedouin riders concealed! "The reader will remember," he adds, "that Xenophon mentions these beautiful animals, which he must have seen during his march over these very plains. He faithfully describes the country, and the quadrupeds and birds that inhabit it, as they are to this day, except that the Ostrich is not now to be found so far north *. 'The country,'

Bikánir herd consists at most of 150 individuals, which frequent an oasis a little elevated above the surrounding desert, and commanding an extensive view around, the animals being exceedingly shy, and making off on discerning an object of suspicion, however distant. There is a low range of hills, several miles off, in which is a watercourse, dry during the hot season; but at the head of this, about a mile into the interior of the hills, there is a perpetual spring, to which the Ghor-khurs resort to drink during the night, maintaining the most vigilant caution. Once only in the year, when the foals are young, a party of five or six native hunters, mounted on hardy Sindh mares, chase down as many foals as they can succeed in tiring, which lie down when utterly fatigued, and suffer themselves to be bound and carried off. In general, they refuse sustenance at first; and about one-third only of those taken are reared, but these command high prices and find a ready sale with the native princes. The profits are shared by the party, who do not attempt a second chase in the same year, lest they should scare the herd from the district, as these men regard the sale of a few Ghor-khurs annually as a regular source of subsistence.

* According to Chesney, Ostriches are still "found in the great Syrian Desert, especially in the plain extending from the Haouran towards Jebel Shammar and Nedja; some of them are found in the Haouran itself, and a few are taken almost every year even within two days' journey of Damascus," &c. (Journal of the Euphrates Expedition, i. 558.) It is well

says he, 'was a plain throughout as even as the sea, and full of wormwood; if any other kind of shrubs or reeds grew there, they had all an aromatic smell; but no trees appeared. Of wild creatures, the most numerous were wild Asses, and not a few Ostriches, besides Bustards and Red Deer (Gazelles), which our horsemen sometimes chased. The Asses, when they were pursued, having gained ground on the horses, stood still (for they exceeded them much in speed); and when these came up with them, they did the same thing again; so that our horsemen could take them by no other means than by dividing themselves into relays, and succeeding one another in the chase. The flesh of those that were taken was like that of Red Deer, but more tender.' (Anab. lib. i. c. 5.) In fleetness," continues Dr. Layard, "they equal the Gazelle; and to overtake them is a feat which only one or two of the most celebrated mares have been known to accomplish. The Arabs sometimes catch the foals during the spring, and bring them up with milk in their tents. They are of a light fawn-colour, almost pink. The Arabs still eat their flesh." This will of course be the animal seen by Mr. Ainsworth at the foot of Taurus, and observed by him among the lower hills*.

It cannot be doubted that this *Asinus hemippus* is the Mesopotamian and Arabian "wild Horse" of Col. Chesney, as distinguished from his "wild Ass" of the southern deserts of Arabia. In Mesopotamia, this author remarks, "we did not obtain a single specimen, although the Arabs engaged to bring one; they brought a skin, however, of a light brown colour, without stripes, and having a mane [! dark streak ?] all along its back. This is more probably the wild Horse."! Again, treating on the animals of Arabia, he remarks: "The wild Horse, the wild Dog [*Lycaon pictus* ?], and a kind of wild Cow [*Oryx beatricis*, Gray ?] inhabit the country adjoining the district of Joff, between Tolink Sanou and Kedrush; and to the south of these places the wild Ass [*Asinus vulgaris* ?] is found in great numbers. The Sherarát Arabs hunt them, and eat their flesh, but not before strangers." Elsewhere he remarks that "the Ass is

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known that Ostriches commonly accompany, at the present day, the troops of Quaggas and Dauws in South Africa.

The remnant of the Ostrich race in Syria requires close examination. From some eggs in Major Tytler's possession, I am strongly inclined to suspect the existence of a second species of Ostrich. These eggs are smaller than the ordinary Ostrich egg, and have a much smoother and more polished surface, with the pores scarcely perceptible. In the ordinary Ostrich egg the pores are particularly conspicuous.

Ostrich feathers, wheresoever obtained, are numerous among the Kurds, who adorn their spears with them.

* Travels in Assyria, Babylonia, and Chaldea, p. 3.

probably the original animal of its kind [i.e. *species* domesticated] in the country; for it is first mentioned in connexion with this part of the world (Gen. xii. 16; Exod. iv. 20), and it was afterwards considered as a royal animal*." Here at least two species are indicated, which are likely to be the *Asinus hemippus* and the genuine *A. vulgaris* in its aboriginally wild state; and the wild Asses of the island of Socotra may be presumed to be no other than the latter. They are noticed by the late Lieut. Wellsted, R.N., who remarks, "Amidst the hills over Tamarida, and upon the plain contiguous to it, there are a great number of Asses, which were described to me as different from the domestic Ass; but, after repeated opportunities of observing them, I could find no reason for such a distinction. The introduction of Camels," he remarks, "having superseded the necessity of employing them as beasts of burden, they are permitted to stray where they please, and now wander about in troops of ten or twelve, evincing little fear unless approached very near, when they dart away with much rapidity." It is more likely that they are truly aboriginal.

The genuine wild Ass would, however, appear to be chiefly an inhabitant of North-east Africa, where considerable troops of these animals still exist, as described by ancient authors; and, being of prehistorical antiquity, it does not appear upon what grounds the late Prince of Canino pronounced them to be the descendants of domestic Donkeys, like those (for certain) in the hotter parts only of America; for it may be remarked that it is only in a hot climate that the Ass has returned to wildness †, and the domestic Ass is said to thrive only in a warm climate, and to be reared with difficulty even in Norway. To this subject, however, I propose to return in the sequel.

Whether or not inhabiting the southern parts of the peninsula of Arabia (which our friends at Aden should endeavour to ascer-

* Col. C. H. Smith remarks that the Ass is "repeatedly mentioned in the Pentateuch before the Horse is noticed,—as in the sacrifice of Abraham, in his visit to Egypt, where he received presents from Abimelech, and in the spoils of Shechem—where Asses are mentioned with other cattle, but the Horse is not mentioned." The Horse is supposed to have been introduced into Egypt by the Hyksos. In Assyria it was reclaimed at the period of the oldest monuments, as abundantly demonstrated, by the discoveries of Layard and others, since Col. Smith wrote.

† Azara notices, of those which have gone wild in South America, and especially about Santa Fé de la Vera Cruz—where he states that the increasing population was fast destroying them (and may have done so by this time)—that those which he saw "appeared to be somewhat larger than the domestic Asses of Paraguay, but smaller than the common Asses of Spain; nor does that large race," he adds, "which is there used for the breeding of mules, exist in these parts. They also appear to have larger and stiffer ears than in my native country."

tain), and also the island of Socotra, it is quite certain * that great troops of wild Asses, properly so-called, exist not only in the sandy deserts, but upon the mountains of North-east Africa; and it appears that a specimen was not long ago added to the Paris Museum, and was there designated "l'Onagre d'Abyssinie." It was presented by M. Degoutin, French consul at Massoua, and (remarks Prof. Isidore St.-Hilaire) "est certainement un Ane sauvage." It belonged, he tells us, to one of those troops which wander about the deserts of North-east Africa, the existence of which was long ago indicated by Ælian, and which are mentioned also by Leo Africanus in the sixteenth century, and by Marmol in the eighteenth century.

"The wild Ass," remarks the latter author, "is grey. There are a number of them in the deserts of Lybia, Numidia, and the neighbouring countries. Their pace is so fleet that only a barb can come up with them. In our days," continues M. St.-Hilaire, "these troops have been met with in various localities by different travellers—among others, by M. Caillaud, in Nubia; and to all the testimony already published may be added 'trois documents inédits,' respectively by M. Botta (formerly travelling naturalist for the Paris Museum, and now consul at Jerusalem), by M. Trémaux (architect), and by M. Gouzillot (Coptic Patriarch in Abyssinia).

"The first observed, in Sennaar, a multitude of wild Asses in troops, which were very distinct, according to the spoils obtained, from other animals designated wild Horses [*A. hemippus*?], which inhabit the opposite coast of the Red Sea, in Arabia. The second, in 1848, remarked them in the desert of Naga, in Nubia; their coat was of a palish grey, and the ears were longer than those of the *Hemione* [*A. hemippus*?], but shorter than in the tame Ass[?]. Lastly, M. Gouzillot, who passed six years in Abyssinia, has assured us of the existence of Onagers in countless herds on the mountains."

These are of course the wild Asses noticed by Col. C. Hamilton Smith, as occurring "on the Nile, above the cataracts; and abundant on the upland plains, between the table-hills below Gous Regun and the Baber-el-Abiad, in Atbara. (*Vide* 'Voyage on the Baber-el-Abiad,' by Adolph Linaud; and Hoskins's 'Travels in Ethiopia.')" According, also, to Sir J. Gardner Wilkinson, they are "common in the districts of the Thebaïd †." Hoskins met with them in the small desert immediately below the fifth cataract. "This desert," he remarks, "is sandy, with quartz and flinty slate disseminated. We saw for the first time three wild Asses, which had been browsing among the acacias near the Nile. There are great numbers of them in the coun-

* Journ. Roy. Geogr. Soc. 1835, p. 202.

† Domestic Manners of the Ancient Egyptians, iii. 21.

try; but the peasants very seldom succeed in catching or destroying them. A mixed breed [!] is sometimes seen in the villages. From the description of the Arabs, I conceive that the Zebra [*A. Burchellii*] also exists in these deserts. The Nile Ass seems larger than the common one; but we were at too great a distance to observe them particularly. The peasants seldom chase them, but, with a good horse, it is not very difficult *."

Both "wild Asses" and "Zebras" are noticed by Mr. W. C. Kirk, in his 'Report on the Route from Tajurra to Ankobar †.' Rüppell has determined this northern Zebra to be the *A. Burchellii*, or Dauw of the Cape colonists; the *Equus zebra* of Burchell, as distinguished from his *E. montanus*; and undoubtedly the true *Hippotigris* of the ancients, if not also the original "Zebra" of Pigafetta, from Congo ‡,—the *wild Paard* of the Dutch colonists, or "Mountain Zebra" of Burchell, being the *Equus* or *Asinus zebra* of modern technical nomenclature. This I mention because the French zoologists, from Cuvier to M. Isidore St.-Hilaire§, persist in the mistake of identifying the "Zèbre de montagne" with the Dauw or *A. Burchellii*.

Bruce notices "Zebras" as being "found in Abyssinia only in the south-west extremity of Kuora amid the Shangalla and Galla, in Narea and Caff, and in the mountains of Dyre and Tegla, and thence to the southward." "Wild Asses, too," he remarks, "I have frequently seen alive, but never dead: in neck, head, face, and tail, very like ours, *only their skins are streaked*, not spotted!" Perhaps he alludes to occasional bars on the limbs, like the wavy lines on those of the Ghor-khur, which Bell seems also to refer to. The wild Ass of North Africa is not mentioned in Dr. Barth's work; but at the Meeting of the British Association for 1858, M. R. Schlagintweit made some remarks relative to the Ghor-khur (as reported in the 'Athenæum'), and stated that Dr. Barth had lately told him that, according to the description which he (M. R. Schlagintweit) had given him, "he thinks the Asses which he saw in Africa identical with the Ghor-khurs of Sindh and Beluchistan." This can hardly be the case. And does the following notice refer to the ordinary wild Ass of North-east Africa? I very strongly suspect otherwise. Col. C. H. Smith remarks: "We have seen a pair of these animals brought from Cáiro; they were equal in size to an ordinary mule, neatly if not elegantly formed, *white* in

* Travels in Ethiopia, p. 41.

† Journ. Roy. Geogr. Soc. xii. 234; and for another notice of an African wild Ass, *ibid.* x. 461. In the Narrative of Lander's expedition (p. 571) a "wild Ass" is mentioned, whatever this may refer to.

‡ Col. C. H. Smith considers this northern "Zebra" to be distinct, and styles it *Hippotigris antiquorum*, but, I think, on very insufficient evidence.

§ Comptes Rendus, 1855, p. 1215.

colour, but silvery-grey on the ridge of the back and nose, with the forehead, neck, and sides of a beautiful pale ash with a tinge of purple; the mane, tail, and cruciform streak black *."

These I take to be choice specimens of the fine Levantine breed of domestic Asses, such as are often represented in antique Egyptian paintings, and always with the black crucial mark. From the remotest times it seems that two races of domestic Asses were known in Egypt, and both are represented in the old paintings. In modern times, Russell (in his 'Natural History of Aleppo,' p. 58) remarks that the Levantine nations have two principal breeds of Asses: "one very large, with remarkably long ears; the other small, and much like ours in England." Chardin, again, tells us that there are two races of the domestic Ass in Persia: "Les Anes du pais, qui sont lents et pesans, comme les Anes de nos pais, dont ils ne se servent qu'à porter des fardeaux; et une race d'Anes d'Arabie, qui sont de fort jolies bêtes, et les premiers Anes du monde. Ils ont le poil poli, la tête haute, les pieds légers, les levant avec action en marchant. L'on ne s'en sert que pour montures: les selles qu'on leur met sont comme des bâts ronds, et plats par dessus, faites de drap ou de tapisserie, avec les étriers et le harnois. On s'assied dessus plus vers la croupe que vers le cou. On met à plusieurs des harnois tout argent, tant le maître est content de la légèreté et de la douceur de leur allure. Il y en a du prix de quatre-cens francs, et l'on n'en sauroit avoir d'un peu bons à moins de vingt-cinq pistoles. On les panse comme les chevaux. Les ecclésiastiques qui ne sont pas encore dans les charges, ou dans les grands bénéfices, affectent à aller montés sur les Anes." He then proceeds to explain how these fine Asses are taught to amble.

The large and small races of Levantine Asses may be said to bear somewhat of the same mutual relation as Horses and Ponies. The small kind only have become domesticated in Northern Europe; and we trace them southward into Dârfur, where they are thus described in Mr. G. Brown's 'Travels' in that country (1799):—"The Ass here is of the same appearance and of the same indocile nature as that of Great Britain. The only good ones are what the Jelahs bring with them from Egypt. Yet the animal is much used for riding; indeed, few persons mount a Horse but the military and those who are in immediate attendance at court. An Egyptian Ass fetches from the value of one to that of three slaves, according to the weight he is able to bear. A slave will purchase three or four of the ordinary breed; and yet the people are not anxious to improve them."

The Asses of Upper Egypt, according to Sounini, are particularly handsome, but they degenerate towards the Delta.

* Naturalist's Library, xii. 312.

Fraser states that the Asses of Omân are the best in Arabia, and individuals of the best breeds sell for extravagant prices *. In Munro's 'Syria' we are told that the Asses of Damascus stand fourteen hands high; and elsewhere he remarks of one of them, "This Ass was the finest of the kind I ever saw; and the guide asserted that he would sell for more than both his own Horses. With all the animation and temper of a Horse, he had the superior qualification of being quicker and easier in his walk. . . . This Ass was found, after a long journey, to refuse his food. On visiting him, after supper, I found that the Ass was not eating, and seemed out of spirits. The guide accounted for this by saying that he was in the habit of living in the house with his master, and that he was alarmed at being left in the dark by himself; wherefore I ordered him into the shed, and his supper being placed near the fire, he fell upon it with great avidity, and had no sooner finished, than he claimed a right to belong to the society, by lying down amongst us, to my great amusement, and the infinite chagrin of my companions, who would have turned him out but for my interference. During the night he became restless, and got up in order to lie down on his other side; in doing which he interfered with the guide's legs, whom I found abusing him for being a pig and an infidel, and threatening to spit on his beard."

In Irwin's 'Memoir of Afghánistán,' we are informed that "the Ass gradually improves as we proceed westward from the Company's provinces. Perhaps the best are those from the west of Khorassán; but even these are much inferior to the Arabian or the Spanish. Asses are imported from Kábul into Bokhára and the north-west of Turkistán." Buckingham tells us that "one of the peculiarities of Bághdád is its race of white Asses, which, as at Cáiro, are saddled and bridled for the conveyance of passengers from one part of the town to another; and these are equally as large and spirited as the Egyptian Ass, and have as easy and speedy a pace. They are frequently spotted over with colours, and otherwise fantastically marked over with red henna-stains."

At Peshâwar, tame Asses of the large race are known as "Bokhára Asses"; and Sir A. Burnes, writing on the domestic animals of Bokhára, remarks, "None are more useful than the Ass; the breed is large and sturdy, and they are much used, both for saddle and bridle. There is no objection to riding them, as in India. There are no mules, from a religious prejudice

* I have somewhere read that the pedigrees of the best Asses of Omân are kept with as much care as those of the choicest breeds of horses in the same province.

against them." His brother, Dr. A. Burnes, also remarks that "Asses, much larger than those of India, are to be met with in Sindh, where the Ass attains the development which it is known to enjoy only within a very limited geographical distribution." But are not these fine Asses chiefly imported into Sindh, rather than bred there? albeit the climate should well agree with them. A correspondent informs me that "what are called Bokhára Asses are frequently brought to Pesháwar. They are very large and strong, and are both of the usual colour and white. Of the latter a friend of mine had three, viz. a male and female, and their offspring. There was one of the usual colour, larger than either of the two white ones, and I have some idea that I had heard it said that he was over thirteen hands high; but of this I will not be positive, having paid no great attention. I think they were not at all uncommon at Pesháwar when the Káfilas were getting through; and, as far as I remember, the price asked for one was from 80 to 150 rupees. As for where they came from, that I don't know in particular, except that they came with the Káfilas of horses from the north. The dark one I have mentioned was an extremely fine specimen; but my friend got him for (I think) 80 rupees, to use as a baggage-donkey, and, as far as I recollect, he was sold cheap because he declined to act as a stallion to *mares*, and was therefore useless for the purpose of begetting mules." It would appear, therefore, that these fine Asses are foreign to Sindh, and are mostly brought for the purpose of procreating mules; in which case she-Asses of the kind are probably scarcely known there, and consequently the race can hardly be said to be introduced into the country. It would nevertheless appear to be completely naturalized in Bokhára.

These superb Asses are bred and duly estimated in America; and it is time that they were introduced into the Australian colonies, if not also those of South Africa. In Capt. Marryatt's well-known 'Diary in America,' the novelist describes a cattle-show which he attended in Lexington, Kentucky. The fourth day of the show was reserved for the exhibition of Asses. "Several were shown standing fifteen hands high, with head and ears in proportion: the breed has been obtained from the Maltese Ass, crossed by those of Spain and the south of France. Those imported seldom average more than fourteen hands high; but the Kentuckians, by great attention and care, have raised them up to fifteen hands, and sometimes even to sixteen. The prices paid for these splendid animals (for such they really are) will prove how much they were in request. One male, of great celebrity, sold for 5000 dollars (upwards of £1000 sterling). A half-share of another male was sold for 2500 dollars. At the show I asked the price of a very beautiful female Ass only one year old; the owner said that he could have 1000 dollars for her, but that he had refused that sum. For a three-year-old male, shown during the exhibition, 3000 dollars (more than £600) were refused. The fact is that mule-breeding is so lucrative, that there is no price which a very large donkey will not command."

With reference to the current statement that the Ass nowhere thrives in a cold climate, it should be remembered that these animals are numerous in Pekin; and that some at least of the Chinese donkeys are fine animals, may be inferred from Dr. Hooker's remark about the Tibetan mules, which he says are often as fine as the Spanish. He "rode one, which had performed a journey from Choombi to Lhassa in fifteen days with a man and load." Nevertheless, as a general rule and irrespective of recent introductions, the finest Asses chiefly inhabit Arabia and the Levantine countries, and the most degenerate are the puny cat-hammed Guddhas of India generally. As Col. Sykes remarks, some of these are scarcely larger than a fine Newfoundland dog; but on what ground Col. C. H. Smith supposed this to be a wild race inhabiting the Dukhun* it is difficult to imagine. There are small Asses also in Persia, as about Ispahán, which Chardin (as we have seen) denominated the race proper to the country, while he mentions that many of the large kind are imported into Persia from Arabia. It is curious that Aristotle states that in his time there were no Asses in Pontus, Syria, or in the country of the Celts (meaning modern Germany and France), Syria being now so celebrated for the excellence of its breed of them. For many ages previously they are known to have existed in Egypt and Arabia. In short, there seems to be no evidence whatever to bear out the current notion that the domestic Ass originated in northern Asia, but, on the contrary, every reason to infer that it originated in the region where the particular species is still found wild, and where also the finest and least-altered of the domestic races prevail to this day; and that the fact should not have been long ago established is surely somewhat remarkable.

A writer on this animal observes, justly enough, that "the Ass is, properly speaking, a mountain species: his hoofs are long and furnished with extremely sharp rims, leaving a hollow in the centre, by which means he is enabled to tread with more security on the steep and slippery sides of precipices. The hoof of the Horse, on the contrary, is round and nearly flat underneath; and we accordingly find that he is more serviceable in

* Nat. Libr. "Mammalia," vol. xii. p. 306.

level countries; and, indeed, experience has long since taught that he is altogether unfit for crossing rocky and steep mountains." Hill-ponies may, indeed, be cited as exceptions to a greater or less extent; but the fact is nevertheless true in the main—and hence the breeding of mules in mountainous countries, which should combine the size and strength of one parent-species with the hardihood and sure-footedness of the other. All of the Asinine tribe seem to be quite indifferent to heat, and some at least of them are equally so to cold, as especially exemplified by the Koulans or Ghor-khurs about Lake Aral; and the tame Asses of this country, under the fiercest mid-day sun, may commonly be observed to evince their innate fondness for the parched desert, as strongly as a kid manifests its propensity to clamber rocks, by keeping to the dusty roads, in preference to the pasture, whenever they are not feeding.

Of several species so very nearly akin, in different countries, it is remarkable that only the Ass should have been subjected to servitude (save in a few individual cases at most); but it appears that the experiments which have been systematically carried on, now for several years, by the Acclimatation Society at Paris, have been attended with considerable success in breaking-in Ghor-khurs, which have been bred there for a series of generations, and that these animals are now daily mounted and ridden. Many years ago, the celebrated Sheriff Perkins drove a pair of Quaggas through the streets of London, as I well remember to have witnessed when a child.

The following species of the division *Asinus*, as defined by Gray, are now likely to be generally acknowledged:—

1. *A. Quagga*. The Quagga, from the Cape territories, and scarcely found northward of the Gariep or Orange River; but still in great herds southward, associating with the White-tailed Gnu, as the next does with the Brindled Gnu, and both with Ostriches (as in Xenophon's time the *A. hemippus* did in Mesopotamia). The most Horse-like in structure of any. The *Hippotigris isabellinus* of Col. C. H. Smith is probably founded on a Quagga-foal, perhaps not very exactly represented. Such an animal as this, or as the "Isabelline Zebra" of Levaillant could not have been overlooked by all subsequent explorers of South Africa.

2. *A. Burchellii*, Gray (*Equus zebra* of Burchell). The Dauw, or original *Hippotigris* of the ancients, and also the original Zebra of Pigafetta from Congo; but unknown to Buffon, who regarded the next, or Mountain Zebra, and the Quagga as the two sexes of one species, denominated by him the Zebra (*Hippotigris Burchellii* and *H. antiquorum* of C. H. Smith). Exten-

sively diffused over Africa, even to Abyssinia and to Congo, and southward to the Gariep river *.

3. *A. zebra* (*Equus montanus,* Burchell). The Zebra of modern nomenclature, or (more distinctively) the Mountain Zebra; Wild Paard (Wild Horse) of the Dutch colonists of South Africa. A thorough mountaineer, and known only to inhabit South Africa. Also the most completely striped of any, down to the very hoofs.

4. *A. vulgaris,* Gray (*E. asinus,* L.). The true *Onager, Onagrus,* or aboriginally wild Ass. Indigenous to North-east Africa. if not also to the southern parts of Arabia and the island of Socotra.

5. *A. hemippus* (*E. hemippus,* Is. St.-Hilaire; *E. asinus onager* apud Wagner). The *Hemionus* or *Hemippus* of the ancients. Inhabiting the deserts of Syria, Mesopotamia, and the northern parts of Arabia.

6. *A. onager* (*E. asinus onager,* Pallas). The Koulan or Ghor-khur. Inhabits West Asia, from 48° N. latitude southward to Persia, Beluchistán, and Western India.

7. *A. hemionus* (*E. hemionus,* Pallas; *E. kyang,* Moorcroft; *E. polyodon,* Hodgson). The Dshiggetai or Kyang. Inhabits Tibet, and thence northward through the Gobi Desert into Mongolia and Southern Siberia.

N.B. So far as known for certain, the last two are distinguishable by shades of colour only, and by unimportant differences in the relative extension of different hues and markings. The *A. hamar* of Col. C. H. Smith is rejected, as having been founded on insufficient evidence of the existence of such an animal.

It is highly improbable, also, that other wild asinine species yet remain to be distinguished.

To recapitulate, I have endeavoured in this paper to establish the following novel propositions:—

1. That the true *Onager* and *Hemionus* of ancient writers were unknown to Pallas, who has assigned these names to cognate species or races that were unknown to the Greeks and Romans.

2. That, accordingly, the Koulan of N. Asia is not the true *Onager* or aboriginal wild Ass, but that it is identical with the Indian Ghor-khur.

3. That the true *Onager,* or wild Ass, is not an inhabitant of North Asia, but of North-east Africa and the southern portion of Arabia.

4. That the Koulan and the Dshiggetai or Kyang, instead of being strongly distinguished apart, as has been asserted, bear

* To this species appertained the "Zebra" lately subjected by Mr. Rarey.

so exceedingly close a resemblance that no decided specific distinction has yet been satisfactorily pointed out, however probable it may be that such distinction may exist.

Why, therefore, the one should be popularly styled a "wild Horse," and the other a "wild Ass," it is difficult to comprehend. Even Pallas terms the Dshiggetai "un Cheval sauvage," though describing it as "ni Cheval ni Ane;" while the other he both designates as the Ass of the steppes and as the "Cheval ou Ane," employing the word "cheval" in its German equivalent evidently in the sense of *equus*. Col. Chesney, as we have seen, terms the Arabian *A. hemippus* a "wild Horse," as distinguished from his wild Ass of South Arabia! The fact is, I apprehend, that the vague application of these names has resulted merely from the colouring.

XXXII.—*Descriptions of new Genera and Species of* Tenthredinidæ *in the Collection of the British Museum.* By Frederick Smith.

The collection of Tenthredinidæ contained in the national Museum is perhaps the most extensive in Europe; the species described in the present paper are, in my own opinion, the most remarkable in the various genera to which they belong. The *Hylotoma imperialis* is unrivalled both in size and beauty by any of the species of that extensive genus. The new *Lyda* is the first species which I have seen from the East, and is remarkable for the extreme elongation of the antennæ. The new genus *Derecyrta* is, however, the finest addition to the family. The new species of *Sirex* must acquire additional interest from the fact of its being discovered in the cedars of Lebanon. Having been engaged in the preparation of a Catalogue of the Tenthredinidæ for some time past, and it being obvious that its completion will occupy still a considerable length of time, I have thought it desirable to secure to myself the description of a few of the more remarkable species and genera of this family of insects.

Genus Hylotoma, Latr.

Hylotoma imperialis.

H. nitens, supra purpureo-violacea; capite, thorace abdomineque infra nigro-chalybeis; alis flavo-hyalinis; antennis nigris, opacis.

Female. Length 8 lines. Brilliant purple, with violet tints above, varying in different lights; beneath of a steel blue, very smooth and shining; the antennæ of an opake black; the wings yellow hyaline, the nervures reddish-yellow.

Hab. North China. Robert Fortune Esq.

Genus Lyda, Fabr.

Lyda flagellicornis.

L. melleo-flava; antennis prælongis, apice graduatim attenuatis; alis pallide flavo-hyalinis, apice fusco late terminato.

Female. Length 5 lines. Darkish honey-yellow, smooth and shining; the antennæ longer than the body, setaceous; the scape, basal joint of the flagellum, and the joints (12–18) yellow, the rest of a blackish brown; the region of the ocelli and middle of the pectus black; the wings pale yellowish-hyaline, their apex broadly fuscous.

Hab. North China. Robert Fortune, Esq.

Genus Derecyrta.

Head subglobose, the *vertex* swollen or convex; the eyes lateral, large and ovate; the *ocelli* prominent, and placed in a triangle between the eyes; the *antennæ* setaceous, composed of 23 joints; the scape short, curved, and slightly thickened towards the apex; the first joint of the flagellum half the length of the scape, the second as long as the scape, the third and four following joints as long as the first; the remaining joints are each in succession shorter than the preceding. *Thorax* as wide as the head, oblong, the sides parallel; the prothorax narrowed anteriorly into a short neck; the mesothorax slightly elevated in front; the scutellum elevated; the anterior wings with one marginal and four submarginal cells; the marginal cell elongate, with a short appendix at the apex; the first submarginal cell small, the second oblong, widest at the apex, the third subquadrate, the fourth extending to the apex of the wing; the second and third cells each receive a recurrent nervure a little within near their base; the tibiæ bispinose at their apex. *Abdomen* cylindrical, about twice the length of the head and thorax; the ovipositor short, and slightly exserted.

Derecyrta pictipennis.

D. ochracea, nitida; capite, abdominis apice, antennis pedibusque nigris; alis fuscis, basi fasciaque transversali flavo-hyalinis.

Female. Length 9 lines. Head shining black, smooth and impunctate behind the ocelli, coarsely and irregularly striated before them; the mandibles short, stout, and armed with three acute teeth, striated externally. Thorax ochraceous, shining; the mesothorax with three deep longitudinal grooves, the spaces between them transversely and coarsely striated, beyond the grooves finely punctured; the scutellum and metathorax finely punctured; wings brown, their base flavo-hyaline; a broad flavo-hyaline fascia crosses the wings at the base of the marginal cell;

the legs black. Abdomen ochraceous; the four apical segments black, the first of the black ones tinged with reddish yellow in the middle; the sides of the abdomen have also a slight reddish tinge.

Captured by Mr. H. W. Bates at Ega, Brazil.

This species is unique in the National Collection, and was acquired in 1858, since which period it has been ticketed as a new undescribed genus; it is certainly the finest addition that has been made to the family Xiphydriidæ for many years.

Genus Sirex, Linn.

Sirex cedrorum.

S. capite nigro, pone oculos flavo; pedibus flavis, femoribus basi tibiisque apice nigris; abdomine supra fascia nigra ante apicem.

Female. Length 1 inch. Black; the head with thin black pubescence; the base of the mandibles and anterior margin of the clypeus obscurely ferruginous; the antennæ and head behind the eyes luteous. Thorax rugose, with the pro- and meso-thorax laterally obscurely testaceous, thinly covered with short black pubescence; wings yellowish-hyaline, with the nervures and costa ferruginous; the posterior femora and the base of the anterior and intermediate pair black; the posterior tibiæ black, with their base yellow. Abdomen with a silky gloss; the two basal segments, and a narrow fascia at the base of the seventh, yellow; the eighth and ninth segments yellow, the former with a black fascia at its apical margin, which extends narrowly over the base of the apical segment.

This species was found in a portion of the trunk of one of the cedars of Mount Lebanon; it closely resembles the *Sirex gigas*, but appears to be distinguished by too many differences to constitute a variety of that insect; the most prominent differences are the head being entirely yellow behind the eyes, the posterior tibiæ nearly entirely black, and the abdomen having a black fascia at its apex; the anterior margin of the clypeus is slightly produced in the middle, and very coarsely punctured; in *S. gigas* it is finely roughened, with its margin smooth and rounded. The male differs from the same sex of *S. gigas* in having only the extreme base of the abdomen and the apical segment black; the head is also entirely yellow behind the eyes.

Genus Cladomacra.

Antennæ composed of sixteen joints, pectinated and pilose; *head* transverse; *eyes* ovate and very prominent. *Wings* ample, the anterior pair with one marginal and four submarginal cells, the first subovate and smaller than the second, the second and third cells oblong, the fourth extending to the apex of the wing. *Legs* simple, elongate; the tibiæ armed with two short spines at their apex.

Cladomacra macropus.

C. nigra; capite, thorace, abdominis basi, coxis femoribusque rufo-testaceis; antennis elongatis, pectinatis; alis fumatis, venis fuscis.

Male. Length 3 lines. Black; the head, thorax, and extreme base of the abdomen rufo-testaceous; the head with a deep depression on each side; the antennæ emanating from a short basal footstalk, one-third longer than the body, and pectinate; the teeth or branches elongate and pilose. The wings of a smoky brown, iridescent, with the nervures dark brown. The legs longer than the body; the coxæ, trochanters, anterior and intermediate femora, the base of the posterior pair, and the anterior and intermediate tibiæ inside, rufo-testaceous; the posterior tibiæ and tarsi with short black pubescence.

This beautiful insect, for which I am obliged to establish a new genus, has been received from Mr. Wallace, who captured it in Celebes; the neuration of the wings, and general habit of the species, appear to indicate clearly its affinity to the genera *Cladius, Trichiocampus,* and *Nematus,* from all of which it is separated by having four submarginal cells, and antennæ composed of sixteen joints. The normal number in the Tenthredinidæ is nine joints; but there are several genera which depart from that number: thus, in *Sirex* there are twenty-five, in *Xiphydria* thirteen, whilst in *Lyda* the number varies, in the different species, from twenty-one to thirty-four.

XXXIII.—*Descriptions of Freshwater Shells collected in Southern India by* Lieut. Charles Annesley Benson, 45th M.N.I. By W. H. Benson, Esq.

The following shells were discovered at Quilon, on the Malabar coast, in the territory of Travancore, a portion of country which appears hitherto to have escaped the researches of conchologists. Among other species, the little-known *Melania Riquetii,* De Grateloup (figured and described by that author in the 'Acts' of the Nat. Hist. Society of Bordeaux), from Bombay, was found to accord perfectly with the published type, which appears to have been subsequently described by Lea under the designation of *M. Tornatella.* The figure in the 'Iconica' (173 *b*) delineates the sculpture of *M. Riquetii,* while that given at 173 *a* agrees better with Souleyet's *M. sculpta,* a species which was found by the late Dr. Bacon at Singapore. I have seen one of the numerous varieties of *Melania lirata,* B. (J. A. S. 1836, subsequently described by Lea as *M. lateritia*), mistaken for *M. Riquetii.*

Clea Annesleyi, B.

Testa oblongo-ovata, solidiuscula, radiatim striata, striis sulcisque spiralibus obsoletis plus minusve decussata, epidermide olivacea, fasciis castaneis superne subtusque conspicuioribus ornata, nonnunquam omnino atro-castanea, induta; spira ovato-conica, apice obtusiusculo plerumque eroso, sutura impressa; anfractibus $4\frac{1}{2}$ convexiusculis, ultimo $\frac{2}{3}$ testæ æquante, prope suturam angulato, infra medium sulcis duobus obliquis, et basin versus crista compressiuscula cincto, basi profunde emarginata; apertura elliptico-ovata, intus (præcipue superne subtusque) fasciata, peristomate tenui, infra ad finem sulcorum undulato, columella superne sinuata, callosa, polita, livide lilacina, margine antice incrassato spiraliter torto, callo parietali crasso, plerumque atro-purpureo. Operculo unguiculato, parvo, corneo, nucleo marginali, dextrali, subbasali, rostro basali elevato munito.

Long. $8\frac{1}{2}$, diam. $4\frac{1}{2}$ mill.

Habitat in stagno prope Quilon.

This interesting form was taken alive in a tank between the sea and the canal which communicates with Cochin to the north of Quilon. It was accompanied by *Corbicula Quilonensis*. The last whorl is occasionally of a blackish olive hue; and in this state the interior is tinged with purplish black. Soaked in warm water, the epidermis assumes a pustulose character, which disappears when the shell is dry.

The species in question appears to enter into the genus *Clea*, H. & A. Adams, founded on shells from Borneo and Malacca, in the 'Zoological Proceedings' for 1855, agreeing therewith in the construction of the columella and base of the shell, though belonging to a different sectional type of form.

Lovell Reeve has, in the 'Conchologia Iconica,' merged *Clea* into Swainson's *Hemisinus*, in which the base of the columella is simply sinuate, and of which the typical species inhabit tropical America. He gives no information regarding the operculum, which was scarcely likely to be absent from all the specimens of *Hemisinus* which came under his inspection in Mr. Cuming's collection. Whether it is spiral as in *Melania*, or unguiculate as in *Tanalia*, is not stated; neither is any account given in the 'Zoological Proceedings' of the construction of the operculum in *Clea*. Figures and descriptions of Brazilian *Hemisini*, under the genus *Melanopsis*, appear in the Number of the 'Journal de Conchyliologie' for July 1860; but no mention is made of the operculum, the examination of which is too frequently neglected.

The aspect of the shells figured in the 'Conchologia Iconica' as *Melanopsis Zelandica*, Gould, and *M. Strangei*, Reeve, affords some grounds for conjecture that an examination of their opercula will eventually prove their approximation rather to *Clea Annesleyi* than to the Southern-European genus with a subspiral operculum, to which they have been attributed. It appears probable that, notwithstanding the basal emargination, *Clea* will, with reference to its unguiculate operculum, be found to have nearer relations with the Cingalese genus *Tanalia* than with *Melania* and its congeners. The curious narrow and somewhat recurved process at the lower part of the operculum is suited to the formation of the base of the shell, of which the emargination is as strongly pronounced as in the genus *Columbella.*

It is not impossible that some of the American species of *Hemisinus* may be found to consort rather with *Clea* than with the original Swainsonian type; but the association of *Melania strigilata*, Dunker, and *M. Esperi*, Fér. (which last has doubtless the spiral operculum of *Melania*), with such conspicuous types as *Clea nigricans* and *C. Annesleyi* is scarcely consistent with the present state of conchological knowledge. *Clea* might apparently be united with more propriety to *Buccinum* than to the Melaniadæ.

Melanopsis Helena, Meder (a Javanese species included by Reeve in *Hemisinus*), approaches *Clea* in the deep emargination at the base, but cannot fairly be included in that genus with reference to other characters. The formation of the columella is very different.

Bithinia Travancorica, B.

Testa imperforata, conoideo-globosa, irregulariter striata, striis minutissimis spiralibus confertim decussata, albida, vel corneo-flavescente, translucente; spira dimidium testæ æquante, apicem versus conoidea, vertice obtusiusculo hyalina, sutura impressa; anfractibus $4\frac{1}{2}$ convexis, ultimo globoso, antice sensim descendente; apertura obliqua, ovata, margine sinistro calloso, callo extus sulco marginato. Operculo normali, crassiusculo, extus nonnunquam tenuiter radiatim striato; nucleo subcentrali.

Long. 6, diam. 5 mill.

Habitat in stagnis prope Quilon.

This shell approaches a smaller species found by Mr. F. Layard in a watercourse at Bandurawelle, near Badulla in Ceylon, but differs from it in having a shorter conoidal spire above the globose lower and penultimate whorl, and in colour and solidity. The minute spiral striation found in several Indian species is common to both. Specimens taken on weed and stones in a pool were in very fine condition, and exhibited the delicate radiating striation on the operculum; a smaller variety from a tank had the shells more or less eroded, chiefly at the summit.

Corbicula Quilonica, B.

Testa inæquilaterali, trigono-rhomboidea, gibba, tenui, concentrice subremote costata, costis postice evanescentibus, sulcis intermediis latioribus, sub lente decussatim striatis, albida vel lutea, radiis fuscis angustis ornata; umbonibus prominentibus, apice fere eroso; latere antico breviore, valde arcuato, angustiore, postico striato, latiore; superne et basin versus angulata; margine ventrali mediocriter arcuato; ligamento oblongo intra nates attenuato; pagina interna valde concava, albida, maculis radiisque purpureis ornata; dente mediana valvæ dextræ duplici, dentibus lateralibus brevibus serrulatis.

Lat. 10, long. 8, crass. $5\frac{1}{2}$ mill.

Habitat prope Quilon in stagno cum *Clea Annesleyi.*

The younger shells are more gibbous towards the umbones in proportion to their length than the larger specimens. A tawny-yellow epidermis covers the fresher specimens. The rays are numerous, more or less broad, sometimes appearing as mere lines of small spots, and occasionally spreading so as to make the surface appear nearly black. The species is very distinct from any of the *Corbiculæ* collected by myself or obtained from Northern or Central India. The shortness of the lateral teeth, on the anterior side especially, is a notable character, as well as the inæquilateral form, which is more conspicuous in the young than in the adult shell.

Dursley, August 29, 1860.

Note.—The water contained in the tank which is inhabited by *Clea Annesleyi* and *Corbicula Quilonica* is probably brackish. A parcel, received while this paper was passing through the press, includes specimens of a *Cerithium* resembling *C. eximium*, Sow., obtained from the same pond, which has a muddy bottom and grassy banks perforated by a small crab. In a large specimen of *Clea*, 10 mill. in length by $5\frac{1}{2}$ in breadth, with five whorls and a less eroded apex, the last whorl scarcely attains $\frac{4}{7}$ of the total length of the shell.

September 3, 1860.

XXXIV.—*On the Genera* Peltogaster *and* Liriope *of Rathke.* By W. Lilljeborg.

[With a Plate.]

[Continued from p. 173.]

Liriope pygmæa, Rathke.

Beiträge zur Fauna Norwegens, Nova Acta Acad. Leop. 1843, vol. xx. p. 60, tab. 1. figs. 8–12. Sine dubio mas junior, tamen non ineunte ætate.

On the 23rd of July, 1858, the author found in the sea, near the town of Molde in Norway, at a depth of from 5 to 6 metres, amongst other *Paguri*, a rather small specimen of *P. pubescens*, which had a *Peltogaster* on its abdomen. This *Peltogaster* (Pl. IV. fig. 1) appeared to be double, or composed of two. As only one of these (*a*), which was of a reddish colour, contained ova and young, the author supposed at first that it was a bag of eggs attached to the body. But, as there was only a single bag of eggs, it departed from the *Suctoria*, in which there are usually two, although at the first glance *Peltogaster* appeared to approach that group in its structure. The doubt thus raised, as to whether the relation between the two parts was that of a maternal animal and an egg-sac, was confirmed by the supposed egg-sac exhibiting strong contractions, although no similar movements were observed in the supposed body of the *Peltogaster*. These contractions continued until the fourth day, and even after the *Peltogaster* had been dissected and the abdomen of the *Pagurus* had become putrid. On examining the young contained in the supposed matrix (fig. 4), Prof. Lilljeborg found that they were quite different from those of *Peltogaster*; and a further examination of the sac showed it to be a distinct animal, parasitic on the *Peltogaster*. The structure of the young proved them to be Isopoda; and as it accorded perfectly with that of Rathke's *Liriope pygmæa*, the relation between that animal and the *Peltogaster Paguri* is easily understood. *Liriope* is therefore an Isopod which lives parasitically upon *Peltogaster*, and probably also upon other Crustacea. Cavolini's observations prove that this, or a nearly allied form, is sometimes found attached within the body of certain Brachyurous Crustacea; and Dana has several times found in a Balanide a parasitic Crustacean (the *Cryptothir*) belonging to the same family as *Liriope*. These two animals may probably belong to a single genus.

The following is an abstract of Prof. Lilljeborg's detailed Latin description of the mature female filled with ova and newly-hatched young (Pl. IV. figs. 2 & 3):—

Length from the mouth (2 *a*) to the opposite part of the body, where the anus appears to be, 4 millim.; breadth (from *c* to *d*) 7 mill.; thickness 3 mill. The body is composed of two distinct parts. *The anterior part* (*cephalothorax*) forms the organ of adhesion*; it is convex and smooth above, concave beneath, and exhibits above four distinct segments, of which the two middle ones are larger than the others. These segments are sinuated in the middle in front, and deflected and reflected towards the sides. There is no indication of eyes or antennæ. Beneath, between the first and second segments, is a brown transverse

* This part is deeply fixed in the integument of the *Peltogaster*, even perforating its inner lining membrane.

spot, no doubt indicating the mouth. Towards the base this part of the body becomes much narrower, forming a neck. No external buccal organs are visible.

The posterior part of the body forms merely a matrix or ovisac. It is a reniform sac, convex above and below, with no impressions, folds, or sutures above, but furnished beneath with a longitudinal fissure (fig. 3) or aperture, through which the young escape. This part is of a reddish or flesh-colour, from the red ova and young shining through the transparent skin. At the point where the anus appears to be, there are some brown spots. During the contraction of the animal, some transverse folds appeared on the upper surface (fig. 1 *a*); these persisted when the animal was preserved in spirit, and perhaps indicate segments. At the posterior extremity of the fissure of the matrix is a round aperture; no doubt, the anus. The skin of the matrix, although transparent, is firm and rather thick.

Upon the cephalothorax, whilst the animal was still attached to the *Peltogaster*, there was a delicate and transparent pendant membrane, probably a cast skin. On the upper surface behind the neck there are an opake and thick skin and two areas of fibrous structure. The evolution of the valves, or the integument of the matrix, probably commences from these areas. The retrograde metamorphosis in this animal is greater than in *Bopyrus*; there are no antennæ, buccal laminæ, feet, or branchial laminæ.

The Male. Prof. Lilljeborg did not detect the male upon or in the *Peltogaster* to which the female was attached, or upon the female herself. He thinks it very probable that the *Liriope pygmæa* described and figured by Rathke was a young male. On comparing it with the description and figures of Kröyer, representing a younger male of his *Bopyrus abdominalis**, which is the same as *Phryxus Hippolytes* of Rathke, the resemblance is striking. Kröyer's young male *Bopyrus* was ½ line, and Rathke's *Liriope* scarcely 1 line in length. Thus, judging from their size, the latter was more developed than the former. The form of the body, the antennæ, the legs, and caudal appendages, are very similar. There are some differences in the form of the posterior pair of thoracic feet; but their structure is very characteristic, and conformable to that occurring in *Liriope*; and this furnished the author with one of his best reasons for identifying the young of the animal found by him upon *Peltogaster Paguri* with Rathke's *Liriope*. In *Liriope* Rathke found six pairs of abdominal feet, Kröyer only five in the young male of *Bopyrus*; but Rathke has only four in his figure of *Liriope*, and the author found only five in the young of his species. According to

* Naturhistorisk Tidskrift, Bd. 3. p. 291, tab. 1. figs. 21–24, tab. 2. figs. 1–3; Voyage en Scandinavie, pl. 29. fig. 1 *t–u*.

Rathke and Kröyer, the abdominal feet are biramose in *Liriope*, and simple in the young of *Bopyrus*; but the author has found them biramose in the latter, although the inner branch is the smallest*. Thus a part of these apparent diversities may be ascribed to errors of observation †; and, besides, it is natural that there should be some differences between two different genera. It would appear, also, that Dana supposed Rathke's *Liriope* to be a male because, without further evidence than its resemblance to that animal, he regards his *Cryptothir* as a male. That Rathke found his *Liriope* in *Peltogaster* without the developed female being there also, does not weaken this assumption, as, according to Kröyer, we meet with an equivalent fact in his *Bopyrus abdominalis* (*Phryxus Hippolytes*, Rathke). Kröyer states ‡ that he once found on a *Hippolyte*, which had no female *Bopyrus* under its abdomen, a male which adhered to one of its eyes. Kröyer also asserts that the young females of *Bopyrus* are always found upon young *Hippolytæ*; and in conformity with this, the young females of *Liriope* ought to occur upon young individuals of *Peltogaster*. There is another circumstance which is greatly in favour of the idea that Rathke's *Liriope* was a male. As the female of *Liriope* is subject to a greater amount of transformation than Rathke's *Phryxus* or Kröyer's *Bopyrus*, and as its newly-hatched young are much smaller than those of the latter, but still, notwithstanding their small size, are equally highly developed, it can hardly be believed that the female young, measuring even a line in length, would not be attached and in course of transformation, when a young female of *Bopyrus*, $1\frac{3}{10}$ line in length, has little resemblance to a larva, excepting in its eyes and thoracic feet. On the other hand, the males of this family retain a portion of their larval characters not only longer than the females, but even throughout their lives, or, in other words, retain the characteristic form of Isopods, which is lost completely in the females by retrograde development.

The author gives the following description of *the young animal just hatched in the matrix* (Pl. IV. figs. 4 & 5) :—

Its length is scarcely $\frac{1}{4}$ millim.; its form is that of an Isopod. The body convex above, concave beneath; when seen from above, oval or oblong-oval, rounded in front, and attenuated behind. Segments 14; the first (head) larger than the rest; the last

* In the 'Voyage en Scandinavie,' Kröyer has figured the abdominal feet of the young *Bopyrus abdominalis* as biramose.

† If Rathke's *Liriope* had six pairs of abdominal feet, exclusive of the caudal appendages, it would possess, in all, seven pairs of abdominal feet, which no Isopod can have. Rathke's assertion, that *Liriope* has only six abdominal segments, also appears to contradict his statement.

‡ *Op. cit.* p. 102.

very small, forming a sort of minute plate concealing the base of the last pair of feet. Head a little broader than the following segment; penultimate segment longer than the preceding one, coarctate and rounded behind. Beneath the lateral margins of the thoracic segments there are small acuminate appendages, bent backwards, which are, no doubt, epimera.

Eyes usually none; sometimes a reddish-brown one on each side (fig. 5): when no eyes are present, there are usually two cells, with reddish-brown pigment, in their place. Similar pigment is seen in several parts of the body, especially behind.

Antennæ of the first pair (fig. 4 *a*) very small, quadriarticulate, having about five setæ, of which two are apical. Antennæ of the second pair (fig. 4 *b*) large, half as long as the body without the apical setæ, quinquearticulate, with the third joint longer than the rest, and the last joint having three or four apical setæ, of which one is very long. Region of the mouth produced; oral aperture forming a transverse fissure. On each side of the mouth there is a mandibuliform appendage.

Thoracic feet (fig. 4 *c*) six pairs, attached to the six thoracic segments; all, except the sixth pair, similar, but the posterior pairs a little longer than the anterior. The five anterior pairs somewhat cheliform, with a rather large, nearly oval palm, bidenticulate within, and a curved, acute, apical claw. Sixth pair of feet longer and more slender, and not cheliform (fig. 4 *d*); palm long and attenuated; claw long, nearly straight, and not retractile.

Abdominal feet five pairs, attached to the five anterior segments of the abdomen, all similar, except that the posterior are a little shorter; they are biramose, with the scape two-jointed, and the branches nearly equal, the outer furnished with three, and the inner with two, long, apical, ciliated setæ (fig. 4 *e*). The last pair, or caudal feet (fig. 4 *f*), are larger and stouter, furnished with several large and strong ciliated setæ, and also biramose. The scape of these is of one thick joint, obliquely excised at the apex, and furnished beneath with one or two slender setæ. The outer branch is a little thicker and shorter than the inner one, and has three stout, curved, apical setæ; the inner one is obliquely excised at the apex, and furnished with two slender setæ. At the base of the inner branch a long and nearly straight seta is attached to the scape.

No intestine could be clearly seen, but in its place there was a patch of a brownish and reddish colour, especially behind; and here and there in the body were larger and smaller oily vesicles, no doubt the residue of the yelk.

On comparing this young animal with the *Liriope pygmæa* of Rathke, their relation is so close, that the differences, from the analogy of *Bopyrus abdominalis,* Kröyer, may readily be ascribed to difference of age, and perhaps of sex. The young animal described by the author was only one-twelfth the size of that described by Rathke. The latter is more elongated, and has one more pair of thoracic feet; the first pair of antennæ are furnished with several setæ; most of the thoracic feet are apparently shorter; the abdominal feet are a little shorter; and the caudal feet are differently constructed, being simple, while the young observed by the author have them biramose. But these and some other differences occur also between the young male of *Bopyrus abdominalis* figured by Kröyer and the still younger larvæ of the same species. Hence the author does not hesitate to consider the parasitic Isopod found by him upon *Peltogaster Paguri* as belonging to the same species as *Liriope pygmæa.*

Now, as it lives parasitically upon *Peltogaster Paguri,* its presence in the cavity of the latter, where it was found by Rathke, is explained without much difficulty. The *Peltogaster* may have borne a fully developed female *Liriope,* which, after reproduction, had fallen off, whilst some of the young may have remained behind upon the *Peltogaster,* and walked about until, finding the orifice at the anterior extremity of the body, they entered by it; or they may have been in search of young females upon the *Peltogaster,* and remained attached to the latter, just as Kröyer found a male of *Bopyrus* attached to the eye of a *Hippolyte* on which there was no female. The author is in favour of the latter opinion, as he thinks that if a mature female of *Liriope* had detached itself from the *Peltogaster,* the marks of its adhesion could not have escaped Rathke's observation.

With regard to the systematic position of *Liriope,* Rathke was evidently wrong in considering it as an Amphipod; and indeed he indicates its "resemblance to some Isopoda of the genus *Idothea.*" Dana was the first to recognize its Isopod nature; he places it in the family *Tanaidæ.* Steenstrup asserts it to be an Isopod of the family *Bopyridæ*; and his view of the relationship of *Liriope,* and its connexion with *Peltogaster,* is accurate. It is with the *Bopyridæ* that Prof. Lilljeborg arranges this singular genus, of which he gives the following character:—

Genus Liriope, H. Rathke.

Animal e Crustaceorum classe, Isopodorum ordine, et Bopyridarum familia.

Fœmina adulta corpore in partes duas distinctas diviso; anterior sive cephalothorax, caput et tria segmenta sequentia comprehendens, est cum posteriore indivisa parte majore, sive matrice, quasi per collum connexa. Nulli oculi, nulli pedes, nullæque appendices branchiales. Pullus et sine dubio mas iisdem *Bopyri* admodum similes, et fere tantummodo pedibus thoracicis postremi paris, ungue longo et recto neque retractili armatis, diversi.

EXPLANATION OF PLATE IV.

Fig. 1. *a. Liriope pygmæa*, female, containing eggs and young, attached to the *Peltogaster Paguri*, *b*, which is fixed in its turn to *Pagurus pubescens*, Kröyer; all seen from above.

Fig. 2. *Liriope pygmæa*, female, dead and preserved in spirit, seen from above: *a*, anterior extremity of the body, or cephalothorax; *b*, posterior part of the body, or matrix; *c*, the right, *d*, the left side.

Fig. 3. *Liriope pygmæa*, female, alive, seen from beneath: *a*, anterior extremity; *b*, posterior part with the supposed anal aperture, and the fissure of the matrix between this aperture and the anterior part of the body (cephalothorax). On the cephalothorax the mouth is seen as a black point.

Fig. 4. The larva of *Liriope* seen from above: *a a*, anterior antennæ, or first pair; *b b*, posterior antennæ, or second pair; *c c*, five anterior pairs of thoracic feet; *d d*, sixth or last pair of thoracic feet; *e e*, five anterior pairs of abdominal feet; *ff*, last pair of abdominal feet, or caudal feet.

Fig. 5. The same, seen from the left side.

Fig. 6. *Pachybdella Carcini*, seen in front (after Lovén): *a*, acetabulum; *b*, orifice of the pallium.

Fig. 7. The same, opened: *a*, acetabulum; *b*, orifice of the pallium; *c*, the fleshy body; *d d*, the ramified external ovaries (ovarian cæca).

Fig. 8. The organ of adhesion of *Peltogaster Paguri*, seen from beneath: *a*, the orifice of the mouth; *b*, the buckler, to which the acetabulum is attached by its neck beneath the *Peltogaster*. In this buckler concentric striæ of cement are seen; and attached to the margins of the acetabulum are fragments of the epidermis of the *Pagurus* to which the *Peltogaster* was attached.

Fig. 9. The two primary ovaries of *P. Paguri* surrounded by a cellular membrane and different formative matters.

Fig. 10. *Peltogaster sulcatus*, filled with eggs and deprived of its pallium. The two sacs of eggs are completely united and surrounded by the delicate membrane which clothes the cavity of the body, and which adheres by a cellular tissue to the inner surface of the pallium or skin. This membrane is produced at *b*, over the inner surface of the short tube which surrounds the anterior orifice; *a a*, the two parts supposed to be male generative organs, probably *vesiculæ seminales*.

Fig. 11. One of the seminal vesicles magnified.

Fig. 12. *Peltogaster Paguri*, filled with eggs, seen from above (length 13 millim.): *a*, acetabulum; *b*, anterior aperture of the body; *c*, posterior extremity of the body, with a fissure and internal line of demarcation between the two sacs of eggs, which is continued towards the anterior extremity.

Fig. 13. The same, deprived of the organ of adhesion, seen from beneath (length 9 millim.): *a*, the anterior orifice of the body; *b*, the posterior extremity, with the boundary between the two sacs of eggs.

Fig. 14. *Peltogaster sulcatus*; the animal seen from the left side: *a*, the organ of adhesion; *b*, the anterior orifice of the body.
Fig. 15. *Peltogaster microstoma*; the animal seen from the left side: *a*, the organ of adhesion; *b*, the anterior orifice of the body.
Fig. 16. The larva of *P. microstoma*, at the point of being hatched, seen from above.
Fig. 17. The larva of a *Pachybdella* (after Cavolini).

XXXV.—*On the Arrangement of the Land Pulmoniferous Mollusca into Families.* By Dr. J. E. Gray, F.R.S., V.P.Z.S.

The opportunity of examining the genus *Aneitea*, and the additional information obtained by the publication of the anatomy of it by Dr. Macdonald, and of that of *Janella* by Mr. Knight, has induced me to reconsider the subject of the arrangement of the terrestrial Pulmonata or *Pulmonata geophila*, given in the Catalogue of Pulmonata, or Air-breathing Mollusca, in the British Museum, published in the year 1855.

I would suggest, for the arrangement given at page 2 of that Catalogue, the following:—

1. Pulmonata geophila. Eyes at the apex of an elongated cylindrical peduncle. Tentacles cylindrical, shorter and lower down than the eye-peduncle, sometimes very small or wanting. Operculum none (except in young *Cryptellæ* ?). Terrestrial.

A. *Head, eye-peduncle, and tentacles retractile under the skin.*

Sect. 1. Vermivora. Buccal mass very large, elongate, projectile like a proboscis. Jaw none; teeth numerous, slender, conical, distant. Mantle well defined. Subterraneous; carnivorous, or worm-eating.

* *The spiral part of the body near the middle of the back. Head without any lateral grooves from the front of the mantle to the outer edge of the eye-peduncles.*

1. Oleacinidæ. The tentacles cylindrical, simple; the labial tentacles elongate, produced, flat, angularly bent. Shell oblong, spiral; the outer lip thin, sinuous. *Oleacina.*

It is to be observed that some *Helicinidæ* have shells so like *Oleacina* (as, for example, *Achatina folliculus*), that it is impossible to distinguish them from the shells of true *Oleacinæ*; yet Moquin-Tandon has figured the animal and the jaws of them, showing their Helicine character and phytophagous habit (see t. 20 & 22), and the animal and jaws have been observed in several other species that have been referred to this genus on account of the form of shell. The genus *Halea*, which differs from *Oleacina* only in being more ventricose, is said t have an animal like *Buccinum*, and to live in the seas,—another example of the impossibility of defining with accuracy and certainty, from the examination of the shell alone, the genus, family, or even order to which a Mollusk may belong.

2. Streptaxidæ. The tentacle cylindrical, bifid, as if it were the tentacle and the labial tentacle united. Shell subglobose; the large whorls excentric, flattened. Peristome thickened. Carnivorous; eating other Slugs and Mollusca. *Streptaxis*.

** *The spiral part of the body on the hinder part of the back. Back and head with two or four lateral grooves from the front of the mantle to the side of the head, including the eye-peduncle and tentacles.*

3. Testacelladæ, Catal. p. 9. *Testacella* and *Daudebardia*. Eating worms.

Sect. 2. Phyllovora. The buccal mass small, ovoid, not produced. Jaw distinct, horny; teeth numerous, four-sided, close together on the lingual membrane. Herbivorous.

* *Mantle (either discal or spiral) defined, on the middle of the back. Pulmonary cavity under the mantle, and attached to it. Head without any lateral grooves.*

4. Helicidæ. Foot tapering behind, without any subcaudal gland. Adult and young alike. (See Tribes in Catalogue, p. 155.)

I may observe that many of the genera referred by Mr. Adams to the family *Oleacinidæ* have no affinity with it, and belong to this family.

5. Arionidæ. Tail with a distinct gland rather above the foot. Adult and young alike. *Arion*, *Geomalacus*, &c.

** *Mantle convex, on the middle of the back of the animal. Pulmonary cavity under the mantle, and attached to it. Head with a central and two lateral diverging grooves enclosing the eye-peduncles.*

6. Parmacellidæ. Mantle central, large, shield-like, free in front, more or less covered with a spiral shell. Young and adult alike. Foot truncated behind, with a subterminal gland. *Parmacellus*, *Mariella*, *Laconia* (Cat. pp. 62, 63), *Vitrinella*, *Nanina*, and the allied genera will probably be found to belong to this family when the animals are more closely ex amined The genus *Helicolimax* (Cat. p. 181) differs from it in having no

subcaudal gland, and a deep central dorsal posterior groove; this may be the type of another family.

So great is the difficulty of procuring the animals of exotic land-shells for examination, that we can make only very gradual attempts at revising the arrangement of them; and great caution becomes necessary, since we find that shells similar in external appearance and character have animals of different conformation and habits.

7. Cryptelladæ. Mantle central, large, shield-like, free in front. Young animal with an operculum, which is at length deciduous, and protected by an external shell, which afterwards becomes hidden in the shield-like mantle of the adult animal. Jaw and teeth of *Helix*. *Cryptella, Drusia,* and *Gerasia* (Cat. pp. 7 & 61).

8. Aneiteadæ. Mantle small, inequilateral, flat, sunken, enclosing a shelly plate. Back with a central groove, giving out opposite branches to the sides. Neck with two distinct diverging grooves to the lips. Jaw horny; teeth square. *Aneitea.*

9. Janelladæ. Mantle verysmall, convex, sunken in the dorsal grooves, enclosing four small plates. Back with a single central dorsal groove. Neck with two grooves, parallel and close together behind, and then separating and extending to the outside of the eye-peduncle. Skin spinulose. Tongue very broad. Teeth oblique, strongly dentated. *Janella.*

****Mantle covering the whole of the back. Respiratory chamber small, thin, in the front of the body, separate from the mantle. Head without any groove. Eye-peduncle and tentacle distinct. Jaw and tongue like* Helix.

10. Philomycenidæ. *Philomycus* and *Meghimatium.* (See Cat. p. 156.)

B. *Head, eye-peduncle, and tentacles simple, contractile. Teeth numerous, four-sided, close on the lingual membrane.*

11. Vermicellidæ. Body elongate. Tentacle bifid. (See Cat. p. 4.)

12. Onchidiadæ. Body ovate. Tentacles cylindrical, simple. (See Cat. p. 4.)

XXXVI.—*On some new Genera and Species of Fishes collected by* Drs. Keferstein *and* Hæckel *at Messina.* By Prof. Kaup.

[With a Plate.]

Family Leptocephalidæ.

Genus Stomiasunculus, n. g.

Diagnosis. No ventral fins; distinct dorsal, caudal, and anal fins only towards the extremity of the body. Head large, with a lobe at the apex of the lower jaw. Operculum produced posteriorly, with a large aperture directed far forwards. No teeth.

Description. This is a very elongated form, round rather than compressed, with a smooth body, of which the muscular chevrons are very simple. Anus situated towards the extremity of the body, in a sacciform process.

In this genus there is a certain resemblance to *Stomias* (such as occurs in *Esunculus* to *Esox*), especially in the position of the dorsal and anal fins. I even suppose that the injured caudal fin was forked, as in *Esunculus*. As there are still many gaps in this family, it is impossible to say exactly what is the true position of this genus.

Stomiasunculus barbatus, Kaup. Pl. III. fig. C.

Head large, obtuse, with black eyes, not silvery as in the *Leptocephali.* The operculum and cheeks exhibit rows of fine points; along the intestinal canal and the anal fin there is a row of points, such as occurs in many *Leptocephali.* The rays of the dorsal and anal fins are finely punctate; and there are also fine points on the lower part of the caudal. Found at Messina by Dr. Keferstein. The figure is three times the natural size.

Genus Leptocephalus, Gron.

To this genus, which is far too little known, I add two new species, found at Messina and received from Drs. Keferstein and Hæckel.

Leptocephalus Hæckeli, Kaup, n. sp. Pl. III. fig. B.

Head small and pointed, with distinct teeth; no rows of points on the middle of the lateral line; rows of points along the yellowish intestinal canal; tail one-eighth of the length of the body. Resembles *L. brevirostris,* Kaup; but the snout is longer, the body not so high, and the tail less pointed.

Leptocephalus Kefersteini, Kaup, n. sp. Pl. III. fig. A.

Head extremely small, with very fine teeth. Seven roundish spots, composed of points, along the intestine. Anus rather behind the middle of the body. The margin of the indistinct anal fin shows rows of points. The lower parts of many of the chevrons blackish in the furrows; punctured with black towards the caudal extremity. Both the dorsal and ventral margins are notched in an undulating manner; the latter is of an orange-colour.

Leptocephalus Morrisi, Penn.

Following Yarrell's example, I unite *L. Spallanzani*, Risso, with *L. Morrisi*. In the 'Ichthyologie de Nice,' Risso described a fish under the latter name, which, as C. Bonaparte remarks, does not belong to it; but where it is to be placed, Bonaparte could not determine any more than myself. The *Lepidopus pellucidus*, Risso, from the description of which the name *Kamarina* and whole passages of the text have been transferred into the description of *Leptocephalus Spallanzani*, likewise remains a doubtful species, although Risso cites it under his *L. Spallanzani*. Bad as is the figure of *L. pellucidus* in the 'Ichthyologie de Nice,' it cannot be believed that it was drawn from a true *Spallanzani* or *Morrisi*. It is also very probable that Rafinesque has described this fish, which is common at Messina, in his 'Caratteri;' but there is no loss to science in leaving his very bad descriptions undisturbed in this genus. According to the reports of Hæckel and Keferstein, this species, like all the rest, lives in the open sea, and not in the sea-weed. They are caught in bottles by boys whilst bathing.

The diagnosis of this species, which is difficult to characterize, might be as follows:—Head large, with an obtuse, projecting snout; black points at the apices of the muscular chevrons, and along the intestine; fine points at the root of the anal and the end of the dorsal fins; caudal fin pointed.

It is impossible to say more than this, for there are no other characters on which we can rely. There are individuals with teeth, with traces of teeth, and without teeth; others in which the body, and others, again, in which the tail is longest. In confirmation of this, I give the measurements of twelve individuals:—

1. Trunk 48,	Tail 65 mill.	7. Trunk 55,	Tail 50 mill.
2. „ 50,	„ 60 „	8. „ 63,	„ 60 „
3. „ 50,	„ 70 „	9. „ 63,	„ 54 „
4. „ 51,	„ 62 „	10. „ 66,	„ 61 „
5. „ 53,	„ 69 „	11. „ 68,	„ 59 „
6. „ 55,	„ 66 „	12. „ 86,	„ 48 „

Even the series of points along the vertebral column is not reliable; it very often disappears beyond the anus, but is still always distinctly visible towards the end of the tail.

Leptocephalus diaphanus, Kaup, Apod. Fish. pl. 17. fig. 9.

This species, of which I have received the greatest number from M. Keferstein, is much more constant in the proportions of its body. The bulbus (Kaup, pl. 17. fig. 9 *a*) frequently appears blackish through the skin, from the presence of food. Four specimens gave the following dimensions:—

1.	To the bulbus or stomach	23,	to the anus	54,	to the caudal	57	mill.
2.	„ „	23,	„	52,	„	53	„
3.	„ „	30,	„	67,	„	66	„
4.	„ „	28,	„	58,	„	61	„

Out of a great number of individuals I only met with two which showed the course of the intestine.

Leptocephalus brevirostris, Kaup, Apod. Fish. fig. 15.

A specimen from Messina exhibits all the characters of that figured by me, except that it has a rather more pointed head and a somewhat longer tail.

Body 48, tail 21 mill. in length

Tilurus trichiurus, Kaup.

Unfortunately my figure, given at pl. 16. fig. 5 of the 'Apodal Fishes,' is drawn from a specimen in which the tail was defective. The hair-like point, which measures 18 mill. in length from the anus, is usually lost when several individuals are sent in the same bottle. In this case the tails are so twisted together that, in separating them, a portion of the filament with the apex is lost, especially from the point at which it becomes blackish. If the black apex of the tail be quite perfect, it forms at the extremity a coil, which is drawn up in the form of a screw, in a gelatinous mass. With the highest magnifying power, I was unable to ascertain the true nature of the apex of the tail (which is as large as a pin's head) and of its envelope. Is the capillary portion with the coil a prehensile tail? Is the gelatinous mass animal mucus, or does it consist of animals which the caudal extremity seizes and surrounds voluntarily or accidentally? These questions can be cleared up only on the spot and by the examination of many individuals.

Genus Porobronchus, Kaup, n. g. Pl. III. fig. D.

Dr. Hæckel has furnished the Berlin Museum and myself with specimens of an excessively small and nearly linear fish, which was taken near Messina. It is so remarkably novel a form, and possesses such abnormal characters, that I should be surprised if it had escaped the Italian ichthyologists. Its characters are as follows:—

Diagnosis. Head and guttural sac large. Eyes rather large, placed towards the extreme angle of the mouth. Teeth wanting. Pectoral fins wanting. Body linear, with a filiform caudal extremity. Dorsal and anal fins of equal length; the former commences above the end of the guttural sac, and exhibits one more strongly developed and elongated ray; the anal runs up to the aperture of the guttural sac. The anus must also open into this aperture. Body naked, with no trace of scales.

I do not know where to place this form, to which I give the name of *Porobronchus linearis* (Pl. III. D). Its place is perhaps in the vicinity of *Saccopharynx*, Mitch., which certainly does not belong to the Apodes, and, like the above genus, forms the commencement of some new family, or of one which is not yet well established.

The specimens described are in the Collection of the British Museum.

XXXVII.—*Mycological Investigation upon Fermentation.* By M. Hermann Hoffmann*.

Although the phenomenon of fermentation long since attracted the attention of observers, its origin was still involved in considerable obscurity, and various hypotheses, amongst others that of spontaneous generation, had been invented to explain it. In order to solve this problem definitively, M. Hoffmann undertook a series of experiments, of which he gives an account in the 'Botanische Zeitung' of Berlin for 1860, Nos. 5 & 6.

1. If the juice extracted from some vegetables be examined by the microscope, it is found to contain here and there, not only cells similar to yeast, but also spores of *Mucedinæ* (such as *Cladosporium, Stemphylium*, &c.), some of which have even begun to germinate. These would be sought in vain in the interior of the fruits furnishing the juice under examination; so that it is extremely probable that they are derived from their surface.

Boiling water kills the germs of yeast-cells. Hence, if gooseberries, before being crushed, be immersed for four to ten seconds in boiling water, it is only after the lapse of four days that a fermentation with evolution of gas makes its appearance in the expressed juice, and then but feebly. If gooseberries be placed for three-quarters of an hour in cold water, and agitated from time to time, the water, when decanted, will be found to contain a small quantity of ferment, which may be employed as yeast, and which will evolve carbonic acid with a solution of sugar. When the surface of a gooseberry is scraped with a blunt knife,

* Translated from the 'Bibliothèque Universelle,' 1860, p. 337, by W. S. Dallas, F.L.S.

and the matter removed is examined by the microscope, the same spores which occur in the expressed juice of the fruit are recognized, mixed with impurities of all sorts; the brown spores of *Stemphylium* and *Cladosporium*, and colourless fragments of *Oidium, Monilia, Torula*, &c. If the matter scraped off be placed in distilled water, and protected from all access of dust from without, there will be at the end of twenty-four hours dense groups of germinating filaments, and numerous cells of yeast in every stage of budding and fragmentation, and with all the varieties of form which characterize the yeast of the juices of fruits. Infusoria are also frequently met with. The expression *yeast* is therefore a collective denomination, and not the name of a species of plant.

2. The cells of yeast from beer or spirit in fermentation are generally more similar than those of vegetable juices which have undergone no boiling; nevertheless they are not only round or oval, but also cylindrical. To ascertain what they really are, two methods may be adopted. The first, which has already frequently been employed, consists in cultivating yeast, and examining what forms of plants it gives origin to. This is the method employed by Kützing, who obtained from it some *Sporotricha* and a *Mucor*. The second, in which the yeast is produced directly by means of the fungi which are presumed to be its cause, was employed by M. Bail; he made use of *Ascophora elegans*, a species of *Mucor*, and *Penicillium glaucum*; and M. Hoffmann states that he cannot but confirm the results obtained by these experiments.

The observations of M. Hoffmann were made on a large scale in breweries, and on a small scale in cultivations of small portions of yeasts. In the breweries, large tufts of *Penicillium glaucum* make their appearance on the yeast which has been thrown out; *Penicillium breve*, Corda, and *Ascophora elegans*, are also seen, but in smaller quantities. By cultivation on a small scale, taking all possible precautions to prevent the access of spores from without, M. Hoffmann has observed the development of the fungi above mentioned, together with *Periconia hyalina*. His experiments were made by pouring a few drops of water into a test-tube inclined obliquely, placing in it a few fragments of fresh yeast, and stopping the mouth of the tube with wadding to prevent the access of any impurities from without. He soon saw the yeast produce mycetoid filaments.

To ascertain that beer-yeast is only the product of these little Fungi, which are so common everywhere and in all climates, M. Hoffmann placed in one of his tubes a solution of sugar, which does not ferment by itself, together with spores of *Penicillium glaucum*, shook the whole strongly, and then placed the tube in as oblique a position as possible. The spores, which contain air, and are therefore specifically very light, rose as usual; but instead of meeting the air, they came in contact with the wall of the tube, and often remained immersed in the fluid. The tube was agitated once a day; and as early as the second or third day a mycelium was developed around the spores, and at this point, and then only, an evolution of gas commenced. From this time the tube had to be shaken more frequently. This experiment, modified in many different ways, proves that the development of the gas is intimately connected with the vegetation of the Fungus. In course of time the liquid becomes acid, and the evolution of gas ceases. If it be examined by the microscope, besides a few fructiferous filaments (in their atypic state), it is found to consist of mycetoid filaments and spores in various stages of germination, besides a great many yeast-cells in all phases of development.

A fermentation of greater or less strength may be produced not only with the spores of *Penicillium*, but also with those of other Fungi. M. Hoffmann succeeded in setting up fermentation in fresh wort, in grape-sugar, cane-sugar, and boiled gooseberry juice, by adding to the fluids spores of *Ustilago carbo*, *Ascophora mucedo*, and *Stachylidium pulchrum*, and also by putting in rose-leaves infected by *Phragmidium incrassatum*, and *Uredo Rosæ*, and finally by means of *Torula fructigena*, Pers. The dust collected on books also produces fermentation. The liquid at first contains yeast and a greater or less number of *Bacteria*; finally, *Penicillia* or *Ascophoræ* are developed on its surface.

The yeast thus artificially produced has all the physical and chemical properties of the ordinary yeast of the juice of raw fruits. M. Hoffmann has even made leaven with yeast produced by means of the Fungi of the Rose. On the other hand, he never succeeded in producing fermentation or the formation of yeast by means of fresh spores of Agarics or *Boleti*. From this it follows that all Fungi cannot assist in the production of yeast. This property appears to depend upon their capacity of forming conidia by their filaments of germination, and also perhaps upon the fact of their having been produced upon parts of plants in good health, or dead or dying. M. Hoffmann is inclined to think that this property of decomposing and penetrating deeply into the surrounding fluids is due especially to the mycetoid filaments.

And now the question presents itself, what part do Fungi and Infusoria take in the decomposition and putrefaction of organized bodies?

If certain Fungi (and Infusoria) alone possess the property of decomposing liquids containing sugar, and evolving gas, or, with the addition of oxygen, of causing the corruption and putrefaction of other organic liquids, then, by protecting these liquids from the Fungi, we should be able to preserve them in an incorruptible state. On this point Schröder has made a series of remarkable experiments, from which it appears that the dust of the atmosphere is in almost all cases the cause of the decomposition of organic liquids which have been boiled. He has, however, half abandoned the suspicion which he entertained that the spores of Fungi played an important part in this, on observing that when the liquids had been heated the spores no longer induced decomposition; and he has arrived at the result that the dust only produces this effect when the materials have been previously in contact with the free air. M. Hoffmann, on the contrary, believes that decomposition may be produced by means of the spores of *Mucedineæ* (supposing that they are not killed thereby), by placing them for an hour in the midst of liquids heated to 214° F.

Organic liquids, such as broth, saccharine solutions, gluewater, boiled apples, honey and water, &c. placed in test-tubes well closed with a cotton plug, and boiled for an hour, remained intact for three to eight months, notwithstanding the excessive heat of the summer of 1859. But the result of the following experiment was very different:—Before pushing in the plug of cotton, an iron wire of moderate strength was passed through it; to the lower extremity of this was attached a small glass tube, two inches long, closed at both ends, containing dry spores of the Fungus on which the experiment was to be made. A second iron wire, placed by the side of the former, was attached to the lower part of the small tube; when the liquid in the testtube had been boiled, and become cool, this served to break the two extremities of the small enclosed tube, and thus place the spores in contact with the liquid surrounding them. If these spores belonged to *Penicillium glaucum*, they rose to the surface, and in a few days covered it with a thick carpet of *Penicillium*. With the spores of *Ustilago carbo* and *Stachylidium pulchrum*, or dried beer-yeast, fermentation does not occur, or is produced very feebly, because the dried spores rise and float on the surface. If, in place of a small closed tube, an open tube be employed, the boiling vapour alone is sufficient to kill the spores, and in this case the liquid undergoes no alteration. Thus, although such experiments cannot be performed without some of the spores contained in the atmospheric dust arriving at the liquid, they would be killed by the boiling.

It has long been known that the dust of inhabited houses contains spores. If an organic liquid which has been boiled be placed in a narrow-necked bottle and left unstopped, its surface is covered in a few days with tufts of *Mucedineæ,* arising from the spores which have fallen from the air. Protecting these liquids from these spores is the object of the methods of preservation of Appert and others. The above experiments furnish a fresh proof that spontaneous generation must be placed amongst dreams.

The following experiment proves that, notwithstanding the free action of the air, there is no formation of Infusoria, Fungi, or *Bacteria* when measures have been taken to prevent the liquid from containing any germs of these organisms. A small alembic is half filled with an organic liquid, and closed with a pierced cork, through which is passed a small glass tube of one or two lines in diameter, of which the free extremity is bent down, for one or two inches, in the form of a hook; the liquid is boiled for an hour, the extremity of the tube being closed with wadding, which is removed after the liquid has become quite cool; the organic matter will then be in free and direct communication with the oxygen of the external air, and, notwithstanding, it will remain intact, without any formation of Infusoria or Moulds for six months and more, even during the hottest summer—evidently because the spores diffused in the atmosphere cannot penetrate to it.

Fermentation is therefore only a simple division of the groups of organic atoms, which is essentially connected with the presence of yeast. M. Hoffmann leaves the question, whether the carbonic acid is a secretion of the interior of the yeast-cell, or produced by its outer surface, undecided. Vesicles of gas are never seen in the interior of one of the active and normal cells; nevertheless, carbonic acid might be contained in the interior in a dissolved state (as in the blood). M. Hoffmann says that he does not see how this question can be solved directly by experiment. It is certain that the development of carbonic acid in a saccharine solution is immediately connected with the yeast-cells; this is proved by the following experiment, amongst others:—If a saccharine solution, or freshly prepared wort, contained in a test-tube, be divided by a thick plug of wadding, and yeast be poured into the upper portion, it is only in this that a fermentation will take place, which may be carried on until the complete disappearance of the sugar. After the lapse of some days, some bubbles of gas pass through the plug of wadding, and increase by degrees until they form a stratum of gas of 2 to 6 lines in thickness, which completely isolates the inferior liquid, but the sugar remains in this without alteration.

"When we see what an energetic and penetrating influence the vegetation of certain Fungi exerts upon organic liquids, we are no longer surprised," says M. Hoffmann, "at the devastations which it causes among plants. We can no longer dispute upon the question whether the Fungi are the cause, or a concomitant of these maladies, and we must admit that, under certain combinations of temperature, atmospheric condition, &c. these effects are due naturally to these Fungi and Infusoria, and see in them redoubtable enemies of plants and animals, and perhaps also of man."

With regard to the potato-disease, M. Hoffmann refers to the valuable discoveries of M. Speerschneider, but gives a succinct account of the results of his own experiments, from which he draws the following conclusion:—After continued heavy rain, accompanied by a low temperature and want of sun, *Peronospora Solani* is developed in prodigious quantity on the leaves of the potato plant, and kills them, as if they had been burnt. The mature spores fail to the ground, and, when the moisture and heat are sufficient, germinate and send down their filaments into the tubers, of which the bark is still tender; the filaments reach the interior of the tubers, introduce themselves into the cells, of which they decompose the walls and amylaceous grains, and thus cause the destruction of the tuber.

This furnishes the indication of a rational treatment for the cure or prevention of the potato-disease. As soon as, under the atmospheric combinations above described, the foliage of the potato-plants appears to be attacked by a whitish blight (*Peronospora*), and appears as if burnt, there is danger of rotting of the tubers—at least unless dry weather supervene. The best method is to cut off the stalks, and it would be well to water the ground above the tubers with milk of lime or a solution of chloride of lime, or to sulphur it, as has been done with the grapes, with the object of destroying the spores of the fungus.

If the disease has begun to affect the potatoes, it would be necessary, before heaping them up, to wash and dry them. The removal of the herbage appears to be of no consequence when the tubers are developed. According to M. Hoffmann's observations, the period of this development, in the part of Germany where he dwells, is seven weeks after the first planting of the tubers, fourteen weeks after planting for late potatoes, and twelve weeks after planting for spring potatoes. Under any circumstances, the removal of the leafy parts towards the end of August cannot be prejudicial.

XXXVIII.—*On the* Calyceraceæ. By John Miers, F.R.S., F.L.S. &c.

[Continued from p. 190.]

2. Gamocarpha.

The typical species was collected in Chile by Pöppig, who described and figured it under the name of *Boopis alpina*. DeCandolle afterwards founded upon it his genus *Gamocarpha*, its name expressing the fact of the accretion of its paleæ, first indicated by Lessing, from whose imperfect account DeCandolle established his brief and defective generic character. Lessing's obscure description is as follows: "Bracteolæ (paleæ) 1-nerviæ, acutæ, apice foliaceæ connatæ in alveolas profundas ovaria tota laciniis 5 ellipticis, acutis, ipsis brevioribus coronata includentes." (Linn. vi. 259.) Pöppig states that the inner whorls of involucral leaflets are sometimes small or rudimentary, "nonnunquam minimæ vel rudimentariæ, sensim in bracteolas (paleas) per receptaculum planiusculum sparsas transeuntes." (Nov. Gen. i. 21.) DeCandolle makes no mention of the existence of any paleæ, nor of the fact of their accretion which gave rise to his name of *Gamocarpha*, while the presence of paleæ is distinctly specified in all the other genera of the family; in their place, however, he states the existence of a fringed sheath round the base of each ovary, which I have not been able to discover: he says, "fimbrillæ recept. acutæ in alveolas concretæ." From this it is manifest that he never examined the plant, that he did not understand Lessing's meaning (rendered still more obscure by Pöppig's description), and that he consequently omitted all details of this unusual structure.

I have had an opportunity of examining a plant in the Herbarium of the Paris Museum, collected by Gay in the same neighbourhood as that where Pöppig found his specimens; and this, compared with the drawing and description of the latter botanist, shows beyond any doubt that it is identical with the typical species which Lessing and Pöppig have severally described. The involucre is here composed of six external folioles, which are very thick and fleshy, and united at their base into a short tube, upon the margin of the fleshy receptacle; within this are four concentric series of paleæ, which are nearly of the length and size of the folioles, and are equally fleshy and green at their summits, though more membranaceous below: they are confluent by their margins for half their length, and the intervals between them are again divided by a number of membranaceous septa emanating from the fleshy midribs of some of the paleæ, and united to the margins of others in the adjoining series, forming in this manner a number of hollow tubular spaces, in three or four irregularly concentric series, spread over the surface of the receptacle: each of the spaces thus constituted contains three or four florets; but the spaces here formed are wrongly designated alveolæ of the receptacle as this term is generally used by botanists; hence the term employed by Lessing was evidently misunderstood by DeCandolle. I have drawn up the following as a more correct expression of its generic features:—

Gamocarpha, Dec. — *Involucrum* 5–6-phyllum; *foliola* ovata, crasso-carnosa, integra, margine subcartilaginea, subacuta, imo in tubum brevissimum margini receptaculi coalitum accreta. *Receptaculum* convexiusculum, carnosum; *paleæ* magnæ, foliaceæ, inter flores onustæ, nonnullæ liberæ, spathulatæ, pleræque ovatæ, carnosulæ, involucro æquilongæ, imo latæ, marginibus usque ad medium mutuo concretis in verticilla 3–4 subconcentrica coalitæ, istis e septis plurimis interjectis in nidulos multos tubæformes 3–4-seriales constitutis: hoc modo transmutatæ, per totum receptaculum sparsæ, et imo eo arcte accretæ; *flores* in singulo nidulo 3–4 imo insiti, plerique fertiles, 5-meri, rarius abortu 4-meri. *Calycis* tubus, ovario adnatus, margine discreto 5-dentato, dentibus æqualibus, ellipticis, acutis, erectis, carnosulis. *Corolla* regularis, infundibuliformis, tubo gracili longo, limbo 5-lobo; lobis oblongis, obtusiusculis, apice crassioribus et macula fusca notatis, 3-nerviis. *Stamina* 5, inclusa; *filamenta* brevissima, imo in annulum monadelphum constrictioni tubi insertum coalita, superne libera, et introrsum arcuata: *antheræ* inferne syngenesiæ, et breviter sagittatæ, apice liberæ, connectivo crasso dorsali filamento continuo affixæ. *Ovarium* obovatum, ultra medium ad calycem accretum, apice liberum, conicum, 1-loculare, 1-ovulatum. *Stylus* filiformis, longe exsertus, apice incrassato-cylindraceus. *Stigma* minimum, globosum, papilloso-rugosum. Achænium ignotum.

Herbæ *Chilenses, Andicolæ, cæspitosæ, acaules,* rhizomate *elongato, repente stolonifero, colles plurimos intersistentes foliiferos emittente*; folia *subradicalia, congesta, lineari-spathulata, integerrima, carnosa*; *scapi pauci, monocephali, folio longiores, sæpius nudi, rarius foliis* 1–2 *supra medium donati, teretes, carnosi*; capitulum *hemisphæricum, carnosum.*

1. *Gamocarpha Pöppigii*, DC. Prodr. v. 2; Remy in Gay, Chile, iii. 247; Weddell, Chl. And. ii. 8;—Boopis alpina, *Pöpp. Nov. Gen.* i. 21, tab. 33; *Lessing, Linn.* vi. 258;—acaulis, foliis subradicalibus, confertis, obovato-ellipticis, apice mucronatis, integris, carnosis, margine cartilagineis, glaberrimis,

enerviis, in petiolum angustum canaliculatum fere æquilongum attenuatis, scapis 2–3, folio 3-plo longioribus, sæpius aphyllis.—In Andibus Chilensibus: Cordillera de Concepcion ad Antuco, altit. 6500 ped.; Cordillera de Concepcion (Gay), *in herb. Mus. Paris.*; *v. s.*

Radix horizontaliter humifusus, pedalis et ultra, colla plura interrupta subacaulia, squamis imbricatis tecta, 5 lin. long. 3 lin. diam. emittens; folia e collo numerosa, pluriserialia, subradicalia, imbricatim conferta, (incluso petiolo 2–4 lin.) 6–10 lin. longa, 2–3 lin. lata, vernatione conduplicata: scapi 2–3, erecti, teretes, 2 poll. longi, sæpius nudi, interdum versus apicem folia 2 brevia subopposita gerentes, monocephali; capitulum subglobosum, cum floribus expansis circiter 10 lin. diam.; involucrum cum foliolis expansis 5 lin. diam.; foliola 5–6, receptaculo carnoso imo accreta, superne libera, sinuato-3-angulata, acuta, integerrima, carnosula, margine cartilaginea, viridia, 1-nervia, 2 lin. longa et fere 2 lin. lata; paleæ numerosæ, foliolis consimiles, 2 lin. longæ, $1\frac{1}{2}$ lin. latæ, per totum receptaculum imo inter se accretæ, et hoc modo nidulos plurimos efformantes, apice quasi laciniatos favos apiarios æmulantes, singulatim 3–4-floros; flores imo inserti, longe exserti, consimiles, hermaphroditi, 3 lin. longi; ovarium ad calycem adnatum, 1 lin. longum; corolla viridis, 2 lin. longa, imo tenuissima; stamina ore campanulato 5-dentato inclusa; stylus longe exsertus *.

2. *Gamocarpha Gilliesii*, n. sp.;—radicibus fusiformibus, distantibus, descendentibus, stolone horizontaliter sarmentoso connexis; foliis radicalibus, plurimis, confertis, rotundato-ovatis, imo in petiolum angustum 2-plo longiorem cuneatis, crassocarnosis, rachi prominente, enerviis; scapis 1 vel 2, teretibus, subgracilibus, summo crassioribus, folium vix excedentibus; capitulo præcedentis dimidio minore; involucri foliolis 5–8, æqualibus, spathulato-oblongis, subacutis, crassis, imo breviter inter se et cum receptaculo accretis, demum reflexis; paleis foliolis consimilibus, inter se imo coalitis, floribus exsertis.—In Andibus Chilensibus:—*v. s. in herb. Hook.*, Cerro del Polcura (Gillies); Los Palomares, Punta de las Vacas, costa orientali; Ojos de Agua, costa occidentali (Bridges).

Species a præcedente distincta; sarmentum horizontaliter humifusum, colla plura interrupta, $1\frac{1}{4}$ poll. remota, subacaulia, squamis imbricatis tecta, 3 lin. long., radicibus fusiformibus donata emittens; folia plura, radicalia, (incluso petiolo) $1\frac{1}{4}$–$1\frac{1}{2}$ poll. long., 3 lin. lat.; scapi 1–2, teretes, apice incrassati,

* The details of this structure are shown in the 'Contributions,' Plate 45 A.

monocephali, sæpius nudi, interdum folio unico infra medium donati, foliis radicalibus minore, 10 lin. long., 2 lin. lat.; capitulum subhemisphæricum, 6–8 lin. diam.; involucri foliola 3 lin. long., $1\frac{1}{2}$ lin. lat.*

3. *Gamocarpha pumila*, n. sp.;—nana, cæspitosa, caulibus brevissimis et fere obsoletis, paucis, scapiformibus, crassiusculis, foliis dimidio brevioribus, monocephalis; foliis plerisque radicalibus, spathulato-lanceolatis, subobtusis, 5-nerviis, integerrimis, in petiolum complanatum subæquilongum attenuatis, paucis, caulinis fere epetiolatis, cuneato-oblongis, paulo sub capitulis enatis, iis multo longioribus; involucri foliolis inæqualibus, 8–10, subexpansis, lineari-oblongis, obtusis; paleis foliaceis, imo inter se accretis, exterioribus foliola involucri subæquantibus.—In Andibus Chilensibus:—*v. s. in herb. Hook.*, Cordillera de Maule, sedibus orientalibus (Germain).

Planta sesquipollicaris, radice fusiformi; in uno specimine scapus unicus 7 lin. longus, nudus, in altero scapi 2 æquilongi, folio solitario paulo sub capitulo muniti; folia plurima, radicalia, (petiolo incluso) $1\frac{1}{2}$–$2\frac{1}{4}$ poll. long., limbo obtuso, spathulato-oblongo, 3 lin. lato, petiolo angustissimo, æquilongo; folium caulinum 15 lin. long., 3 lin. lat.; capitulum floriferum 6 lin., fructiferum 15 lin. diam.; involucri foliola $1\frac{1}{2}$ lin. long., $\frac{1}{2}$ lin. lat., subpatentia; paleæ exteriores foliolis consimilibus; achænium immaturum ejus *Nastanthi* forma†.

4. *Gamocarpha ligulata*, n. sp.;—humilis, fere acaulis; foliis plurimis, radicalibus, spathulato-linearibus, integris, in petiolum subtenuem complanatum angustatis, glaberrimis, enerviis; scapis paucis, aphyllis, folio 2-plo longioribus, rarius foliolis 3 superne munitis, teretibus, lævibus, monocephalis; involucri foliolis sub 10, subinæqualibus, spathulato-oblongis, obtusis, integris, carnosulis, patentibus; paleis foliaceis, majusculis, foliola involucri æquantibus, imo breviter inter se accretis, apice liberis et spathulatis, erectiusculis; floribus exsertis.—In Andibus Chilensibus:—*v. s. in herb. Hook.*, Prov. Arauco (Lechler, 289).

Planta cæspitosa, 3-uncialis; radix fusiformis; folia 1–$1\frac{1}{2}$ poll. long., $1\frac{1}{2}$ lin. lat., in petiolum $\frac{1}{4}$ lin. lat. angustata; scapi 2-3, erectiusculi, teretes, $\frac{1}{2}$ lin. crassi, $2\frac{1}{4}$–$2\frac{1}{2}$ poll. alti; capitulum floriferum cum foliolis expansis 1 poll. diam.; receptaculum 5 lin. diam.; foliola involucri 3–4 lin. long., 1–$1\frac{1}{2}$ lin. lat.‡

* A drawing of this plant will be seen in Plate 45 B.
† This species is represented in Plate 45 C.
‡ This plant is shown in Plate 45 D.

3. Boopis.

This genus was established in 1803 by Jussieu, upon a plant collected by Commerson in the neighbourhood of Buenos Ayres, which he named *Boopis anthemoides*: with this he associated the *Scabiosa sympaganthera* of the 'Flora Peruviana,' which was afterwards separated and placed in *Calycera*. Richard, in his admirable memoir on the *Calyceraceæ*, published in 1820, gave ample details of the structure of the genus, then reduced to its typical species. To this original type are to be added three new species recently described by Dr. Philippi, and three others which I now contribute; so that the genus will thus comprise seven species. *Boopis* in many points approaches *Acicarpha*, but it differs from that genus in having a gamophyllous involucre in the form of a depressed cup with an incised border, quite free from its small globular receptacle, which is not of larger diameter than its peduncular support, and which remains bristled with the persistent radiating paleæ after the achænia have fallen off: it is also distinguished from that genus by its achænia being quite free from each other, and not accreted into a cylindrical or spherical mass; and by its calycine lobes, which preserve their original form, and do not become enlarged in the form of long excrescent subulate spines. It differs from *Calycera* in the union of the free leaflets of the involucre into a gamophyllous cup, and in its isomorphous achænia, not heteromorphous with the calycine segments often becoming enlarged into extremely long spines.

The genus *Acarpha* has been proposed by Dr. Grisebach * for a Magellanic plant of this family collected by Lechler. It obtained this name on account of the supposed absence of paleæ in the receptacle; but I have examined authentic specimens of Lechler's collection in the Museum of Paris, and find very distinct paleæ present in all the capitula, though not accompanying all the florets. Even if this were a distinct genus, the name would require to be changed; but it appears to me a true *Boopis*, as its involucrum shows; and in the peculiar form of its achænia it quite accords with *B. multicaulis* and *B. gracilis*.

Boopis, Juss. Char. reformat.—*Involucrum* gamophyllum, cyathiforme, depressum, submembranaceum, plurinerve, fere ad medium 5–10-dentatum, dentibus integris, vel denticulatis, lanceolatis, vel 3-angularibus, venoso-reticulatis, rigidulis. *Receptaculum* parvum, convexum, *paleolis* linearibus, scariosis, apice dilatatis, achæniis æquilongis, persistentibus echinatum. *Flores* omnes fertiles et consimiles. *Calycis tubus* adnatus,

* Diagn. Pl. Philippi et Lechler, p. 37; Walp. Ann. v. p. 142.

ovario brevior; *lobi* 5, dentiformes, acuti, submembranacei, integri vel inciso-denticulati, imo marginibus involutis et cum costis prominentibus ovarii accretis. *Corollæ tubus* gracilis, ovario longior, superne campanulatus; *limbus* 5-fidus, laciniis acutis, reflexis. *Stamina* 5, subexserta; *filamenta* brevissima, imo in tubulum e contractione tubi corollæ ortum connata, superne discreta; *antheræ* ad basin connatæ, apice liberæ. *Ovarium* acute 5-costatum, tubo calycino adnatum, apice liberum, hinc conicum, 5-sulcatum. *Stylus* capillaceus, exsertus, apice cylindraceo-clavatus. *Stigma* globulosum, rugosum. *Achænium* 5-costatum, dentibus calycinis mucronatis rigidis patentibus supra medium circumdatum. *Semen* ordinis.

Suffrutices *humiles Bonarienses, Chilenses, et Patagonici, ramosi, rarius cæspitosi*; caules *flexuosi, ramosi*; folia *rigida, lineari-elongata, laciniato-dentata, aut pectinato-laciniata, laciniis angustis linearibus*; pedunculi *solitarii, vel pauci, ex axillis superioribus, monocephali.*

1. *Boopis anthemoides*, Juss. Ann. Mus. ii. 350; Rich. Mem. Mus. vi. 41. tab. 11;—caule striatulo, ramosissimo; foliis caulinis simplicibus, linearibus, ramorum pinnato-pectinatis, laciniis 3–5–7, angustissime linearibus, apice aciculatis, coriaceo-rigidis; pedunculis monocephalis, capitulis parvis, subsphæricis, involucro 5-fido, lobis triangularibus, mucronatis, denticulatis, patentibus.—Prov. Cordova Argentinarum ad Punta de Agua et Cañada de Lucas.—*v. v.*

Frutex parvus, fere decumbens, e basi ramosissimus, 4–6-pollicaris, rarius altior, locis uliginosis et salitrosis gaudens: rami lignosi, flexuosi, internodiis brevibus, 2–4 lin. distantibus; folia alterna, in ramis primariis simplicia, linearia, 3–5 (rarius 7) lin. long., $\frac{1}{4}$ lin. lat., coriacea, rigida; margine cartilagineo reflexo, apice pungenti-mucronato; in ramis secundariis pectinato-pinnatifida, sæpius 3-juga cum impari, 5–9 lin. long., laciniis anguste linearibus, 3 lin. long., rachique $\frac{1}{4}$ lin. lat., rigida et mucronata; pedunculi breves, monocephali, in ramulis terminales et axillares, 3–9 lin. long.; capitula 3–5 lin. diam.; involucrum parvum, imo gamophyllum et pateriforme, margine profunde 5-laciniatum, laciniis patentibus, 1 lin. long.; receptaculum parvum, simplex; paleæ tot quot flores, spathulatæ, acutæ, subrigidæ, $1\frac{1}{2}$–2 lin. long.; flores numerosissimi, consimiles; calyx profunde 5-sulcatus, ovario adnatus, margine 5-dentatus.

2. *Boopis rigidula*, n. sp.;—caulibus simplicibus, erectis, angulato-striatis, paulo flexuosis; foliis pinnato-sectis, laciniis rachique anguste linearibus, 4–5-jugis cum impari, divaricatis,

apice mucronatis, opacis, rigide coriaceis, margine revoluto, utrinque pallidis, costa mediana in angulos caulinos decurrente; capitulo solitario terminali, longe pedunculato; involucro gamophyllo, late campanulato, submembranaceo, fere ad medium 10-fido, laciniis linearibus, acutis, erectis, integris, 3-nervatis, apice aciculatis; paleis lineari-lanceolatis, mucronatis; floribus æquilongis; dentibus calycinis membranaceis, ovatis, 1-nerviis, apice obtuse 3-dentatis.—Chile, *v. s. in herb. meo et Hooker.*; Patagonia (Capt. King), et in Andibus Mendozinis (Gillies).

Species a præcedente distincta; differt caule strictiore, foliis longioribus, rigidioribus, segmentis latioribus et crassioribus, substramineis; pedunculo longissimo solitario; involucro 10-dentato. Internodia superiora 1 poll. distantia, inferiora approximata; folia pallide glauca, rigida, $1\frac{1}{4}$–$1\frac{3}{4}$ poll. long., rachi lineari parallele nervoso $\frac{1}{2}$ lin. lat., laciniis divaricatis 6–8 lin. long., $\frac{1}{2}$ lin. lat.; pedunculus $3\frac{1}{4}$ poll. long., capitulum subglobosum; involucrum hemisphæricum, campanulatum, 6 lin. diam., vix ad medium 10-dentatum, dentibus integris, linearibus; receptaculum minimum, fundo involucri insitum *.

3. *Boopis gracilis*, Philippi, Linn. xxviii. 707;—annua, glaberrima, glauca, polycephala, ramosa, ramis cauleque elongatis, gracilibus; foliis superioribus lineari-spathulatis, pectinatim laciniatis, dentibus utrinque 3–5 remotiusculis, supremis integris, omnibus enerviis; pedunculis gracilibus, monocephalis; involucro gamophyllo, campaniformi, ad medium 5-dentato, dentibus late 3-angularibus, flores æquantibus, paleis paucissimis, setaceis, achænio 5-costato, angulis paulo prominulis. —In Andibus Chilensibus:—*v. s.*, Cordillera de Maule, Depart. Linares (Germain).

Planta habitu *Anomocarpi leucanthemi*, circa 9-pollicaris; radix fusiformis, ramosus, 3 poll. long.; caulis e basi ramosus, $1\frac{1}{4}$ lin. diam.; rami alterni, iterumque divisi, angulato-striati; folia inferiora e basi linearia, 12–15 lin. long., ultra medium integra, summum versus dentibus brevibus patentibus remotis laciniata; folia superiora 6–7 lin. long., $\frac{1}{3}$ lin. lat.; pedunculi ex axillis superioribus solitarii, monocephali, folio 2–3-plo longiores; capitulum $4\frac{1}{2}$ lin. diam.; corolla $1\frac{1}{2}$ lin. long., tubo gracillimo, viridi, limbo albo; achænia albida, ovata, acuta, 5-angulata, in sinubus transversim rugosa, $1\frac{1}{2}$ lin. long., diametro paulo minore; dentes calycini angulis continui, obtusi; paleæ persistentes; receptaculum parvum, depresso-conicum, foveatum†.

* A representation of this species is given in the 'Contributions,' Plate 46 A.

† A drawing of this plant will be seen in the same work, Plate 46 B.

4. *Boopis multicaulis*, Ph., Linn. xxviii. 706;—glaberrima, caulibus elongatis e basi plurimis, erectis, ultra medium subnudis; foliis radicalibus elongatis, longissime petiolatis, summo profundissime pinnato-partitis, laciniis remotiusculis, spathulato-oblongis, obtusis, integris, aut sæpe utrinque 1-dentatis, carnosulis, enerviis, pallide viridibus, subtus flavescentibus, petiolo limbo 2–3-plove longiore, complanato, imo dilatato; caulinis paucis, alternis, multo brevioribus, brevius petiolatis, pinnato-partitis; pedunculis axillaribus et terminalibus, 1–4, elongatis, nudis, aut rarius folio brevi munitis, summo paulo incrassatis et monocephalis; involucro gamophyllo, ultra medium 5-partito, laciniis 5, inæqualibus, spathulato-linearibus, integris aut 3-dentatis, paleis lanceolatis, aut setaceis.—In Andibus Chilensibus:—*v. s. in herb. meo et Hook.*, Cordillera de Maule, Depart. Linares (Germain).

Caules pedales; folia radicalia $3\frac{1}{2}$–$4\frac{1}{2}$ poll. long. (incluso petiolo), laciniis utrinque 6–7, plerisque integris, 6–7 lin. long., $1\frac{1}{2}$–$2\frac{1}{2}$ lin. lat., caulina vix pollicem longa; pedunculi teretes, striati, straminei, $2\frac{1}{2}$–3 poll. longi; capitulum globosum; involucrum imo campanulatum, cum laciniis crassis mucronatis patentibus 6–9 lin. diam., dentibus (ubi adsunt) calloso-mucronatis; flores tubo viridi elongato, limbo albido, 3 lin. longi, 5-meri; achænium pentagonum, 5-sulcatum, angulis dentibus calycinis parvis obtusis concavis coronatis *.

5. *Boopis squarrosa*, n. sp.;—subcæspitosa, glabra, caulibus vel pedunculis subscapiformibus, plurimis; foliis pluribus radicalibus, aliisque caulinis brevioribus, lineari-lanceolatis, inciso-serratis, laciniis remotis, angulatis, acutis, mucronatis, sæpe subrecurvis, in petiolum longissimum complanatum angustatis; pedunculis monocephalis, sub apice foliiferis, ad apicem incrassatis; involucro cyathiformi ultra medium 5-fido, laciniis linearibus, acutis, denticulatis; paleis floribus brevioribus, lineari-spathulatis.—Ad Fretum Magellanicum:—*v. s. in herb. Hook.* (Le Guillou).

Planta cum foliis radicalibus divaricatis 5 poll. diam.; folia radicalia numerosa, circiter 3 poll. long., dentibus inclusis 3 lin. lat., iis exclusis 1 lin. lat., 1-nervia; caulis scapiformis, 3 poll. long., paulo supra basin ramosus, ramo æquilongo monocephalo supra medium folio 4–6 lin. long. munitus; capitulum 9 lin. diam.; involucri segmenta 4 lin. long., 1 lin. lat.; paleæ centraliores ovario 2-plo longiores, exteriores 2-plo majores; dentes

* This species is represented in Plate 46 c.

calycini acuti, hyalini, carinati, carinis cum angulis ovarii continuis *.

6. *Boopis* (?) *australis*, Dcne. Voy. Pôle Sud, Bot. ii. 87, tab. 18 B; Acarpha Australis, *Griseb. Diagn. Pl. Lechler.* 38; *Walp. Ann.* v. 142;—cæspitosa, caule brevi, e scapis centralibus 3–4 ad medium inter se accretis; scapis dehinc alternatim liberis, imo et infra capitulum foliiferis, scapis alteris brevissimis, in externa serie plurimis, cum foliis radicalibus enatis, summo sub capitulo folio unico longo lineari munitis, omnibus radiantibus, et monocephalis; foliis radicalibus plurimis, rosulatis, divaricatis, capitula longe superantibus, caulinisque brevioribus, anguste linearibus, summo paulo latioribus, obtusis, subcarnosis, integris, enerviis; capitulis parvis; involucro 7–8-fido, segmentis linearibus subinæqualibus flores superantibus.—Ad Fretum Magellanicum:—*v. s. in herb. Mus. Paris. et in herb. Hook.*; in Penins. Brunswick ad "Packet Harbour" (Lechler, 1143).

Planta cum foliis expansis 5 poll. diam.; folia radicalia 2–2¾ poll. long., 1 lin. lat., superne paulo latiora, et hinc subspathulata; caules 9–12 lin. long., 1½ lin. lata, compressa; scapi 3–6 lin. long., ¾ lin. lat., compressi; capitula juniore ætate, 3 lin. diam.; involucri segmenta 7–8, inæqualia, 2½–4 lin. long., 1 lin. lat.; flores 1–1½ lin. long. Paleas paucas distincte vidi, lineari-spathulatas, carnosas, virides, florum longitudine. Ovaria creberrima, profunde 5-angulata, in juniore ætate angulis late alæformibus, diaphanis, arcte congestis, et imo inter se vix adhærentibus. Clar. Grisebach, qui fructus vidit, dixit, "achenia pentagona inferne transversim rugosa," et inde libera; idcirco species ad *Boopidem* retuli †.

7. *Boopis graminea*, Phil. Linn. xxviii. 707;—perennis, glaberrima; foliis radicalibus confertis, elongato-linearibus, obtusiusculis, integerrimis, erectis, basin versus angustatis, carnosis, uninerviis; scapo erecto, longissimo, tereti, striato, monocephalo, infra medium foliifero, superne nudo; involucro circiter 8-phyllo, capitulum æquante; paleis setaceis; tubo corollæ brevi.—In Andibus Chilensibus:—*v. s. in herb. Hook.*, Prov. Maule, Depart. Linares.

Planta *Gamocarphæ* habitum aliquanto simulat, sed, e receptaculo et paleis, ad hoc genus nullo modo convenit; in aspectu omnibus præcedentibus valde dissimilis, nihilominus structura floralis cum *Boopide* satis congruat. Radix alba, 3½ lin. crassa;

* This plant is shown in the 'Contributions,' Plate 47 A.

† A representation of this species is given in Plate 47 B.

scapus pedalis, basi 2 lin. crassus; folia radicalia plurima, rosulata, $2\frac{1}{2}$–$3\frac{1}{2}$ poll. long., 1 lin. lat.; folia scapi breviora; capitulum 8 lin. diam.; corolla 2 lin. long., omnino alba, tubo attenuato, paleæ liberæ, lineari-setaceæ; ovaria libera, profunde 5-angulata, et, ut in ultima specie, valde hyalina, dentibusque 5 acutis coronatis*.

[To be continued.]

XXXIX.—*On the Animal of* Umbonium vestiarium. By Arthur Adams, F.L.S. &c.

Since writing my notice of the animal of *Umbonium giganteum*, which I observed at Hakodadi in Japan, I have had an opportunity, in the north of China, among the Mia-tau Islands, at the entrance of the Gulf of Pe-chili, of observing *Umbonium vestiarium*, Linn. (*Rotella lineolata*, Lamk.), in a living state, and have succeeded in procuring a correct figure of the architect of a shell which, like that of *Phorus* and *Terebellum* formerly, has long been familiar to naturalists, but the true position of which, in a natural arrangement of Mollusca, has remained doubtful.

The animal may be found, at low-water spring-tides, in vast numbers covering the sandy patches between the trachytic and basaltic rocks which compose the basis of the islands of this group. Some few individuals, half-covered with sand, may be seen on the surface; but the majority must be sought for under the surface of the wet sand, by following the traces they leave, They burrow rapidly by means of their broad and flexible foot. which they press downwards, and scoop out a bed for the shell, throwing up the sand from under it. The use of the curious fimbriated funnel-shaped organ formed from or appended to the modified eye-peduncle of the left side is now obvious: it serves as a means of communication between the surrounding water, which fills the cavity in which the Umbonium is lodged, and the gills —ejecting the particles of sand, and performing the part of a true siphon.

On a level surface the animal marches in a deliberate manner, taking long strides as it seems, the onward movement being effected by alternate lateral undulations of the foot, one side advancing at a time. As it walks, the caudal extremity moves from side to side in an undulatory manner. The Umbonium is very sensitive to alarm, shrinking at any sudden noise or vibration. When placed on its back, it soon rights itself, by placing its foot under the shell, and will often turn over several times.

The muzzle is short and rounded, and of a pale brown, the extremity being pellucid, and the margins furnished with ra-

* This species is represented in Plate 47 c.

diating beards. The tentacles are long and tapering, semi-opake, white, with about five or six rather distant black rings. The eyes are placed at the ends of stout elongated peduncles, the right free, the left attached to the pseudo-siphon; the eyes, at the apex of a white bulb, are of a dark brown colour, with a small round black pupil. The white peduncles are stained with dark brown just below the bulb. The funnel-shaped organ on the left side is semipellucid, and furnished inside with numerous opake white papillæ; the edge is fringed, and adorned with black dots. The neck-lappet on the right side is large, and folded on itself, forming a conspicuous anal siphon flecked with opake white, but sufficiently pellucid to allow the passage of the fæces to be distinctly seen through the walls of the tube. This organ is sometimes thrown up upon the back of the shell.

The mantle, as might have been surmised from the polished nature of the surface of the shell, is reflected over the front edge of the outer lip, forming a narrow black rim, and, when touched, is immediately retracted. The portion of shell covered by the mantle is seen void of colour or markings on the perfect adult shell. In cabinets the shell is rarely perfect, on account of the thin, brittle nature of this part. The lateral membrane of the foot is provided with four tentacular filaments, the two posterior rather closer together than the two anterior.

The foot is voluminous, with flat thin margins; it is semi-pellucid, and the operculum is placed on the dorsal surface, close to the shell; the hind part of the foot extends in the form of a tail far beyond the operculum, and is triangular, flat above, and angular at the sides, two dark lines meeting behind in a point behind the flat area. The sole is greyish, with a median opake white patch at the fore part, and with numerous very fine radiating pencilled lines on each side; a dark-grey median streak extends from the white blotch as far as the end of the tail, and in the middle part are one or two slender dark transverse lines.

Any further observations on the anatomy and dentition I must for the present reserve.

Wei-hae-Wei, Shan Tung, China,
April 15, 1860.

XL.—*Notice of an undescribed Peculiarity in* Teredo. By J. Gwyn Jeffreys, Esq., F.R.S.

On my return last week from the Continent, through Holland, I had the pleasure of meeting Dr. Verloren at Utrecht, and of examining living specimens of *Teredo marina* which he had kept in a glass jar for about ten months. They appeared to have become habituated to the loudest noise; and even when the jar was moved, or the light suddenly obstructed, they did not withdraw their terminal tubes or siphons. The longer (or alimentary and inhalant) tube was in frequent motion, and inflected in various directions, as if in search of food, while a current of water full of animalcula continually passed into it. The shorter (or fæcal and exhalant) tube performed its functions at intervals, expelling the woody pulp by a spasmodic action, and occasionally withdrawing itself, in order the better to effect its purpose, when any stoppage occurred. Each tube was transparent, and fringed with cilia at its orifice. Professor Harting, in his elaborate treatise, which has just been published, 'over het Mechanisme van den Troestel,' &c., appears to have mistaken the nature and relative use of these tubes, calling the longer tube the "cloacaal sipho," and the shorter one the "branchiaal sipho." The Teredines seemed to prefer the sunny side of the jar; and they are said to be very sensitive to cold. But the most interesting peculiarity which I witnessed, and to which my attention was directed by Dr. Verloren (although it has not been noticed, so far as I am aware, by any one of the numerous writers on the *Teredo*), is that each of the tubes is protected or enveloped externally by a very thin, pellucid, and film-like membrane or sheath. These tube-sheaths are irregularly annular, like the testaceous tube or tunnel which lines the excavation in the wood; and they bear a considerable resemblance in form to the stem of *Tubularia indivisa,* though differing from it in texture and colour. The alimentary tube-sheath is about an inch long, and the other is half that length. Their annular structure evidently arises from successive accretions of growth. The use of the sheath in *Teredo* may be either to prevent the delicate tubes, which it covers for about half their length, being choked or obstructed by the accumulation of flocculent pulp which lies outside, or else to protect them from the attacks of minute predaceous animals. It is renewed from time to time; and in one of the specimens four separate sheaths were attached to the tubular opening in the wood, one pair having been apparently disused, and a new set formed for present use. I am more than ever of opinion that the foot of *Teredo* (and most probably of every other boring shell-fish) is the sole instrument of perforation, instead of any of the methods described in the 'History of British Mollusca.'

I will add a few words as to the synonymy of *Teredo marina.* The *Teredo navalis* of Linnæus comprised at least two species (viz. *T. Norvagica,* or the "Italianische see-wurm" of the older Dutch writers, and *T. marina* of Sellius), as appears from the references in the twelfth edition of the 'Systema Naturæ' to Vallisnieri, Plancus, and Sellius. The diagnosis ("Teredo intra lignum testa flexuosa") is applicable to almost any species of *Teredo*; and the expression used by Linnæus, "calamitas navium ex Indiis in Europam propagata," would refer rather to some exotic than to a European species. In the 13th (or Gmelin's) edition, one of the generic characters of *Teredo*, describing the pallets as "lanceolatis," is peculiarly appropriate to *T. Norvagica*. The *T. marina* (or "Hollandische see-wurm") does not, I believe, occur in sailing ships, but only in piles or fixed wood. I examined in vain the Linnæan Collection (which has been partly arranged by Mr. Hanley) for Teredines, but could not find any; and Mr. Hanley admits, in his valuable work entitled 'Ipsa Linnæi Conchylia,' that unfortunately no specimen was preserved in it, so as to ascertain which species Linnæus meant by his *Teredo navalis**. Under these circumstances, I think I am justified in restoring the prior and appropriate name of "*marina*," given by Sellius, who used it in a legitimate sense to distinguish this species from those described by Vallisnieri and other authors.

25, Devonshire Place, Portland Place, London,
Sept. 18, 1860.

BIBLIOGRAPHICAL NOTICE.

Flora of Cambridgeshire; *or, a Catalogue of Plants found in the County of Cambridge.* By C. C. Babington, M.A., F.R.S., F.L.S. Van Voorst, 1860.

The plants of Cambridgeshire have occupied the attention of many eminent botanists: Mr. Babington mentions, in his 'Introduction,' no less than sixteen treatises bearing upon his subject. But as botany has advanced, so has the surface of the country greatly changed since the times of Ray and of Relhan. With the progress of agriculture and drainage, many species have become scarce, while some have altogether disappeared; on the other hand, large additions have been made to the list, through the industry of Mr. Babington and his colleagues. Hence the need of a new Flora; and we are glad to think the task has fallen into the able hands of the author of the 'Manual of British Botany.'

Mr. Babington has spared no pains to render his work as complete as possible. The older writers have been scrupulously consulted, and the plants referred to their earliest finders. The whole county

* The following extract from Mr. Hanley's work, which was published in 1855, will confirm the view I have taken as to the necessity of rectifying the nomenclature of this species:—"*Teredo navalis.* It is impossible to determine, from the language of Linnæus, to what particular species of ship-worm the very comprehensive term *navalis* should be restricted. Our author has not indicated the possession of examples; consequently his cabinet affords no assistance in the investigation."

has been surveyed afresh, and the distribution of the plants is separately exhibited in a table, where each species is traced through the eight districts into which the county has been divided for botanical purposes; these districts are further elucidated by some clear topographical remarks and a serviceable map. All descriptions of genera and species are intentionally omitted, as out of place in a local Flora, but room is given for the "kind of places" where the plant grows, its duration, and period of flowering. Then follow the localities, arranged under their proper districts; and here the stations which rest upon ancient authority only, are distinguished by being printed in italics.

Great attention has been paid to the introduced plants; and, in addition to the recognized marks of possibly (†) and certainly (*) introduced, we have for the first time a separate brand (‡) reserved for the intermediate cases of "probably naturalized." Several of the "colonists," or weeds of cultivation, receive the brand of "possibly introduced;" and, while we think this will be acknowledged as a step in the right direction, we could have wished to have seen the mark of exotic origin even more freely bestowed on this class.

Arenaria leptoclados (Guss), *Lotus tenuis* (Sm.), and *Triticum pungens* (Pers.), now appear as species. The last, Godron (Flore de France, iii. p. 606) has already noticed as British; and there is reason for believing that the late Mr. E. Forster considered he had gathered it in Essex. Some alterations also occur among the *Rubi*, about which we are promised more information when Mr. Babington's long-expected Monograph appears. In other respects, the arrangement and names correspond with the fourth edition of the 'Manual.'

In an Appendix occur some valuable critical remarks, amounting to so many distinct essays: upon *Thalictrum flexuosum* and *T. saxatile*; upon two plants confounded under the name of *Papaver dubium*; on *Viola canina*, Linn.; on three forms of *Arenaria serpyllifolia*; on several Brambles; on *Serrafalcus*; and on *Triticum*.

The paper on the Vegetation of the Fens is extremely interesting; so is the list of lost plants, which amount to nearly fifty species; among these, *Sonchus palustris, Senecio palustris, Sturmia Lœselii*, and *Caucalis latifolia* are the most remarkable.

The last few pages are devoted to the enumeration of such plants as find (within Great Britain) their western, northern, or southern limit in the county; and the negative features of the Cambridgeshire flora are illustrated by a comparison with the list given in the sixth chapter of the 'Cybele Britannica' (vol. iv.), from which it appears that out of the 718 species most widely distributed in Britain, 61 are absent from Cambridgeshire.

Enough has been said to show the general plan and arrangement; those who wish for details respecting the species must refer to the work itself. We are sure that Mr. Babington's volume will be highly appreciated, as it deserves to be most carefully studied, especially by those who are engaged in similar labours. Would that we had many other such County Floras!

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

Communication received since the end of the Session (June 21, 1860).

"Natural History of the Purple of the Ancients." By M. Lacaze Duthiers, Professor of Zoology in the Faculty of Sciences of Lille.

The purple dye so esteemed by the ancients has by turns excited the curiosity of naturalists and of historians. The number of memoirs upon the subject is considerable, and they are to be found in almost all tongues. However, in all these works, remarkable in many respects, and which cannot be analysed in this short notice, three deficiencies are to be noted regarding matters of very great moment in the history of this substance.

What are, 1st, the producing organs? 2ndly, the nature? 3rdly, the natural primitive colour of the dye? It is difficult to give any answer to these three questions by means of the facts contained in existing memoirs. It is for the purpose of replying to them that I have undertaken the investigation, whose chief results I have the honour now to lay before the scientific world.

The two genera *Murex* and *Purpura* have yielded the species observed. In very distant localities, as at Mahon in Minorca, *Murex brandaris, M. trunculus,* and *Purpura hæmastoma* have furnished results which observations conducted at Boulogne on *Purpura lapillus,* at Pornic (Vendée) on the same species and *Murex erinaceus,* and at La Rochelle and L'Ile de Rhé, have confirmed. At Marseilles, *Murex brandaris* has yielded precisely similar results; and this concordance of all the observations permits me to offer them with much confidence.

What is the organ which produces the dye?

The analogy which some chemists imagine they have found between the colour of alloxan or of murexide and the purple of the Mollusca, has led them to misconceive the nature of the organ which produces the colouring matter. It is indubitable that uric acid treated with nitric acid gives a beautiful reddish purple colour when the residue is exposed to ammoniacal vapour; and this reaction furnishes a means of detecting the renal organ in mollusks. But from this circumstance no one could be justified in concluding that the purple dye was either the secretion of the kidney or the result of a modification of the urine.

Careful dissection of the purpuriferous mollusca proves that the purple dye is secreted by a very limited portion of the mantle, which can in no way be confounded with the true renal organ, as which the organ of Bojanus is now generally regarded; the position and the structure of the purpuriferous organ are indeed totally different from those of the kidney.

Small in extent, this part occupies very nearly the space bounded by the branchiæ and the rectum, beyond whose extremities it hardly extends anteriorly, while posteriorly it, at most, reaches the organ of Bojanus. It forms neither a sac nor a reservoir, as it has been stated to do; and these phrases, as well as 'purpuriferous vein,' should be rejected, because the organ is simply extended over the surface.

Large elongated cells, placed perpendicularly side by side on the surface of the pallial cavity in the direction of its greatest diameter, compose its tissue. They form about two or three layers, the most exterior of which, covered with vibratile cilia, presents the most developed cells. Below lies a very rich capillary network, which distributes the blood coming from the organ of Bojanus and the neighbouring parts of the mantle to the branchiæ. The cells, when they have reached maturity, fall into the pallial cavity, become endosmotically distended, burst, and mingle their contents with the other mucus which already existed there. This independent and isolated shedding of the histological elements constitutes the secretion of the dye-stuff, which, it is obvious, is not produced by a compound gland, or indeed by any gland in the proper sense of the word, but by a glandular portion of the pallial surface. It is the granular but soluble matter contained in these cells which possesses singular properties, and constitutes the dye-stuff.

The peculiar layer whose position has just been indicated is not special, anatomically speaking, to the two genera *Murex* and *Purpura*; and this is important if, in looking at the matter morphologically, a similar part of the surface of the mantle of most gasteropods appears to produce a substance of like histological character, but different in its properties. In the Aplysiæ and the Snails it is naturally coloured, whilst in *Turbo littoralis* and *Trochus cinereus* it is colourless, and undergoes no modification by the action of the solar rays.

Thus, then, it is incorrect to say, with some chemists, that, anatomically speaking, the purple dye-stuff is yielded by the kidneys of *Mollusca*.

Anatomical investigation has led to the recognition in the genera *Murex* and *Purpura* of a peculiar anal gland placed alongside the rectum, and opening by a terminal pore close to the anus. This gland, which does not seem to have been described hitherto, is in structure and the arborescent disposition of its secretory cæca, a well-defined gland; and by this very circumstance it is impossible to confound it with the purpuriferous organ.

Properties of the Purple Dye-stuff.—A very curious fact, known from all antiquity, since the very existence of the dye depends upon it, is the transformation of the dye-stuff by the action of the solar rays. In the living animal this substance is at first colourless, or more or less yellowish; exposed to the light of the sun, in a moist state it acquires a pure violet hue; in a word, it is photogenic.

The solar action causes the three simple colours to be developed successively, and in the following order, yellow, blue, and red. Between these, the compound colours green and violet which result from their mixture, are obtained with the greatest distinctness if the action is slow. But whilst the yellow disappears by prolonged action, a considerable amount of blue always remains; whence in nature the final red is never pure, so that the dye always inclines more or less to violet.

These properties have been placed beyond doubt by the possibility of making photographs on silk and cambric, which exhibit a remarkable delicacy in detail, combined with great strength of tone.

In a photograph obtained in this way, the different tints through which the dye-stuff passes before becoming violet are more or less to be seen, but the deep violet predominates, and represents the black of ordinary photographs.

The changes in the colour of the purple dye-stuff are accompanied by the production of a very penetrating fœtid odour, similar to that of essence of garlic. The evolution of this odour is as characteristic of the solar action as the changes of colour, a consideration of much importance when we desire to solve the problem to which I now turn—*What was the primitive colour of the purple stuffs of antiquity?*

At first sight this question seems to be easily answered; but when one seeks for a precise signification of the word "purple," one soon becomes embarrassed. If we ask a painter, without telling him why, "Be so good as to paint the shade which you would give to a purple drapery in a historical painting," each painter to whom the request is made will give a different colour. This is the case because no one has an exact idea of the primitive colour, which has been gradually modified, and which has now become the red, almost scarlet, which many painters understand by the word purple. It is only by the interpretation of the phrases of the ancients, and comparing them with direct observations, that one arrives at a solution of the difficulty, which would appear to be of great use to art.

It is enough to remark that the purple colour exists only because it has been developed by the sun, in justification of the conclusion that the ancients must have been acquainted with this peculiarity, as also with that of the development of the characteristic fœtid odour. Pliny, moreover, speaks of both, and hence it cannot be doubted that the purple was produced formerly exactly as at present, unless we admit that the animals and their dye-stuff have changed, which would be an altogether gratuitous hypothesis. The conclusion to which we are driven then is this: the colour was produced formerly as at present, under the same conditions and with the same characters, so that it ought to have been similar to that which we now obtain.

In simple and natural experiments the violet has never failed to appear, while pure red has always been absent. One is led to conclude, therefore, that the natural and unmodified purple of the ancients was violet, as it is now; for whoever discovered it must have made the experiment, as it has been so often repeated, on the sea-shore, by breaking a purpuriferous mollusk, and crushing its mantle on moist linen which is exposed to the sun.

Pliny cites Cornelius Nepos, who states positively that at first the violet purple was esteemed; and the passages of Plato and of Aristotle, which relate to the colour, lead to the same conclusion.

However, it cannot be doubted that though the colour of purple stuffs was primitively violet, the requirements of taste and of fashion led to the variation of its shades. Thus some stuffs were dyed twice, to give them a richer and more vivid colour—the so-called 'purpurea dibapha.' The mixture of species also contributed to modify the hues.

Murex trunculus gives an almost blue shade. The fishermen of Port Mahon told me that it always yielded that colour, and especially that it would give a fixed and permanent colour. On the contrary, *Purpura hæmastoma* (which they call 'cor de fel') was known to them as staining their linen very permanently and ineffaceably.

It ought also to be recollected that when mineral colours replaced the animal matter of mollusks, the hue varied; and though the term 'purple' might be retained, it was easy to pass by degrees to the deep red which rises in the mind when we recollect the purple worn by cardinals.

Perhaps also the manipulations to which the molluscan dye-stuff may have been subjected by the dyers, of the nature of which we know nothing, approximated the purple to the red, which Pliny compares to that of coagulated blood.

But it remains none the less demonstrated, both by the passages from ancient authors and by experiment, that the *primitive and natural colour of the purple was formerly, as now, violet.*

Hence it would appear to be requisite for a painter to consider the epoch when the personages who are represented clothed in purple drapery lived, for the hue varied with the age. The properties of the purple dye-stuff also render intelligible one ground of the esteem in which the colour was held; for, developed by the influence of light, it could not fade, like the red of cochineal for example, but must always have remained beautiful, even in the luminous and dazzling atmosphere of Italy and the East.

It would be difficult, with the scanty materials we possess, to determine exactly the species employed by the ancients. Without

Fig. 1.

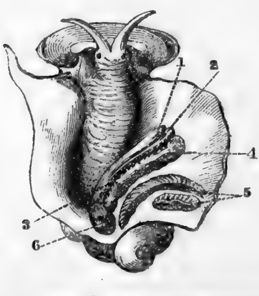


Fig. 2.

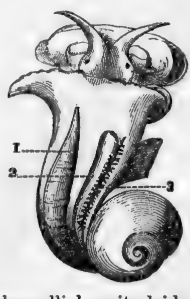


Fig. 1. Animal with *Purpura lapillus*, with the pallial cavity laid open.

1. Genital orifice. 3. Anal gland. 5. Branchiæ.
2. Anus. 4. Purpurogenic organ. 6. Organ of Bojanus.

Fig. 2. The animal simply removed from its shell.

1. Branchiæ. 2. Purpurogenic organ. 3. Anal gland.

doubt Pliny has indicated the two genera *Murex* and *Purpura* of the moderns by the names *Purpura* and *Buccinum*. It is probable that *Murex trunculus* and *brandaris*, and *Purpura hæmastoma*, were employed by the dyers; but it would be difficult to identify the different species indicated by Pliny. Zoological investigations, accompanied by experiments which are all simply and easily made, would perhaps lead to results more definite than can be obtained by the interpretation of passages, if one could carry them out on the shores of countries formerly famous for their purple—those of Tyre for example.

GEOLOGICAL SOCIETY.

June 13, 1860.—L. Horner, Esq., President, in the Chair.

"On the Ossiferous Caves of the Peninsula of Gower, in Glamorganshire, South Wales." By H. Falconer, M.D., F.R.S., F.G.S. With an Appendix, on a Raised Beach in Mewslade Bay, and on the occurrence of the Boulder-clay on Cefn-y-bryn; by J. Prestwich, Esq., F.R.S., Treas.G.S.

The object of this communication was to give a summary of researches made during the last three years by the author and Lieut.-Col. E. R. Wood, F.G.S., the latter of whom has carefully explored at his own charge, since 1848, some of the caves previously known, as well as several discovered by himself. The known bone-caves of Gower (of which Paviland, Spritsail Tor, and Bacon Hole have already supplied Dr. Buckland and others to some extent with materials for the history of the Cave-period) are in the Carboniferous Limestone; and, with the exception of that of Spritsail Tor, which is on the west coast of the peninsula, they all occur between the Mumbles and the Worm's Head. The most important are "Bacon Hole," "Minchin Hole," "Bosco's Den," "Bowen's Parlour," "Crow Hole," "Raven's Cliff Cavern," and lastly the well-known "Paviland Cave." Bone-caves formerly existed at the Mumbles, in Caswell Bay, and in Oxwich Bay; but the sea has destroyed them. One cavern named "Ram Tor" between Caswell Bay and the Mumbles, presumed to be ossiferous, remains unexplored.

Before proceeding to describe the bone-caves and their contents, the author briefly noticed a raised beach and talus of breccia, which Mr. Prestwich had lately traced for a mile along Mewslade Bay, westward of Paviland; and he pointed out their important relationship to the marine sands and overlying limestone-breccia found in several of the Gower Caves. Dr. Falconer also referred to Mr. Prestwich's recent discovery of some patches of Boulder-clay on the highland of Gower, and in Rhos Sili Bay.

"Bacon Hole" was first treated of. It has been worked out by Colonel Wood, and described by Mr. Starling Benson. On the limestone-floor of the cave are:—(1) a few inches of marine sand, abounding with *Litorina rudis*, *L. litoralis*, and *Clausilia nigricans*, with bones of an *Arvicola* and Birds; (2) a thin layer of stalagmite; (3) two feet or less of blackish sand, containing a mass of bones of *Elephas antiquus*, with remains of *Meles taxus* and *Putorius* (*vul-*

garis?); (4) one to two feet of ochreous cave-earth, limestone-breccia, and sandy layers, with remains of *Elephas antiquus, Rhinoceros hemitœchus, Hyæna, Canis lupus, Ursus spelæus, Bos,* and *Cervus*; (5) irregular stalagmite, partly enveloping a huge tusk of an Elephant imbedded below it; (6) limestone-breccia and stalagmite, from 1 to 2 feet thick, with bones of *Ursus* and *Bos*; (7) irregular bed of stalagmite, 1 foot or more, with *Ursus*; (8) dark-coloured superficial earth, kept soppy by abundant drip, with bones of *Bos, Cervus, Canis vulpes,* horns of Reindeer and Roebuck, together with shells of *Patella, Mytilus, Purpura, Litorina* (probably brought into the cavern as food by birds), and also pieces of ancient British pottery. The marine sand at the bottom of "Bacon Hole" was analogous to that on the rocky floor of the San Ciro Cave, near Palermo; but contained fewer species of Mollusca. The uppermost layer of stalagmite is about 30 feet above high water. The Elephant-remains belonged to at least three individuals, one of which was adult, and one young with milk-dentition.

"Minchin Hole" is the grandest and most spacious of all the Gower Caves, being 170 feet long, by 70 feet where widest, and 35 feet high at the entrance. Here the section gave:—(1) Loose limestone-breccia, 3 feet; (2) Yellow cave-earth, 9 inches; (3) Sand, 1 foot; (4) Blackish sandy loam containing abundant remains of *Rhinoceros, Elephas,* and *Bos,* 2½ feet; (5) Greyish-yellow marine sand, varying in thickness from 1 to 4 feet, and resting on the rocky floor. Some of the lower jaws of *Rhinoceros* from this deposit exhibit *Litorinæ* and comminuted shells imbedded in the encrusting matrix: and the black sand yielded *Helix hispida* similarly attached. In the interior, the cave-earth was thicker, and the black sandy loam more unctuous. The mammalian remains were closely analogous with those from Bacon Hole; but the Elephant-remains (*E. antiquus*) were fewer, and those of *Rhinoceros hemitœchus* were more numerous and better preserved, including two skulls. No remains of *Elephas primigenius* or of *Rhinoceros tichorhinus* were met with in Bacon Hole or Minchin Hole.

"Bosco's Den" is a cavernous fissure, of great interest, between "Bacon Hole" and "Minchin Hole." It is about 70 feet high, and has been worked out by Col. Wood, who, having succeeded in reaching a hole called (by the quarrymen) "Bacon's Eye," found it to be an angular opening (2½ feet in diameter) at the top of one of the great vertical fissures in the limestone, and leading into a fine cavern. Beneath it the fissure was filled up with a mass of angular fragments of limestone (with bones, teeth, and land shells) impacted in ochreous loam, about 20 feet in height, resting on a solid platform of breccia, beneath which the fissure had to a great extent been washed out by the sea. On enlarging the aperture, by undermining the projecting mass of loam and breccia, a cavity was found extending 76 feet backwards, with a width of from 7 to 16 feet, and a general height of about 15 feet. A line of fissure runs along the angle of the roof, and towards the outer part of the cavern the crack widens into an irregular flue, which had evidently communicated with the surface:

here the cavern rises to a height of 40 feet. When first opened, the eastern wall only of the cavern was found to be coated with stalagmite. The floor was tolerably smooth, and shelved down gradually from the mouth to the extremity, the deposits being thicker outwards. The floor having been excavated down to the hard breccia, there were observed:—(1) at the top, a bed of sandy peat or turf, formed chiefly of bits of sticks and comminuted vegetable matter, about 1 foot thick, except under the flue, where it formed a low conical heap. In or on this peaty covering were bones of Ox and Wolf, and bones and broken shed antlers of Deer, of species or varieties allied to the Reindeer (*Cervus Guettardi* and *Cerv. priscus*). (2) Stalagmite, regular, but usually less than a foot thick. At one spot it rose into a boss 2 ft. 3 in. high, which was found in a shattered condition, the fragments being loose, but still in place. This must indicate—1st, the operation of some shock since the formation of the stalagmite, and even since the peat began to be formed; and 2ndly, the absence of drip in the cave since the shock took place. (3) Sandy loam, 1 ft. 4 in., with fragments of rock and without bones; (4) sand, 2 ft. 6 in.; (5) a bed of loose stony breccia, 4 feet, without bones; (6) ochreous loam, or the usual cave-earth, 6 to 7 feet thick, resting on the solid cemented breccia which forms a floor or diaphragm between the upper and lower chambers of the fissure. *Ursus spelæus, Canis lupus, C. vulpes, Bos, Cervus,* and *Arvicola* occur in the loam, the latter in abundance. The most remarkable circumstance about these remains was the great excess of Deers' antlers above the others. Upwards of one thousand antlers, mostly shed and of young animals belonging *chiefly* to *Cervus Guettardi,* were collected. The lower chamber was penetrated by Col. Wood, Dr. Falconer, and a friend last September, and found to have been washed out by the sea to a depth inwards of 31 feet; and at its extremity they met with a compact mass of marine sand and gravel, about 9 feet thick. The solid breccia forming the roof of the lower, and the base of the upper cave, increases in thickness from 6 feet at the outside to a greater depth inwards. Its materials correspond with the bed of angular *débris* observed by Mr. Prestwich on the raised beach of Mewslade Bay.

"Bowen's Parlour," or "Devil's Hole," is also a cavernous fissure in the limestone cliff, situated between Bosco's Den and Crow Hole. It has been washed out by the sea,—portions only of its cave-deposits remaining, especially a diaphragm of cemented breccia, which divides the fissure into an upper and lower story—the former about 20 feet high at the mouth, the latter 14. Thin tabular aggregations of sand adhere to the lower surface of the partition, showing that it was deposited on a bed of sand. The same phenomena are repeated in "Crow Hole" with modifications, the cave-deposits being still *in situ*: here remains of *Ursus, Meles, Rhinoceros,* and some other forms have been found by Col. Wood.

"Raven's Cliff" presents a cavernous fissure broad and high externally, contracted within. Here a thin crust of stalagmite formed a floor upon sand 9 feet thick, which filled the fissure close up to the roof, leaving only an empty angular chamber about a foot high above the stalagmite. Upon the latter, remains of *Mustela foina*, *Canis vulpes*, and some Fish-bones and Bird-bones were found. In the sand large coprolites of Carnivores, some fine remains of *Felis spelæa*, bones of *Rhinoceros*, and the vertebræ of a Fish were discovered. Below the sand, as usual in the Gower Caves, there was a sandy breccia cemented by stalagmite, about a foot thick. Upon it a large block of limestone, smoothed and polished, probably by the rubbing of passing cave-animals, was discovered; and patches of polished surface were seen on the walls of the cave. Remains of *Elephas*, *Rhinoceros*, *Bos*, and *Cervus* were met with above the breccia. Below the breccia was a bed of dark-grey gritty sand, indurated by calcareous infiltration, and attaining a maximum thickness of about 8 feet. In this sand, and close upon the rock-floor, teeth of *Hippopotamus major*, young and old, and remains of *Ursus*, *Cervus*, and *Arvicola*, were met with. There was evidence, on the cliff beyond the aperture, of the cave and its contents having formerly been continued further seawards.

The author pointed out that in all these caves the bottom appears to have been first filled with sea-sand or shingle, with which were occasionally intermingled the bones of pachyderms, ruminants, &c., then living on the emerged land of Gower; that when this deposit was elevated above high-water mark, stalagmite and angular *débris* of limestone rock formed a floor, on which subsequently cave-earth or other common alluvial materials, with bones and antlers, often in profusion, were accumulated through the fissure above, during a long lapse of time after the rise had been accomplished. At last, by a converse action, of comparatively modern date, the level of the caves was depressed. The raised beach at Mewslade Bay, which appears, according to the evidence of Mr. Prestwich, to be of later date than the Boulder-clay, has without doubt partaken of changes of level similar to what the caves and their contents have undergone, although, the marine deposits in the caves not being at a uniform level either in relation to each other or to the raised beach, it is probable that there have been locally unequal depressions of level in comparatively modern times. The author thinks that the sea has effected but a comparatively slight inroad on the cave-deposits and raised beach; and hence he infers that they belong to a relatively modern epoch—seeing also that they are probably of later date than the Boulder-clay period, and rest on marine sands containing existing species of shells.

Paviland Cave was next referred to; but the author restricted his remarks to the remains of *Elephas primigenius* and human bones that were found in it, and argues that the latter (*i. e.* the skeleton of the "Red Lady") are of more recent date than the former.

In the cave at Spritsail Tor (cursorily examined by Sir H. De la Beche, and thoroughly explored by Colonel Wood), under a stalagmitic bone-breccia, the irregular fissure of the rocky floor was impacted with ochreous cave-earth full of bones and teeth of *Elephas antiquus*, *E. primigenius*, *Rhinoceros tichorhinus*, *Equus*, *Sus*, *Bos*, *Cervus, Lepus, Arvicola, Mus, Ursus spelæus, U. priscus*(?), *Felis spelæa, Hyæna spelæa, Canis lupus, C. vulpes, Meles taxus*, and *Mustela*. Coprolites of *Hyæna*, gnawed bones of *Bos, Equus*, and *Cervus*, and a great abundance of the detached molars of Horse, gave the cave the undoubted character of having been a Hyæna's den. In the superficial sand on the stalagmite, the antlers of a Reindeer and some human bones were found.

General remarks on the distribution of the Mammalian remains in the different caverns were offered, and the special anomalies pointed out; and, after a comparative review of the fauna of the Gower bone-caves in relation to that of other cave-districts of England in particular, and of Europe in general, the author arrived at the following conclusions as being consistent with the existing state of our knowledge :—

1. That the Gower Caves have probably been filled up with their mammalian remains since the deposition of the Boulder-clay.

2. That there are no mammalian remains found elsewhere in the ossiferous caves in England and Wales referable to a fauna of a more ancient geological date.

3. That *Elephas* (*Loxodon*) *meridionalis* and *Rhinoceros Etruscus*, which occur in, and are characteristic of, the "Submarine forest Bed" that immediately underlies the Boulder-clay on the Norfolk coast, have nowhere been met with in the British caverns.

4. That *Elephas antiquus* with *Rhinoceros hemitœchus*, and *E. primigenius* with *Rh. tichorhinus*, though respectively characterizing the earlier and later portions of one period, were probably contemporary animals; and that they certainly were companions of the Cave-Bears, Cave-Lions, Cave-Hyænas, &c., and of some at least of the existing mammalia.

ZOOLOGICAL SOCIETY.

June 12, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Descriptions of twenty-two New Species of Humming-Birds. By John Gould, F.R.S., etc.

As my work on the *Trochilidæ* is now fast drawing to a close, I have examined with care and minute detail my entire collection of this great and important family of birds, and I find therein more than twenty species, which, I believe, have not yet received specific appellations. Many of these I have had by me for years, while others have been more recently acquired. Of the specific value of those described in the following pages I am perfectly satisfied; but in case any doubt should be entertained on the subject, my collection is, and will be, at all times accessible for their elucidation.

Grypus Spixi, Gould.

Crown of the head bronzy-brown; upper surface and all the tail-feathers very rich reddish-bronze; wings reddish purple-brown; line above the eye buff; ear-coverts dark-brown; throat, chest and under surface deep reddish-buff; under tail-coverts bronzy, each slightly tipped with buffy-white; upper mandible black; under mandible yellow, with a black tip; feet yellow.

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

Hab. Supposed to be Brazil.

Remark.—This bird is considerably smaller than *G. nævius*, and has a less cuneate tail. It is possible that this may be one of the sexes of *Glaucis Dohrni*; many of its colours would induce such a belief; and if such should prove to be the case, that bird must be removed from the genus *Glaucis* to that of *Grypus*. I have named this bird in honour of the celebrated traveller Spix, in whose work there occurs a figure of a bird (*G. ruficollis*) which somewhat resembles my specimen: not so, however, the accompanying description, which appears to be that of the species so frequently sent from Rio de Janeiro, and which is generally known as *Grypus nævius*.

Glaucis melanura, Gould.

Centre of the throat, chest, and under surface buff; a streak of dark brown passes downwards from the base of the lower mandible, between which and the ear-coverts is a stripe of buff; there is also a line of buff behind the eye; crown of the head brown; back of the neck, upper surface, and two middle tail-feathers golden-green; upper tail-coverts narrowly edged with grey; basal portion of the inner webs and the shafts of the four lateral tail-feathers rich reddish-buff approaching to chestnut, the remainder of these feathers being black, tipped with white; bill black, except the base of the under mandible, which is yellow.

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

Remark.—This species is much smaller than the *G. hirsuta* of Trinidad and the eastern coast of America. It has also a much greater amount of black colour in its tail; this organ, in fact, when closed and viewed from beneath, appears to be entirely black, the under coverts concealing the buff colouring at its base. I possess two specimens of this bird, one of which, a very fine one, was received from the upper Rio Negro, the other from the Napo.

Phaëthornis zonura, Gould.

Crown of the head brown; back of the neck, back, and shoulders bronzy-green; rump and upper tail-coverts rich reddish-buff; all the under surface buff, palest on the throat; three outer tail-feathers on each side black at the base, with rich buffy tips; the fourth feather the same except at the tip, where the outer half is buff and the inner half white; the two central prolonged feathers black at the base, largely tipped with white; bill black, except the basal half of the lower mandible, which is either yellow or flesh-colour; feet yellow.

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

Hab. Peru, where it was procured by M. Warszewicz.

Remark.—This is a fine and very distinct species; it is perhaps most nearly allied to *P. griseogularis*; it is, however, a much larger bird, and has its tail much more strongly marked. In fact, the tail must show very conspicuously when outspread, from the strong contrast which the black basal portion offers to the buff tips and the rich rufous colouring of the rump and upper tail-coverts. It belongs to that section of the genus *Phaëthornis* to which Prince Bonaparte has given the subgeneric name of *Pygmornis*.

AUGASMA SMARAGDINEUM, Gould.

Crown of the head and throat glittering greenish-blue, imperceptibly passing into the glittering green at the breast; back of the neck and upper surface golden-green; upper tail-coverts grass-green; under tail-coverts green inclining to purple on some of the feathers; thighs brown; tail bluish-black, the two outer feathers on each side slightly tipped with white; bill black, with the exception of the basal half of the under mandible, which is flesh-colour.

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

Hab. Brazil.

Remark.—This bird is about the size of *Thalurania furcata*; it is therefore a rather large species; it is also an elegantly formed bird. Those who are acquainted with the *T. chlorocephala* of M. Bourcier will find in this a very near ally; I have not the least doubt, however, of its being quite distinct. The only examples I have seen are one in my own collection, and another in that of M. Verreaux of Paris. In M. Verreaux's specimen the white tippings of the outer tail-feathers are nearly obsolete, while in mine they are conspicuous; in my specimen, also, the two middle tail-feathers are marked with green on their upper surface, while in M. Verreaux's these feathers are uniform in colour throughout. My bird was kindly sent to me by T. Reeves, Esq., of Rio de Janeiro.

EUCEPHALA CÆRULEO-LAVATA, Gould.

Crown of the head greenish-blue, not very brilliant, but having a few conspicuous small bright-blue feathers intermingled; throat and chest bright greenish-blue, passing into purer green on the flanks; back of the neck, and back, deep grass-green; wings purplish brown; upper tail-coverts bronzy-orange; under tail-coverts bronzy purplish brown; two middle tail-feathers deep purplish bronze; the next on each side is washed with bronze on its outer margin; the remaining feathers purplish-black; thighs greyish-white; the bill appears to have been reddish flesh-colour at the base of both mandibles (this colour also pervades nearly the whole of the under mandible); the remainder of the bill black.

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

Hab. St. Paulo in Southern Brazil.

Remark.—I am indebted to T. Reeves, Esq., of Rio de Janeiro, for a fine specimen of this new bird, which differs so widely from every other known species, that I am unable to compare it with any one of them. It is a stout and rather large bird, with a well-proportioned bill and tail, the latter of which is considerably forked.

I am not quite satisfied that a place in the genus *Eucephala* is the proper position for this bird among the *Trochilidæ*, and I feel that I might, without overstepping the bounds of propriety, have constituted it the type of a new genus.

EUCEPHALA HYPOCYANEA, Gould.

Crown of the head, back of the neck, back and flanks somewhat dull-green; throat and chest brilliant blue, passing into glittering green on the centre of the abdomen; wings purplish-brown; upper tail-coverts reddish-bronze; under tail-coverts brownish-black, with bronzy tips; tail steel-black; thighs brown; upper mandible black; basal two-thirds of the under mandible flesh-colour, the apical third black.

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

Hab. Said to be Bahia in Brazil.

Remark.—This is a rather small, but distinctly marked species, unallied to any other bird. Lesson's Plate 49 of his 'Histoire Naturelle des Oiseaux-mouches,' appears to have been taken from a bird of this kind; but the term *bicolor* cannot for a moment be entertained.

ERYTHRONOTA? ELEGANS, Gould.

Crown and all the under surface of the body glittering light-green; back of the neck and back golden- or orange-green; upper tail-coverts purplish-red or puce-colour; tail long, forked, and of a purplish violet-hue with green reflexions on the tips of the two centre feathers; wings purplish brown; tarsi white; under tail-coverts grey with bronzy-purple centres; upper mandible flesh-colour at the base, and black for the remainder of its length; under mandible flesh-colour, except at the tip, which is black.

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

Hab. Unknown.

Remark.—It is easier to assign a specific name to a bird than to determine to which generic form it is referable; and if there be any bird which is a puzzle to the ornithologist, this is one. It is a very elegant species, and quite distinct from every other known Humming-Bird: in its glittering light-green crown, throat, and chest it looks like a *Chlorostilbon*; but the form of its tail and some other characters ally it to the *Erythronotæ*, with which I have provisionally placed it.

THAUMATIAS VIRIDICEPS, Gould.

Crown of the head, nape, and sides of the neck glittering light green; back and shoulders bronzy-green; throat and abdomen pure white; flanks white, faintly spotted with yellowish-green; under tail-coverts white; the rather short and narrow tail-feathers purplish-grey, with an obscure band of purplish-brown near the tip of the three outer ones on each side; upper mandible black; under mandible yellowish, except at the extreme tip, which is black.

Total length 4 inches; bill $\frac{9}{16}$; wing $2\frac{1}{8}$; tail $1\frac{3}{8}$.

Hab. Ecuador.

Remark.—Of this somewhat remarkable species I have two specimens, which appear to be male and female. It is a robust bird, being almost as stout in its bill, head, and body as the members of the genus *Cyanomyia*, while its tail is short and the feathers narrow, as in *Thaumatias leucogaster* and *T. chionopectus*.

THAUMATIAS CÆRULEICEPS, Gould.

Crown of the head and back of the neck deep shining greenish-blue; back and shoulders green, passing into bronzy-green on the rump and upper tail-coverts; tail nearly uniform bronze, with a very faint indication of a zone of brown across the outer feathers near the tip; wings purplish brown; sides of the neck glittering bluish-green, the blue tint predominating on the ear and immediately under the eye; centre of the throat and chest broken glittering green and white; flanks bronzy-green; under tail-coverts grey, with brown centres; upper mandible dark brown; under mandible appears to have been yellow, except at the tip, which is dark brown.

Total length $3\frac{1}{2}$ inches; bill $\frac{15}{16}$; wing $2\frac{1}{8}$; tail $\frac{1}{2}$.

Hab. Bogota.

Remark.—This species, which is somewhat allied to the *T. Milleri*, differs from that, as well as from every other known member of its genus, by the blue colouring of its crown.

THAUMATIAS NITIDIFRONS, Gould.

Crown of the head, face, chest, and breast glittering green; abdomen and flanks golden green; back, shoulders, and rump bronzy-green; tail pale bronzy greyish-green, with a zone of purplish-brown crossing the four lateral feathers on each side near their tips; under tail-coverts grey, with a patch of bronzy-green in the centre of each; tarsi greyish-brown; upper mandible black; under mandible yellow, black at the tip.

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

Hab. Unknown.

Remark.—Nearly allied to the *T. brevirostris* and *T. Milleri*, but differing from both in the glittering green of the face and crown, and in the centre of the breast being covered with the same shining colour. The specimen described was presented to me by G. N. Lawrence, Esq., when I visited New York in 1858.

CHLOROSTILBON MELANORHYNCHUS, Gould.

Bill black; crown of the head and the entire under surface glittering golden-green, the golden hue being most conspicuous on the crown; the back of the neck and upper surface are also golden-green, but less brilliant; wings purplish-brown; the short and slightly forked tail is greenish or steel-blue; thighs brown; anal region, and a small tuft springing from each side of the body, white.

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

Hab. The neighbourhood of Quito in Ecuador.

Remark.—Differs from *C. chrysogaster* in its black bill, its shorter and less forked tail, and in its being a stouter or more robust bird.

CHLOROSTILBON ACUTICAUDUS, Gould.

Crown and all the under surface glittering green, the green assuming a golden hue on the crown; back, all the upper surface, and tail rich golden-green; wings purplish-brown; bill black.

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

Hab. Antioqua in Columbia.

Remark.—This very distinct species is allied both to *Chlorostilbon Portmanni* and *C. Aliciæ*; but it differs from the former in the greater length of its bill, and from the latter in the greater length of its tail-feathers. In the present species, the outer tail-feather on each side is prolonged nearly an eighth of an inch beyond the next, which again is a little prolonged beyond the centre feathers. When the tail is closed, the two outer feathers join at the tip, and form a sharp point; in the two species with which I have compared it, the tail is more truncate.

CHLOROSTILBON OSBERTI, Gould.

Crown of the head glittering golden-green; throat and all the under surface glittering grass-green; wing purplish-black; tail black, the six centre feathers terminated with a mark of brown, which is more conspicuous in some specimens than in others; in some also the two central feathers are tipped with green; bill coral-red at the base, black at the tip.

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

Hab. Guatemala.

Remark.—This species, which I have named after Mr. Osbert Salvin, and which is an inhabitant of the neighbourhood of Dueñas and some other parts of Guatemala, has been a great puzzle to me, as it must be to every Trochilidist who studies the little green Humming-Birds to which the generic name of *Chlorostilbon* has been applied. It is, in fact, a diminutive *C. Caniveti*, but too diminutive to be regarded in any other light than in that of a species.

In naming this bird after Mr. Osbert Salvin, I feel that a finer species might have been more appropriately dedicated to him; for there is no person of his youthful age who has exerted himself so praiseworthily or so successfully in collecting facts and specimens of ornithology. Mr. Salvin has already traversed a great part of the country of Central America, and has also paid a hurried visit to North Africa, and collected in both countries an immense mass of materials in every department of zoology, which he has liberally placed at the disposal of those who have devoted themselves to the several departments to which they pertain.

CALOTHORAX DECORATUS, Gould.

Male.—Crown of the head, all the upper surface and flanks deep grass-green; throat and sides of the neck very lovely shining lilac; chest grey; wings and tail purplish-brown; bill black.

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

Hab. Supposed to be Antioqua in Columbia.

Remark.—This species might easily be mistaken for *Calothorax Heliodori*; but although closely allied to that species, it differs from it in several particulars—in being much larger, in having the frill in front of the throat not so prolonged at the sides (in which respect it more nearly resembles *C. Mulsanti*), the two centre tail-feathers finer or more spiny, and the bill much longer. These comparisons have been made with fine specimens in my collection of all three species.

Amazilia alticola, Gould.

Crown of the head and nape of the neck dark brown, with very slight reflexions of golden-green; back of the neck, back, and rump golden- or orange-green; upper part of the throat, cheeks, and sides of the neck light golden-green; lower part of the throat, chest, centre of the abdomen, thighs, and the thickly clothed tarsi pure white; flanks rich bright buff; under tail-coverts white, washed with buff; tail rich deep reddish-buff, the two centre feathers washed with bronzy-grey, and the four outer ones, on each side, washed on their outer edges with bronzy-green; wings purplish-brown; bill black at the tip, the remainder white or flesh-colour.

Total length 4 inches; bill $\frac{15}{16}$; wing $2\frac{5}{8}$; tail $1\frac{5}{8}$.

Hab. Said to be the Puna district of Peru.

Remark.—In its general style of colouring, this bird is very similar to *Amazilia leucophæa,* but, compared with that species, is a giant in size; it has also less of the glittering golden-green on the cheeks and sides of the neck.

I am indebted to M. Bourcier for permission to describe this species.

Phlogophilus hemileucurus, Gould.

Crown of the head brownish-green; back of the neck, upper surface, two middle tail-feathers, and the flanks grass-green; sides of the face and ear-coverts greenish-brown; centre of the throat, chest, middle of the abdomen, and under tail-coverts white; tail rounded; the four lateral feathers on each side white with an oblique band of black or blackish-purple occupying the centre of each, this band of black extending along the margin of the two outer feathers to the tip, so that the inner web only is white; not so on the next, which is terminated with a large spot or tip of white; upper mandible black; under mandible flesh-colour; feet yellow.

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

Hab. The borders of the Rio Napo.

Remark.—I have no doubt that the bird from which the above description was taken is immature; when the adult is discovered, it will probably be found to be a very remarkable species; in fact, the specimen described exhibits characters differing from those of every other known Humming-bird, among which its singularly-marked, rounded tail is especially noticeable.

Calliphlox? iridescens, Gould.

The whole of the body, including the upper and under tail-coverts, iridescent, pale green and light coppery-red, most brilliant on the throat; the deeply forked tail steely dark-brown, each feather tipped with a more bronzy or purplish hue, which is seen only in certain lights; upper mandible and the tip of the lower one black, the remainder of the latter apparently reddish flesh-colour.

Total length $3\frac{1}{4}$ inches; bill $\frac{3}{4}$; wing $1\frac{9}{16}$; tail $1\frac{1}{4}$.

Hab. Rio de Janeiro.

Remark.—If, as I believe, I am right in referring this little bird to the genus *Calliphlox*, it is one of the most remarkable Humming-birds that it has fallen to my lot to describe. In its size and form it is very similar to *C. amethystina*, but in colouring it is like a *Chlorostilbon*. The only specimen I have seen was sent to me by T. Reeves, Esq., of Rio de Janeiro.

APHANTOCHROA ? GULARIS, Gould.

Crown shining grass-green ; back of the neck, shoulders, back, upper tail-coverts, and two centre tail-feathers deep grass-green ; under surface of the body grass-green, with the exception of a glittering patch of lilac on the throat, and the centre of the abdomen, the thighs, and under tail-coverts, which are white ; primaries purplish-brown ; four outer tail-feathers, on each side, purplish-green ; bill slightly curved and black, with the exception of the base of the under mandible, which appears to have been flesh-colour.

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

Hab. My specimens were procured on the banks of the Rio Napo.

Remark.—In the general style of its colouring, and in the shortness and similar colouring of its tail, this bird approaches more nearly to *Aphantochroa cirrhochloris* than to any other species ; but it differs from that bird in having a much longer bill, and a bright metallic deep-lilac patch on the throat, similar to that observed in *Phaiolaima rubinoïdes* ; and in having white under tail-coverts. In size it is somewhat smaller.

ERIOCNEMIS SQUAMATA, Gould.

Crown of the head, back of the neck, upper surface, sides of the neck, and flanks coppery-bronze, inclining to green on the back and to rust-colour on the upper tail-coverts ; throat, chest, and centre of the abdomen hoary grey with green and coppery reflexions ; in certain lights the feathers of the throat and chest appear to be edged with grey, giving those parts a scaled appearance—hence the specific name ; under tail-coverts smoky-grey ; anterior portion of the feathers clothing the tarsi white, the posterior portion buff; tail dull steel-black ; wings purplish-brown ; bill black.

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

Hab. Ecuador.

Remark.—This bird is nearly allied to *Eriocnemis lugens* ; but it differs from that bird in its considerably larger size, and in the parti-colouring of the tarsi-feathers, in which respect it assimilates to *E. Aureliæ*. The three species, indeed, viz. *E. lugens, Aureliæ,* and *squamata,* constitute a minute section of the genus, and all, I believe, inhabit very high mountains.

SCHISTES PERSONATUS, Gould.

Forehead, face, and throat glittering brilliant green, in the form of a mask, posterior to which is a patch of black, below this spring two lengthened tufts of violet-blue feathers, below these tufts a crescentic mark of white ; crown of the head, back of the neck, back and shoulders golden-green ; tail green, each feather crossed near its apex by a broad band of steel- or bluish-black; abdomen green; wings purplish-brown; bill black.

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

Hab. Ecuador.

Remark.—This species is nearly allied to *Schistes Geoffroyi*; but it is a much finer bird, the forehead and throat being covered by a mask of glittering green; its bill is also considerably longer.

THALURANIA TSCHUDII, Gould.

Crown of the head and all the upper surface golden-green, inclining to bronzy-green on the tail-coverts; throat beautiful green; abdomen prussian-blue; under tail-coverts steel-black, many of the feathers slightly fringed with white; thighs, tarsi, and anal region white; tail steel-black.

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

Hab. The neighbourhood of the River Ucayali, and the countries of Ecuador and Peru.

Remark.—The two species to which this bird is most nearly allied are the *T. furcata* and *T. nigrofasciata*; but it differs from the former in having a more robust body and broader tail-feathers, and in having the abdomen prussian-blue instead of ultramarine-blue; and from the latter in the form of the green mark on the throat, which in this bird is truncate, while in *T. nigrofasciata* it descends nearly to a point towards the centre of the abdomen. This is the species mentioned by Tschudi in his 'Fauna Peruana,' under the name of *Trochilus furcatus*,—a fact of which I am certain, as I have received a specimen from his collection direct from Neuchatel.

OREOPYRA LEUCASPIS, Gould.

Crown of the head exceedingly beautiful glittering grass-green; back of the neck, and all the upper surface, deep grass-green, with bronzy reflexions; throat pure white, contrasting conspicuously with the glittering grass-green of the breast; flanks and abdomen greyish-green, with bronzy reflexions; wings purplish-brown; tail forked and steel-black; thighs thickly clothed with hoary or greyish-brown feathers; behind the eye, and extending some distance down the sides of the neck, is a stripe of pure white; bill straight, and both mandibles of a uniform black.

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

Hab. The Volcano of Chiriqui in Costa Rica, where it was discovered by M. Warszewicz at an elevation of from 9000 to 10,000 feet.

Remark.—One solitary individual, and that badly shot about the tail, is the only example I have ever seen of this remarkable and beautiful bird—a bird which differs so much from every other member of the *Trochilidæ*, that I have been necessitated to make it the type of a new genus.

MISCELLANEOUS.

Description of the Larva of a Brachiopod. By F. Müller.

Dr. F. Müller has sent from Brazil the description of a larva belonging undoubtedly to a Brachiopod, which is the more interesting as the Brachiopoda are the only Mollusca regarding the development of which we have no information.

The larva in question is a small, perfectly orbicular bivalve Mollusk. The two valves are similar, but unequal in size, the dorsal valve being the largest. At the place of the hinge a small oval plate is placed transversely between the two valves of the shell. The mantle is gaping all round. Five pairs of very stiff setæ, of which one is much stronger than the others and curved backwards, project at the periphery. They originate in the mantle of the ventral half; at least, this is the case with four of them. A series of finer setæ spring from the circumference of the mantle of the dorsal valve, and curve down upon the outside of the ventral valve. The animal, as well as the shell, would be divided into two perfectly symmetrical halves by a plane drawn vertically through the middle of the hinge. The body, which is furnished with an alimentary canal, two auditory capsules, and two eyes, fills the posterior half of the space between the valves. The anterior half is occupied by four pairs of cylindrical arms, between which a rounded knob is situated. Behind this knob the mouth is perceptible. These four pairs of arms are supported upon a common peduncle, at the extremity of which, therefore, the mouth is placed. The arms are covered with a very well developed ciliary coat, by the agency of which the little animal swims. The reproductive and circulatory organs are wanting.

During natation, the mouth is always directed forwards, which is in favour of the generally received opinion as to the anterior and posterior regions in the Brachiopoda. It is, in fact, now evident that the Brachiopods are *depressed* animals, have an anterior or ventral and a posterior or dorsal valve. MM. Agassiz and Vogt are therefore wrong in regarding them as *compressed* animals, like the Lamellibranchiate Mollusks—that is to say, as animals having a right and a left valve.

The larva, moreover, can not only swim, but also creep. This latter mode of progression is effected by a sort of rotation of the ventral valve alternately to the right and left. In this movement the animal pushes by supporting itself principally upon the strongest of the bristles above mentioned.—*Reichert und Du Bois' Archiv*, 1860, p. 72.

Notice of some new Corals from Madeira discovered by J. Y. Johnson, Esq. By Dr. J. E. Gray, F.R.S. &c.

Mr. James Yate Johnson of Madeira having kindly sent me some Corals from that island, I herewith send you the following short notice of some specimens which do not appear to have been heretofore inscribed in the Catalogues.

1. *Corallium Johnsonii.*

Coral branched, subflabelliform. Branches nearly simple, subparallel, flexuose, with a few very short ascending branches scattered on the sides of the upper surface. Bark yellow, granular, with three or four rows of rather convex polype-cells on the upper surface of the branches only. Axis white.

Hab. Madeira.

This Coral is at once known from *Corallium rubrum* on account of its polypes being placed only on one side of the stem, as is the case with *Corallium secundum* of Dana from the Sandwich Islands; but it is easily distinguished from the latter by the colour of the bark and axis, and the thick, elongated, subsimple, subparallel branches.

2. *Antipathes* (*Cirripathes*) *setacea.*

Coral simple, elongate, setaceous, straight, erect, closely covered with short conical spinules. Length 18 inches.

Hab. Madeira.

We have recently received from Mr. Edwin Todd, from Turk's Island in the West Indies, a specimen of *Antipathes* which differs from the former only in being rather more slender and very much more elongate, being more than 9 feet in length. It may be a distinct species, for the spinules appear to be rather closer and smaller; but I am rather inclined to regard it, for the present, as a variety of the above, and it may be called var. *β. occidentalis.*

Both specimens are at once known from *Antipathes spiralis* by their slenderness, the abundance of the spinules, and their being straight, without the slightest tendency to assume a spiral form.

3. *Antipathes gracilis.*

Coral rather fan-like, expanded, very slender, repeatedly forked. Branches very slender, elongate, subsimple, tapering; stem and branches covered with very close, rather elongated spinules.

Hab. Madeira.

The Coral about 6 inches high, rather fan-like, on a single plane; the stem slender, about as thick as a thick bristle, subalternately branched, with the rows of branches on the outer side, giving them the appearance of being forked; the branches and branchlets elongate, very slender and subsimple, and gradually tapering till they are quite hair-like.

Mollusca found in the Neighbourhood of Jerusalem. By Robert Damon.

To the Editors of the Annals of Natural History.

Gentlemen,—I beg to forward for insertion in your 'Annals,' should you consider the communication of sufficient interest, a list of Mollusca found in the neighbourhood of Jerusalem, all of which I have at various times received direct from a correspondent and resident in that city. To those interested in the distribution of the Mollusca the information may be acceptable.

Helix spiriplana, *Olivier*.
—— Cæsareana, *Parreys*.
—— cavata, *Mousson*.
—— candidissima, *Drap*.
—— Steetzenii, *Koch*.
—— striata, *Drap*.
—— Boissieri, *Charpentier*.
—— figulina, *Parreys*.
—— variabilis, *and* var., *Drap*.
—— fimbriata, *Bourg*.
Helix Syriaca, *Ehrenb*.
—— Jebusitica, *Roth*.
—— tuberculosa, *Conrad*.
—— sancta, *Bourg*.
—— Erdelii, *Roth*.
—— Hierosolymitana, *Bourg*.
—— Carthusianella, *Drap*.
—— hierochantica, *Roth*.
—— aspersa.

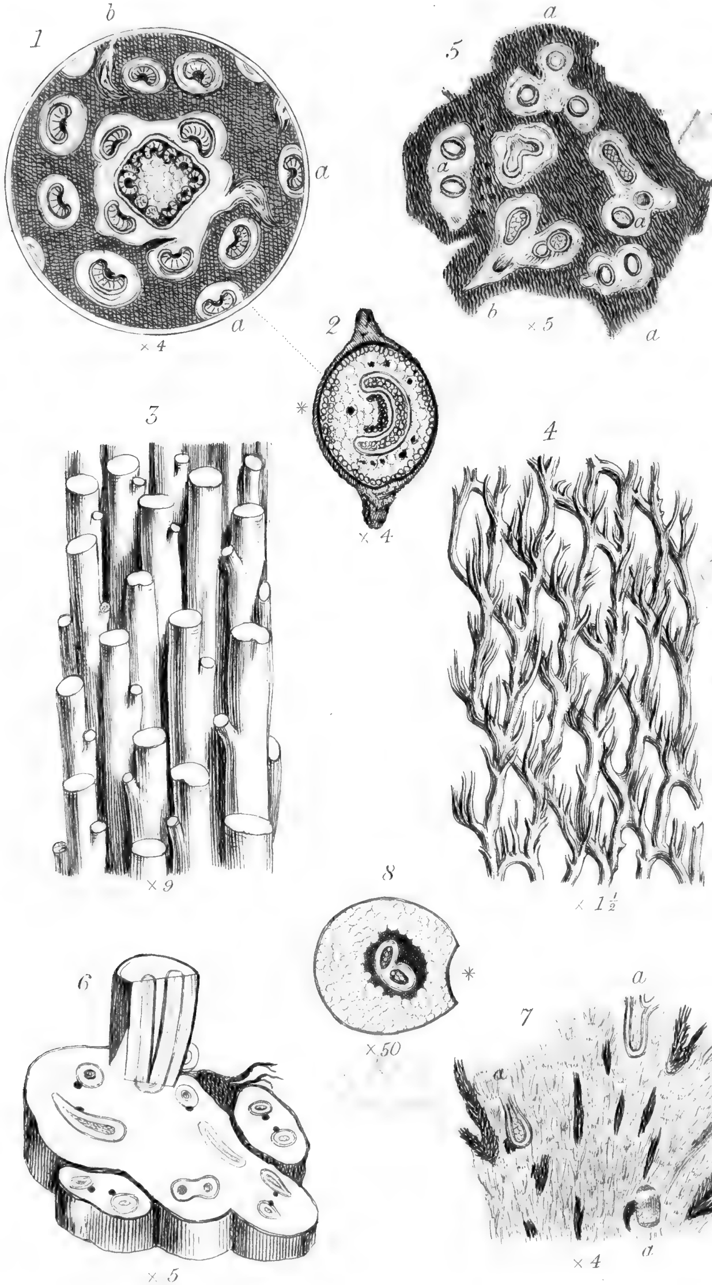
together with a few other species I have not been able to identify.

Bulimus labrosus, *Olivier*.
—— attenuatus, *Mousson*.
—— septemdentatus, *Roth*.
—— Aleppinus, *Pfeiffer*.
—— Sidoniensis, *Férussac*.
—— mucifragus, *Parreys*.
—— Sauleyi, *Bourg*.
Cyclostoma Olivieri, ?
Melanopsis prærosa, *Lam*. Engedi.
—— Sauleyi, *Bourg*. Jericho.
Melanopsis costata, *Olivier*. Lake of Tiberias.
Melania tuberculata, *Müller*. Ditto.
Clausilia mœsta, *Fér*.
Pupa Rhodia, *Roth*.
Cæcilianella tumulorum.
Tornatellina Hierosolymorum, *Roth*.
Neritina Michonii, *Bourg*.
—— Jordani, *Butler*. Lake of Tib.
Unio ?

I would also observe that I have on former occasions received specimens (dead shells) of *Melanopsis, Neritina*, &c., that were collected on the shores of the Dead Sea. As most writers on Palestine state that no living animal is to be found in that lake, I inquired of my friend whether his knowledge of the district confirmed or otherwise the generally received opinion? to which the following is his reply:—"No shells are found in the lake itself, or on its margin, except the bleached specimens of *Melanopsis, Neritina*, and various *Unionidæ*, which have been washed down by the Jordan, and afterwards drifted on shore. In fact, so intense is the bitter-saline quality of its waters, that no mollusk (nor, so far as I know, any other living creature) can exist in it."

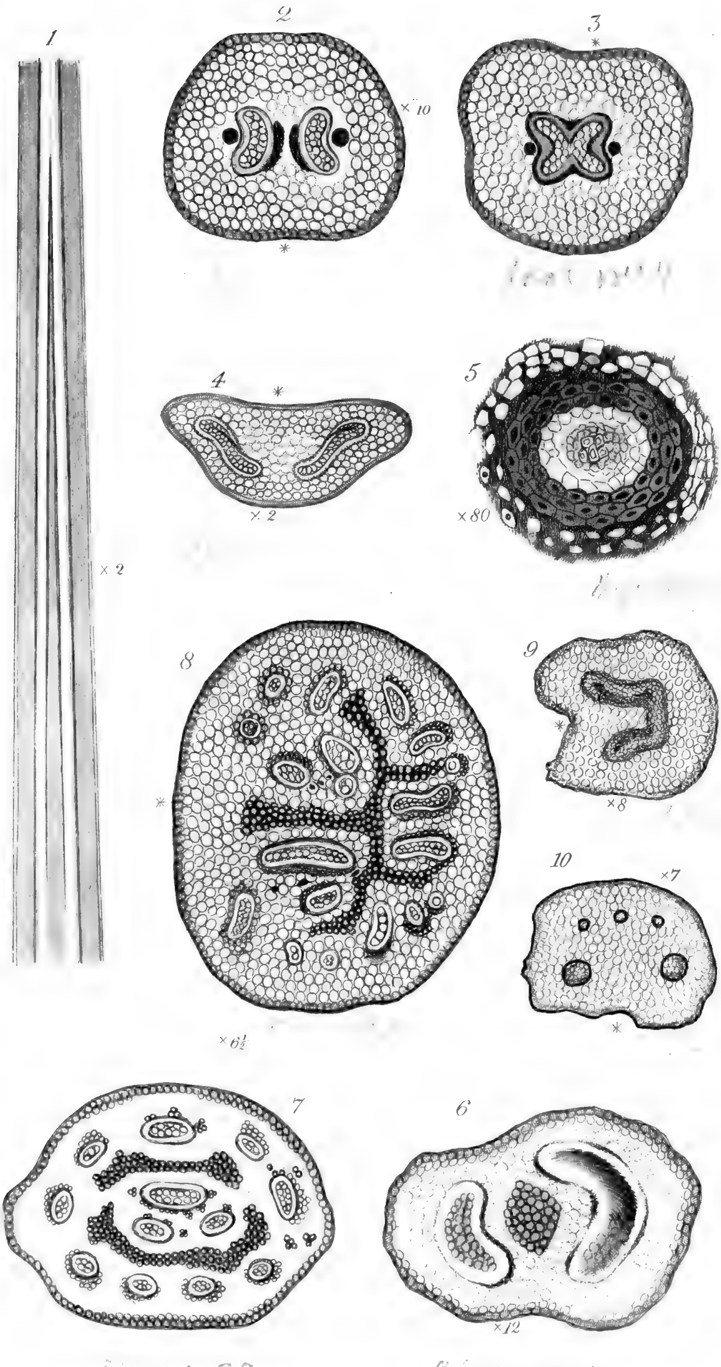
I am, Gentlemen,
Your obedient Servant,
Robert Damon.

Weymouth, Sept. 12, 1860.



James Aiken, del

J. De C. Sowerby, sc.



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XLI.—*Remarks on the so-called Woody and Vascular Fasciculi of Ferns.* By George Ogilvie, M.D.*

[With two Plates.]

In a former communication (Annals, Dec. 1859) I have referred to a common feature in the rhizomes of Ferns, namely, that the vascular bundles form a curious netted cylinder, dividing the cellular matrix of the stem into a central or medullary, and a peripheral or cortical region. To the dark-coloured tissue which, in dense woody bands or in some other form, is frequently present in the substance of the stem, constituting one of its most remarkable features, I made only a passing allusion, as I found that its arrangement (unlike that of the vascular tissue) varied so much in different species as to require a more particular examination of its modifications than I was able to undertake at the time. Since then, I have re-examined a considerable number of rhizomes with special reference to the disposition of this tissue, as well as of the vascular bundles.

In regard to the former, I have not been able to arrive at any conclusion which could be reduced to the form of a general expression. Still I have thought that a short notice of the actual structure and arrangement of the tissues in the species examined might be worth recording, as I cannot find that any systematic observations have yet been made on these points†. Considering

* Communicated by the author, having been read in part at the Meeting of the British Association at Oxford, June 1860.

† My attention has since been directed by the Rev. W. W. Newbould to some 'Hints on a new Character in Ferns,' with illustrative figures, by the Rev. W. A. Leighton (Phytologist, n. s., i. p. 256). The author confines his remarks to the *petioles* of a few species, and does not always very distinctly state the *part* of the petiole examined, which may account for some apparent differences between his description and that here given

how unsatisfactory all the systems of classification are which have been proposed in this order, these particulars may possibly have a certain value, as increasing the store of facts bearing on the general organography of the group, from which it is to be hoped that some botanist may yet draw materials for a more natural method of arrangement than any which has yet been brought forward. The peculiarities, too, in these points, are in some cases so striking that they appear worth recording as specific characters *.

A brown-coloured principle is very extensively distributed in the organization of Ferns. It is particularly conspicuous in the sporangia and other parts of fructification, and in the epidermis of the stem, and the *ramenta* or scales with which it is clothed; and it is so characteristic of the group, that it communicates a peculiar rusty tint to the vegetation of districts in which (as in some parts of New Zealand) Ferns form a prevailing feature. It is probably identical with the brown principle which occurs in other foliaceous Cryptogamia, particularly in the stems and capsules of Mosses; and, whatever may be its chemical relations —a point on which I can say nothing,—it at least resembles the woody matter of phanerogamic plants in being deposited in the interior of cells, in concentric pitted layers, on the inner aspect of the first-formed wall of cellulose. The tissues in which it is deposited often acquire great hardness, but are deficient in the toughness of true wood; on drying, especially, they become very brittle.

This brown matter is very constantly met with in the epidermic cells of the Fern-stem. The hardening of the cortical layer in these plants, as in arborescent endogens, is even more necessary for the support and defence of the stem than the accumulation of the layers of bark in exogenous trees, on account of the occasional deficiency of hard tissues in the interior of the rhizome. Generally, however, there is a certain limited amount of internal induration also; for we find that particular tracts of the

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(see a criticism by Mr. Moore, Phytol., n. s., i. p. 378). There is a still greater indefiniteness about the sectional views in Mr. Francis's 'Analysis of the British Ferns.' Another reference given me by the same gentleman (Duval Jouve, 'Etudes sur le Pétiole des Fougères,' in Billot's 'Archives de la Flore de France,' pp. 50–149) I have been unable to verify, though I have made inquiry for the work in the principal libraries in London. I have not had access to the works either of Mohl or others of the German botanists who have discussed the structure of Fern-stems, so that I cannot say how far they may have gone over the same ground.

* In this connexion I may refer to the great similarity in the disposition of the dark tissue in the petioles of *Scolopendrium vulgare* and of *Ceterach officinarum* (*Grammitis Ceterach*), once referred to the first-mentioned genus.

parenchyma become the seat of such a deposit, so that a section commonly shows the pale tissue of the stem relieved by a dark pattern of the indurated cells, as well as by the cut ends of the vascular bundles, which are generally of a whiter colour. This induration of the parenchymatous cells is sometimes not attended by any alteration in their form, the resulting tissue somewhat resembling that of the shells of nuts. In certain cases, however, the cells become elongated into fibres; and we find every variety of brown tissue, from one of short cells like those of the husky structures of the higher plants, to long fusiform fibres, undistinguishable, except in colour, from the wood of the Phanerogamia. The wood-like tissue generally occurs in cords or bands, either surrounding the vascular bundles or interposed between two sets of fasciculi. In the denser fibrous bands the cells become so filled up with brown matter that only a small central cavity is left, as in the duramen fibres of the harder woods; but in the less indurated tracts the cells (both prosenchymatous and parenchymatous) have frequently a large central space filled with starch-grains, like those of the pale-coloured cellular matrix of the stem. Starch-grains, it may be observed, occur in a similar way in the woody fibres of the ivy, and probably in those of *Banksia* and a few other plants, though this arrangement is not usual among Phanerogamia.

The disposition of the tracts of indurated tissue differs very much, as I have already remarked, in different species. There are some instances in which the brown deposit appears to be confined to the layers of cells forming the cuticular investment of the rhizome and of the bases of the petioles near their origin from the rhizome. This is the case, more or less distinctly, in all our Polypodies, in the majority of the species of *Asplenium*, and in *Polystichum aculeatum, Lastrea Filix mas*, and *Adiantum Capillus Veneris*.

The deficiency is most marked in the nodulated stems of the common Polypody; their peculiar fragility is due to the soft watery parenchyma in which the minute and straggling vascular bundles are imbedded. In most of the other species there is, more or less, some compensating provision. Thus in *Polypodium Dryopteris*, and still more in *P. Phegopteris*, the parenchyma is much denser, and has a decidedly dark or brownish tinge. In *Asplenium Filix fœmina*, there is no such dark tinge in the fresh parenchyma, but it has a peculiar hardness, from the thickness of the walls of its component cells. In *Lastrea Filix mas*, again, the vascular bundles have a brownish tint, and a degree of tenacity which allows them to be dissected out with more ease than in any other of our Ferns.

We find, too, that in many of these species the brown substance, which is deficient in the rhizome, makes its appearance in the petioles as sheaths of dark tissue round the vascular fasciculi. In *Asplenium lanceolatum,* in which there is no dark sheath of this kind, the scalariform vessels and cambium-layer of the fasciculi become themselves the seat of a deposit of dark substance, by which they are not merely tinged brown as in *L. Filix mas,* but the cavities of the vessels are more or less filled up. The induration is confined, so far as I have observed, to the fasciculi near the base of the petiole, not extending either upwards towards the frond, or downwards into the rhizome.

In all the species, indeed, now mentioned, the dark tracts stop short just above the origin of the petioles from the rootstock; but there are others in which they pass some way into the substance of the latter, accompanying the vascular bundles to their junction with the netted cylinder, and even bordering some of the anastomosing fasciculi by whose interlacement the cylinder is formed, so that they appear as dark spots in a transverse section of the rhizome.

Thus in *Scolopendrium vulgare,* in which we find in each petiole two vascular fasciculi, running into one above in the midrib of the frond, these are accompanied, from their origin in the rhizome, by dark lines on their outer margins. In the petiole itself, a little above the base, other dark lines appear on the inner margins of the fasciculi, gradually expanding, as they ascend, into two half-sheaths, which become united by their convexities as the fasciculi approach, and finally stop short at the point of junction of the latter, while the outer marginal lines run far on, along the midrib of the frond. The general arrangement of these parts is illustrated in Plate VI. figs. 1, 2, 3.

In *Ceterach officinarum* (*Scolopendrium Ceterach, Grammitis Ceterach*) the two fasciculi of the petiole are accompanied, from their origin in the netted cylinder, by three dark lines—two on the outer margins, and one median, the latter at first somewhat on the upper or inner aspect of the petiole, but gradually insinuating itself between the fasciculi, so as to form two half-sheaths united by their convexities, as in the last species. Higher up in the petiole, where the fasciculi unite into a single vascular cord in the midrib of the frond, the median tract of dark tissue comes to lie on its upper surface, the others continuing to run along its lateral margins.

In *Lastrea Oreopteris* the petiole has two fasciculi of scalariform vessels, and on the inner margin of each (that lying next to the axis of the stalk) a chain of dark-coloured cells—sometimes continuous, sometimes interrupted. The two chains unite below, like the sides of the letter V, just above the junction of the vascular bundles of the petiole with those of the netted cylinder of the rhizome. A horizontal section of the rhizome shows these tracts in section as dark spots on the contiguous margins of such of the vascular bundles as have been divided a little above the point of convergence (Pl. V. fig. 6).

In *Asplenium Ruta muraria,* instead of these dark lines, we have, near the base of the petiole, a complete sheath of brown tissue surrounding the single central vascular fasciculus (Pl. V. fig. 8). In the rhizome, the sheaths of the petiolar fasciculi become reduced to dark lines on the outer and inner margins of the vascular bundles which go to join the netted cylinder; and on a horizontal section, they are represented by a series of black spots on each side of the interrupted circle formed by the cut extremities of these bundles, but most distinctly on the inside. In *Asplenium Trichomanes* the arrangement is somewhat similar, but the dark sheaths round the petiolar fasciculi appear to be mainly derived from the brown cortex or tegumentary investment of the bases of the petioles.

But the darker spots seen in a horizontal section of the rhizome are not always due to the prolongation downwards of the lines of brown tissue belonging to the petioles. In *Lastrea dilatata* there occur in the medullary parenchyma (that is, inside the circle formed by the netted vascular cylinder) numerous isolated fusiform nodules, with their long diameter parallel to the axis of the rhizome. Each nodule consists of a few short cells placed end to end and filled with a very dark, almost black deposit (Pl. V. fig. 7)*. This species has its petiolar fasciculi ensheathed with dark tissue, as in its congener *L. Filix mas*; but these sheaths disappear near the base of the petiole, and there is no connexion between them and the nodules in the centre of the rhizome.

The nodules in *L. dilatata* may be considered as an example of the first degree of induration in the rhizome; in the species which remain to be noticed the amount of dark tissue is much more considerable. In *Pteris aquilina* and *Allosorus crispus* there are continuous bands or cords running the whole length of the stems; and in *Blechnum boreale, Osmunda regalis,* and *Hymenophyllum,* the dark tissue really makes up the principal mass of the rhizome.

In *Pteris aquilina* the creeping rhizome is invested by a villose integument of a hard leathery consistence, formed of rounded cells indurated by the dark deposit. In the pulpy and lubricous parenchyma immediately underneath, there is a series of vascular

* The allied species or variety *L. Fœnisecii,* which, I am informed by Prof. Balfour of Edinburgh, is remarkable for the dark colour of the central part of the rhizome, probably owes this peculiarity to the great development of these dark nodules.

bundles corresponding to the netted cylinder of other Ferns, though, from the way in which the stem is drawn out longitudinally, the reticulations are represented only by long wide slits formed by the irregular anastomosis of the bundles. Inside the more external layer of parenchyma containing these bundles are two dark bands, of a hard woody nature, running the whole length of the rhizome,—one on its upper, and the other on its under aspect. The former is flat; the latter, which is broader, is turned at the edges, like the sides of a boat; so that the two together partially enclose the axis or central portion of the stem, consisting of soft white parenchyma, like that on their exterior. But the great peculiarity of the rhizome of *P. aquilina*, in which it differs from all our other Ferns, is the occurrence of a second vascular system in this central region, consisting of two bands or broad fasciculi lying immediately on the inner aspect of the woody tracts (Pl. VI. fig. 7). The fasciculi are in the main distinct from each other, and from those of the outer series, though there is an occasional communication by anastomosing fibres. In the same way the two woody bands are generally quite distinct, though here and there they may become fused together for a space, on one or both sides, so as in the latter case to form a complete ring round the medullary parenchyma and the vascular fasciculi imbedded in it. This occurs at points where several fronds are given off in close proximity—a circumstance which affects the disposition of the tissues of the stem, both woody and vascular, in consequence of these branching out to form the corresponding tissues of the petioles. In the petiole the main tract of dark tissue forms a plaited band, having a T-shaped section,—the perpendicular lamina, which lies towards the inner aspect of the petiole, arising mainly from the upper band of the rhizome, and the fluted transverse lamina from the lower. These central plates, along with subsidiary and more superficial tracts, arising in the petiole itself, serve partially to ensheath the numerous fasciculi of vessels which are derived from both the vascular systems of the rhizome, outer and inner (Pl. VI. fig. 8). The brown tint and woody character of the plates disappear in the upper part of the petiole, their tissue merging into the general parenchyma of the part. The parenchyma of the rhizome, both medullary and cortical, is also marked occasionally with interrupted striæ of brown tissue, like those occurring in the medullary parenchyma of *Lastrea dilatata*, but much more attenuated, and of very considerable length.

In *Allosorus crispus* (*Cryptogramma crispa*) there is a perceptible tracery of dark tissue round the several fasciculi of the netted cylinder; but the principal accumulation is along the axis of the stem, nearly the whole of the parenchyma within the vascular circle being converted into a hard woody core, of a deep brown colour, which is continued through all the ramifications of the rhizome (Pl. VI. fig. 6). It is as if the two longitudinal tracts of the Braken stem were fused into a solid central cord, to the obliteration of the intervening parenchyma and vascular bands.

The induration of the stem reaches its maximum in the genera *Blechnum* and *Osmunda*. In the former, even in the petioles, near their origin from the rootstocks, the dark cortical layer becomes so much thickened at the expense of the pale parenchyma, that the latter is reduced to a thin sheath investing the vascular fasciculi; and the same arrangement prevails throughout the whole rhizome, which consists, from its exterior to its centre, of hard tissue, formed of dark fusiform cells, except only a thin stratum of pale parenchyma surrounding the cambium-layer of the fasciculi of the netted cylinder (Pl. V. fig. 5). Even the interstices of the latter are occupied in the centre by the dark material; so that, as compared with some of the rhizomes which have been described, the white and dark substances seem to have changed places: instead of the vascular bundles and their sheaths forming a dark network on a pale field, we have here a general dark ground marked by a pattern of light reticulations. This great development of the indurated brown tissue gives to the rootstock of *Blechnum* a very remarkable hardness as compared with others in which the pale parenchyma is the sole or preponderating element. In this respect *Blechnum* and *Osmunda* are peculiar among our Ferns, though at the same time they differ from each other in one or two important points.

In *Osmunda* the vessels of the petiole are all collected into a single voluminous bundle, crescentic in horizontal section, with the concavity towards the common axis of the plant. A band of parenchymatous brown tissue, with a similar crescentic curve, lies in the concavity of the vascular bundle, separated from the scalariform vessels by the cambium-layer of the fasciculus. The general parenchyma of the petiole is also marked on all sides with fusiform striæ of brown tissue, like those before described as occurring in the rhizome of *Pteris aquilina* (Pl. V. fig. 2). The cuticular layers of cells form a very tough investment —green above, but passing at the lower part of the petiole into a dark brown. Towards the base it is covered on the exterior with a soft whitish film, forming lateral wings, by which the bases of the petioles overlap each other, as they become crowded upon the rhizome. This film becomes brown and chaffy whenever it is left exposed. The bases of the petioles are at first somewhat dilated, and then taper away to their connexion with the rhizome, and their *internal* dark tissue disappears, while the *cortical* is much thickened and, by fusion with that of the neighbouring petioles, forms a mass of dark-brown prosenchyma on the exterior of the rhizome, very hard and tough, and of such thickness as to make up the great bulk of the stem,—the only other constituents being a slender medullary tract of pale tissue, in which the vascular cylinder is imbedded, and a cuticular film of white spongy substance, derived from that investing the bases of the petioles (Pl. V. fig. 1). It is the thick and tough cortical layer of dark indurated tissue that gives the tenacity to the stem which is so remarkable in this species, and is probably connected with the great age and size it occasionally attains.

In this toughness of texture, and in the preponderance of dark tissue on which it depends, there is a great resemblance between the stems of *Osmunda* and *Blechnum*, notwithstanding the larger dimensions of the former; but they differ in this—that the induration extends to the medullary region of *Blechnum*, where we find a dense axial column of dark tissue; while in *Osmunda* the axis, though reduced to slender dimensions, is distinctly formed of a pale parenchyma consisting of delicate cells with less than the usual amount of starchy deposit in their interior. The thick cortical layer of dark substance which surrounds it is marked on a horizontal section with white spots, indicating the points of passage of the vascular bundles of the petioles and rootlets.

Another point of difference is, that in *Osmunda* the vascular cylinder has not (at least to the naked eye) the beautiful netted appearance so common in the rhizomes of Ferns, from the closeness with which the component fasciculi are set together. Each fasciculus has the same crescentic section as in the petiole; and a transverse division of the stem shows about eight crescents placed in a circle near the outer margin of the pale medulla, with their concavities all turned inwards, and encircled in turn by the thick cortical layer of dark tissue. The vascular cylinder as a whole forms a cord of some thickness, cellular within, where the medullary parenchyma is not separated from the vessels by any cambium-layer, and fibrous externally, without any apparent interstices, but imbricated with the fasciculi given off to the petioles. On microscopical examination, a real interlacement of the vascular bundles may be detected; but it may be observed at the same time that the whole cord is surrounded by one continuous cambium-layer on its exterior, which dips partially between the several fasciculi, but never passes through the vascular circle to form an internal investment to the component bundles, as in other Ferns. Hence, while it is not difficult to dissect off from the vessels the stratum of pale parenchyma interposed between them and the dark cortical portion of the stem, it is hardly possible to separate the vascular coat in the same way from the delicate cellular tissue of the medulla which it invests. (Pl. V. fig. 3; compare with fig. 4.)

The rhizomes of *Hymenophyllum Tunbridgense* and *H. Wilsoni* are of interest from presenting a transition to the type of stem characteristic of the Lycopodiaceæ, as there is but a single vascular bundle, lying in the axis of the bristle-like rhizome (Pl. VI. fig. 5). This central fasciculus contains four or five scalariform vessels, surrounded by a cambium-layer. Round this, again, there is a thin stratum of pale parenchyma, and a cortical layer of brown tissue, fibrous and much indurated internally, but loose and chaffy on the exterior. The transition-character of the stem is of the more interest that we have in it all the essentials of the rhizome of *Osmunda*. We have only to conceive the stout caudex of the latter drawn out till it is reduced to the thread-like dimensions of the rhizome of *Hymenophyllum*, to have a complete transformation of the one into the other; for when the vascular cord of *Osmunda* is reduced to the dimensions of that of *Hymenophyllum*, its cellular pith necessarily disappears, as a single series of vessels of the ordinary thickness must come to occupy its whole diameter.

In all the stems noticed above, with the dark tissue much developed, and particularly in *Osmunda regalis, Blechnum boreale, Pteris aquilina,* and *Allosorus crispus,* there is a very remarkable contrast between the hardness of the coloured tracts and the great softness and delicacy of the pale parenchyma and of the vascular bundles (especially in their cambium-layer). The close juxtaposition of tissues of such different powers of resistance adds much to the difficulty of obtaining thin sections for microscopical purposes. The permanency of these tissues is in proportion to their hardness. Thus in the rhizomes of the common Braken, after long exposure the cortical layer and the two internal bands of dark substance are sometimes the only parts left, the pale parenchyma and the vascular bundles having all disappeared by the process of natural decay. And when this dark substance forms the main element, as in *Osmunda* and *Blechnum,* the whole rootstock has a like protracted duration, as has been already observed of the former species.

In connexion with this subject, the question suggests itself, whether the hard brown tissue now referred to (or *phænchyma,* as it might be called) corresponds to the proper wood of the higher or phanerogamic plants? There is some difficulty in answering this question, arising principally out of the ambiguity of the term "woody tissue." I do not see any reason to doubt that in many of the higher plants there are hard parts, commonly called woody, which may in all essential points be compared with those of Ferns, and which really owe their induration to a deposit in the cells of ligneous matter undistinguishable from that of the true wood of the stem—such as the veins of leaves, nut-shells, and various husky tissues. But between the dark tracts of the rhizomes of Ferns and the proper wood of the stems of Phanerogamia, there are at least two points of difference, both of considerable importance:—

1st. Unlike the woody tissue of the stems of the higher plants, the cells of the dark-coloured tracts of the Fern, even when they assume a distinctly fibrous character, never occur in the same fasciculus or layer with the vascular tissue, but are always separated from the ducts by the cambium-layer which encircles each vascular bundle,—and this even when in the closest relation, as in the sheath of dark tissue round a fasciculus.

2nd. The hard tissues of Ferns, even when they put on most distinctly a woody character, do not seem to be formed out of a superincumbent layer of cambium-cells, like the true wood of the phanerogamic stem, but simply by an induration of the parenchyma, with occasional elongation of its cells. Hence, while the vascular bundles—lubricated, as it were, by their cambium-coat—may with a little pains be dissected clean out of the cellular tissue of the stem, the coloured tracts adhere so intimately to the surrounding parenchyma, that, with every care, the denuded surface has a rough or villose appearance, from adhering particles.

I have found these points constant in all the British Ferns I have examined; and I have reason to believe that they hold also in Tree-ferns, though my opportunities of examining the latter have been too limited to allow me to speak very positively on this point.

It may be observed, further, that while the woody fibres of the ribs of leaves and of their footstalks in all Phanerogamic plants are continuous with those of the stem or trunk, the dark lines of the petioles of Ferns are rarely to be traced into those of the rhizome. Among our native species, the Braken (*Pteris aquilina*) is perhaps the only instance.

The variability in the development and disposition of these dark tissues seems of itself an argument in the same direction, as tending to assimilate them rather to the capsular indurations and the husky tissues generally of the higher plants, which we observe to vary much, even in allied species*, than to the true stem-wood, which possesses so constant and uniform a structure.

Mr. Berkeley takes the same view of the relations of the

* Compare, for instance, the fruit of the Apple, Pear, and Mountain Ash, and, more strikingly, of the different suborders of Rosaceæ.

masses of dark tissue. In his remarks on the structure of the stems of Ferns, in his 'Introduction to Cryptogamic Botany' (p. 515), he states distinctly that the hard tracts belong to the parenchyma, and do not correspond to the proper wood of the Phanerogamia. The latter he considers to be represented by certain pale fibres, occurring in the substance of the vascular bundles. I have recognized such fibres distinctly enough in two species of Tree-fern which I have lately examined. They form a sort of surface-coating to the fasciculi, exterior to the scalariform vessels, and immediately within the cambium-layer. This is just the position occupied by the pleurenchyma of the Endogenous stem; but in themselves these fibres have none of the characters of woody tissue. They appear to be portions of the cambium-layer which have undergone an imperfect conversion into vascular tissue. The transformation seems to take place by the clustering of the minute cambium-cells into long fusiform masses, which then become invested by a cell-wall, on whose inner surface the scalariform markings are developed, by a deposit of cellulose at particular points, *pari passu* with the disappearance of the original cells of the cluster enclosed by it. I think I have observed all stages of this transition—fusiform masses of cellules, pale granular fibres, and tubules or elongated cells, differing from the scalariform vessels of the fasciculus only in their smaller diameter and fainter markings.

In most of our indigenous species I have been unable to recognize any distinct fibrous coating to the vascular bundles, though the inner stratum of the cambium-layer has certainly at times an appearance of faint longitudinal striation, and the scalariform vessels on the exterior of the fasciculus are generally of smaller diameter and less distinctly marked than those within. The striated layer comes nearest to the characters of a real fibrous tissue in the netted cylinder of *Polystichum Lonchitis* and *Cystopteris fragilis*, and in the indurated petiolar fasciculi of *Trichomanes radicans* and *Asplenium lanceolatum*. In *P. Lonchitis* and *A. lanceolatum* some of these cambium-fibres make a still closer approach to those of woody tissue, by the deposit of a brown sclerogenous matter in their interior. In *Botrychium Lunaria* similar fibres occur, and the vessels are rather annular than scalariform.

That the woody fibres of plants generally differ from the ducts or vessels only in being a less-differentiated form of cambium-tissue, is a view which was very distinctly laid down by Schleiden*, and one which derives some support from the replacement of ducts by punctated woody tissue in the Coniferæ, and from the occurrence in some species of various intermediate forms, such

* Principles of Botany, bk. 2. c. 2. § 26.

as the woody fibres of the Lime and the Yew, which are marked in the interior with a spiral thread.

Not that woody fibres of any kind are themselves to be regarded as elements in progress of conversion into vessels or ducts, or as in any sense in a transition state. Both fibres and vessels are equally ultimate forms, though it may be surmised that, according to the energy of the developmental process, the result is either simple woody fibre or some of the varieties of vascular tissue. The transformation, according to Schleiden, takes place progressively from within outwards in the fasciculi of Endogenous plants, but in Ferns simultaneously throughout the whole of that portion of the cambium-tissue which is to undergo conversion.

A summary is here subjoined of the more prominent characters of the petiole and rhizome in the species which have been enumerated, and a few others. It was my wish to have included all the well-defined species of our flora; but in a few cases I have not been successful, after every exertion, in obtaining rhizomes in a state fit for examination. The notice could not have been made even so complete as it is, but for the kind assistance of some friends, among whom I have especially to tender my thanks to Professors Balfour of Edinburgh and Dickie of Belfast, Mr. L. Squire of Falmouth, the Rev. W. Gregor of Macduff, and Mr. Beverley and Mr. Roy, Sen., of Aberdeen. All the descriptions have been verified by the examination of fresh specimens.

Polypodium vulgare.

The petiole has three or more fasciculi, derived from the netted cylinder of the creeping rhizome, which acquire sheaths of dark tissue, and finally run into one central bundle as they ascend towards the frond.

The rhizome consists of pale tissue, invested by a brown cuticular layer.

Polypodium Dryopteris.

The petiole has two fasciculi running the whole length of the frond, with sheaths of dark tissue.

The rhizome as in the last species, though less tortuous and much more attenuated.

Polypodium Phegopteris.

The petiole has two fasciculi running into one above the base, and without dark sheaths.

The rhizome as in the former species, except that the general tissue (as well as that of the lower part of the petiole) has its cells somewhat elongated, and of a decided brown tint.

Polypodium alpestre.

The petiole has two flattened fasciculi, without dark sheaths, which, as they pass upwards, run into one of a horseshoe section, with the convexity towards the back of the stalk.

The rhizome is of pale tissue, with a brown cuticular layer, and occasionally with a faintly-marked stratum of darker cells surrounding the fasciculi of the netted cylinder*.

Polystichum Lonchitis.

The petiole has two large lateral fasciculi, and one or more intermediate, of smaller size, sparingly anastomosing with each other and with the former; all without dark sheaths.

The rhizome has the fasciculi of the netted cylinder indurated in places by the conversion of part of the cambium-coat into fibres with an internal brown deposit; but there are no dark tracts in the general parenchyma.

Polystichum aculeatum.

The petiole has numerous fasciculi invested with dark sheaths, and sparingly connected by slender transverse branches.

The rhizome, at the origins of the petioles, has deep indentations running into the interstices of the netted cylinder. The whole substance is of pale tissue, except the cuticular layer.

Lastrea Filix mas.

The petioles as in the last species.

The rhizome is of pale tissue (except a brown cuticular layer), thick and fleshy, with the netted cylinder deeply imbedded in its substance; the vascular fasciculi and their cambium-coat have a brownish tint.

Lastrea dilatata.

Petiole and rhizome as in the last species, except that the rhizome has numerous isolated fusiform nodules, of a very dark tissue, in the parenchyma within the netted cylinder.

Lastrea Oreopteris.

The petiole has two fasciculi, and a tract of dark tissue on the inner margin of each, meeting its fellow at the point where the fasciculi are connected with the netted cylinder of the rhizome.

The rhizome is of pale substance, with a cuticular layer of brown tissue; and a transverse section shows dark spots in the line of the netted cylinder, at the points of convergence of the tracts of the petioles.

* These characters apply in some degree to all the specimens which have been shown me as of this species, though differing considerably in the general appearance of the fronds.

Lastrea cristata.

The petiole has two large lateral fasciculi, and three smaller intermediate, the latter running into one upwards; all with dark sheaths.

Lastrea Thelypteris.

The petiole has two flattened and plaited fasciculi, somewhat resembling those of *Athyrium Filix fœmina*, but with dark sheaths. They unite above into one of a horseshoe section, as in *Polypodium alpestre*.

The rhizome is long, and creeps horizontally. The fasciculi of the vascular cylinder which lie towards the upper surface are thicker than those on the lower. The substance is of pale tissue, with a brown cuticular layer.

Athyrium Filix fœmina.

The petiole tapers from a swelling near the base to its point of connexion with the rhizome; it has two fasciculi, without dark sheaths, which acquire the form of fluted bands, in the dilated portion of the petiole.

The rhizome is indented as in *Polystichum aculeatum*, and is formed of pale but dense and thick-walled cells, with a cuticular layer of brown tissue.

Athyrium fontanum.

The petiole has two fasciculi running on into the midrib of the frond, without dark sheaths.

The rhizome has no dark deposit in the parenchyma, but the scalariform vessels have a decided brown tint.

Asplenium marinum.

The petiole has a single central fasciculus, without a dark sheath.

The rhizome is of pale tissue, except the cuticular layer.

Asplenium Adiantum nigrum.

Petiole and rhizome as in the last species, except that the former has two fasciculi at the base, which coalesce as they ascend towards the frond.

Asplenium lanceolatum.

The petiole has two (or sometimes three) fasciculi, uniting above, as in the last species, without dark sheaths, but with the vessels themselves and the cambium-layer of a brown colour, most decided at the base of the petiole, and disappearing upwards.

The rhizome is of pale tissue, as in the last species, except that the cells immediately surrounding the fasciculi of the netted cylinder have a light-brown tint.

Asplenium viride.

The petiole has a single central fasciculus, without a dark sheath.

The rhizome shows no dark tissue in its interior.

Asplenium Trichomanes.

The petiole has a single central fasciculus and a cortical layer of dark substance, much thickened at the base.

The rhizome has the general parenchyma of a brownish tinge, with a darker tissue (continuous with that of the petioles) forming a cortical layer, and also partially ensheathing the vascular bundles. The anastomosis of the fasciculi of the netted cylinder is very close.

Asplenium Ruta muraria.

The petiole has a single central fasciculus, containing a double vascular cord, and surrounded near the base with a sheath of dark tissue.

The rhizome has the same general arrangement as in the last species; only the dark tissue about the netted cylinder is less marked, and is mainly derived from the sheaths of the petiolar fasciculi.

Asplenium septentrionale.

The petiole has a single fasciculus, with a dark sheath at the base.

The rhizome has also a thin stratum of dark tissue round the fasciculi of the netted cylinder, as in the last species,—especially on their outer side*.

Woodsia ilvensis.

The petiole has a single fasciculus, without a dark sheath.

The rhizome shows no dark tissue in its interior.

Cystopteris fragilis.

The petiole has two fasciculi, running into one about the middle of the frond, without dark sheaths.

The rhizome shows no dark tissue internally, but the outer stratum of the vascular bundles of the netted cylinder has a distinctly fibrous character.

Adiantum Capillus Veneris.

The petiole has a dark glossy cortical layer, and a single fas-

* In decaying parts of the rhizome, the central parenchyma becomes brown, presenting somewhat the appearance of the dark central tract of *Allosorus crispus.*

ciculus with a double origin from the netted cylinder, but without any dark sheath.

The rhizome is of pale tissue, except the cuticular layer, and one of brownish cells round the fasciculi of the netted cylinder.

Scolopendrium vulgare.

The petiole has two fasciculi uniting above in the midrib of the frond, and separated below by two half-sheaths of dark tissue, united by their convexities. Externally also the fasciculi are bordered by dark lines, which run down into the rhizome.

The rhizome is of pale tissue, except the cuticular layer and the lower ends of the outer dark lines of the petioles just mentioned.

Ceterach officinarum.

The petiole has two fasciculi, which unite above in the midrib of the frond, and three lines of dark tissue, which run down into the rhizome—two lateral, on the outer margins of the fasciculi, the other median, forming two half-sheaths, united by their convexities.

The rhizome is of pale tissue, except the cuticular layer and the inferior extremities of the petiolar lines just noticed.

Pteris aquilina.

The petiole has numerous anastomosing fasciculi derived from the outer and inner systems of the rhizome, also a main central plaited band of dark fibrous tissue (connected with those of the rhizome), and some subsidiary tracts arising within the petiole.

The rhizome has a white pulpy parenchyma, with a hard cortical shell of dark tissue, and two longitudinal dark bands within, separating an inner vascular system of two flat bundles from a more external, which consists of numerous small fasciculi anastomosing sparingly to form an irregular wide-meshed cylinder.

Allosorus crispus.

The petiole has a single fasciculus without a dark sheath, and a double vascular cord.

The rhizome consists in part of pale tissue, with a brown cuticular layer, but it contains also dark tissue internally—as a central cord along the axis, and as faintly-marked sheaths round the fasciculi of the netted cylinder.

Blechnum boreale.

The petiole has two fasciculi, imbedded in the pale tissue of the interior, which towards the base is reduced to a mere sheath by the thickening of the dark cortical layer continuous with the substance of the rhizome.

The rhizome is almost wholly composed of dark substance, both externally and internally, the pale tissue forming only thin sheaths round the several fasciculi of the netted cylinder.

Trichomanes radicans.

The petiole has a single fasciculus, without a dark sheath, but with a fibrous development in the cambium-coat.

Hymenophyllum Tunbridgense and *Wilsoni.*

The petiole has a central fasciculus, surrounded by a dark cortical fibrous layer, continuous with that on the exterior of the rhizome.

The rhizome consists of a cortical coat of dark tissue (dense and fibrous internally, loose and chaffy on its outer surface), and of a layer of pale tissue surrounding the cambium-coat of the single central fasciculus or vascular cord.

Osmunda regalis.

The petiole has a crescentic fasciculus, with a dark band on its concavity, which looks towards the axis of the rhizome. These structures are imbedded in a pale parenchyma. As the petiole tapers to its connexion with the rhizome, the dark band disappears, and the pale tissue is reduced to a mere sheath, by the thickening of the dark cortical layer.

The rhizome has a thick layer of dark tissue externally, continuous with the cortex of the petioles, and a thin sheath of pale tissue within, round the vascular cylinder and the fasciculi connecting it with the petioles. The vascular cylinder is solid, having no obvious reticulations in its walls, from the closeness of the fasciculi, and the absence of any cambium-layer between their inner surface and the cellular tissue of the axis which they enclose.

Botrychium Lunaria.

The petiole has two fasciculi, united at the base, without dark sheaths.

The rhizome has a vascular cylinder with very few openings or reticulations, and with a cambium-layer only on its exterior. There is no dark tissue, except the cuticular investment.

Ophioglossum vulgatum.

Stem fistulose, with eight or nine fasciculi in the wall, without dark sheaths.

In the following Table the species are arranged with reference to the external characters of the rhizomes, as explained in my former communication on this subject (Ann. Nat. Hist. Dec. 1859).

Rootstock a stoloniferous rhizome.

Polypodium vulgare.
—— Dryopteris.
—— Phegopteris.
Lastrea Thelypteris.
Pteris aquilina.
Adiantum Capillus Veneris.
Hymenophyllum Tunbridgense.
—— Wilsoni.
Trichomanes radicans.

Rootstock a dichotomous caudex.

Polypodium alpestre.
Polystichum Lonchitis.
Lastrea Oreopteris.
—— rigida.
Cystopteris fragilis *.
Athyrium Filix fœmina.
—— fontanum.
Asplenium Adiantum nigrum.
—— lanceolatum.
—— marinum.
Asplenium viride.
—— trichomanes.
—— Ruta muraria.
—— septentrionale.
Woodsia Ilvensis.
Allosorus crispus.
Scolopendrium vulgare.
Ceterach officinarum.
Blechnum boreale.
Osmunda regalis.

Rootstock a right caudex (extending by a single terminal bud).

Polystichum aculeatum.
Lastrea Filix mas.
—— dilatata.
Lastrea cristata.
Botrychium Lunaria.
Ophioglossum vulgatum.

EXPLANATION OF THE PLATES.

Plate V.

Fig. 1. Cross section of the rhizome of *Osmunda regalis,* showing the brown cortical substance and the pale tissue within, surrounding the central vascular cylinder with its cellular pith, and a cambium-layer only on its exterior: *a a,* origins of the petioles; *b b,* rootlets. (The outer tissue has been partially pared away, to fit the specimen into the section instrument.)

Fig. 2. Cross section of a petiole near the base, showing the cut extremities of the longitudinal filaments and of the crescentic fasciculus and dark band. The asterisk in this and the other sections of petioles marks the side next the rhizome—that which is uppermost when the frond is laid on its back.

Fig. 3. The central vascular cylinder of the rhizome of *O. regalis* dissected out, showing the imbricated fasciculi going to the petioles.

Fig. 4. A portion of the netted cylinder of *Lastrea dilatata* opened out, showing the origin of the petiolar fasciculi.

Fig. 5. Cross section of the rhizome of *Blechnum boreale,* showing the great development of dark tissue in this stem. The outer series of fasciculi (in pairs), *a a a,* belong to the origins of the petioles;

* The other British forms of *Cystopteris* are questionable species; but if Mr. Newman is correct in assigning to *C. montana* a "stoloniferous rhizome" (History of British Ferns, p. 97), this may perhaps be a good species.

the inner, *c c c*, represent the section of the netted cylinder; *b*, origin of a rootlet.

Fig. 6. Cross section of the rhizome of *Lastrea Oreopteris*, somewhat foreshortened, with a portion of a petiole attached, showing the converging tracts of dark tissue, *a*.

Fig. 7. Section of the rhizome of *Lastrea dilatata* along the axis, showing the fusiform dark nodules in the medullary tissue: *a a*, fasciculi of the netted cylinder in section.

Fig. 8. Cross section of a petiole of *Asplenium Ruta muraria* near the base.

PLATE VI.

Fig. 1. Section of the petiole of *Scolopendrium vulgare*, along the axis, showing the course of the dark tracts, like two converging lines of railway.

Fig. 2. Cross section of the same, a little above the base.

Fig. 3. Cross section of the same, about the commencement of the lamina of the frond. In the small fronds of *Ceterach officinarum* the arrangement is somewhat similar.

Fig. 4. Cross section of the petiole of *Athyrium Filix fœmina* at the base.

Fig. 5. Cross section of the rhizome of *Hymenophyllum Wilsoni*, showing the brown cortical and pale medullary tissue, with the single vascular fasciculus imbedded in the latter.

Fig. 6. Cross section of the rhizome of *Allosorus crispus*, showing the central dark cord, and the sheaths round the fasciculi of the netted cylinder.

Fig. 7. Cross section of the rhizome of *Pteris aquilina*, showing the outer and inner series of vascular fasciculi, the two intermediate dark bands, and the extremities of some of the longitudinal dark filaments.

Fig. 8. A corresponding section of the base of the petiole.

Fig. 9. Cross section of the petiole of *Polypodium alpestre* above the point of junction of the two lateral fasciculi. The section below this point is nearly as in fig. 4. These two figures would also represent in some degree the arrangement in *Lastrea Thelypteris*, if the fasciculi were surrounded by a coat of dark tissue.

Fig. 10. Cross section of the petiole of *Lastrea cristata* near the base.

There is a similar arrangement in *Polystichum aculeatum*, *Lastrea Filix mas*, and *L. dilatata*, and also, with the exception of the dark sheaths, in *Polystichum Lonchitis*.

The magnifying power is marked beside each figure.

XLII.—*On some new Genera and Species of Mollusca from Japan.* By ARTHUR ADAMS, F.L.S., &c.

Genus ZAFRA, A. Adams.

Testa acuminato-ovalis utrinque angustata, in medio tumida; anfractibus longitudinaliter plicatis, ultimo ad basin constricto. Apertura linearis, angusta; labio effuso, margine externo libero; labro margine acuto, postice subsinuato, in medio recto, subinflexo.

This little shell will constitute the nucleus of a group of *Turridæ*, of which several from deep water have been described by D'Orbigny, and figured, I believe, in the last plate of Reeve's

Monograph of *Pleurotoma.* They are small, mitriform, plicate species, with a narrow-linear aperture, and with the last whorl contracted at the fore part.

Zafra mitriformis, A. Adams.

Z. testa mitriformi, in medio incrassata, alba, fascia fusca obscura ad suturas ornata, anfractu ultimo ad basin rufo tincto, et linea angusta rufa transversa ad peripheriam circumcincto; anfractibus $6\frac{1}{2}$, planiusculis, longitudinaliter plicatis; plicis validis, obliquis, subdistantibus; anfractu ultimo antice constricto et oblique sulcato.

Hab. Mino-Sima; 63 fathoms.

Genus Rissoella, Gray.

The little shells I propose to describe as species of this genus agree with it as at present constituted, and all have the appearance of being adult. They may, however, as may those also from the British Seas, be the young of other genera. But until we are in a position to demonstrate their real nature, or until, by an examination of the animal, they are proved to be only a transition state in the metamorphoses of some higher Mollusca, it is desirable to record their existence in every sea investigated. Numerous small shells, evidently nuclear whorls of known genera, have been rejected from my list, some being immature *Macrocheili* and *Odostomiæ,* and others the embryonic state of larger Gasteropods.

1. *Rissoella omphalotropis,* A. Adams.

R. testa conoidali, alba, opaca, profunde umbilicata; umbilico carinula circumcincto; anfractibus $3\frac{1}{2}$, convexiusculis, suturis profundis, anfractu ultimo ad peripheriam vix angulato, transversim obsolete exarato; apertura subcirculari, antice vix producta; labio rectiusculo, subincrassato.

Hab. Sado; 30 fathoms.

2. *Rissoella vitrina,* A. Adams.

R. testa conoidali, anguste umbilicata, solidiuscula, vitrea, pellucida; anfractibus $3\frac{1}{2}$, lævibus, convexiusculis, ultimo rotundato, ventricoso, suturis marginatis; umbilico angusto, simplici; apertura orbiculari.

Hab. Tabu-Sima; 25 fathoms.

3. *Rissoella vesicalis,* A. Adams.

R. testa globoso-conoidea, rimate umbilicata, alba, semiopaca; anfractibus $3\frac{1}{2}$, convexis, lævibus, suturis profundis, simplicibus, anfractu ultimo rotundato, ventricoso; apertura circulari; labio brevi, rectiusculo, superne subdilatato.

Hab. Sado; 30 fathoms.

4. *Rissoella minima*, A. Adams.

R. testa perparva, umbilicata, lævi, nitida, subopaca; anfractibus $3\frac{1}{2}$, convexis, suturis profundis, anfractu ultimo ventricoso, ad peripheriam rotundato; umbilico angusto, rimato; apertura circulari.

Hab. Tsu-Sima; 26 fathoms.

5. *Rissoella turgidula*, A. Adams.

R. testa brevi, conoidea, anguste et profunde umbilicata, semiopaca, nitida, alba; anfractibus $3\frac{1}{2}$, convexis, simplicibus, suturis profundis, anfractu ultimo turgido, ad peripheriam rotundato; apertura ovata; labio tenui, acuto.

Hab. Korea Strait; 46 fathoms.

6. *Rissoella mundula*, A. Adams.

R. testa vix rimata, conoidali, tenui, alba, opaca; anfractibus convexis, simplicibus, suturis profundis, anfractu ultimo amplo; apertura ovata; labio tenui, antice subproducto.

Hab. Tsu-Sima; 26 fathoms.

7. *Rissoella hydrophana*, A. Adams.

R. testa conoidali, profunde umbilicata, alba, tenui, semipellucida; anfractibus $3\frac{1}{2}$, convexis, lævibus, ultimo rotundato, ventricoso; suturis marginatis; umbilico patulo, striis radiantibus ornato.

Hab. Tabu-Sima; 25 fathoms.

8. *Rissoella spiralis*, A. Adams.

R. testa helicoidea, profunde et late umbilicata, tenui, pellucida; anfractibus $3\frac{1}{2}$, lævibus, rotundis, suturis profundis, anfractu ultimo ad peritrema vix soluto; apertura semicirculari; labio rectiusculo.

Hab. Sado; 30 fathoms.

Genus Syrnola, A. Adams.

I discovered the type of this pretty little genus (*S. gracillima*) in 1859, in the Sea of Japan; and since then I have obtained some additional species from deep-water dredgings in the same sea. They are all of small size, and seem to fall very naturally into this group; they are all banded, and of a vitreous texture, by which, and their subulate or aciculate form, they are readily distinguished from *Odostomia*, the species of which are white and destitute of coloured markings. *Syrnolæ*, in fact, are small slender *Obelisci* with a single columellar plait.

am 1959 1. *Syrnola cinctella*, A. Adams.

S. testa gracili, subulata, lævi, nitida, semipellucida; anfractibus $9\frac{1}{2}$, planis, linea angusta transversa rufo-fusca ad suturas ornatis; suturis exaratis; anfractu ultimo ad peripheriam subangulato, in medio linea rufo-fusca circumcincto; apertura subquadrata; plica parietali conspicua transversa; labro simplici, acuto.

Hab. Korea Strait; 46 fathoms.

2. *Syrnola pupina,* A. Adams.

S. testa subulata, in medio tumida, subopaca, nitida, longitudinaliter substriata; anfractibus $8\frac{1}{2}$, planiusculis, fascia lata pallide fusca transversa in medio ornatis; anfractu ultimo elongato, ad basin rotundato; apertura oblonga, plica parietali obliqua; labro margine subrecto.

Hab. Mino-Sima; 63 fathoms.

3. *Syrnola lepidula,* A. Adams.

S. testa ovato-subulata, tenui, carneola, semipellucida, lævi, nitida, longitudinaliter substriata; anfractibus 7, convexiusculis, fascia angusta rufo-fusca transversa ad suturas ornatis; anfractu ultimo elongato, ad basin rotundato; apertura oblonga; plica parietali obliqua, tenuicula; labro simplici, acuto.

Hab. Tsu-Sima; 16 fathoms.

4. *Syrnola teretiuscula,* A. Adams.

S. testa subulato-aciculata, sordide alba, lævi, nitida; anfractibus $10\frac{1}{2}$, planiusculis, suturis exaratis; anfractu ultimo elongato, ad basin dilatato, rotundato; apertura subquadrata; plica parietali conspicua, transversa; labro simplici, acuto.

Hab. Tsu-Sima; 16 fathoms.

5. *Syrnola mera,* A. Adams.

S. testa aciculato-subulata, gracili, sordide alba; anfractibus 8, planiusculis, suturis impressis, anfractu ultimo ad basin subangulato; regione umbilicali callo circumcincta, excavata; apertura subquadrata; plica parietali transversa; labro simplici, acuto.

Hab. Mino-Sima; 63 fathoms.

6. *Syrnola bizonalis,* A. Adams.

S. testa subulata, tenui, alba, opaca; anfractibus $9\frac{1}{2}$, planulatis, in medio zonula transversa pallide rufescente ornatis; anfractu ultimo elongato, zonulis duabus rufescentibus succincto; apertura oblonga; plica parietali tenuicula, obliqua, mediana; labro simplici, acuto.

Hab. Korea Strait; 46 fathoms.

7. *Syrnola pyramidalis,* A. Adams.

S. testa brevi, acuminato-conoidea, albida; anfractibus 7, planis, longitudinaliter striatis, ultimo amplo, ad basin rotundato; apertura subquadrata; plica parietali parva, transversa; labro simplici, acuto.

Hab. Tsu-Sima; 16 fathoms.

8. *Syrnola vitrea*, A. Adams.

S. testa acuminato-conoidea, alba, semipellucida, vitrea, nitida; anfractibus 5, planulatis, linea angusta transversa rufescente in medio ornatis, suturis exaratis; apertura ovata; plica parietali valida, mediana, transversa; labro intus transversim sulcato.

Hab. Mino-Sima; 63 fathoms.

9. *Syrnola nitidula*, A. Adams.

S. testa subulatim conoidali, vitrea, nitida, semipellucida, suturis profundis; anfractibus $7\frac{1}{2}$, planulatis, lævibus, in medio fascia rufa angusta transversa ornatis; apertura subquadrata, antice subacuminata; plica parietali valida, mediana; labro intus sulcato.

Hab. Mino-Sima; 63 fathoms.

Genus Styliferina, A. Adams.

Testa imperforata, ovato-conica, tenuis, lævis; anfractibus multis, supremis in stylum productis, nucleo sinistrali. Apertura subquadrata, antice integra; labio simplici, recto.

The genus *Entoconcha* of J. Müller, which is parasitic on *Synapta*, also has "the columellar margin straight;" but the form is described as being very different from *Styliferina*, there being almost no spire, and the aperture being transverse and semilunar. I have never seen a specimen of *Entoconcha*, which is also said to be operculate. My shells were, unfortunately, in the case of both the species, dredged dead, though perfect. I examined dozens of the blue *Asterinæ* that came up with them, but found no parasite, nor was I more fortunate with *Spatangi* or *Clypeasteres*.

1. *Styliferina orthochila*, A. Adams.

S. testa imperforata, ovato-conica, pallide fusca, tenui, semiopaca; anfractibus normalibus 6, convexiusculis, lævibus, ultimo inflato; apertura subquadrata; labio recto, antice in labrum continuo; labro arcuato.

Hab. Tsu-Sima; 26 fathoms.

This species was dredged from a bottom abounding in red and blue *Asterinæ*, on which it may be parasitic.

2. *Styliferina goniochila*, A. Adams. BM

S. testa ovato-conica, imperforata, pellucida, vitrea, albida, tenui; anfractibus normalibus 5, convexiusculis, lævibus, ultimo inflato; apertura subquadrata; labio recto, antice in angulum productum desinente; labro arcuato.

Hab. Mino-Sima; 63 fathoms.

This species was dredged from a bottom containing large quantities of fragments of dead *Ophiuri*, on which it may possibly be parasitic.

Genus Niphonia, A. Adams.

Testa depresso-globosa, tenuis, imperforata; anfractibus rapide accrescentibus. Apertura ampla, circularis; peritremate duplicato, externo tenui, acuto, in anfractum ultimum ascendente, interno incrassato, in labrum intus continuo.

This little genus most nearly resembles *Stomatella*; but the shell is very thin, and the aperture has an internal ledge, as if for the operculum. Two specimens only were obtained, both dead, and both wanting the opercula.

Niphonia pulchella, A. Adams.

N. testa lævi, pallide fusca, nitida, spiraliter lirata; anfractibus $2\frac{1}{2}$, convexis, ultimo liris transversis majoribus quinque et multis minoribus basalibus instructo; regione umbilicali impressa; peritremate margine acuto.

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

Genus Finella, A. Adams.

Testa tenuis, pupoidea, imperforata, in medio tumida; anfractibus transversim liratis, longitudinaliter plicatis, ultimo simplici. Apertura ovali, peritremate interrupto; labro simplici, acuto, non reflexo aut incrassato.

This genus, which is founded upon a small shell allied to *Rissoa*, will form a member of the family *Rissoidæ*.

Finella pupoides, A. Adams.

F. testa tenui, pupoidea, imperforata, pallide fusca, fascia transversa rufo-fusca in medio anfractuum, in anfractu ultimo fasciis duabus; anfractibus $7\frac{1}{2}$, convexis, transversim liratis, anfractibus supremis longitudinaliter plicatis, in medio subangulatis, ultimo simplici; apertura ovali; labro margine acuto, recto.

Hab. Tsu-Sima; 26 fathoms. Korea Strait; 46 fathoms.

Genus Minolia, A. Adams.

Testa globoso-conoidea, late et profunde umbilicata; anfractibus rotundatis, clathratis, suturis canaliculatis; anfractu ultimo ad aperturam subsoluto; umbilico perspectivo. Apertura circularis, intus margaritacea; peritremate continuo; margine recto, tenui, acuto.

Minolia is very like *Torinia* in form and sculpture; but the aperture is pearly within. It also resembles in form some southern species of *Margarita*; but the texture, markings, and sculpture of the shell are different. In sculpture also it resembles the species of *Euchelus*, and especially the subgenus *Perrinia*, which I also dredged from deep water in the same locality. I have named the genus from Mino-Sima, the little island near Niphon, in the vicinity of which favourable circumstances enabled me to glean, by deep-water dredging, much fragmentary knowledge of the malacology of the Japanese archipelago.

Minolia punctata, A. Adams.

M. testa helicoidea, macromphala, fulva, rufo-punctata; anfractibus 6½, convexis, cingulis transversis granulosis, majoribus cum minoribus alternantibus, rufo-punctatis ornatis, interstitiis lamellis tenuibus obliquis pulcherrime clathratis; suturis canaliculatis; umbilico perspectivo, cingulis granulosis concentricis instructo, interstitiis concinne clathratis.

This is another modification of the hollow spiral cone of the Trochoid family; the whorls are somewhat loosely rolled on themselves, which causes the sutures to be very deep, and the last whorl at the peritreme to be almost disunited from the penultimate whorl. The red-brown spots on the beaded ribs, and the exquisite clathrate sculpture of the surface, render this one of the prettiest shells in the great family of Trochoid Scutibranchs. In texture it resembles *Enida Japonica* and *Turcica monilifera*, and, judging from the shell, it appears to be more closely associated with the *Zizyphinus* group than with *Gibbula* or *Margarita*.

Wei-hae-Wei, Shan-Tung, China,
April 15, 1860.

XLIII.—*On the Nomenclature of the* Foraminifera.

By W. K. Parker, M. Micr. Soc., and T. R. Jones, F.G.S.

[Continued from p. 40.]

Part V. *The Foraminifera enumerated by* Denys de Montfort.

Denys de Montfort, being desirous to do justice as far as possible to the elucidation of the "Microscopic Shells" in his systematic and illustrated work on Conchology*, introduced the figures and descriptions of several *Foraminifera* into his book, stating that he was far from pretending to have given all their genera, but that he aimed at making some at least of their singular forms better known to naturalists (Discours préliminaire, p. xxviii). To this end he figured some specimens apparently

* 'Conchyliologie Systématique, et Classification Méthodique des Coquilles; offrant leurs figures, leur arrangement générique, leurs descriptions caractéristiques, leurs noms; ainsi que leur synonymie en plusieurs langues,' 2 vols. 8vo, Paris, 1808–1810.

from his own collection, and selected from the Monograph of Fichtel and Moll several of their so-called *Nautili*, and from Soldani's 'Testaceographia' some of his figured microscopic shells; he produced modified figures of these, and classified and named the whole according to his conchological system, arranging most of them (genres iii^e—lxii^e) as "Coquilles univalves cloisonnées, contournées en spirale," and others (genres lxiii^e—lxxxiii^e) as "Coquilles univalves cloisonnées, droites." De Montfort's delineations of these *Foraminifera* and other *Microzoa* were all drawn and engraved on wood by himself; and very proper remarks does he make in his 'Discours préliminaire' (p. viii) on the advisability of naturalists being their own draughtsmen. In this case, however, we have but poor results; and, to say nothing of the execution of the cuts, we look in vain for correct drawing as to the superficial sculpturing of these little shells; whilst the attempt on the part of De Montfort to give in one figure, placed obliquely, the features both of surface and edge (shown in two views by Fichtel and Moll) adds greatly to the general incorrectness and obscurity of the figures.

Putting aside our author's notions as to the Cephalopodous nature of these little chambered shells, we may notice that he was much struck by the fact of their extensive development and distribution in the present seas, and their frequently enormous accumulation in the fossil state in some of the limestones of the Alps, Apennines, and other mountains (Disc. prélim. p. xxvii). The beauty of these little creatures, their symmetry and elegance, the neatness of their construction, their delicate colours, iridescence, and pearliness, strongly impressed De Montfort with a love for these tiny *bijoux* of Nature's workmanship, so lavishly scattered among the sea-sand of every clime.

As results arising from De Montfort's systematic handling of the *Foraminifera* we have not much to point out. His generic names are, for the most part, useless; since the several species, varieties, and figured individuals of a genus have respectively received a new binomial appellation at his hand. The specific names proposed by him are also mostly unnecessary, being generally duplicate to some former name. Occasionally, however, his appellations are useful,—*Peneroplis*, for instance, having been preserved; and some of the trivial names are good for subspecies and varieties. We may remark that, with regard to some of the fossil forms (such as *Alveolina*, &c.), De Montfort has collected many useful bibliographical references.

Writing subsequently to Lamarck (de la Marck in those days), De Montfort refers to the early edition of the 'Syst. An. s. Vert.';

he does not, however, notice the species figured and described in the 'Annales du Muséum.'

1. Vol. i. p. 10. 3^e genre. Phonemus. Le Phonème tranchant. This is referred by De Montfort to the *Cristellaria Vortex* of Fichtel and Moll*; but it is not at all a copy of their figure. It is more like a common *Cristellaria Calcar.*

2. Vol. i. p. 14. 4^e genre. Elphidium. L'Elphide souflé. An oblique figure intended to comprehend Fichtel and Moll's views of their *Polystomella macella,* var. *β.*

3. Vol. i. p. 18. 5^e genre. Geophonus. Le Géopone jaune. Intended for *Polystomella macella,* var. *a,* F. & M.

4. Vol. i. p. 22. 6^e genre. Pelorus. Le Pélore ambigu. Intended for *Polystomella ambigua,* F. & M.

5. Vol. i. p. 26. 7^e genre. Chrysolus. Le Chrysole perlé. De Montfort says that this is the *Nautilus* (*Cristellaria*) *Crepidula* of F. & M.; but it is evidently meant for their *Nautilus* (*Polystomella*) *Faba.*

6. Vol. i. p. 34. 9^e genre. Pharamum. Le Pharame perlé. This is intended for *Cristellaria Calcar,* Linn.; var. *δ,* F. & M.

7. Vol. i. p. 38. 10^e genre. Andromedes. Andromède gauffrée. This is intended for *Polystomella strigillata,* var. *a,* F. & M.

8. Vol. i. p. 42. 11^e genre. Sporilus. Sporulie pectiné. Intended for *Polystomella strigillata,* var. *β,* F. & M.

9. Vol. i. p. 46. 12^e genre. Canthropes. Canthrope galet. This was found in the shingle at Boulogne-sur-Mer; and is stated to be figured of the natural size (2 inches in diameter). It looks like a highly magnified, very flat *Polystomella.* Excepting its superficial ornament, it has some resemblance to a large Nummulite. It might be some complanate Coral, or other discoidal fossil; it may even be inorganic.

10. Vol. i. p. 66. 17^e genre. Melonis Etruscus. This is the *Nonionina pompilioides,* F. & M.

11. Vol. i. p. 70. 18^e genre. Antenor diaphaneus. De Montfort speaks of specimens of this shell having been found at Borneo, both in the sea-sand and attached to the corallines in deep water; and says that it has eight arms, two of which are palmate! The shells, he says, are a line in diameter, and, when fresh, diaphanous, smooth, of a rosy colour, and iridescent, crossed by the more opake septal lines. He refers it (with justice) to Soldani's specimen in Testaceogr. i. pl. 33. fig. E, which is a dentately keeled *Cristellaria Calcar* from the Mediterranean. De Montfort adds, "Nous observerons ici que les

* For an account of the species and varieties of Foraminifers enumerated by Fichtel and Moll (' Testacea Microscopica,' &c., 1803) see Annals Nat. Hist. ser. 3. vol. v. pp. 98, 174, &c.

coquilles microscopiques sont répandues dans les mers des deux hémisphères, et que de très-fortes raisons font soupçonner qu'il n'est aucune profondeur qui en soit exempte, et leur multiplication y est prodigieuse."

12. Vol. i. p. 94. 24^{e} genre. Oreas subulatus. This is a modified figure of *Cristellaria acutauricularis,* F. & M.

13. Vol. i. p. 102. 26^{e} genre. Jesites vermicularis. After a figure by Soldani in Testaceogr. i. pl. 30. fig. X. This is a minute discoidal *Serpula.*

14. Vol. i. p. 106. 27^{e} genre. Charybs plicatus. After Soldani's Testaceogr. i. pl. 29. fig. K. This also is a minute discoidal *Serpula.*

15. Vol. i. p. 110. 28^{e} genre. Cidarollus plicatus. After Soldani, Testaceogr. i. pl. 36. fig. S. A common variety of *Rotalia repanda,* F. & M.; the same as *R. pulchella,* D'Orb. Modèles, No. 71.

16. Vol. i. p. 114. 29^{e} genre. Cortalus Pagodus. This may possibly be a *Rotalia*; but more probably it is a minute Gasteropodous shell. Such a turbinate little shell is figured by Soldani, Testaceogr. pl. 14. Vas. 95. X; but De Montfort's reference to Sold. Testac. pl. 86. Vas. 162. X. is quite wrong.

17. Vol. i. p. 122. 31^{e} genre. Cibicides refulgens. After Soldani, Testaceogr. i. pl. 46. fig. *o o.* This is the *Truncatulina refulgens,* D'Orb. Ann. Sc. Nat. vii. p. 279, No. 5; Modèles, No. 77. In the plate of the 'Testaceogr.' to which both De Montfort and D'Orbigny refer (the latter, however, quoting "48" instead of "46") are two very similar forms of two very distinct species. One of these (fig. *n n*) is a small and extremely conical form of *Rotalia repanda* (from the Chalk it has been described as *R. Micheliniana* by D'Orb., and as *R. nitida* by Reuss, and there are several allied varieties, all of deep-sea habitats); the other (fig. *o o*), usually a somewhat larger shell, and still more conical, is of totally different parentage; it is an extremely contracted form of *Planorbulina farcta,* inhabiting rather deep water; and gentle gradations may be readily traced between this and *Truncatulina lobatula.* The similarity of these two forms, at first sight perplexing, has led D'Orbigny to question whether they be the same or not. We may point out, however, that the extremely smooth, glossy, flat, spiral surface in *T. refulgens,* with its thick septal walls, more translucent than the cell-walls (as well indicated in Soldani's figure), and its coarser pores, are important diagnostics between this and fig. *n n.* The latter, with sulcate septal lines on its spiral face, has a tendency to gibbosity on this surface, and has often minute tuberculations, which help to make it an opakely white shell, as compared with the glassy *T. refulgens.* Its alliances with *R. repanda* and its sub-variety *R.*

Menardii, D'Orb., are through numerous and more or less oblong varieties, as yet undescribed, from the very deep soundings in the tropical parts of the Atlantic Ocean.

18. Vol. i. p. 126. 32^e genre. Eponides repandus. After Fichtel and Moll. It is the *Rotalia repanda.*

19. Vol. i. p. 130. 33^e genre. Storilus radiatus. From the Persian Gulf and Leghorn. This is a Rotalian form, flat on one side and strongly umbonate on the other. It is difficult to conjecture its identity with any known form, though it may be meant to represent some large variety of *Rotalia Beccarii,* which is extremely variable in its growth in different seas.

20. Vol. i. p. 134. 34^e genre. Florilus stellatus. A bad drawing after Fichtel and Moll's figures of *Nonionina asterizans.*

21. Vol. i. p. 138. 35^e genre. Polyxenes cribratus. After Fichtel and Moll's figure of *Planorbulina farcta.*

22. Vol. i. p. 142. 36^e genre. Æolides squammatus. The figure in Soldani's 'Testaceographia' (pl. 167. fig. *v v*) which De Montfort has here copied, with fanciful modifications, is one of Soldani's "Reteporæ muscipulæ minimæ." There is no doubt that Soldani's specimen was a young and somewhat excentric *Orbitolites complanatus.* Four or five other dwarfish and somewhat worn specimens are figured by Soldani in pls. 167 & 168, with a want of his usual clearness of delineation, his notion of the relations of these little *Orbitolites* (always small in the Mediterranean, especially at Leghorn) not having been very definite.

23. Vol. i. p. 146. 37^e genre. Tinoporus baculatus. Modified from the figure of *Calcarina Spengleri,* var. *a,* F. & M.; or, rather, this is apparently a curious hybrid picture, consisting of a three-spined *Orbitolina* *, according to its surface-ornament and its vertical section, but outlined after a three-spined *Calcarina Spengleri* (such as fig. *e.* pl. 15, in Fichtel and Moll's 'Test. Microsc.'). The indication of an aperture (the broken newest chamber in *Calcarina*) is also after Fichtel and Moll's figure. The sectional aspects in Montfort's woodcut appear to have been taken, the *vertical* (Orbitoline) from nature, the *horizontal* (Calcarine) from Fichtel and Moll's fig. *k,* with the sectional feature of the spine (also Calcarine) added from some other source. Some stellate variety of *Orbitolina sphærulata* may perhaps claim the name of *O. baculata,* Montf.; but Montfort's indefiniteness may well lead us to drop the name altogether.

24. Vol. i. p. 150. 38^e genre. Siderolites calcitrapes (*Siderolites calcitrapoïdes,* De la Marck. Syst. An. s. Vert. p. 376). Maestricht. This is the *Rotalia* (*Calcarina*) *Spengleri,* Gmelin

* For an account of *Orbitolina,* see Annals Nat. Hist. ser. 3. vol. vi. p. 29, &c.

(see Ann. Nat. Hist. ser. 3. vol. iii. p. 480; and vol. v. p. 174, &c.) "Siderolites," "Calcarina," and "Siderolina" (the last applied by D'Orbigny to one of the varieties of *C. Spengleri* from Maestricht) are synonyms. As the third name has also been given to some of the star-shaped *Orbitolinæ* of the South Seas, it is advisable, that we may avoid confusion, to retain "Calcarina" as the name of the subgenus.

Calcarina Spengleri has the following synonyms:—*Siderolites calcitrapoïdes,* Lamarck, *S. calcitrapes,* Montfort, *Asteriatites siderolithes,* Schlotheim, *Sideroporus calcitrapa,* Bronn, *Siderolina calcitrapoïdes,* D'Orbigny, *S. calcytrapoïdes,* Defrance, and *Siderolithus calcitrapoides,* Bronn.

25. Vol. i. p. 154. 39e genre. Numulites denarius. De Montfort seems to refer to *Nummulites lævigata,* Lamarck*, as being the same as his figured specimen; but the latter is totally valueless as a means of recognition.

26. Vol. i. p. 156. 40e genre. Lycophris lenticularis. This is the "Nautilus lenticularis, var. β," of Fichtel and Moll. A small granulose Nummulite.

27. Vol. i. p. 162. 41e genre. Rotalites radiatus. This is Fichtel and Moll's "Nautilus lenticularis, var. δ." A small Nummulite of the "radiate" group; a variety of *Nummulina planulata.*

28. Vol. i. p. 166. 42e genre. Egeon perforatus. This is the "Nautilus lenticularis, var. ϵ," of Fichtel and Moll. A small granulated Nummulite of the "radiate" group.

29. Vol. i. p. 170. 43e genre. Borelis melonoïdes. The *Alveolina Melo,* var. β, F. & M. Ehrenberg and Bronn adopt "Borelis" as the generic name, in preference to "Alveolina." (Leth. Geogn., 3rd edit., iii. pt. 5. p. 199.)

30. Vol. i. p. 174. 44e genre. Miliolites sabulosus. A very bad figure of a fusiform *Alveolina,* such as are abundant in some of the Tertiary beds in the environs of Paris and in Touraine, where, as De Montfort declares with great truth, the number of the shells of these little Microzoa surpasses the imagination.

31. Vol. i. p. 178. 45e genre. Clausulus indicator. This is Fichtel and Moll's "Nautilus Melo, var. *a,*" a nearly spherical *Alveolina.*

32. Vol. i. p. 186. 47e genre. Discolites concentricus. This is the *Orbitolites complanatus,* Lamarck. De Montfort's account of the large specimens from Grignon and Cortagnon (sometimes an inch broad) is very correct, except that the spirality ceases always with the young state, and in fine specimens is scarcely at all traceable.

* See Annals Nat. Hist. ser. 3. vol. v. p. 290.

Fortis * invented the name "Discolithes" as a general appellation for the small and mostly discoidal fossils previously known as "pierres lenticulaires, numismales, frumentaires, hélicites, et dernièrement camerines,"— that is *Nummulinæ* (including *Assilinæ*), *Orbitoides, Orbitolites,* some discoidal and polygonal *Calcarinæ, Alveolinæ,* and *Fabularia.*

33. Vol. i. p. 190. 48ᵉ genre. Archaias spirans. This is intended for *Orbiculina angulata,* F. & M.

34. Vol. i. p. 194. 49ᵉ genre. Helenis spatosus. Of the figures here given by De Montfort the upper one is referable to *Orbiculina adunca,* F. & M.; the lower one is a bad copy of the section of *O. Orbiculus.*

35. Vol. i. 198. 50ᵉ genre. Ilotes rotalitatus. A bad copy of Fichtel and Moll's figure of *Orbiculina Orbiculus.*

36. Vol. i. p. 202. 51ᵉ genre. Themeon rigatus. This is the common *Polystomella crispa,* Linn.

37. Vol. i. p. 206. 52ᵉ genre. Cellanthus craticulatus. Badly copied from Fichtel and Moll's figure of *Polystomella craticulata.*

38. Vol. i. p. 210. 53ᵉ genre. Nonion incrassatus. This is the "Nautilus incrassatus" of Fichtel and Moll. D'Orbigny's generic term *Nonionina,* modified from De Montfort's "Nonion," is applicable to this form, but only as a subsidiary term, not even of subgeneric value in a zoological sense, though often useful in descriptions and catalogues. The *Nonioninæ* are weak varieties of *Polystomella.*

39. Vol. i. p. 214. 54ᵉ genre. Robulus cultratus. *Cristellaria Calcar,* var. λ, F. & M. One of the most common of the whole-keeled Nautiloid *Cristellariæ.* D'Orbigny founded his *Robulina* on this form, which has a triangular aperture,—a feature of extreme variability.

40. Vol. i. p. 218. 55ᵉ genre. Patrocles querelans. Fichtel and Moll's var. *η* of *Cristellaria Calcar* is here intended.

41. Vol. i. p. 222. 56ᵉ genre. Spincterules costatus. This represents *Cristellaria costata,* F. & M.

42. Vol. i. p. 226. 57ᵉ genre. Clisiphontes Calcar. This is Fichtel and Moll's var. *a* of *Cristellaria Calcar.* De Montfort, who gives Buffon's 'Mollusq.' (Sonnini) pl. 47. fig. 4, and Soldani's 'Testaceogr.' as affording the original figure of his illustration, says that this shell abounds on the coasts of Borneo and Java, as well as in the Mediterranean.

43. Vol. i. p. 230. 58ᵉ genre. Herion rostratus. *Cristellaria Calcar,* var. ϵ, F. & M.

* See the "Mémoire sur les Discolithes" in the 2nd vol. of his 'Mémoires pour servir à l'Histoire Naturelle de l'Italie,' 1802; also Journ. de Phys. vol. lii. p. 106, &c., 1801.

44. Vol. i. p. 234. 59^e genre. Rhinocurus araneosus. Soldani, Testaceogr. pl. 58. fig. *h h*. A finely grown tooth-keeled *Cristellaria Calcar*.

45. Vol. i. p. 238. 60^e genre. Macrodites cucullatus. Apparently an oblong keelless *Cristellaria*. Iridescent with red, yellow, and blue tints, according to De Montfort, when fresh from the Adriatic.

46. Vol. i. p. 242. 61^e genre. Lampas trithemus. This is the *Cristellaria Calcar*, var. ζ, of Fichtel and Moll.

47. Vol. i. p. 246. 62^e genre. Pollontes vesicularis. A well-grown, finely striated form of *Quinqueloculina* from the Indian Ocean. It is well figured by Soldani ('Testaceographia,' pl. 154. figs. *b b*, *c c*, *d d*, *ee*, *ff*, *g g*) in its different stages of growth. De Montfort refers his specimen, with doubt, to fig. *c c*. It is the *Triloculina Brongniartii*, D'Orb., Ann. Sc. Nat. vii. p. 300, No. 23; *T. Brongniartiana*, D'Orb., Foram. Cuba, pl. 10. figs. 6–8; and the *Quinqueloculina Dutemplii*, D'Orb. For. Foss. Vien. p. 294, pl. 19. figs. 10–12.

This *Miliola*, which is but gently modified from *M. Seminulum*, is very widely distributed; in some localities, however, as in the shallow water off the mouth of the river Hermus, Levant, it is a dominant form, there representing the common *M. Seminulum* of other shores. In like manner, the more coarsely ribbed or paucicostate form (*Q. pulchella*, D'Orb., *Q. Schreibersii*, D'Orb.) is dominant at other places, as, for instance, at 40 fathoms in Suda Bay, Crete.

48. Vol. i. p. 250. 63^e genre. Scortimus navicularis. A free copy of Soldani's fig. D. pl. 55, Testaceog. A *Cristellaria* (of the *C. Cassis* subvariety) in which an approach to the Flabelline growth is assumed, the chambers taking on a chevron-like shape.

49. Vol. i. p. 254. 64^e genre. Linthuris cassidatus. This is *Cristellaria Cassis*, var. β, F. & M.

50. Vol. i. p. 258. 65^e genre. Peneroplis lanatus. Badly copied from Fichtel and Moll's "Nautilus planatus, var. β." De Montfort's generic term *Peneroplis* having been adopted, we have here *Peneroplis planatus*, F. & M. sp.

51. Vol. i. p. 262. 66^e genre. Astacolus crepidulatus. Intended for the *Cristellaria Crepidula*, F. & M.

52. Vol. i. p. 266. 67^e genre. Cancris auriculatus. A bad figure, modified from that of *Rotalia Auricula*, var. β, F. & M.

53. Vol. i. p. 270. 68^e genre. Periples elongatus. An elongate narrow *Cristellaria*, with strongly dentate keel, from Borneo, and referred by De Montfort to one of Soldani's figures of a similar *Cristellaria*, but keelless (Testaceogr. pl. 58. fig. *b b*).

54. Vol. i. p. 290. 73^e genre. Canopus fabeolatus. Possibly a

Polymorphina, from the description; but the figure is unrecognizable. From Java and other eastern islands.

55. Vol. i. p. 294. 74^e genre. Misilus aquatifer. This is intended for a figure of a common guttiform *Polymorphina* with staghorn processes,—that is, with the last chamber giving off tubular sheaths for a few large pseudopodia*. Soldani figures many forms of these (his "Polymorpha Corcula spinosa") in his 'Testaceograph.' plates 109–111. De Montfort doubtingly refers his specimen to pl. 111. fig. Y. Similar forms of horned *Polymorphinæ* have been variously named *Guttulina tubulosa*, D'Orb., *Globulina horrida*, Reuss, *Guttulina damicornis*, Reuss, *Raphulina Humboldtii*, Zborzewski, *Apiopterina D'Orbignii*, Zb., *Aulostomella Pediculus*, Alth.

56. Vol. i. p. 298. 75^e genre. Cantharus calceolatus. This is a very unfaithful copy from Soldani, Testaceogr. pl. 107. fig. *r r* (misprinted "*p p*" by De Montfort). There is little doubt that Soldani's figure represents a worn or fractured specimen of a large coarse *Polymorphina lactea*. Soldani has figured it upside down as regards the other figures on the same plate, evidently deceived by the fractured primordial chamber looking like the aperture.

57. Vol. i. p. 302. 76^e genre. Arethusa corymbosa. Soldani's figure of a somewhat elongate variety of *Polymorphina lactea* (Testaceogr. pl. 107. fig. *n n*) is here copied, with a misprint of "L L" for "*n n*."

58. Vol. i. p. 306. 77^e genre. Chelibs gradatus. Two or more globular chambers (?), vitreous and semitransparent, arranged in a straight series and graduated in size. From the Adriatic. These may be portions of small *Nodosariæ*, bits of Corallines, or possibly concretionary morsels of globular carbonate of lime.

59. Vol. i. p. 310. 78^e genre. Lagenula flosculosa. A prettily ornamented *Lagena*, with a long and annulate neck, is here somewhat ludicrously miscopied from Soldani, Testaceogr. pl. 120. fig. *z*. Soldani's figs. *y* and *z* represent a subglobular *Lagena* in which the ribs are modified by secondary short oblique riblets, altogether forming a zigzag costation, intermediate between the ornamentation of *L. sulcata*, Walker, which is the type, and *L. squamosa*, Montagu. The neck, with its variable thickened annuli, is converted by De Montfort into a neatly turned, but stout and wooden-looking pedestal-like appendage. This figure is reproduced by Zborzewski, Nouv. Mém. Soc. Nat. Mosc. iii. pl. 28. fig. *c*.

60. Vol. i. p. 314. 79^e genre. Glandiolus gradatus. Possibly *Nodosaria* (*Glandulina*) *lævigata*, D'Orb., with its last (largest) chamber broken with a dentate outline, although it is placed

* See remarks on similar forms in our paper on the Foraminifers of the Norway Coast, Annals Nat. Hist. ser. 2. vol. xix. p. 283.

amongst his "Testaceæ polymorphæ" by Soldani (Testaceog. pl. 117. fig. *r*).

61. Vol. i. p. 330. 83e genre. Reophax Scorpiurus. Soldani, Testaceogr. pl. 162. fig. K. This is a uniserial and, as it were, abortive variety of the arenaceous *Lituola nautiloidea*, and is of world-wide distribution in shelly deposits. Soldani's figure, true as to outline, fails to exhibit the sandy texture of the shell. De Montfort fancifully exaggerates the angularities of the segments of Soldani's drawing into doubly crossed chambers, "singulièrement quadrillées."

D'Orbigny refers the *Reophax* of De Montfort (under the terms "Réophage" and "Reophagus") to the *Nodosariæ* in several of his notices of the synonyms of *Nodosaria*.

62. Vol. ii. p. 362. 91e genre. Oveolites Margaritula. A very bad figure of the *Oveolites Margaritula*, Lamarck, Syst. des An. s. Vert. 1801, p. 402 (*Ovulites Margaritula*, Lamarck, Hist. An. s. Vert. ii. p. 194). From the Calcaire grossier of Grignon. (See Ann. Nat. Hist. ser. 3. vol. v. p. 291, &c.)

No.	Genres.	*Montfort's Names.*	*Corrected Names.*
1.	III.	Phonemus (Le Phonème tranchant).	Cristellaria Vortex, *F. & M.*
2.	IV.	Elphidium (L'Elphide souflé).	Polystomella macella, var. *β. F. & M.*
3.	V.	Geophonus (Le Géopone jaune).	Polystomella macella, var. *a*, *F. & M.*
4.	VI.	Pelorus (Le Pélore ambigu).	Polystomella ambigua, *F. & M.*
5.	VII.	Chrysolus (Le Chrysole perlé).	Polystomella Faba, *F. & M.*
6.	IX.	Pharamum (Le Pharame perlé).	Cristellaria Calcar, *Linn.*, var. *δ*, *F. & M.*
7.	X.	Andromedes (Andromède gauffrée).	Polystomella strigillata, var. *a*, *F. & M.*
8.	XI.	Sporilus (Sporulie pectiné).	Polystomella strigillata, var. *β*, *F. & M.*
9.	XII.	Canthropes (Canthrope galet).	[?].
10.	XVII.	Melonis Etruscus	Nonionina pompilioides, *F. & M.*
11.	XVIII.	Antenor diaphaneus	Cristellaria Calcar, *Linn.*
12.	XXIV.	Oreas subulatus	Cristellaria acutauricularis, *F. & M.*
13.	XXVI.	Jesites vermicularis	Serpula *.
14.	XXVII.	Charybs plicatus	Serpula *.
15.	XXVIII.	Cidarollus plicatus	Rotalia repanda, *F. & M.* var. pulchella, [*D'Orb.*

* Just as these little *Serpulæ* (badly copied from Soldani's figures) have supplied De Montfort with two of his "chambered univalve shells," so another *Serpula* from the same source is collated by him with the type of "an unchambered univalve" in his vol. ii.,—namely *Anatomus indicus*, 70e genre, p. 278. Soldani's figure of the young fry of a Buccinoid univalve affords another of the types, namely *Camillus*, 111e genre, p. 442, vol. ii.; whilst *Bitomus Soldani*, 57e genre, p. 226, is probably the fry of a Naticoid shell; and *Hercoles radicans*, 69e genre, p. 274, is possibly a young Turbinoid shell.

In the Annals Nat. Hist. ser. 3. vol. v. p. 182, we alluded to the probability of the *Lippistes Cornu* of Montfort (32e genre, p. 126, vol. ii.) being the *Separa-*

No.	Genres.	*Montfort's Names.*	*Corrected Names.*
16.	XXIX.	Cortalus Pagodus	Gasteropod? or Rotalia??
17.	XXXI.	Cibicides refulgens	Truncatulina refulgens, *Mont.* [*Type*, Planorbulina farcta, *F. & M.*]
18.	XXXII.	Eponides repandus	Rotalia repanda, *F. & M.*
19.	XXXIII.	Storilus radiatus	Rotalia.
20.	XXXIV.	Florilus stellatus	Nonionina asterizans, *F. & M.*
21.	XXXV.	Polyxenus cribratus	Planorbulina farcta, *F. & M.*
22.	XXXVI.	Æolides squammatus ..	Orbitolites complanatus, *Lam.* (young).
23.	XXXVII.	Tinoporus baculatus....	Orbitolina?
24.	XXXVIII.	Siderolites calcitrapes ..	Rotalia (Calcarina) Spengleri, *Gmel.*
25.	XXXIX.	Numulites denarius	Nummulina lævigata, *Lam.*
26.	XL.	Lycophris lenticularis ..	Nummulina planulata?, *Lam.*, var.
27.	XLI.	Rotalites radiatus......	Nummulina planulata, *Lam.*, var.
28.	XLII.	Egeon perforatus	Nummulina planulata, *Lam.*, var.
29.	XLIII.	Borelis melonoides	Alveolina Melo, var. β, *F. & M.*
30.	XLIV.	Miliolites sabulosus	Alveolina Melo, *F. & M.*, var.
31.	XLV.	Clausulus indicator	Alveolina Melo, var. *a*, *F. & M.*
32.	XLVII.	Discolites concentricus..	Orbitolites complanatus, *Lam.*
33.	XLVIII.	Archaias spirans	Orbiculina adunca, var. angulata, *F. & M.*
34.	XLIX.	Helenis spatosus	Orbiculina adunca, *F. & M.*
35.	L.	Ilotus rotalitatus	Orbiculina adunca, var. Orbiculus, *F. & M.*
36.	LI.	Themeon rigatus	Polystomella crispa, *Linn.*
37.	LII.	Cellanthus craticulatus..	P. crispa, *Linn.*, var. craticulata, *F. & M.*
38.	LIII.	Nonion incrassatus ...	Nonionina incrassata, *F. & M.*
39.	LIV.	Robulus cultratus......	Cristellaria Calcar, *Linn.*, var. λ, *F. & M.*
40.	LV.	Patrocles querelans	C. Calcar, *Linn.*, var. η, *F. & M.*
41.	LVI.	Sphincterulus costatus..	C. Calcar, *Linn.*, var. costata, *F. & M.*
42.	LVII.	Clisiphontes Calcar	C. Calcar, *Linn.*, var. *a*, *F. & M.*
43.	LVIII.	Herion rostratus	C. Calcar, *Linn.*, var. ε, *F. & M.*
44.	LIX.	Rhinocurus araneosus ..	C. Calcar, *Linn.*, var.
45.	LX.	Macrodites cucullatus ..	C. Calcar, *Linn.*, var.
46.	LXI.	Lampas trithemus......	C. Calcar, *Linn.*, var. ζ, *F. & M.*
47.	LXII.	Pollontes vesicularis	Miliola (Quinqueloculina) Seminulum, *Linn.*, var.
48.	LXIII.	Scortimus navicularis ..	Cristellaria Calcar, *Linn.*, var.
49.	LXIV.	Linthuris cassidatus	C. Calcar, *Linn.*, var. β. *F. & M.*
50.	LXV.	Peneroplis lanatus	Peneroplis planatus, *F. & M.* sp.
51.	LXVI.	Astacolus crepidulatus ..	Cristellaria Calcar, *Linn.*, var. Crepidula, *F. & M.*
52.	LXVII.	Cancris auriculatus	Rotalia repanda, var. Auricula, *F.* & *M.*
53.	LXVIII.	Periples elongatus......	Cristellaria Calcar, *Linn.*, var.
54.	LXXIII.	Canopus fabeolatus	Polymorphina?
55.	LXXIV.	Misilus aquatifer	Polymorphina lactea, *W. & J.*, var. tubulosa, *D'Orb.*
56.	LXXV.	Cantharus calceolatus ..	P. lactea, *W. & J.*
57.	LXXVI.	Arethusa corymbosa	P. lactea, *W. & J.*
58.	LXXVII.	Chelibs gradatus	[?]
59.	LXXVIII.	Lagenula flosculosa	Lagena sulcata, *W. & J.*, var.
60.	LXXIX.	Glandiolus gradatus	Glandulina lævigata, *d'Orb.*?
61.	LXXXIII.	Reophax Scorpiurus	Lituola nautiloidea, *Lam.*, var.
62.	XCI.	Oveolites Margaritula ..	Ovulites Margaritula, *Lam.*

tista Grayi of H. Adams; this has now been confirmed by Mr. S. P. Woodward, who, with the late Dr. Livesay and Mr. H. Adams, has carefully compared with Fichtel and Moll's figures Mr. Cuming's specimens of *Lippistes Cornu*, F. & M. sp., as well as some which we had received from the Cape of Good Hope.

XLIV.—*On the Mollusca of the Upper Harz.*

By J. Gwyn Jeffreys, Esq., F.R.S.

During a visit with my family this autumn to the northern part of the Harz, I assisted my son and one of his sisters in collecting the land and freshwater Mollusca there; and the following notice of some of the less common species may be useful with reference to their geographical distribution. Neither Carl Pfeiffer, Rossmässler, nor (as I believe) any other conchologist has indicated any localities in this part of Germany.

Limax arborum. Occasionally in the woods about Alexisbad.

L. Sowerbyi. Under stones at Falkenstein and other places; not common.

Succinea Pfeifferi. With *S. putris*, near Alexisbad; but less common than that species.

S. oblonga. With the last; not common.

Vitrina diaphana. Under stones in the woods about Alexisbad; common.

Helix fruticum, var. rufescens. On shrubs and nettles in the same woods. Adult specimens are rare.

H. incarnata. In the same woods, and at the Rosstrappe; rather common.

H. strigella. Rubeland; rare. A half-grown specimen contained the larvæform pupa of *Drilus flavescens*, the female of which has been named *Cochleoctonus vorax*, from its snail-eating habit. I found a similar pupa, five years ago, in a *Helix incarnata* near Lausanne in Switzerland, which, as in the present case, completely occupied the spire of the shell after devouring its former inhabitant.

H. lapicida, var. pallida. On rocks near Alexisbad; rare.

H. pygmæa. In the woods near Alexisbad; not common.

H. pomatia. It is remarkable that, although we diligently searched for several weeks the environs of Alexisbad, not a single specimen was found by us; and the residents at that place said they had not met with it. It is common in other parts of the Harz. This shows how irregular and apparently capricious is the distribution of some species.

Zonites alliarius. Rosstrappe, where only one specimen occurred to us.

Z. nitens (Michaud). In woods at different places; common. It appears to have been confounded, in this country, with the *Helix nitidula* of Draparnaud.

Z. nitidus. In marshy places near Alexisbad and Harzgerode; common.

Z. radiatulus, and var. pallida (*Helix viridula*, Menke). In the woods and under stones near Alexisbad, Harzgerode, and Stolberg; common.

Z. purus. With the last; but rare.

Bulimus Lackhamensis. In the woods at Alexisbad; rare.

Azeca tridens. With the last; not common.

Zua lubrica, var. pallida and var. gracilis. With the last; not uncommon.

Clausilia plicata. On the castle-walls at Stolberg; not common.

C. biplicata, and var. alba. On rocks near Alexisbad; local.

C. plicatula. On rocks and trees at the same place; common. The authors of the 'British Mollusca' were mistaken in referring the *C. Rolphii* of Gray to this species. The form, sculpture, and dentition of each of these species are very different; and they have been properly separated by Moquin-Tandon in his valuable work on the French land and freshwater Mollusca.

C. dubia. With the last, and equally common. Whether it is specifically distinct from *C. nigricans* is, however, questionable.

C. parvula. On rocks in the woods at Alexisbad; common.

Balea fragilis. On rocks and trees near Alexisbad; not uncommon.

Vertigo pusilla. In the woods at Alexisbad; not uncommon.

V. edentula. With the last; rare.

V. alpestris. Under stones and on moss in the same woods; rare. This is a true *Vertigo*, and has not the slightest vestige of the lower pair of tentacles. The animal is of a light straw-colour, and differs, besides, from that of *V. pygmæa* (which is not uncommon in the same locality) in having a longer foot and tentacles. It is the *Pupa Shuttleworthiana* of Charpentier, as previously identified by me (Ann. Nat. Hist. 3rd ser. vol. ii. p. 132); but I much doubt its being the *Vertigo alpestris* of the late Baron Férussac. Two specimens from his collection (only one of which, however, is entire) are preserved in the Jardin des Plantes at Paris, and labelled in the author's handwriting "Vertigo alpestris, nob., 4 D., Charp. No. 9. Alpes." In these specimens the longitudinal striæ are scarcely perceptible under a lens having a quarter-of-an-inch focus; and the shells are smooth, thin, and glossy in appearance. I am inclined to consider these specimens, and consequently the *V. alpestris* of Férussac (which is a mere MS. name, although adopted by Mr. Alder), to be a variety of *V. pygmæa*.

V. minutissima. Under stones at Harzgerode and Falkenstein; not common.

Pisidium pusillum, P. nitidum, and P. Henslowianum (var. pulchellum). Alexisbad; not common.

When we consider that the latitude of the district I have thus cursorily explored is nearly parallel to that of the south-eastern part of Great Britain, it is curious to observe how many species of Mollusca occur in the former, and not in the latter, region. These exceptions are by no means of species which comprise only a few or inconspicuous individuals, but on the contrary, the individuals are numerous and comparatively large. They are *Vitrina diaphana, Helix fruticum, H. incarnata, H. strigella, H. personata, Clausilia plicata, C. plicatula,* and *C. parvula.* One of them (viz. *Helix incarnata*) occurs as a Pleistocene fossil in England. The only satisfactory mode of accounting for this partial distribution of land animals would seem to be the great and continual alterations which have, from time to time since the commencement of the Tertiary epoch, successively taken place in the relative position and quantity of land and water, caused by subsidence in some, and elevat ion in other parts; and geologists have yet a great deal to do and learn before they can elucidate this difficult problem.

Oct. 10, 1860.

XLV.—*On the* Calyceraceæ. By John Miers, F.R.S., F.L.S. &c.

[Continued from p. 288.]

4. Anomocarpus.

I have already alluded to this genus, which differs from all others of this order in many esssential characters. The inflorescence generally consists of a single head of a few florets standing upon a very short peduncle, in each axil of the dichotomously branching stems; the involucre is thin, membranaceous, cup-shaped, divided half-way down into a 5-toothed border, its receptacle being reduced to a small point scarcely larger than the summit of the peduncle, and in some instances quite void of paleæ. The achænia are remarkably dissimilar in form; in some the calycine lobes retain their original shape, or become almost obsolete, while in others they become greatly elongated into subulate, rigid, concave, straight, patent, and almost spinose expansions: hence the generic name, derived from ἄνομος, *inæqualis*; καρπὸς, *fructus*. This habit prevails in the three first-mentioned species; but in the fourth the stems disappear, the plant becoming completely depressed and cæspitose; the cauline leaves thus come to be entirely radical and radiating, each bearing upon its petiole an almost sessile capitulum, the whole plant forming a somewhat hemispherical head, as in the genus *Nastanthus*. This species is the *Calycera pulvinata* of Remy, from whose description it formerly appeared to me to constitute a new genus, which I suggested under the name of *Discophytum* (Lindl. Veg. Kingd. 703), agreeing with *Nastanthus* in its peculiar habit, and approaching *Anomocarpus* in other respects. Subsequently I obtained a sight of the plant, and its examination convinced me that it agrees perfectly with the latter genus in its floral and carpological structure, and is dissimilar in no respect except in its habit, which is entirely due to the complete depression of its axis, by which it is reduced to cæspitose proportions. Each capitulum represents a depressed branch, its leaves, thus approximated, assume a campanular involucral form, being accreted at their base into a broad shallow cup supported upon a short stipe, with a border of foliaceous segments; and it contains about seven distinct capitella, which are analogous to the short scapes, each bearing a monocephalous head, seen in each axil of the stem in the typical species, but in this instance all are brought close together by the depression of the stem; each capitulum is supported upon a short stipe, and consists of an involucel of five to seven linear leaflets containing a solitary spined achænium in the centre, surrounded by seven or eight other achænia which are quite unarmed, and all are supported by a small epaleaceous receptacle. Thus considered, the plant exhibits all the peculiar and essential characters of *Anomocarpus*.

I have united with this genus the *Leucocera* of Turczaninow, founded upon the *Boopis leucanthema* of Pöppig, which agrees with *Anomocarpus* in all essential respects, except that the receptacle is more convex, almost conical, and charged with persistent paleæ, after all the achænia have fallen off, as in *Boopis*. These characters are hardly sufficient to claim a distinct generic rank for *Leucocera*—a name that would have been ill applied, as the spines of the achænia are of a yellowish brown colour. The great difference in the form of the achænia was scarcely recognized by Turczaninow—a feature better characterized by the name *Anomocarpus*, which I had long previously employed for the more legitimate species.

Anomocarpus, nov. gen.—*Involucrum* gamophyllum, campanulatum, plus minusve profunde partitum, membranaceum, plurinerve, nervis 15–21, parallelis, laciniis 5–7, triangularibus aut lineari-oblongis, acutis, erectis, interdum demum auctum et explanatum. *Receptaculum* minimum, areolatum, nudum, rarius parce paleaceum. *Flores* sæpius pauci, inclusi, omnes fœcundi. *Calyx* ovario adnatus, 5-angulatus, in floribus radii limbi lobis abortivis, in unico centralibus (sæpe unico) lobis 5, æqualibus, liberis, ovatis, acutis, denticulatis et mucronatis, erectis, demum patentibus et excrescentibus. *Corollæ* omnes consimiles, tubo infundibuliformi imo coarctato, cum ovario articulato, limbo breviter campanulato 5-partito, lobis acutiusculis, crassiusculis. *Stamina* subexserta; *filamenta* imo in tubum brevissimum syngenesia, medio tubi corollæ inserta, apice longiuscule libera, et conniventia; *antheræ* oblongæ imo in tubum accretæ, in floribus radii sæpe polline destitutæ. *Ovarium* oblongum, 5-angulatum, imo ad calycem adnatum, supra medium liberum, hinc conicum, 5-sulcatum, 1-loculare, 1-ovulatum; *ovulum* funiculo brevi ex apice pendulum. *Stylus* filiformis, exsertus, apice paulo incrassatus. *Stigma* subglobosum, papillosum. *Achænia radii* obovata, inermia, profunde 5-costata, costis transversim rugosis, apice nodis cupuliformibus stylum versus conniventibus (e lobis calycinis tabidis) munitis; *centralia* iis radii conformia, sed supra medium lobis calycinis longissime excretis, acutissime mucronatis, horizontaliter patentibus, profunde concavis, imo tubiformibus, margineque tenui scarioso-denticulatis coronata. *Semen* ordinis.

Herbæ *Chilenses, sæpius pusillæ et erectæ, dichotome ramosæ;* folia *in dichotomiis solitaria, alterna, spathulato-lanceolata, longe petiolata;* capitula *parva, interdum demum aucta, in dichotomiis solitaria, breviter pedunculata.*

1. *Anomocarpus axillaris*, n. sp.;—herbacea, glaberrima, caulibus nonnullis, e basi dichotome ramosis; foliis in axillis ramorum, alternis, elliptico-lanceolatis, spathulatis, integris vel paucidentatis, 3-nerviis, petiolo angusto æquilongis; capitulis in dichotomiis solitariis, brevissime pedunculatis; involucro membranaceo, campanulato aut semigloboso, 5-partito, 15-nervio, laciniis 3-angularibus, erectis; receptaculo parvo, 6-floro; floribus exsertis; achæniis 5, exterioribus inermibus, unico centrali spinis longis latis acutissimis canaliculatis denticulatis coronato.—Chile, *v. s. in herb. Hook.* (Valparaiso, Cuming, 664).

Planta 3-pollicaris; internodi inferiores 11 lin., superiores 7 lin. distantes; folia inferiora (incluso petiolo limbo æquali) $1\frac{1}{2}$ poll. long., limbo 3 lin. lat., integra; superiora remote dentata (utrinque dentibus 2), incluso petiolo $1\frac{1}{4}$ poll. long., limbo 2 lin. lat.; pedunculus brevissimus, $\frac{1}{4}$–1 lin. long.; involucrum semiglobosum, campanulatum, 2 lin. long., 3 lin. diam., ad medium 5-dentatum; flores exserti; ovarium $\frac{1}{2}$–$\frac{3}{4}$ lin. long.; corolla $1\frac{1}{4}$ lin. long.; achænium $1\frac{1}{2}$ lin. long., spinis 5, patentibus, $1\frac{1}{2}$ lin. long., rigidis, profunde canaliculatis*.

2. *Anomocarpus subsessiliflorus*;—Calycera sessiliflorus, *Ph. Linn.* xxviii. 706;—annua, caulibus paucis, ramosis; foliis radicalibus oblongis, in petiolum attenuatis, remote et grosse dentatis, caulinis breviter petiolatis; capitulo primo fere radicali, reliquis in dichotomiis caulis subsessilibus; involucro semigloboso, capitulum æquante, achæniis nonnullis spinis 5 complanatis fructui fere æquilongis coronatis, 5-costatis, lævibus, aliis dentibus brevibus terminatis, 5-angularibus, angulis

* A drawing of this plant, with details of its structure, is given in the 'Contributions,' Plate 48 A.

rugosis.—Chile, *v. s. in herb. Hook.*; prope Quillota (Germain); Cerro Bravo, prope Santiago (Philippi).

Species præcedenti valde proxima; differt foliis latioribus, majoribus et grosse dentatis, capitulo involucro æquilongo, achæniis spinosis plurimis, spinis brevioribus, et reliquis dentibus brevibus coronatis. Planta circiter 3-pollicaris; folia (incluso petiolo) 2 poll. long., 5 lin. lat., capitula 3 lin. diam.*

3. *Anomocarpus eryngioides*;—Calycera eryngioides, *Remy, in Gay, Fl. Chil.* iii. 254; *Weddell, Chl. And.* ii. 7, tab. 43 A;—herbacea, debilis, caulibus plurimis simplicibus, laxatim dichotome ramosis, ramis flexuosis, remotis, glaberrimis, angulato-striatis; foliis radicalibus semi-pinnatifidis, longissime attenuatis, superioribus caulinis, alternis, spathulato-oblongis, integris aut pauci-, grosso- et mucronato-dentatis, submembranaceis, nervosis, utrinque glaberrimis; petiolo lineari limbo tertia parte breviore; pedunculis in dichotomiis solitariis, folio dimidio brevioribus, imo glabris, summo puberulis, demum in fructu 3-plo longioribus, monocephalis; involucro late campanulato, 5-dentato, glaberrimo, dentibus 3-angularibus, demum in fructu valde aucto, tunc rotatim expanso, submembranaceo et parallelim nervoso; receptaculo minimo, multifloro; paleis paucis, inæqualibus, lineari-subulatis, imo tenuissime attenuatis, viridibus, nonnullis floribus longioribus, aliis multo brevioribus; corollæ tubo filiformi, elongato, superne infundibuliformi; achæniis centralibus inermibus, exterioribus longissime spinosis, spinis 5, divaricatis, inæqualibus.—In Andibus Chilensibus, Prov. Santiago, *v. s. in herb. Mus. Paris.*

Planta pedalis et ultra, ramis 1 lin. diam., subflexuosis, nitidis, striatis, medulla cellulosa repletis, sicco fragilibus; internodi 3 poll. remoti; folia caulina (incluso petiolo angusto æquilongo) $1\frac{1}{2}$ poll. long., 3–5 lin. lat., alterna; capitula (dum florent) 6 lin. diam.; involucrum gamophyllum, tunc late campanulatum, ad medium 5-dentatum, dentibus acutis subexpansis, 6–8 lin. diam., demum valde augescens et in fructu $1\frac{3}{4}$–$2\frac{1}{4}$ poll. diam., viride, membranaceum, reticulato-nervosum, complanato-expansum et folium planum stellatum simulans; receptaculum convexum, 2 lin. diam.; flores numerosissimi, fere omnes consimiles; paleæ paucissimæ, virides, lineari-spathulatæ, imo angustissimæ, apice acutæ, mucronatæ, 3–7 lin. long., $\frac{1}{4}$–$\frac{3}{4}$ lin. lat.; calyx adnatus, 5-angulatus, breviter 5-dentatus; corollæ 5 lin. long. tubus imo gracillime coarctatus, pro dimidio vel tertia parte superne infundibulatus; limbi laciniæ 5, lineares, erectæ; stamina longitudine fere laciniarum 1 lin. long.; filamenta imo in annulum brevem

* This species is shown in Plate 48 B.

liberum ori tubi affixum connata; antheræ lineares, imo breviter syngenesiæ, superne liberæ; stylus apice incrassatus, exsertus. Achænia spinigera pauca, cum plurimis inermibus intermixta, turbinata, profunde 5-angulata, 2 lin. long., spinis 5 (quarum 2 sæpe brevioribus), 3 poll. long., patentissimis, subulatis, superne sulcatis, acutissime pungentibus, stramineis, imo incrassatis et denticulatis; inermia plurima, pleraque centralia, 1½ lin. long., 1 lin. diam., profunde sulcata, angulis 5, lævibus, convexis et dentibus calycinis minimis concavis superatis, apice conico, corolla persistente 2–3-plo longiore sæpius terminata; in externa serie pauca, inermia, corolla persistente reliquis breviore (cujus stamina emasculata) apicata*.

4. *Anomocarpus pulvinatus*;—Calycera pulvinata, *Remy, Ann. Sc. Nat.* 3e sér. vi. 352; *Walp. Ann.* ii. 382; *Weddell, Chl. And.* ii. 6, tab. 43 B;—acaulis et cæspitosus, pusillus, glaberrimus; foliis radicalibus, paucis, radiatis, rhomboideo-oblongis, squarroso-laciniatis, laciniis irregularibus, obtusis, calloso-mucronatis, imo in petiolum elongatum deplanatum spathulatis, crasso-carnosis, e basi 5-nerviis; capitulis numero foliorum, imo petiolorum fere sessilibus, et in orbem pulvinatum dense glomeratis, singulatim breviter involucratis; involucris gamophyllis, 5–7-partitis, singulis capitella 4–8 iterumque involucellata claudentibus; involucellis gamophyllis, profunde 5–7-partitis; receptaculo minimo, epaleaceo; floribus 6–10, longe exsertis; involucris involucellisque fructiferis, demum valde auctis et tunc arcte consociatis; achæniis exterioribus inermibus, unico centrali in quoque involucello semper spinescente.—Bolivia, *v. s. in herb. Mus. Paris.*; grand plateau des Andes, Prov. Carangas (Pentland, spec. fructif.); circa Laguna, Potosi (Weddell, spec. florif.).

Planta pusilla, inclusis foliis radiantibus 2–3 poll. diam.; pulvinus capitulorum, ætate florali, 10–12 lin. diam., e capitulis 16–20 crebriter aggregatis; folia circiter 16–20, omnia radicalia (incluso petiolo sublongiore) 1–1¾ poll. long., et inclusis laciniis 6 lin. lat.; petiolus imo submembranaceus, 1 lin. lat.; capitula 3–3½ lin. diam., subglobosa; pulvinus capitulorum, ætate fructifera, 2½–3 poll. diam.; involucra subsessilia, pateriformia, 7–10 lin. diam., 3 lin. alta, imo plana et gamophylla, foliolis 7–9, hinc liberis, erectiusculis, subimbricatis, obovato-oblongis, margine denticulatis, membranaceis, reticulato-venosis; involucella in singulo involucro sæpius 8 (forsan e paleis inter se in verticillum imo accretis), breviter pedicellata; pedicellus complanatus, 1 lin. long. et lat.; tubus gamophyllus, 2 lin. diam., 1 lin. alt., foliolis

* A drawing of this species, with analytical details, is given in Plate 48 c.

uniserialibus, circiter 7, lineari-oblongis, acutis, membranaceis, erectis, parallele nervosis, subinæquilongis, 3–5 lin. long., 1–$1\frac{1}{2}$ lin. lat.; receptaculum planum, minimum, epaleolatum, areolatum, pauciflorum; achænium centrale unicum, spinigerum, $1\frac{1}{4}$ lin. long., profunde angulatum, spinis 5, subulatis, subæqualibus, subdivaricatis, imo incrassatis, cum angulis lævibus continuis, 3–4 lin. long.; achænia exteriora circiter 8, inermia, 1 lin. long. et lat., 5-angulata, in sulcis transversim rugosa; flores in externa serie abortivi et immutati *.

5. *Anomocarpus leucanthemus*;—Boopis leucanthema, *Pöp. Nov. Gen.* i. 21, tab. 34; *Lessing, Linn.* vi. 259; *DC. Prod.* v. 2; *Remy in Gay, Chile,* iii. 250; *Weddell, Chl. And.* ii. 8;—Leucocera annua, *Turcz. Flor. B. Zeit.* xxxi. 712; *Walp. Ann.* ii. 807;—Acicarpha lanata, *Lag. Pers. Ench.* ii. 438; *DC. l. c.* 3;—herba pusilla, radice fusiformi, caule sæpius e basi ramoso, ramisque gracilibus, flexuosis, dense cano-lanuginosis; foliis pinnatifidis, laciniis patentibus rachique anguste linearibus, glaberrimis, crassis, calloso-mucronatis, radicalibus longe petiolatis, caulinis tertia parte brevioribus; pedunculis oppositifoliis, lanuginosis; involucro campanulato, profunde 5–8-fido, laciniis inæqualibus, linearibus, mucronatis, glabris, flores superantibus.—In Andibus Chilensibus, in scaturiginosis, *v. s. in herb. Mus. Paris. et Hook.*; in excelsis Cordillera de Antuco, Prov. Arauco (Pöppig); Cordillera de Colchagua (Bridges, 1186–1187); circa Talca (Germain).

Species habitu generis *Acicarphæ* valde similis, sed differt achæniis omnibus liberis et dissimilibus, involucro libero, profunde laciniato, imo gamophyllo; a *Boopide* etiam differt achæniis dissimilibus, aliisque longe spinosis. Planta 3–5 poll. alta; caulis dense lanatus, paulo supra basin ramos plurimos emittens, ramis erectiusculis, præsertim summo dense lanatis; folia radicalia 1 poll. long. incluso petiolo limbo æquilongo, 3–4 lin. lat.; pedunculi oppositifolii, lanati, in flore 3 lin., in fructu 6–9 lin. long., monocephali; capitula in flore hemisphærica, 3 lin. diam., in fructu globosa, 4–5 lin. diam.; involucrum glabrum, immutatum, demum reflexum; receptaculum semiglobosum, foveatum, $\frac{3}{4}$ lin. diam., paleis persistentibus spathulato-setaceis sparsis onustum. Corolla tubo gracili viridi, limbo expanso albo 5-partito æquilongo; segmenta linearia, acuta. Achænia omnia usque ad basin libera, creberrima, fusca, inermia et spinigera intermixta, obconica, profunde 5-angulata, in sulcis transversim rugosa, $1\frac{1}{2}$ lin. long., lobis calycinis stellatim radiatis, naviculiformibus, acutis; alia majora, 2 lin. long., brunnea, straminea,

* Full details of this structure are shown in Plate 49 A.

angulis acute carinatis, et in spinis e lobis calycinis valde auctis terminatis, spinis superne profunde sulcatis, subulato-compressis, subtus carinatis, 1½ lin. long.*

6. *Anomocarpus tenuis*, n. sp.;—caulibus simplicibus, gracillime elongatis, flexuosis, primum decumbentibus, mox erectis, stramineis, sub lente parce puberulis, demum glabris, foliis pinnato-sectis, laciniis linearibus, membranaceis, utrinque 2, in petiolum angustissimum attenuatis, glaberrimis; pedunculis remotis, oppositifoliis, valde elongatis, monocephalis; capitulis semiglobosis, involucro fere ad basin 5-laciniato, laciniis anguste linearibus, membranaceis, glabris; paleis persistentibus, longis, spathulatis, involucro æquilongis.—Chile, *v. s. in herb. Mus. Paris.* (Gay).

Caulis gracilis, 10 poll. alt., ¼–½ lin. diam; folia 9 lin. long., segmentis rachique ½ lin. lat., supremis simplicibus 3–4 lin. long., subsetaceis; pedunculus in flore 6 lin., in fructu 18 lin. long.; capitulum 2–3 lin. diam.; flores quam in *A. leucanthemo* pauciores et minores; corolla 5 lin. long.; achænia alba, libera, pleraque inermia, ½ lin. long., alia pauca, brevissime spinigera †.

7. *Anomocarpus tenuifolius*; Calycera tenuifolia, *Phil. MSS.*;—subcæspitosa, caulibus pluribus brevioribus, subdecumbentibus, lanato-pilosis; foliis radicalibus plurimis, radiantibus, elongatis, longe petiolatis, profunde pinnato-partitis, laciniis subdivaricatis, linearibus, glaberrimis, superne enerviis, subtus costa mediana prominula signatis; caulinis brevioribus, alternis; pedunculis axillaribus, oppositifoliis, incurvis, pilosis, monocephalis; capitulis parvis.—In Andibus Chilensibus, *v. s. in herb. Hook.*; Cordillera de Chillan (Germain).

Radix fusiformis, 2 poll. long.; caules 2–2¼ poll. long.; folia radicalia 1–1½ poll. long., petiolo 6–9 lin. long., rachique ½–1 lin. lat., laciniis inæqualibus, sæpius 4–5-jugis, 1–2 lin. long., ½–1 lin. lat.; folia caulina 6–12 lin. long.; pedunculi 3 lin. long.; capitulum 2–3 lin. diam.; flores 2 lin. long.; ovarium 5-angulatum, 5-carinatum, obconicum, dentibus 5, erectis, carnosulis, acutis, dorso carinatis; corollæ tubus gracilis, viridis, limbo albo, 5-partito.

* A drawing of this species will be seen in Plate 49 c.
† This plant is represented in Plate 49 b.

[To be continued.]

XLVI.—*Characters of some apparently undescribed Ceylon Insects.* By F. Walker.

[Continued from vol. v. p. 311.]

Fam. Chalcidiæ.

Chalcis dividens. *Fœm.* Nigra, conferte punctata, facie excavata, antennis thorace brevioribus, abdominis dimidio basali glabro, pedibus rufis, tibiis posticis basi tarsisque posticis nigris, alis fuscescentibus.

Female. Black, thickly and minutely punctured. Head as broad as the thorax, deeply excavated in front. Antennæ filiform, very compact, shorter than the thorax. Prothorax very narrow in the middle, much dilated on each side. Abdomen conical, narrower but not longer than the thorax, smooth and shining from the base to the middle; first segment less than half of the whole length. Legs red, stout; hind tibiæ towards the base, and hind tarsi, black. Wings brownish; veins black; ulna about one-fourth of the length of the humerus; radius extending nearly to the tip of the wing. Length of the body 2¾ lines; of the wings 4 lines.

Chalcis pandens. *Fœm.* Nigra, conferte punctata, facie excavata, antennis apice rufis, metathorace sulcato, tibiis posticis tarsisque rufis, alis hyalinis.

Female. Black, thickly and minutely punctured, much like the preceding species in structure. Antennæ red at the tips. Metathorax with a longitudinal furrow. Abdomen a little longer than the thorax. Tarsi, knees, tips of tibiæ, tips of hind coxæ, hind femora towards the base, and hind tibiæ, red. Wings hyaline; calli of the fore wings red. Length of the body 2½ lines; of the wings 3½ lines.

Halticella rufimanus. *Mas.* Nigra, obscura, confertissime punctata, antennis thorace paulo longioribus, abdomine elliptico parvo basi glabro, tarsis anterioribus rufis, alis fuscis.

Male. Black, opake, very thickly and minutely punctured. Head hardly broader than the thorax. Antennæ filiform, stout, very compact, a little longer than the thorax. Prothorax transverse, not broader on each side than in the middle. Abdomen elliptical, smooth, and shining towards the base, narrower and much shorter than the thorax; first segment occupying half the length. Anterior tarsi red. Wings brown; veins black, red towards the base; ulna about one-fourth of the length of the humerus; radius shorter than the ulna; stigma extremely small. Length of the body 2 lines; of the wings 3 lines.

Halticella inficiens. *Mas.* Nigra, obscura, confertissime punctata, abdomine basi glabro, tibiis anterioribus apice tarsisque anterioribus fulvis, alis albido-hyalinis.

Male. Black, opake, very thickly and minutely punctured, in structure much like the preceding species. Abdomen smooth towards the base. Anterior knees, anterior tarsi, and tips of anterior tibiæ tawny. Wings whitish hyaline; veins piceous. Length of the body 1¼ line; of the wings 1¾ line.

EURYTOMA CONTRARIA. *Mas.* Nigra, rude punctata, antennis moniliformibus, thorace robusto, petiolo longiusculo, abdomine glabro parvo subcompresso, genubus tibiis apice tarsisque flavis, alis albis, venis pallide flavis.

Male. Black, roughly punctured. Head not broader than the thorax. Antennæ moniliform, not longer than the thorax; joints elongate, petiolated. Thorax very robust. Petiole rather long. Abdomen smooth, shining, slightly compressed, not more than half the length or the breadth of the thorax. Knees, tarsi, and tips of tibiæ, yellow. Wings white; veins pale yellow. Length of the body 1½ line; of the wings 2 lines.

EURYTOMA INDEFENSA. *Fœm.* Nigra, conferte punctata, capite magno, antennis subclavatis, scapo luteo, abdomine glabro longi-elliptico, pedibus fulvis, femoribus tibiisque posterioribus nigro latissime fasciatis, tarsis flavescente-albis, alis fuscescentibus.

Female. Black, thickly punctured. Head broader than the thorax. Antennæ subclavate, not longer than the thorax; scape luteous. Abdomen elongate-elliptical, smooth, shining, narrower but not longer than the thorax; first segment occupying nearly the whole surface; oviduct extending a little beyond the tip. Legs tawny; each femur and posterior tibia with a very broad black band; tarsi yellowish white, Wings brownish, rather broad; veins black. Length of the body 1 line; of the wings 1½ line.

EUCHARIS CONVERGENS. *Mas.* Viridis, cupreo varia, rude punctata, antennis piceis thorace brevioribus octo-ramosis, scapo flavo, thorace gibbo, scutello spinis duabus longis divergentibus basi connexis armato, petiolo longo gracili, abdomine cyaneoviridi longi-ovato glabro parvo, pedibus flavis, alis cinereis fusco notatis. *Fœm.* Obscure viridis, antennis nigris subclavatis submoniliformibus, femoribus piceis.

Male. Green, partly cupreous, roughly punctured. Head as broad as the thorax. Antennæ piceous, shorter than the thorax, with eight linear branches, whose tips are acuminated; scape yellow. Thorax gibbous, well developed; scutellum conical, prominent, furrowed along the middle, armed at the tip with two long, diverging spines, which are connected at the base; metathorax large, declining. Petiole slender, cylindrical, nearly as long as the abdomen; the latter elongate-oval, bluish green, smooth, shining, slightly compressed, and consisting apparently of but one segment. Legs yellow, rather slender. Wings cinereous. Fore wings brownish about the stigma; veins and stigma black; ulna shorter than the humerus; radius very short; cubitus short. *Female.* Dark green. Head a little narrower than the thorax, impressed between the eyes. Antennæ with the flagellum black, subclavate, submoniliform. Petiole much shorter than the abdomen; the latter coarctate, much elevated, red beneath. Femora piceous, except towards the tips. Fore wings with the spot on the stigma darker and more concise than that of the male, and with a diffuse brownish mark behind it. Length of the body 2 lines; of the wings $3\frac{1}{2}$ lines.

Eucharis deprivata. *Mas.* Viridis, cupreo varia, rude punctata, antennis piceis thorace longioribus novem-ramosis, scapo flavo, thorace gibbo, petiolo longo gracili, abdomine fusiformi compresso glabro subtus rufo, pedibus flavis, alis cinereis fusco notatis.

Male. Green, partly cupreous, roughly punctured. Head as broad as the thorax. Antennæ piceous, longer than the thorax, with nine subclavate branches; scape yellow. Thorax gibbous, well developed; scutellum prominent; metathorax large, declining. Petiole slender, cylindrical, nearly as long as the abdomen; the latter fusiform, compressed, smooth, shining, red beneath. Legs yellow, slender; coxæ green. Wings cinereous. Fore wings with an elongated brown spot extending from the stigma to the middle of the disk; veins black, in structure like those of the preceding species. Length of the body $1\frac{3}{4}$ line; of the wings 3 lines.

Pteromalus magniceps. *Mas.* Obscure cyaneus, brevis, latus, crassus, antennis fulvis clavatis, scapo luteo, abdomine piceo conico glabro, pedibus fulvis, tarsis posterioribus luteis, alis anticis luridis sat angustis.

Male. Dark blue, shining, short, broad, thick. Head broader than the thorax. Antennæ tawny, short, clavate; scape luteous. Abdomen piceous, conical, very smooth and shining, reddish and keeled beneath, not longer than the thorax. Legs tawny; posterior tarsi and tips of tibiæ luteous. Fore wings lurid, rather narrow; veins piceous. Length of the body $\frac{3}{4}$ line; of the wings $1\frac{1}{2}$ line.

Note.—Another species of the *Chalcidiæ* is mentioned as *Pteromalus rufus* in the Catalogue referred to above; but the specimen so named is mutilated, and cannot be satisfactorily described.

Encyrtus obstructus. *Mas.* Niger, robustus, nitens, scitissime punctatus, capite magno, antennis piceis filiformibus corpore vix brevioribus, scapo luteo, abdomine cyaneo brevi, pedibus piceis, tarsis posterioribus flavis, alis albis.

Male. Black, robust, shining, very finely punctured. Head a little broader than the thorax. Antennæ piceous, filiform, nearly as long as the body; joints elongated; scape luteous. Abdomen bright blue, much shorter than the thorax. Legs piceous; posterior tarsi yellow, with piceous tips. Wings white; veins pale. Length of the body $\frac{2}{3}$ line; of the wings 1 line.

Fam. Diapriadæ.

Diapria apicalis. *Fœm.* Nigra, gracilis, glabra, nitens, capite globoso, antennis luteis capitatis corpore brevioribus clava nigra, abdomine fusiformi, pedibus luteis, alis pallide cinereis.

Female. Black, slender, smooth, shining. Head globose, as broad as the thorax. Antennæ luteous, capitate, shorter than the body; three apical joints black, thick. Thorax and abdomen fusiform. Legs luteous. Wings pale cinereous. Length of the body 1 line; of the wings 2 lines.

This species seems to be more nearly allied to *D. nitida* than to any other of the British *Diapriæ*.

XLVII.—*Descriptions of two Coleopterous Insects from Cambogia.* By the Barão do Castello de Paiva, Professor of Botany in the Academia Polytechnica of Oporto, &c.

The two insects which I describe below have been lately forwarded to me from London by my friend T. Vernon Wollaston, Esq., to whom I am indebted for many favours.

Ordo COLEOPTERA.

Fam. **Cerambycidæ**.

Genus Abryna, Newman (1842).

Abryna Regis-Petri, Paiva.

A. nigra, albo irrorata et picta; prothorace transverso, ad latera versus angulos anticos bituberculato (vix spinoso); elytris punctulis albidis undique irroratis, necnon fasciis duabus transversis albidis (una sc. antemedia et altera postmedia), in dorso interruptis fractis, ornatis; tarsis magnis, latissimis.

Long. corp. lin. 12–13.

Habitat in Cambogia, ad Europam pauca specimina nuperrime missa.

Regi fidelissimo Petro V°., Portugaliæ Regum primo rerum naturalium studioso scrutatori et scientiarum protectori indefesso, hanc pulchram Abrynam, et certe novam, ob affabilitatis obsequium mihi semper concessum, læto corde sponte dedicavi.

A. magna, lata, subcylindrica sed postice leviter et facile angustior, sat dense punctata, nigra et pilis robustis brevibus demissis (aut potius squamulis) nigris et albidis undique variegata. *Caput* magnum, latum, deflexum, fronte deplanata in medio inter oculos carinata (carina calva, antice et postice evanescente, postice in canaliculam ducta), sat remote punctatum; *labro* (sed præsertim *clypeo*) dilutiore subflavescente, *instrumentis cibariis* nigris. *Prothorax* transversus, antice et postice constrictus, ad latera inæqualis et intra angulum anticum tuberculo calvo utrinque instructus, angulo antico ipso in spinam tuberculiformam producto, sparse punctatus, in medio longitudinaliter leviter canaliculatus (canalicula in disco obsoleta). *Elytra* lætius et distinctius picta, punctis rotundatis albidis undique irrorata, necnon fasciis duabus transversis dentatis albidis (una mox ante medium et altera mox pone medium sitis), in media parte disjunctis fractis, ornata; vix densius et profundius punctata, sed punctis in seriebus longitudinalibus haud dispositis; ad apicem ipsum truncata et conjunctim leviter emarginata. *Antennæ* fere corporis longitudine, nigræ, articulis (circa quinque) basilaribus plus minus albido irroratis. *Pedes* longi, validi, densius albido irrorati; *tarsis* magnis, latissimis, subtus densissime spongioso-setulosis.

This beautiful Coleopterous Longicorn has been recently sent to England from Cambogia, the fertile region situated between Siam and Cochin-China, on the eastern coast of the Indian Ocean. It appears to be a normal representative of the genus *Abryna* of Newman, though in its external *facies* somewhat resembling an *Agelasta*. Apart from other differences, however, the members of the genus *Agelasta* have no tooth at the sides of their prothorax (although one or two species have something approaching to a tooth, in the shape of a small tubercle); whereas the *Abrynæ* have two teeth, well pronounced, the one above the other—as in the *Abryna Regis-Petri*. Moreover the *Abrynæ* are narrower and more cylindric insects than the *Agelastæ*. The *A. Regis-Petri* is a very interesting and important species, and one which at first sight somewhat resembles the large *Agelasta bifasciata*, White, an insect which occurs in Northern India; however, the *generic* characters of the *Abryna Regis-Petri*, specified above, will at once distinguish it from that species.

Genus Niphona, Dejean.

Niphona Regis-Ferdinandi, Paiva.

N. nigra, squamulis demissis ferrugineis plus minus tecta et irrorata, profunde et dense punctata; prothorace inæquali, longitudinaliter profunde subsulcato (sulcis interruptis irregularibus), ad latera versus angulos anticos bituberculato; elytris postice paulatim acutiusculis, punctis squamosis vix albidioribus parce irroratis, ad apicem ipsum truncatis pilosis et singulatim emarginatis; tarsis latis.

Long. corp. lin. vix 10.

Habitat in Cambogia, una cum præcedente degens.

Regi Ferdinando Saxe Coburgi Gothæ, artium liberalium et agriculturæ insigni cultori et etiam patrono generoso, hanc Niphonam novam et formosam necnon valde anomalam, ob gratiam nobilitatis mihi regie collatam, grato animo libenter dedicavi.

N. sat angusta, postice paulatim et distincte attenuata, profunde et dense punctata (punctis magnis, latis, subconfluentibus), nigra et squamulis demissis ferrugineis plus minus tecta et irrorata. *Caput* deflexum, in medio canaliculatum, *labro* (sed præsertim *clypeo*) dilutiore subflavescente, *instrumentis cibariis* piceis. *Prothorax* antice et postice constrictus, valde inæqualis, punctis maximis profundis et sulcis interruptis irregularibus longitudinalibus impressus, versus utrumque latus intra angulum anticum tuberculo calvo minus exstante armatus, angulo antico ipso incrassato tuberculum spiniforme vix formante, undique dense ferrugineo-squamosus et in medio longitudinaliter levissime canaliculatus (canalicula antice in carinam mergente). *Elytra* punctis irregularibus vix albidioribus squamosis hinc inde irrorata, posterius paulatim et facile (sed distincte) attenuata, ad apicem ipsum pilosa truncata et singulatim subito excavata, fere spinas quatuor efficientia. *Antennæ* circa corporis longitudine, nigræ, articulis ad basin plus minus albidioribus. *Pedes* validi, plus minus ferrugineo irrorati; tarsis latis, subtus densissime spongioso-setulosis.

Like the last insect, the present one has been lately received in London from Cambogia, and forms an important addition to the Coleopterous fauna of that region. The genus *Niphona* is principally an East-Indian one; nevertheless species have been discovered at Natal and other parts of Southern Africa, and one (the *N. saperdoides*) has been described by Mulsant even from Algeria and the south of Europe. The *N. Regis-Ferdinandi* has some affinity with the *N. cylindracea* from the East Indies, although widely distinct therefrom specifically. The habits of the *Niphonæ* are rather peculiar; and I am informed by my friend T. V. Wollaston, Esq., of London, that there is a species from Sumatra, in the Collection of the British Museum, which has the following note, relating to its mode of life, appended to it:—

"Sumatra, May 1818. . . . Attaches itself strongly to smooth flat surfaces, for which the inferior part of the tarsi seems peculiarly to be adapted,—being in a manner scutellate, like the feet of the Gecko, common Fly, and *Dytiscus*. They have great strength in the antennæ, which they seem to use as levers for removing obstructions and turning themselves."

Lisbon, Oct. 15, 1860.

XLVIII.—*Note on* Hypericum Anglicum. By G. A. Walker-Arnott, LL.D.

The history of *Hypericum Anglicum* is given by Mr. Babington in the Ann. and Mag. Nat. Hist. ser. 2. vol. xi. p. 360, and vol. xv. p. 92. At first Mr. Babington was disposed to assign this name to what he was afterwards satisfied was *H. hircinum*, a south of Europe species, cultivated and perhaps now naturalized near Cork. Afterwards he more correctly transferred it to specimens he had received from Plymouth, and to others he had seen in Dr. Balfour's herbarium. While preparing the eighth edition of the 'British Flora,' this species much embarassed me. I possessed no specimens from this country at all agreeing with

Mr. Babington's character, except one from "Hills behind Greenock," which I found in the herbarium of the late Mr. D. Steuart of Edinburgh, but without any indication of the precise locality, the person by whom or the date when collected, although various circumstances connected with my late friend lead me to suppose that he had either collected or received it prior to 1818. This specimen agreed so well with Mr. Babington's description, that I could not doubt of its being the same species which he had in view, although in mine the pedicels and peduncles were certainly not winged—a point which he and Bertoloni considered of great importance. In all the species of *Hypericum* the leaves are opposite and decussate; and it usually results from this mode of arrangement that herbaceous stems, or the herbaceous or young parts of woody stems, are 2-edged or 4-angled, but that after the leaves cease, and there are no large bracts to fulfil their functions, the peduncles are irregularly angled or terete. When there are four sepals, and these of large size, we often find the pedicels 2–4-angled; but when there are five, or when they are small, vegetable physiology shows that we cannot expect this appearance, or, when it is observed, must conclude that it is accidental, and not a peculiarity of the species. I was therefore not disposed to consider the wings on the peduncles mentioned by Bertoloni to be of any importance for distinguishing the species—if, indeed, he had not been deceived by a much-pressed, dried specimen.

H. elatum of Aiton is said to have been introduced to our gardens in 1762; but as yet its native country is undetermined: at one time it was supposed to have been brought from North America, but it is now well ascertained not to be indigenous there. On comparing *H. Anglicum* from Greenock with a cultivated specimen named *H. elatum*, which I have from the late Mr. Brodie's herbarium, their identity was so apparent that I was disposed at once to cancel the former name; but I was deterred by the description given by Spach of his *Androsæmum parviflorum* (Ann. Sc. Nat. 2me sér. v. p. 361), which was taken from a cultivated specimen of *H. elatum*, Ait. (not Desrousseaux), in which he states that the flowers are not much larger than in *H. Androsæmum*, and that the sepals become much enlarged as the fruit advances towards maturity,—neither of which characters applied to what I had before me. I am now quite satisfied, however, that they are the same, and that the sepals vary much in size on the same branch, and sometimes in the same corymb; indeed, they may occasionally be seen small long after the petals fall away, while they are large in some of the flower-buds. The size of the flowers appears to depend much on the humidity of the situation.

Dr. Balfour's localities are three in number:—banks of the Crinan Canal, Argyleshire, Sept. 6, 1827; Culross, Perthshire, July 1833; and Galway in Ireland, Aug. 6, 1838. His specimens are very imperfect, but are doubtless specifically the same as mine; their pedicels and peduncles do not appear to me to be winged. The first of these stations I examined with great care during the month of August of this present year, but found nothing at all resembling the plant of which I was in quest; but as there are some small gardens there (which, however, I did not search), I am now convinced that it had been cultivated. The second locality is known to abound in ornamental foreign shrubs planted throughout the Valleyfield grounds by the gardener. Of the nature of the third locality I am not qualified to speak.

My friend Dr. Dickie of Belfast (now Professor of Botany in the University of Aberdeen) having informed me that he had met with what he supposed to be *H. Anglicum* in the woods at Donard Lodge, at the base of Slieve Donard, near Newcastle, co. Down, I proceeded immediately to Belfast, and accompanied him to the place on the 26th of Sept. Several large bushes of it, some with a woody stem an inch or two in diameter at the base, occurred at a low elevation; but there were many smaller ones about 500 feet higher up. It had obviously been planted, but whether brought down from the mountain or from a distance remained doubtful until we met the old forester, who assured us that there had been neither a tree nor a shrub there except the *Ulex nanus*, var. *Gallii* (which was everywhere), until he himself planted them, and that he had brought all from a small nursery he had at Castlewellan, a few miles distant. We still clung to the idea that it might have been introduced by him to his nursery from the Slieve; but he as positively asserted that he had procured it, with many others of the ornamental shrubs we saw, about fifty or sixty years ago, from Dickson's gardens at Edinburgh. The Donard plant quite agrees with my specimen marked *H. elatum*, also with Dr. Balfour's specimens named *H. Anglicum* by Mr. Babington; and it also accords with the figure of *Androsæmum grandifolium* of Reichenbach (Fl. Germ. vi. p. 70, t. 352. f. 5193). Reichenbach mentions that his specimens had been collected in a thicket or shrubbery at Sion in Switzerland, where it must have been cultivated, and also in "Arran, Buteshire." This last, in all probability, had been taken by some tourist from the grounds about Brodick Castle—a place well adapted to it on account of the mildness of the climate, but where it must have been planted.

I have some doubts about its being the *H. grandifolium* of Choisy or *Androsæmum Webbianum* of Spach; but I have not authentic specimens from the Canary Islands to decide that point. Spach arranges his *A. parvifolium* (*H. elatum*, Ait.) and *A. Webbianum* at some distance from each other; and as he was acquainted with both, the presumption is that they do differ: at the same time, the essential character assigned by Choisy to his *H. grandifolium*, in DeCandolle's 'Prodromus,' is equally applicable to *H. elatum*,—the *H. elatum* of Choisy in the same work being no doubt that of Desrousseaux in the 'Encyclopédie Méthodique,' and not that of Aiton: from other circumstances, however, I believe that it will be found that the true *H. grandifolium* has styles almost as long as those of *H. hircinum*, and narrower sepals than those of *H. elatum*. What the Madeira plant alluded to by Mr. Babington is, I do not know.

H. elatum (for so I presume we must in future call the *H. Anglicum* of Bertoloni) is a very handsome shrub, from 2½ to 5 feet high, woody below, much branched, and bearing copious lemon-yellow flowers. Branches often purple or red, as in *Cornus sanguinea*, slightly 2-edged, except between the two uppermost pairs of leaves, where it is usually much compressed or winged. Leaves large, from 2½ to 3½ inches long, and 1¼ to 2 inches broad, glossy, usually green, but sometimes spotted or tinged with red in autumn. Peduncles and pedicels, when recent, slightly angled, sometimes appearing flat or 2-winged when dried under pressure. Sepals in a double row, outer ones usually much broader than the inner, oval, acute, or with a minute point, varying much in size on the same branch, but without regard to the state of the flower, and not becoming enlarged after the petals fall off; all the sepals become reflexed after flowering, and are persistent. None of the flowers at Donard Lodge had the petals fully expanded, even although they and the bundles of stamens fell off by touching them; all were erect, concave, and closely surrounded the stamens; but this might be caused by their growing in the shade, or by the lateness of the season. The stamens were in five bundles or androphores, and were so slightly united at the base that the stamens appeared distinct when removed artificially.

H. elatum appears to be a much more tender shrub than *H. hircinum*, and is not adapted to general cultivation in this country, except in green-houses: the same localities which are suitable to growing Fuchsias in the open air, where they become small trees or large bushes, are equally adapted to *H. elatum*. Both are injured readily by frost, and then either transformed into an unseemly shrub, or cut down to the ground every winter. It has now almost entirely disappeared from our botanical gardens, but is, I learn, still to be seen in the Botanic Garden of Trinity College, Dublin. Its native country is probably the Azores; and it can have no claim to be considered a native of Europe, and can scarcely be said even to be naturalized in the British Islands.

Besides the places I have mentioned where it has been seen growing, Mr. Babington states that it was found by Mr. Polwhele on the cliff above Falmouth Harbour; and I learn that there is a specimen in Sir William J. Hooker's herbarium at Kew, sent from Helston, a few miles from Falmouth, by Mr. C. A. Johns.

Glasgow, Oct. 13, 1860.

BIBLIOGRAPHICAL NOTICES.

Gatherings of a Naturalist in Australasia: being Observations principally on the Animal and Vegetable Productions of New South Wales, New Zealand, and some of the Austral Islands. By George Bennett, M.D., F.L.S., F.Z.S. &c. 8vo, London, Van Voorst, 1860.

Little more than seventy years have elapsed since the foundation of the British colony of New South Wales. At the period of its establishment, and for many years afterwards, scarcely anything was known in the mother country of the vast island on the shores of which this almost infinitesimally small settlement had been made. Even its coast-line was only made out imperfectly by numerous voyages of discovery; and the condition of its interior has been ascertained within the last few years. But such are the capabilities of this New World, such its adaptation to the production of all the necessaries and most of the luxuries of a highly cultivated state of society, that within this short period—indeed, within the memory of living men—it has advanced from a very unpromising origin to be the most important of our colonial possessions, affording a home and an easy subsistence to so many thousands of our countrymen, that it is hard to find in the old country any one who has not some connexion amongst its inhabitants.

Parallel with this material prosperity, our knowledge of the natural productions of Australia has also advanced rapidly. Scientific expeditions have been sent to explore the coasts and the recesses of those parts of the continent not inhabited by white settlers; private collectors have zealously done their part of the work of discovery, and some of the first botanists and zoologists of Europe have devoted themselves to the task of describing the materials thus collected. Upon the Birds and Mammals of Australia we have in this country two splendid works from the pen of Mr. Gould, who himself undertook a voyage to the Antipodes for the sake of observing his feathered favourites in their native haunts. The sea-weeds of the Australian coasts have also found an able expositor in Prof. Harvey; and of many other groups, both of plants and animals, we possess more or less accurate details.

But the majority of the works in which these particulars are to be found are scarcely available to any but the professed naturalist; and we know of no work professing to give a sketch of the ordinary natural productions of Australia, for the use of the general reader, such as Dr. Bennett has furnished in the book before us. A residence of nearly thirty years in New South Wales, interspersed only with occasional voyages, principally in the Australasian Seas, during the whole of which he appears to have been constantly engaged in the acquisition of zoological and botanical information, may be regarded as giving him some right to speak with authority upon the natural history of his adopted country; and the value of many observations upon the habits of birds and other animals, for which we are already indebted to our author, will confirm this right in the eyes of the scientific naturalist. In fact, several of the most valuable and important zoological chapters of the present work have already been communicated by the author to the Zoological Society: such are those on the *Ornithorhynchus*, the Mooruk, and the Australian Jabiru.

Passing over Dr. Bennett's account of marine animals observed on his voyage to Sydney, we find that the first actual step into the zoology of Australia is made by his observations upon that most anomalous of all vertebrate animals, the *Ornithorhynchus*. Indeed this seems to have been one of the first objects to which he directed his attention on his arrival in New South Wales, when we find him setting out in pursuit of the "Mallangong" (as it is termed by the natives) with an energy which astonished those dusky gentry, who could not understand why the "white feller," with plenty of cattle and sheep at his command, should take so much trouble to get an inferior article of food. Dr. Bennett's account of the *Ornithorhynchus*, of which he had several specimens alive, forms one of the most interesting chapters in his book.

The descriptions of the manners of the Australian Jabiru (*Mycteria australis*) and of the Mooruk or Cassowary of New Britain in confinement, are likewise highly interesting. For the discovery of the latter bird we are indebted to Dr. Bennett; and his name has deservedly been handed down to posterity in its scientific denomination of *Casuarius Bennetti*. Besides these, we find brief notes on numerous other birds of Australia and the neighbouring islands, such as the Albatrosses, Tropic-Birds, Frigate-Birds, Petrels and Gulls of the coasts, and the King-fishers, Cuckoos, Lyre-Birds, Honey-eaters, Bower-Birds, Pigeons, and Parrots of the interior. And, in connexion with these, Dr. Bennett calls the attention of his fellow-colonists to the effects of the wanton or ignorant destruction of the feathered inhabitants of the countries in which they have taken up their abode, pointing out, as has frequently been done (we fear with very little effect) in this country, not only that many interesting birds are now nearly exterminated in regions where, not many years ago, they gave animation to the woods and fields, but that, by constantly shooting or driving away birds which we may suppose to be injurious to our possessions, we are in many cases actually destroying our best friends. Even in the case of those birds which are known to be most destructive to the produce of our fields and gardens, it must always be borne in mind that their attacks upon our property are generally confined to some particular periods of the year, whilst their instincts are constantly prompting them to the destruction of other enemies of our crops, whose insidious attacks can rarely be detected by the husbandman or gardener until after the mischief is done; so that in this way they far more than repay us for any damage that they may do in their own proper persons. In illustration of his remarks, Dr. Bennett tells us that the Kingfisher, known to the settlers by the not very complimentary name of the "Laughing Jackass" (*Dacelo gigantea*), was "for many years a doomed bird, merely from ignorance of its natural habits; for, having been seen occasionally to pounce upon and devour a chicken, in the absence of its usual food of snakes, mice, &c., it was regarded as one of the destroyers of the poultry-yard; and from the general destruction of these birds, a corresponding increase of reptiles and vermin of all kinds was found upon the farms." Subsequently the farmers seem to have discovered their error, and the Laughing Jackass is now unmolested. In a country which abounds in numerous snakes (of which Mr. Bennett gives an account that might almost frighten an intending emigrant) all reptilivorous birds should certainly be protected; and yet these, as being especially liable to temptation at the sight of chickens when their natural food is not in the way, often become peculiarly obnoxious to the farmer. But, as indicated by Dr. Bennett, even the smaller Hawks will probably be found to do more good in the exercise of their natural vocation than will suffice to compensate for any depredations that they may commit upon our domestic birds. Self-interest is most likely one great cause of the difficulty with which these views are entertained by farmers. A chicken carried off is an actual loss to the individual, but the destruction of vermin is a benefit to the community.

Of the peculiar Mammals of Australia Dr. Bennett gives but few notices. Almost the only reference to the Kangaroos is to be found at page 5, where, after quoting the saying of Charles Lamb, that the small fore feet of these animals seemed to be peculiarly adapted for picking pockets, our author remarks that it should have been added that they have pockets to be picked. "We have often amused ourselves," he adds, "by throwing sugar or bread into the pouch of a Kangaroo, and seen with what delight the animal has picked its own pocket, and devoured the contents,—searching its bag, like a Highlander his sporran, for more." The *Echidna*, the Long-tailed Flying Opossum (*Belideus flaviventris*), and the Flying Fox (*Pteropus*) come in for rather a larger share of notice. Of the second, Dr. Bennett had a living specimen, of which he gives an interesting account. It is now in the Collection of the Zoological Society. Our author also describes a few of the marine Mammals inhabiting the shores of New South Wales, especially the Sperm Whale and the Dugong, the latter of which, he tells us, furnishes an oil possessing the medicinal properties of cod-liver oil, in place of which it has been prescribed by some Australian physicians.

A more important service than even the detection of a new species of Cassowary was rendered to the science of Zoology by Dr. Bennett at a very early period of his residence in Australasia. "On the 24th of August, 1829," he says, "when walking on the deck of the ship (at Erromanga) on a calm evening, I observed an object floating upon the water, resembling a dead tortoiseshell cat. So unexpected a sight excited my curiosity; and the boat, which was alongside the ship at the time, was immediately manned, and sent to ascertain the nature of the floating object. It was found to be the Pearly Nautilus." And thus Dr. Bennett was the first naturalist, since the time of Rumphius, who had the good fortune to behold a living specimen of this remarkable creature, almost the sole living representative of that great group of chambered Cephalopods whose remains are to be met with in some of the oldest of geological formations. Who cannot enter into the feelings of our author, when the supposed tortoiseshell cat turned out such a prize? or sympathize with his friend, referred to on page 383, who, on inquiring of a native of the Fiji Islands whether he was acquainted with the Nautilus, was coolly informed by him that "he had just eaten one"? It appears, indeed, that all the time that our zoologists have been longing for the opportunity of examining the animal of the Pearly Nautilus, these "ignorant brutes" of islanders have been in the constant habit of capturing and devouring them; and a lady friend of Dr. Bennett's informed him that she was acquainted with a person who was wrecked upon an island near New Caledonia, where he was frequently regaled with *curried Nautili*, which he most unpoetically compared with Whelks.

We have devoted so much space to the consideration of the zoological contents of Dr. Bennett's volume that we have but little to spare for that of the interesting botanical information which it contains. In his fifteenth chapter he describes the curious Australian Baobab-tree (*Adansonia Gregorii*), the enormous gouty stems and comparatively small branches of which give it a most singular aspect. The sixteenth chapter is devoted to the cultivation of the Orange-tree in Australia—a branch of industry which has already made much progress, and which, from the peculiar suitability of the climate, is probably destined to become of great importance to the colony of New South Wales. It appears that it is amongst the orange-groves that the singular Cicada, *Cystosoma Saundersii*, is to be met with, and that so constantly that it is known in the colony as the Orange-locust. We find also descriptions of the numerous species of Acacias, Gum-trees, Casuarinas, Araucarias, and Apple-trees (*Angophoræ*), and of the several Dammara Pines which have lately been discovered both in Australia and the islands of the Pacific,—interspersed with interesting accounts of the districts in which these various trees grow, and the uses to which they are applied both by natives and settlers. The last two chapters previous to that in which Dr. Bennett describes his homeward voyage, are devoted to the consideration of the vegetable productions of New Zealand and Polynesia, with especial reference to those plants which are considered by the natives to possess medicinal properties. Amongst these we have an interesting account of the Kava (*Piper methysticum*), which appears to have some claim to be considered as a useful remedy in certain cases, and is also used, like the *Amanita* of the Kamtschadales, to produce a certain amount of jollification. Dr. Bennett describes a symposium of this kind in the island of Tongatabu; and from his account of the preliminary operations, in which a general chewing of the Kava was performed by the company *before* its infusion with water to make the cheering beverage, it would appear to be necessary that the partakers of this entertainment should possess almost as little squeamishness as the inferior classes of Kamtschadales.

We must now conclude our notice of Dr. Bennett's 'Gatherings.' We trust that we have said sufficient to indicate that his volume contains much valuable and interesting matter. Although the style in which it is written is somewhat discursive, the general performance of the work is satisfactory, and it may be perused with much advantage both by the general reader and the scientific naturalist. The illustrations consist of several plates, some of them coloured, representing the more interesting of the objects referred to, and of numerous woodcuts scattered through the text.

The Honey-Bee; its Natural History, Habits, Anatomy, and Microscopical Beauties. By JAMES SAMUELSON, assisted by J. BRAXTON HICKS, M.D., F.L.S. With tinted Illustrations. 12mo. London, Van Voorst, 1860.

Under the title of 'Humble Creatures,' Mr. Samuelson appears to propose bringing before the public a series of notices of the structure and habits of some of the lower animals; and the present volume is the second effort he has made towards the accomplishment of this design. His object, as explained by himself, is to show, from the minute examination of some of those creatures which are usually regarded as insignificant or even contemptible by the world at large, how even these have been cared for by the Creator, how beautifully their structure is adapted to all the purposes which they are intended to fulfil in Nature, and how important they may be in the œconomy of the world. Towards the attainment of this laudable object he made a first essay some years ago, when he published the histories of "The Earthworm and the Housefly," and we are glad to see, by an advertisement in his new volume, that its predecessor has met with sufficient success to justify the production of a second edition. In selecting the Honey-Bee for his second essay, he has perhaps, departed a little from the precise line which he might have been expected to follow; as the Bee is certainly not one of those "humble creatures" which are regarded with contempt or considered unimportant by even the most superficial; and so much has been written upon this insect and its wonderful instincts, that most people would be ready to admit its history to be a subject of interest. However, it is probably the general interest taken in the Bee that has induced our author to make it the subject of his present volume; and, considering the new and remarkable facts which have lately been discovered in the history of this insect, and which have scarcely yet found their way into popular works, we cannot blame him for his choice.

Mr. Samuelson's treatise on the Honey-Bee may be regarded as a popular Monograph of that insect; that is to say, he not only describes its external appearance and general habits, but enters minutely into its anatomy and physiology, discussing its instincts and various operations at considerable length. With the assistance of the figures, most of which are good, the reader may investigate the whole structure, internal and external, of the Bee, and thus gain a better general knowledge of the machinery by which the functions of insect life are performed than could be obtained by the same amount of labour in any other way. The structure of the eyes, antennæ, and oral organs, of the legs and wings, and of the segments of the body, is clearly described; and as the functions of each part are referred to *en passant*, these details are relieved from that *dryness* which might otherwise accompany a purely anatomical description. We have, however noticed one or two slight errors and omissions in this Part, to which we may call attention. Thus, at page 9, Mr. Samuelson seems to intimate that each of the maxillæ is employed as a separate "trowel-shaped blade" in plastering and moulding the wax; which, we think, is hardly the case, any more than that they are employed as a pair of scissors for clipping the thin wax of the cells, as would seem to be implied by statements on pp. 36 and 37. The use of the mandibles in working the wax does not appear to be referred to, although, as far as our recollection serves, these are important organs in the architectural operations of the Bee. In describing the differences between the Drones and the two kinds of female Bees, our author has omitted all mention of the additional joint in the antennæ of the former, nor do we find this referred to in his description of the antennæ. From the large size of the eyes in the Drones, Mr. Samuelson argues (p. 28) that we must suppose them to have some duty to perform in the hive; but we think that, considering the number of cases in which a similar excessive development of the visual organs occurs in the males of Insects, although we cannot see the reason for it, this argument of design will hardly hold, and the "male sex" of the Honey-Bee must submit contentedly to the charge of being "of no use in the house," which is often brought by their partners against males far higher in the scale of organization.

Mr. Samuelson's account of the mode of formation of the comb is of course founded to a great extent upon the labours of his predecessors, and contains nothing new; it is, however, well put together, and will prove interesting to the reader. In treating of the cause of the hexagonal form of the cells, our author inclines to the theory that this form is produced in consequence of the mechanical conditions under which the cells are built, as opposed to the assumption either of a special instinct prompting the workers to make hexagonal cells, or of some condition in the structure of the Bees which renders this form the necessary result of their labours. In this view he is no doubt correct, as the principal evidence certainly tends to show that the hexagonal form of the cells is caused by a process analogous to that by which numerous contiguous and equally expanding cylinders acquire this configuration; and we must therefore submit with a good grace to give up this as an example of instinct in the Bee. There is, however, a striking exercise of instinct in the construction of the comb, which we are sorry to see that Mr. Samuelson has entirely omitted to mention, namely the alternate arrangement of the cells on the two sides of the comb, by which, as is well known, a considerable economy of space and material is realized. This is a serious omission in a work devoted to the history of the Honey-Bee.

Notwithstanding the defects to which we have alluded, and one or two others of minor importance, Mr. Samuelson has succeeded in producing a valuable contribution to our popular entomological literature, and one which we can safely recommend. He has concluded it most appropriately with two chapters on instinct; but to these we cannot allude, further than to say that they contain a good *résumé* of the subject. The plates illustrating the description of the Bee are well executed, on tinted paper, and will materially assist the unlearned reader in understanding the anatomical details.

Actinologia Britannica: a History of the British Sea-Anemones and Madrepores. By P. H. Gosse, F.R.S. London, Van Voorst, 1858–60.

[Second Notice.]

It is just two years since we called our readers' attention to the appearance of the first parts of this valuable work; and it is with much pleasure that we now announce its completion. There are but few books on the Natural History of these Islands that can in any way compare with Mr. Gosse's 'Actinologia Britannica,' whether we regard the evident care and conscientiousness with which it has been got up or the elegance of the illustrations.

In our previous notice we remarked upon the great strides which have been made in the knowledge of our Helianthoid Polypes within the last few years, mainly in consequence of the strong taste for aquaria, to which Mr. Gosse has most zealously lent a helping hand. A careful comparison of the book now before us with the other standard work on the subject, namely Johnston's 'British Zoophytes,' shows clearly how greatly we are indebted to our author for the progress that has been made in this branch of zoology. In Johnston's volume we find descriptions of thirty-two Sea-Anemones and Corals; Mr. Gosse describes nearly double that number, namely sixty-three, whilst five others are indicated as imperfectly described by other authors, or as doubtful species, and six more, only one of which was known to Johnston, are placed in an appendix as *species incertæ sedis*. If these doubtful species be hereafter established, the number of British Helianthoida will be raised to seventy-four. On further examination it appears that in all eleven of Johnston's species have disappeared from the list, being placed either as synonyms of others or as doubtful species; so that the number of species described as British by Johnston which still retain their full specific rank amounts to only twenty-one. We thus get an addition of forty-two species to the British list; and of these it appears that no less than thirty-three have been first described by Mr. Gosse, twelve of them in the work now under consideration. Moreover, for the discovery of twelve of the new species we are indebted to our author; so that he may put in a strong claim to be considered the historian of the British Sea-Anemones. Amongst the additions, it is interesting to see that no less than ten species of Coralligenous Polypes occur in our seas, Johnston only describing three, if we omit the *Pocillopora interstincta,* which is inserted by Mr. Gosse with a note of interrogation.

As we have already described the mode in which Mr. Gosse has treated his subject, it will be unnecessary to enter upon its consideration here, further than by stating that he has executed his plan most judiciously throughout; his descriptions are clear and characteristic; and the habits of the animals are treated of in that agreeable manner which must be familiar to all readers of Mr. Gosse's books. The system adopted by Mr. Gosse in conferring English names upon the Sea-Anemones is also worthy of notice, as he has, by a bold manufacture of diminutive names, most happily succeeded in avoiding those sesquipedalian combinations which usually render the so-called English names of animals more uncouth and unpronounceable than their scientific denominations.

The last Part contains an Index and an Introduction, the latter giving a description of the anatomy and physiology of the Helianthoid Polypes, which will be found of great service to the student, especially as so many of the anatomical terms now adopted for these and many other groups of the lower animals are not to be found in any of our zoological text-books. We have already spoken of the great beauty of the illustrations, and may therefore now take leave of Mr. Gosse's book, in the hope that many of our readers will avail themselves of such an excellent guide in the investigation of the interesting order of animals to which it is devoted.

MISCELLANEOUS.

DARWIN *on the Origin of Species.* By Prof. ASA GRAY, Cambridge, United States *.

[In our Number for September last we placed before our readers an extract from the forthcoming volume of Prof. Agassiz's 'Contributions to the Natural History of the United States,' relating to the interesting question as to the origin of species, newly raised by Mr. Darwin's well-known book. We now give a notice on the opposite side of the question to that taken by Prof. Agassiz, from the pen of another able naturalist of the United States, for the communication of which we are indebted to Mr. Darwin.—EDS.]

"I CAN entertain no doubt, after the most deliberate study and dispassionate judgment of which I am capable, that the view which most naturalists entertain, and which I formerly entertained—namely that each species has been independently created—is erroneous. I

* From the 'Atlantic Monthly,' August 1860.

am fully convinced that species are not immutable, but that those belonging to what are called the same genera are lineal descendants of some other and generally extinct species, in the same manner as the acknowledged varieties of any one species are the descendants of that species. Furthermore, I am convinced that Natural Selection has been the main, but not exclusive, means of modification."

This is the kernel of the new theory—the Darwinian creed, as recited at the close of the introduction to the remarkable book under consideration. The questions "What will he do with it?" and "How far will he carry it?" the author answers at the close of the volume: "I cannot doubt that the theory of descent with modification embraces all the members of the same class." Furthermore, "I believe that all animals have descended from at most only four or five progenitors, and plants from an equal or lesser number." Seeing that analogy as strongly suggests a further step in the same direction, while he protests that "analogy may be a deceitful guide," yet he follows its inexorable leading to the inference that "probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed *."

In the first extract we have the thin end of the wedge driven a little way; in the last, the wedge is driven home.

We have already sketched some of the reasons suggestive of such a theory of derivation of species—reasons which give it plausibility, and even no small probability, as applied to our actual world and to changes occurring since the last tertiary period. We are well pleased at this moment to find that the conclusions we were arriving at in this respect are sustained by the very high authority and impartial judgment of Pictet, the Swiss palæontologist. In his review of Darwin's book †—much the fairest and most admirable opposing one that has yet appeared—he freely accepts that *ensemble* of natural operations which Darwin impersonates under the now familiar name of Natural Selection, allows that the exposition throughout the first chapters seems "*à la fois prudent et fort,*" and is disposed to accept the whole argument in its foundations,—that is, so far as it relates to what is now going on, or has taken place inthe present geological period, which period he carries back through the diluvial epoch to the borders of the tertiary ‡. Pictet accordingly admits that the

* Page 484, Engl. ed. In the new American edition (*vide* Supplement, pp. 431, 432) the principal analogies which suggest the extreme view are referred to, and the remark is appended—"But this inference is chiefly grounded on analogy, and it is immaterial whether or not it be accepted. The case is different with the members of each great class, as the Vertebrata or Articulata; for here we have in the laws of homology, embryology, &c., some distinct evidence that all have descended from a single primordial parent."

† In Bibliothèque Universelle de Genève, Mars 1860.

‡ This we learn from his very interesting article 'De la Question de l'Homme Fossile,' in the same (March) number of the Bibliothèque Universelle.

theory will very well account for the origination by divergence of nearly related species, whether within the present period or in remoter geological times,—a very natural view for him to take, since he appears to have reached and published, several years ago, the pregnant conclusion that there most probably was some material connexion between the closely related species of two successive faunas, and that the numerous close species, whose limits are so difficult to determine, were not all created distinct and independent. But while accepting, or ready to accept, the basis of Darwin's theory and all its legitimate direct inferences, he rejects the ultimate conclusions, brings some weighty arguments to bear against them, and is evidently convinced that he can draw a clear line between the sound inferences which he favours, and the unsound or unwarranted theoretical deductions which he rejects. We hope he can.

This raises the question, Why does Darwin press his theory to these extreme conclusions? Why do all hypotheses of derivation converge so inevitably to one ultimate point? Having already considered some of the reasons which suggest or support the theory at its outset,—which may carry it as far as such sound and experienced naturalists as Pictet allow that it may be true, perhaps as far as Darwin himself unfolds it in the introductory proposition cited at the beginning of this article,—we may now inquire after the motives which impel the theorist so much further. Here proofs, in the proper sense of the word, are not to be had. We are beyond the region of demonstration, and have only probabilities to consider. What are these probabilities? What work will this hypothesis do to establish a claim to be adopted in its completeness? Why should a theory which may plausibly enough account for the *diversification* of the species of each special type or genus be expanded into a general system for the *origination* or successive diversification of all species, and all special types or forms, from four or five remote primordial forms, or perhaps from one? We accept the theory of gravitation because it explains all the facts we know, and bears all the tests that we can put it to. We incline to accept the nebular hypothesis for similar reasons, not because it is proved—thus far it is wholly incapable of proof—but because it is a natural theoretical deduction from accepted physical laws, is thoroughly congruous with the facts, and because its assumption serves to connect and harmonize these into one probable and consistent whole. Can the derivative hypothesis be maintained and carried out into a system on similar grounds? If so, however unproved, it would appear to be a tenable hypothesis, which is all that its author ought now to claim. Such hypotheses as from the conditions of the case can neither be proved nor disproved by direct evidence or experiment are to be tested only indirectly, and therefore imperfectly, by trying their power to harmonize the known facts, and to account for what is otherwise unaccountable. So the question comes to this—What will an hypothesis of the derivation of species explain which the opposing view leaves unexplained? Questions these which ought to be entertained before we take up the arguments which have been advanced against this theory. We can only glance at some of the considerations which Darwin adduces, or will be sure to adduce in the future and fuller exposition which is promised. To display them in such wise as to indoctrinate the unscientific reader would require a volume. Merely to refer to them in the most general terms would suffice for those familiar with scientific matters, but would scarcely enlighten those who are not. Wherefore let these trust the impartial Pictet, who freely admits that, "in the absence of sufficient direct proofs to justify the possibility of his hypothesis, Mr. Darwin relies upon indirect proofs, the bearing of which is real and incontestable," who concedes that "his theory accords very well with the great facts of comparative anatomy and zoology—comes in admirably to explain unity of composition of organisms, also to explain rudimentary and representative organs, and the natural series of genera and species—equally corresponds with many palæontological data—agrees well with the specific resemblances which exist between two successive faunas, with the parallelism which is sometimes observed between the series of palæontological succession and of embryonal development," &c.; and finally, although he does not accept the theory in these results, he allows that "it appears to offer the best means of explaining the manner in which organized beings were produced in epochs anterior to our own."

What more than this could be said for such a hypothesis? Here, probably, is its charm, and its strong hold upon the speculative mind. Unproven though it be, and cumbered *primâ facie* with cumulative improbabilities as it proceeds, yet it singularly accords with great classes of facts otherwise insulated and enigmatic, and explains many things which are thus far utterly inexplicable upon any other scientific assumption.

Darwin's hypothesis is the natural complement to Lyell's uniformitarian theory in physical geology. It is for the organic world what that popular view is for the inorganic; and the acceptors of the latter stand in a position from which to regard the former in the most favourable light. Wherefore the rumour that the cautious Lyell himself has adopted the Darwinian hypothesis need not surprise us. The two views are made for each other, and like the two counterpart pictures for the stereoscope, when brought together, combine into one apparently solid whole.

If we allow, with Pictet, that Darwin's theory will very well serve for all that concerns the present epoch of the world's history—an epoch which this renowned palæontologist regards as including the diluvial or quaternary period—then Darwin's first and foremost need in his onward course is a practicable road from this into and through the tertiary period, the intervening region between the comparatively near and the far remote past. Here Lyell's doctrine paves the way, by showing that in the physical geology there is no general or absolute break between the two, probably no greater between the latest tertiary and the quaternary period than between the latter and the present time. So far, the Lyellian view is, we suppose, generally concurred in. Now, as to the organic world, it is largely admitted that numerous Tertiary species have continued down into the quaternary, and many of them to the present time. A goodly percentage of the earlier and nearly half of the later Tertiary Mollusca, according to Deshayes, Lyell, and, if we mistake not, Bronn, still live. This identification, however, is now questioned by a naturalist of the very highest authority. But, in its bearings on the new theory, the point here turns not upon absolute identity so much as upon close resemblance. For those who, with Agassiz, doubt the specific identity in any of these cases, and those who say, with Pictet, that "the later Tertiary deposits contain in general the *débris* of species *very nearly related* to those which still exist, belonging to the same genera, but specifically different," may also agree with Pictet that the nearly related species of successive faunas must or may have had "a material connexion." Now the only material connexion that we have an idea of in such a case is a genealogical one. And the supposition of a genealogical connexion is surely not unnatural in such cases—is demonstrably the natural one as respects all those Tertiary species which experienced naturalists have pronounced to be identical with existing ones, but which others now deem distinct; for to identify the two is the same thing as to conclude the one to be ancestors of the other. No doubt there are differences between the Tertiary and the present individuals—differences equally noted by both classes of naturalists, but differently estimated. By the one these are deemed quite compatible, by the other incompatible with community of origin. But who can tell us what amount of difference is compatible with community of origin? This is the very question at issue, and one to be settled by observation alone. Who would have thought that the peach and the nectarine came from one stock? But this being proved, is it now very improbable that both were derived from the almond, or from some common amygdaline progenitor? Who would have thought that the cabbage, cauliflower, broccoli, kale, and kohlrabi are derivatives of one species, and rape or colza, turnip, and probably rutabaga, of another species? And who that is convinced of this can long undoubtingly hold the original distinctness of turnips from cabbages as an article of faith? On scientific grounds, may not a primordial cabbage or rape be assumed as the ancestor of all the cabbage races, on much the same ground that we assume a common ancestry for the diversified human races? If all our breeds of cattle came from one stock, why not this stock from the Aurochs, which has had all the time between the diluvial and the historic periods in which to set off a variation perhaps no greater than the difference between some sorts of cattle?

That considerable differences are often discernible between Tertiary individuals and their supposed descendants of the present day affords no argument against Darwin's theory, as has been rashly thought, but is decidedly in its favour. If the identification were so perfect that no more differences were observable between the Tertiary and the recent shells than between various individuals of either, then Darwin's opponents, who argue the immutability of species from the ibises and cats preserved by the ancient Egyptians being just like those of the present day, could triumphantly add a few hundred thousand years more to the length of the experiment and to the force of their argument. As the facts stand, it appears that, while some Tertiary forms are essentially undistinguishable from existing ones, others are the same with a difference which is judged not to be specific or aboriginal, and yet others show somewhat greater differences, such as are scientifically expressed by calling them marked varieties, or else doubtful species; while others, differing a little more, are confidently termed distinct, but nearly-related species. Now, is not all this a question of degree, of mere gradation of difference? Is it at all likely that these several gradations came to be established in two totally different ways—some of them (though naturalists can't agree which) through natural variation, or other secondary cause, and some by original creation, without secondary cause? We have seen that the judicious Pictet answers such questions as Darwin would have him do, in affirming that, in all probability, the nearly-related species of two successive faunas were materially connected, and that contemporaneous species, similarly resembling each other, were not all created so, but have become so. This is equivalent to saying that species (using the term as all naturalists do and must continue to employ the word) have only a relative, not an absolute fixity; that differences fully equivalent to what are held to be specific may arise in the course of time, so that one species may at length be naturally replaced by another species a good deal like it, or may be diversified through variation or otherwise into two, three, or more species, or forms as different as species. This concedes all that Darwin has a right to ask, all that he can directly infer from evidence. We must add that it affords a *locus standi*, more or less tenable, for inferring more.

Here another geological consideration comes in to help on this inference. The species of the later Tertiary period for the most part not only resembled those of our days (many of them so closely as to suggest an absolute continuity), but also occupied in general the same regions that their relatives occupy now. The same may be said, though less specially, of the earlier Tertiary and of the later Secondary; but there is less and less localization of forms as we recede, yet some localization even in palæozoic times. While in the secondary period one is struck with the similarity of forms and the identity of many of the species which flourished apparently at the same time in all or in the most widely separated parts of the world, in the Tertiary epoch, on the contrary, along with the increasing specialization of climates and their approximation to the present state, we find abundant evidence of increasing localization of orders, genera, and species; and this localization strikingly accords with the present geographical distribution of the same groups of species. Where the imputed forefathers lived, their relatives and supposed descendants now flourish. All the actual classes of the animal and vegetable kingdoms were represented in the Tertiary faunas and floras, and in nearly the same proportions and the same diversities as at present. The faunas of what are now Europe, Asia, America, and Australia differed from each other much as they now differ: in fact (according to Adolphe Brongniart, whose statements we here condense*), the inhabitants of these different regions appear for the most part to have acquired, before the close of the Tertiary period, the characters which essentially distinguish their existing faunas. The eastern continent had then, as now, its great Pachyderms, Elephants, Rhinoceros, and Hippopotamus; South America its Armadillos, Sloths, and Anteaters; Australia a crowd of Marsupials; and the very strange birds of New Zealand had predecessors of similar strangeness. Everywhere the same geographical distribution as now, with a difference in the particular area, as respects the northern portion of the continents, answering to a warmer climate then than ours, such as allowed species of Hippopotamus, Rhinoceros, and Elephant to range even to the regions now inhabited by the Rein-deer and the Musk-ox, and with the serious disturbing intervention of the glacial period within a comparatively recent time. Let it be noted also, that those Tertiary species which have continued with little change down to our days are the marine animals of the lower grades, especially Mollusca. Their low organization, moderate sensibility, and the simple conditions of an existence in a medium like the ocean, not subject to great variation, and incapable of sudden change, may well account for their continuance; while, on the other hand, the more intense, however gradual, climatic vicissitudes on land, which have driven all tropical and subtropical forms out of the higher latitudes and assigned to them their actual limits, would be almost sure to extinguish such huge and unwieldy animals as Mastodons, Mammoths, and the like, whose power of enduring altered circumstances must have been small.

This general replacement of the Tertiary species of a country by others so much like them is a noteworthy fact. The hypothesis of the independent creation of all species, irrespective of their antecedents, leaves this fact just as mysterious as is creation itself; that of derivation undertakes to account for it. Whether it satisfactorily does so or not, it must be allowed that the facts well accord with that assumption.

The same may be said of another conclusion, namely, that the geological succession of animals and plants appears to correspond in a general way with their relative standing or rank in a natural system of classification. It seems clear that though no one of the *grand types* of the animal kingdom can be traced back further than the rest, yet the lower *classes* long preceded the higher; that there has been on the whole a steady progression within each class and order; and that the highest plants and animals have appeared only in relatively modern times. It is only, however, in a broad sense that this generalization is now thought to hold good. It encounters many apparent exceptions, and sundry real ones. So far as the rule holds, all is as it should be upon a hypothesis of derivation.

The rule has its exceptions; but, curiously enough, the most striking class of exceptions, if such they be, seems to us even more

* In Comptes Rendus de l'Acad. des Sciences, Févr. 2, 1857.

favourable to the doctrine of derivation than is the general rule of a pure and simple ascending gradation. We refer to what Agassiz calls prophetic and synthetic types; for which the former name may suffice, as the difference between the two is evanescent.

"It has been noticed," writes our great zoologist, "that certain types, which are frequently prominent among the representatives of past ages, combine in their structure peculiarities which at later periods are only observed separately in different, distinct types. Sauroid fishes before reptiles, Pterodactyles before birds, Ichthyosauri before dolphins, &c. There are entire families of nearly every class of animals, which in the state of their perfect development exemplify such prophetic relations. . . . The Sauroid fishes of the past geological ages are an example of this kind. These fishes, which preceded the appearance of reptiles, present a combination of ichthyic and reptilian characters not to be found in the true members of this class, which form its bulk at present. The Pterodactyles, which preceded the class of Birds, and the Ichthyosauri, which preceded the Cetacea, are other examples of such prophetic types *."

Now these reptile-like fishes, of which Gar-pikes are the living representatives, though of earlier appearance, are admittedly of higher rank than common fishes. They dominated until reptiles appeared, when they mostly gave place to (or, as the derivationists will insist, were resolved by divergent variation and natural selection into) common fishes, destitute of reptilian characters, and saurian reptiles,—the intermediate grades, which, according to a familiar piscine saying, are "neither fish, flesh, nor good red-herring," being eliminated and extinguished by natural consequence of the struggle for existence which Darwin so aptly pourtrays. And so, perhaps, of the other prophetic types. Here type and antitype correspond. If these are true prophecies, we need not wonder that some who read them in Agassiz's book will read their fulfilment in Darwin's.

Note also, in this connexion, that, along with a wonderful persistence of type, with change of species, genera, orders, &c., from formation to formation, no species and no higher group which has once unequivocally died out ever afterwards reappears. Why is this, but that the link of generation has been sundered? Why, on the hypothesis of independent originations, were not failing species recreated, either identically or with a difference, in regions eminently adapted to their well-being? To take a striking case. That no part of the world now offers more suitable conditions for wild horses and cattle than the Pampas and other plains of South America, is shown by the facility with which they have there run wild and enormously multiplied, since introduced from the Old World not long ago. There was no wild American stock. Yet in the times of the Mastodon and Megatherium, at the dawn of the present period, wild horses and cattle—the former certainly very much like the existing Horse—roamed over those plains in abundance. On the principle of ori-

* Agassiz, 'Contributions:' Essay on Classification, p. 117, where, we may be permitted to note, the word "Crustacea" is by a typographical error printed in place of *Cetacea.*

ginal and direct created adaptation of species to climate and other conditions, why were these types not reproduced, when, after the colder intervening era, those regions became again eminently adapted to such animals? Why, but because, by their complete extinction in South America, the line of descent was here utterly broken? Upon the ordinary hypothesis, there is no scientific explanation possible of this series of facts, and of many others like them. Upon the new hypothesis, "the succession of the same types of structure within the same areas during the later geological periods ceases to be mysterious, and is simply explained by inheritance." Their cessation is failure of issue.

Along with these considerations, the fact should be remembered, that, as a general thing, related species of the present age are geographically associated. The larger part of the plants, and still more of the animals, of each separate country are peculiar to it; and, as most species now flourish over the graves of their by-gone relatives of former ages, so they now dwell among or accessibly near their kindred species.

Here also comes in that general "parallelism between the order of succession of animals and plants in geological times, and the gradation among their living representatives" from low to highly organized, from simple and general to complex and specialized forms; also "the parallelism between the order of succession of animals in geological times, and the changes their living representatives undergo during their embryological growth,"—as if the world were one prolonged gestation. Modern science has much insisted on this parallelism, and to a certain extent is considered to have made it out. All these things, which conspire to prove that the ancient and the recent forms of life "are somehow intimately connected together in one grand system," equally conspire to suggest that the connexion is one similar or analogous to generation. Surely no naturalist can be blamed for entering somewhat confidently upon a field of speculative inquiry which here opens so invitingly; nor need former premature endeavours and failures utterly dishearten him.

All these things, it may naturally be said, go to explain the order, not the mode, of the incoming of species. But they all do tend to bring out the generalization expressed by Mr. Wallace in the formula that "every species has come into existence coincident both in time and space with pre-existing closely allied species." Not, however, that this is proved, even of existing species, as a matter of general fact: it is obviously impossible to prove anything of the kind. But we must concede that the known facts strongly suggest such an inference. And since species are only congeries of individuals, and every individual came into existence in consequence of pre-existing individuals of the same sort, so leading up to the individuals with which the species began, and since the only material sequence we know of among plants and animals is that from parent to progeny, the presumption becomes exceedingly strong that the connexion of the incoming with the pre-existing species is a genealogical one.

Here, however, all depends upon the probability that Mr. Wallace's inference is really true. Certainly it is not yet generally accepted; but a strong current is setting towards its acceptance.

So long as universal cataclysms were in vogue, and all life upon the earth was thought to have been suddenly destroyed and renewed many times in succession, such a view could not be thought of. So the equivalent view maintained by Agassiz, and formerly, we believe, by D'Orbigny, that, irrespective of general and sudden catastrophes, or any known adequate physical cause, there has been a total depopulation at the close of each geological period or formation, say forty or fifty times, or more, followed by as many independent great acts of creation, at which alone have species been originated, and at each of which a vegetable and an animal kingdom were produced entire and complete, full-fledged, as flourishing, as wide-spread and populous, as varied and mutually adapted from the beginning as ever afterwards,—such a view of course supersedes all material connexion between successive species, and removes even the association and geographical range of species entirely out of the domain of physical causes and of natural science. This is the extreme opposite of Wallace's and Darwin's view, and is quite as hypothetical. The nearly universal opinion, if we rightly gather it, manifestly is, that the replacement of the species of successive formations was not complete and simultaneous, but partial and successive, and that along the course of each epoch some species probably were introduced, and some, doubtless became extinct. If all since the Tertiary belongs to our present epoch, this is certainly true of it; if to two or more epochs, then the hypothesis of a total change is not true of them.

Geology makes huge demands upon time; and we regret to find that it has exhausted ours,—that what we meant for the briefest and most general sketch of some geological considerations in favour of Darwin's hypothesis has so extended as to leave no room for considering "the great facts of comparative anatomy and zoology" with which Darwin's theory "very well accords," nor for indicating how "it admirably serves for explaining the unity of composition of all organisms, the existence of representative and rudimentary organs, and the natural series which genera and species compose." Suffice it to say that these are the real strongholds of the new system on its theoretical side; that it goes far towards explaining both the physiological and the structural gradations and relations between the two kingdoms, and the arrangement of all their forms in groups subordinate to groups, all within a few great types; that it reads the riddle of abortive organs and of morphological conformity, of which no other theory has ever offered a scientific explanation, and supplies a ground for harmonizing the two fundamental ideas which naturalists and philosophers conceive to have ruled the organic world, though they could not reconcile them,—namely, Adaptation to Purpose and the Conditions of Existence, and Unity of Type. To reconcile these two undeniable principles is a capital problem in the philosophy of natural history; and the hypothesis which consistently does so thereby secures a great advantage.

We all know that the arm and hand of a monkey, the fore leg and foot of a dog and of a horse, the wing of a bat, and the fin of a porpoise are fundamentally identical; that the long neck of the giraffe has the same and no more bones than the short one of the elephant; that the eggs of Surinam frogs hatch into tadpoles with as good tails for swimming as any of their kindred, although as tadpoles they never enter the water; that the Guinea-pig is furnished with incisor teeth which it never uses, as it sheds them before birth; that embryos of Mammals and Birds have branchial slits and arteries running in loops, in imitation or reminiscence of the arrangement which is permanent in Fishes; and that thousands of animals and plants have rudimentary organs which, at least in numerous cases, are wholly useless to their possessors, &c. Upon a derivative theory this morphological conformity is explained by community of descent; and it has not been explained in any other way.

Naturalists are constantly speaking of "related species," of the "affinity" of a genus or other group, and of "family resemblance," —vaguely conscious that these terms of kinship are something more than mere metaphors, but unaware of the grounds of their aptness. Mr. Darwin assures them that they have been talking derivative doctrine all their lives without knowing it.

If it is difficult, and in some cases practically impossible, to fix the limits of species, it is still more so to fix those of genera; and those of tribes and families are still less susceptible of exact natural circumscription. Intermediate forms occur, connecting one group with another in a manner sadly perplexing to systematists, except to those who have ceased to expect absolute limitations in nature. All this blending could hardly fail to suggest a former material connexion among allied forms, such as that which a hypothesis of derivation demands.

Here it would not be amiss to consider the general principle of gradation throughout organic nature,—a principle which answers in a general way to the law of continuity in the inorganic world, or rather is so analogous to it that both may be fairly expressed by the Leibnitzian axion, *Natura non agit saltatim*. As an axiom or philosophical principle, used to test model laws or hypotheses, this in strictness belongs only to physics. In the investigation of Nature at large, at least in the organic world, nobody would undertake to apply this principle as a test of the validity of any theory or supposed law. But naturalists of enlarged views will not fail to infer the principle from the phænomena they investigate,—to perceive that the rule holds, under due qualifications and altered forms, throughout the realm of Nature, although we do not suppose that Nature in the organic world makes no distinct steps, but only short and serial steps—not infinitely fine gradations, but no long leaps, or few of them.

To glance at a few illustrations out of many that present themselves. It would be thought that the distinction between the two organic kingdoms was broad and absolute. Plants and animals belong to two very different categories, fulfil opposite offices, and, as to the mass of them, are so unlike that the difficulty of the ordinary observer would be to find points of comparison. Without entering into details, which would fill an article, we may safely say that the difficulty with the naturalist is all the other way—that all these broad differences vanish one by one as we approach the lower confines of the two kingdoms, and that no *absolute* distinction whatever is now known between them. It is quite possible that the same organism may be both vegetable and animal, or may be first the one and then the other. If some organisms may be said to be at first vegetables and then animals, others, like the spores and other reproductive bodies of many of the lower Algæ, may equally claim to have first a characteristically animal and then an unequivocally vegetable existence. Nor is the gradation purely restricted to these simple organisms. It appears in general functions, as in that of reproduction, which is reducible to the same formula in both kingdoms, while it exhibits close approximations in the lower forms; also in a common or similar ground of sensibility in the lowest forms of both, a common faculty of effecting movements tending to a determinate end, traces of which pervade the vegetable kingdom; while, on the other hand, this indefinable principle, this vegetable *animula vagula, blandula,* graduates into the higher sensitiveness of the lower class of animals. Nor need we hesitate to recognize the fine gradations from simple sensitiveness and volition to the higher instinctive and other physical manifestations of the higher brute animals. The gradation is undoubted, however we may explain it. Again, propagation is of one mode in the higher animals, of two in all plants; but vegetative propagation, by budding or offshoots, extends through the lower grades of animals. In both kingdoms there may be separation of the offshoots, or indifference in this respect, or continued and organic union with the parent stock; and this either with essential independence of the offshoots, or with a subordination of these to a common whole, or finally with such subordination and amalgamation, along with specialization of function, that the same parts, which in other cases can be regarded only as progeny, in these become only members of an individual.

This leads to the question of individuality—a subject quite too large and too recondite for present discussion. The conclusion of the whole matter, however, is that individuality—that very ground of *being* as distinguished from *thing*—is not attained in Nature at one leap. If anywhere truly exemplified in plants, it is only in the lowest and simplest, where the being is a structural unit, a single cell, memberless and organless, though organic—the same thing as those cells of which all the more complex plants are built up, and with which every plant and (structurally) every animal began its development. In the ascending gradation of the vegetable kingdom, individuality is, so to say, striven after, but never attained; in the lower animals it is striven after with greater though incomplete success; it is realized only in animals of so high a rank that vegetative multiplication or offshoots are out of the question, where all parts are strictly members and nothing else, and all subordinated to a common nervous centre—fully realized, perhaps, only in a conscious person.

So also the broad distinction between reproduction by seeds or ova and propagation by buds, though perfect in some of the lowest forms of life, becomes evanescent in others; and even the most absolute law we know in the physiology of genuine reproduction—that of sexual cooperation—has its exceptions in both kingdoms in parthenogenesis, to which in the animal kingdom a most curious series of gradations leads. In plants, likewise, a long and most finely graduated series of transitions leads from bisexual to unisexual blossoms; and so in various other respects. Everywhere we may perceive that Nature secures her ends, and makes her distinctions on the whole manifest and real, but everywhere without abrupt breaks. We need not wonder, therefore, that gradations between species and varieties should occur—the more so since genera, tribes, and other groups into which the naturalist collocates species are far from being always absolutely limited in Nature, though they are necessarily represented to be so in systems. From the necessity of the case, the classifications of the naturalist abruptly define where Nature more or less blends. Our systems are nothing, if not definite. They are intended to express differences, and perhaps some of the coarser gradations. But this evinces, not their perfection, but their imperfection. Even the best of them are to the system of Nature what consecutive patches of the seven colours are to the rainbow.

Now the principle of gradation throughout organic Nature may, of course, be interpreted upon other assumptions than those of Darwin's hypothesis—certainly upon quite other than those of materialistic philosophy, with which we ourselves have no sympathy. Still we conceive it not only possible, but probable, that this gradation, as it has its natural ground, may yet have its scientific explanation. In any case there is no need to deny that the general facts correspond well with a hypothesis like Darwin's, which is built upon fine gradations.

We have contemplated quite long enough the general presumptions in favour of a hypothesis of the derivation of species. We cannot forget, however, while for the moment we overlook, the formidable difficulties which all hypotheses of this class have to encounter, and the serious complications which they seem to involve. We feel, moreover, that Darwin's particular hypothesis is exposed to some special objections. It requires no small strength of nerve steadily to conceive not only of the diversification, but of the formation of the organs of an animal through cumulative variation and natural selection. Think of such an organ as the eye—that most perfect of optical instruments—as so produced in the lower animals and perfected in the higher! A friend of ours, who accepts the new doctrine, confesses that for a long while a cold chill came over him whenever he thought of the eye. He has at length got over that stage of the complaint, and is now in the fever of belief, perchance to be succeeded by the sweating stage, during which sundry peccant humours may be eliminated from the system.

For ourselves, we dread the chill, and have some misgivings about the consequences of the reaction. We find ourselves in the "singular position" acknowledged by Pictet,—that is, confronted with a theory which, although it can really explain much, seems inadequate to the heavy task it so boldly assumes, but which nevertheless appears better fitted than any other that has been broached to explain (if it be possible to explain) somewhat of the manner in which organized beings may have arisen and succeeded each other. In this dilemma, we might take advantage of Mr. Darwin's candid admission that he by no means expects to convince old and experienced people, whose minds are stocked with a multitude of facts all viewed during a long course of years from the old point of view. This is nearly our case.

The Cutting Ant of Texas (Œcodoma Mexicana, *Sm.*). By S. B. Buckley.

These Ants have homes under ground. In order to kill the ants, great excavations were made. Their extent almost exceeds belief, but they were seen by hundreds of the citizens. The underground rooms are rounded or oblong cavities connected by cylindrical passages from 1 to 3 or 4 inches in diameter. Some chambers are 6 inches wide by nearly as many in height, others 12 inches. In a clayey soil these chambers are walled by a thin dirty-brown wax-like secretion. The lowest chambers are generally 10 or 12 feet deep, while the upper cells are rarely nearer the surface than 18 inches. I extended a tape line down to the bottom of one, and found it 17 feet deep; at one of their largest dens, a room was found 16 feet beneath the surface, and several others were at near the same depth. At that place the ground is dug out from 12 to 16 feet deep, extending over an area having an average diameter of 25 feet, all of which was filled with ant-cells. Several large avenues (4–5 in. diam.) entered the bottom of this large den. On striking an avenue, some ants were seen to enter it followed by others, loaded with barley, all coming from that underground passage. Where they got the barley was the question, which was finally solved by going to a stable more than 300 feet distant, from which ants were seen to descend, each with his barley-grain, and enter a hole in the ground near the base of the stable, which was the only place in the vicinity where there was any barley. Another avenue on the other side is said to come out at the bank of a stream, between 200 and 300 feet distant, where are some elm-trees, from which the ants obtained bits of leaves, and carried them through the said avenue into the base of the den. That they have extensive underground passages there is not the least doubt. A gentleman recently told me of an instance where they dug under or tunneled a stream to get into a garden. There was a large ant-den on the other side of the stream, and for a long time the garden was safe from their depredations; but finally the Cutting Ants were seen there, carrying bits of leaves into a small hole in the ground. There was no ant-den in the vicinity, except the one across the creek; and as there were no dirt-heaps on the surface of the ground in the garden, as there always are above an ant-den, the inference was, that those Cutting Ants seen in the garden belonged to the tribe across the river.

The question will naturally arise, how is it possible for them to direct their course in digging those long underground passages so as to reach the surface at the wished-for spot? Let those who ask also answer. I only know that such long avenues exist, having thrust a long stick into one at the bottom of one of their dens, and I have also seen the outer openings of many of them on the banks of rivers and streams, where food can easily be had from the trees and bushes usually found growing on the banks of streams in all prairie lands.

At the large ant-den in Austin, before spoken of, millions of working ants, and bushels of eggs and larvæ, with great numbers of males and females, were destroyed. As soon as the large apartment containing the eggs, larvæ, and winged ants was found, a fire was kindled forthwith amongst them, for which purpose light combustible stuff was kept near. The pupa-cases were of different sizes, belonging to opposite sexes, and were in a more or less advanced stage of development. The workers at first are very small, scarcely a line in length. The eggs, mixed with minute young ants, were in a soft, grey, spongy substance, apparently leaves finely triturated and mixed with an animal secretion.

It is said they sometimes abandon their caves when from long residence the chambers become filthy, or perhaps they are injured from heavy rains, or it may be that the ants desire a better situation for provender. Whatever may be the cause, they have been known to emigrate *en masse*, and after making new excavations, and dwelling in them a few years, to return again to their first residence. It is probable that they have a division of labour; some nurse the young, and others provide food. In one instance I saw one cut off a segment of an elm-leaf, and another seized it as soon as cut, and carried it away; but generally I have noticed that he who cuts also carries. When cutting, one mandible is inserted and carried slowly along, the head swaying to and fro, and the other mandible moving its sharp point, apparently breaking the surface to lessen the thickness to be cut by the other.

The ant often stands on the part of the leaf which he is cutting off, but he is careful to remove to a firm place before it is finally severed; which done, he seizes one edge of it with his mandibles, and with a rapid movement throws it on his head and thorax, so that its lower edge rests between the lobes of the head and the spines of the thorax, and the upper edge is aloft. Away he goes, and joins the busy throng in the main path, which looks as if the ants had a gala day and were marching with banners flying. Lately, on the banks of the Colorado River, near Austin, I saw multitudes of ants in their path, going uphill with fragments of leaves and hack-berries (*Celtis*), some entire, and others with a small portion cut off to render them lighter and suitable to be carried by the smaller ants. The place at which they entered the ground was about 6 feet from the top of the bank. This pathway was steep, and even perpendicular for a distance of 5 or 6 inches at a place about 1 foot below their doorway.

The labour was severe to carry the berries up this path, but the struggle was great to get them to the top of the perpendicular spot. In performing this feat the berry-carriers met with many falls, often rolling 1 or 2 feet down the hill; but always sticking fast to their burdens, and trying again until they finally triumphed. One fell when near the top, and as he came up again and was about to succeed, I touched his load with the point of a knife, and down it and the ant went. His third attempt was put to the same test, but even then he did not get angry, or show the least impatience, but cheerfully took his berry, and went up and in at the door of the long avenue.

A lady lately showed me a safe where she kept sugar and sweetmeats which drew swarms of small ants. The legs of the safe were then placed in vessels of water, and the ants did not succeed in reaching the sweets during several days, but finally many of them were found in the sugar. After some little study to discover how they got there, they were seen to drop on the safe from the roof at the distance of about 2 feet above. These, however, were not the Cutting Ants.

The Cutting Ants often assist each other. I saw one which fell with a hack-berry at the vertical place before named. The berry got loose from him, and, instead of shouldering it again, he tried to drag it along, but was unable to pull it up the perpendicular. Many passed him and gave the cold shoulder; finally a kind ant came and pushed. By shoving and pulling, the two succeeded in getting the berry to the top, when the assister immediately left, and started down the hill. They live on both animal and vegetable food. I have seen them carrying worms and bugs. Whole beetles and numerous elytra have been found in their cells, but nothing indicating that they lay up large stores of food, like some of the East India ants, which have been seen to fetch their stores of corn to the surface to dry after heavy rains. The common Tumbler Bug (*Coprobius lævis*), in rolling his ball, sometimes heedlessly backs up over a nest of the Cutting Ant, and falls a victim, being overcome by numbers. Once I saw a very large one roll his ball into their midst, when he was fiercely attacked by the multitude. At first he stuck his nose in the sand, or rather between his fore legs, but the bites behind were so severe that he roused and flew in circles, finally alighting near me, which was no sooner done than an ant who accompanied the flight jumped to the ground, for a moment looked bewildered, then ran home, it may be to tell of his wonderful ride on the big bug.

Great is the damage which these ants do by destroying trees and vegetables. I know of one family who are about to leave a beautiful situation near a fine spring because the Cutting Ants have nearly killed their fruit-trees and ornamental shrubbery, especially roses, for which they have a peculiar fondness. They have been known to strip a fruit-tree of its leaves in a single night. In some sections these ants prevent the cultivation of fruit. Thousands of dollars have been uselessly spent in attempts to kill them by blowing noxious gases into their dens, or by placing poison at the doorways of their dwellings. A knowledge of the habits and abodes of these insects shows the futility of such attempts. The fact is, but few of these can be reached by gas, let the bellows blow ever so hard; nor can many be killed by poison, even if the most deadly be placed within their doorways, for as soon as they discover harm, they form a new entrance. The only effectual method of destroying them is to dig, and kill the females and young, when the neuters will perish. This is so expensive that it will only be resorted to near a garden or dwelling; and as the Cutting Ants are scattered through western and central Texas, they probably never will be exterminated by man.—From the *Proc. Acad. Nat. Sciences of Philadelphia*, 1860, page 233.

Note on Fredericella Sultana *being found in the Winter.* By The Rev. W. Houghton, M.A., F.L.S.

To the Editors of the Annals of Natural History.

Gentlemen,—Professor Allman, in his valuable Monograph of the Freshwater Polyzoa (Ray Society, 1856), draws attention to the following fact in the economy of *Fredericella Sultana*:—"The statoblasts are small and seem to be but sparingly produced,—a circumstance in which this animal differs strikingly from several species of *Alcyonella* and *Plumatella*, in which the tubes at the proper season are constantly found loaded with statoblasts in the greatest profusion." In confirmation of the truth of the above remark, and as an interesting fact explanatory of the comparative scarcity of the statoblasts in the tubes of *Fredericella Sultana*, I have to observe that I have met with this species in the months of December and January, as well as in the spring, summer, and autumn seasons. This species, therefore, it would appear, is perennial,—a point in which it differs from perhaps all the other members of the Freshwater Polyzoa. Now this seems to me to be a very satisfactory explanation of the fact alluded to by Dr. Allman, inasmuch as this species, since it lasts through the year, requires not a profusion of statoblasts. I know not whether any other species of freshwater Polyzoa are, like the *Fredericella*, perennial, but I am inclined to believe that the above-named species is an exception to the rule, and that all the members of the other genera which occur in this country do not last through the year; hence in these cases the necessity of a profusion of statoblasts (for but a very few, comparatively speaking, ever germinate) as a provision for fresh colonies in the spring of every succeeding year.

I remain, Gentlemen,
Truly yours,
W. Houghton.

Solihull, Oct. 18, 1860.

Note on Mr. Blyth's *Paper on the Animals known as Wild Asses.* By Major R. Strachey, F.R.S., F.L.S.

In Mr. Blyth's recent paper on the Animals known as wild Asses, he states that "the late Professor H. Walker referred the Tibetan Kyang to *Equus hemionus* of Pallas, and the Ghor-khur of this country is even more satisfactorily referable to *E. onager* of Pallas, figured by Gmelin; but Prof. Walker committed the extraordinary mistake of figuring and describing an Indian Ghor-khur for a Kyang, so that the alleged distinctions which he has pointed out are valueless. However this mistake originated, there is no doubt whatever of the fact*."

Now I am in a position to say *quite positively* that Dr. Walker was right, and that Mr. Blyth is wrong, in the *matter of fact*. The animal in question was bought in my presence for the late Mr. Thomason for Rs. 100, at the fair at Bágesar in Kumaon, from a Tuhári Bhotiya by whom it had been obtained in Tibet. The story of its attachment to the pony, to which Mr. Blyth also alludes, is odd; and I will state it in full, with the hope that I may satisfy everybody that I really do know something of the personal history of Dr. Walker's Kyang.

Mr. Thomason paid a visit to Almora (the capital of Kumaon) at the end of 1847. I was there at the time; and so was my brother, Mr. John Strachey. We heard of the Kyang; and Mr. Thomason having been informed of its existence, asked my brother to buy it for him, and to send it down to Calcutta, to be forwarded thence to England for the Zoological Society. The animal was bought, as I before said. But on attempting to remove it from the place where it was tied up, it most flatly refused to stir; neither coaxing nor force was of any use. We were rather puzzled what to do, when, on inquiry of its old Bhotiya owner, we learned that it had always been in company with a white pony for which it had a strong affection. It then occurred to us that if we got the pony too, the Kyang might be induced to follow where the pony led; and so it turned out. One or two attempts were made subsequently to surprise the Kyang into a more independent sort of existence, but it was of no use, and so the pony and he went off to Calcutta together.

The end of the pair was tragical. In a gale of wind off the Cape, the Kyang died; and the captain somewhat savagely threw the pony overboard alive, as his existence seemed no longer necessary after the Kyang's death.

Thus much as to the Kyang's identity. I must add, however, that although I am thus forced to point out Mr. Blyth's mistake in this matter of fact, I in reality corroborate the force of his arguments as to the probable specific identity of the two Asses—the Kyang and the Ghor-khur. It is obvious that Dr. Walker's description of a true Kyang answers perfectly for a true Ghor-khur; and, as Mr. Blyth observes (though in a somewhat different sense), the alleged distinctions pointed out by Dr. Walker are probably valueless enough.

I have no pretensions to such a knowledge of zoology or anatomy as would make my opinion of any weight on the question of specific identity; but I may add a few words as to some of the more prominent features of the Kyang, having seen many of these animals dead and alive.

In the first place, my impression as to the voice of the Kyang is that it is a shrieking bray—not like that of the common Ass, but

* Annals for October, p. 234.

still a real bray, and not a neigh. The differences of opinion on this point are easily reconcileable, I think, considering the inarticulate nature of the sounds.

As to the colour of the animal, it varies very greatly, and I think no dependence, as regards specific character, can be placed on mere depth of tint or brilliancy of hue. So also as to the dorsal and humeral stripes. The dorsal stripe is always plain. The humeral cross varies much, but is often as strongly marked as in the Ass bred in Kumaon, in which, however, it is not commonly very well defined.

I see nothing in the habits of the Kyang to make it improbable that it is, in fact, the same species as the Ghor-khur. The Kyang must be a very hardy animal to be able to live on the desert plateaus of Tibet; and though in winter the climate in which he exists is different enough from that of the plains of Sindh, yet, in the summer, the arid surface and scorching heat of the mid-day sun place the Kyang much more on a par with the Ghor-khur than might be supposed.

The Kyang, so far as external aspect is concerned, is obviously an Ass, and not a Horse.—From the *Journal of the Asiatic Society of Bengal*, vol. xxix. p. 136.

On a supposed New Fish.
By the Prince of Salm-Horstmar.

The Prince of Salm-Horstmar has written to the editor of the 'Archiv für Naturgeschichte,' stating that some years ago he found a small fish lying dead upon the sand of a brook called the Hühner-Bach, near Coesfeld. The fish resembled a Stickleback (*Gasterosteus aculeatus*) in size and general appearance, but differed from a Stickleback in the following characters:—

1. Its lower jaw, or its apex, stands far back in proportion to the apex of the upper jaw; and the lower jaw is quite different.

2. At the apex of the lower jaw there is a remarkable chisel-shaped tooth, the edge of which appears under the lens to be finely notched. The profile of the tooth is .

The author did not preserve the fish, which he took for a Stickleback; but on afterwards examining true Sticklebacks, he found that they possessed neither the chisel-shaped tooth nor the peculiar proportion of the jaws.—*Wiegmann's Archiv*, 1860, p. 119.

Notes on the Habits of the Brown Coati (Nasua fusca, *Desm.*).
By George Bennett, M.D., F.Z.S., etc.

A full-grown living specimen of this interesting Plantigrade animal, a native of Tropical South America, was presented to me in Sydney, N. S. Wales, by the commander of a ship, who had procured it from the coast of South America, and had had it in captivity for eleven months. It was of the size of a very large cat, with hair of a greyish-brown colour over the back and sides, the tail long, bushy, and of a dark brown colour, and the ears round. The colour seems to vary according to age. There are two species at present known, the *Nasua rufa* and the one under notice, which I consider the largest. This animal bears some affinity to the Racoon, but is distinguished by having an elongated, truncated, and moveable snout, with which it roots up the earth in search of worms and grubs. The jaws are armed with sharp teeth, and the under jaw is shorter than the upper. It preys upon small quadrupeds and birds. It climbs trees in search of prey, and also frequently seeks its food upon the ground.

The possession of this living specimen enabled me to observe its habits; and as it was permitted to roam about at liberty, its natural actions could be better observed than when the animal is kept in confinement. It would come when called, like a dog, evincing much attachment, and always seemed gratified when patted or otherwise caressed, more especially when rubbed behind the ears, displaying during the operation as much delight as a cat under similar treatment, crouching down, placing the head with the nose close to the ground, uttering at the same time a subdued, sharp, whistling cry. If placed in confinement, it would run round the cage, rapidly biting at its tail during its circular movements; and on any person approaching the cage, would spit, growl, and utter loud, sharp, and discordant cries. The instant, however, it was set at liberty, it permitted itself to be fondled even by strangers. One of its habits was very peculiar: it would take glue or any adhesive substance, if in its way, and rub some over its tail, and soon after amuse itself by licking it off, or endeavouring to remove it by washing its tail in water. It was very fond of sucking the blood of animals; and when these were placed before it dead, always selected the part in which the blood had been retained in the greatest quantity before any other portion of its prey. I have also frequently seen it eat the fruit of the Moreton Bay fig-tree, running about under the tree, and, after selecting the ripest that had fallen, opening them and sucking out the pulp. One morning I observed it commence a meal upon a rat which had just been killed and given to it. The first process on receiving the prey was, as usual, to suck all the blood from those parts in which it found any had been retained; it then began rolling the rat upon the ground with its fore paws, but for what purpose this operation was performed I could not ascertain. After the prey had been treated in this manner for some time, it pulled out the intestines, and devoured some portion of them before eating any other of the fleshy part. On approaching the animal at this time, it would dart away with the prey, uttering shrill cries, and was exceedingly savage if any attempt was made to take it away. When running about in the garden, it would insert its long, flexible snout into the earth, root it up, and seemed to be eagerly devouring worms or any similar food it found there. It evidently possessed an acute sense of smell; for after smelling about for some time it would insert the snout to some depth into the earth in the selected place, and secure the worm or grub which it had been seeking.—*Proc. Zool. Soc.* June 26, 1860.

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XLIX.—*On the Occurrence of the Fingered Naïs* (Proto digitata) *in England.* By the Rev. W. Houghton, M.A., F.L.S.

To the Editors of the Annals of Natural History.

Gentlemen,

Dr. Johnston, in his unpublished 'Catalogue of British Annelids' (for the loan of which I have been indebted to the kindness of Dr. Gray), expresses a doubt whether the rare and curious worm *Proto digitata* has been admitted with sufficient evidence into the English fauna. I am able to give satisfactory proof that this Annelid is an undoubted "British possession," having been fortunate enough in July of last year to make some slight acquaintance with this fingered species of the Naïdine family. I regret, however, that I did not pay sufficient attention to the study of this worm last summer; but, from lack of opportunity of consulting the works of Müller, Grube, &c., and my consequent ignorance that my specimens were of any value as far as a new discovery was concerned, and feeling sure that I had only to wait for another summer to be able to find the worms again in the same spot from whence I had originally taken them, I made but a cursory examination of my specimens. Alas! the summer is gone (if, indeed, we can say that is gone which never came)! and vain have been my numerous visits in search of *Proto digitata.* Nor alone in the summer have I sought the worm; on several occasions both in the winter and spring I have most patiently examined the sand and mud from the water where I had expected to meet with specimens: but my perseverance has been unavailing; I could not renew my acquaintance with *digitata*—not a *finger* would she extend. As, however, this worm is undoubtedly a rare one, and it may be long ere one "looks upon his like again," I will take the present opportunity of briefly noticing it.

This species appears to have been first noticed by O. F. Müller in his 'Würmern des süssen und salzigen Wassers,' pp. 90–102, under the names of "die blinde Naide" and "das Blumen-Thier." In tab. 5, this writer gives several figures of this Annelid in various positions, which on the whole are very fair representations of it. In the 'Vermium terrestrium et fluviatilium Historia,' vol. i. p. 22, Müller notices this worm under the appropriate name of *Naïs digitata*, abandoning the name he had previously given it, as the epithet *blind*, being applicable to other worms of this family, could not be considered to constitute a specific difference. Turton (Brit. Faun. 137) mentions this species under Müller's latter name, as belonging to our own fauna; and notices of it are given by Stewart (Elem. i. 391) and Pennant (Brit. Zool. iv. 98, ed. of 1812), but it does not appear that any of these authors had ever seen a living specimen: hence Dr. Johnston's remark, "The evidence on which this species has been introduced into the British fauna is unsatisfactory." Oken (Lehrb. der Naturg. Th. iii. 1. p. 363) appears to have been the first to separate this Annelid from the genus *Naïs*, forming what he terms the genus *Proto*; and Oersted (Kröy. Tid. iv. 2. p. 133) notices it under the name of *Proto digitata*. See also Blainville (Dict. des Sc. Nat. lvii. 498, atlas, pl. 1 fig. 1). Grube (Die Familien der Anneliden, p. 105) proposes *Dero* as the name for this genus, and demurs to the *Proto* of Oken, as being one of uncertain derivation: but unde derivatur *Dero*?

I have seen the *Proto digitata* but on one occasion, and was much puzzled, at the first sight of this novel worm, as to what kind of creature I was beholding. Having taken home and put into a glass vessel a small piece of submerged stick which was covered with the commonest of our native freshwater Polyzoa (*Alcyonella fungosa*), my attention was soon drawn to some pink-coloured objects, about 2 lines in length and $\frac{1}{8}$ line in breadth, projecting from the surface of the fungoid mass; the upper end was split into six or eight unequal, digitiform segments, broadest at the base and gradually narrowing to the apex. These segments were ciliated, and doubtless are branchial in their functions. With Müller, I imagined that the object I was beholding was the head and upper portion of the animal, especially when, upon tapping the glass vessel, the creature suddenly disappeared, concealing the whole of that part of its body within the thick and entangled filaments of the polyzoon, reminding one of the similar action observed in the *Melicerta*. Upon further examination, however, I soon discovered that the portion I was looking at was the tail extremity, and that the anterior part was hidden within the interstices of the cœnœcium of the *Alcyonella*. The ciliated segments are in the position represented in the annexed figures only when the worm is stationary: if it be withdrawn from its habitation, and put into a vessel of clean water, the fingers will close; and then the only difference between the appearance of the posterior and anterior extremity consists in the former being the more obtuse.

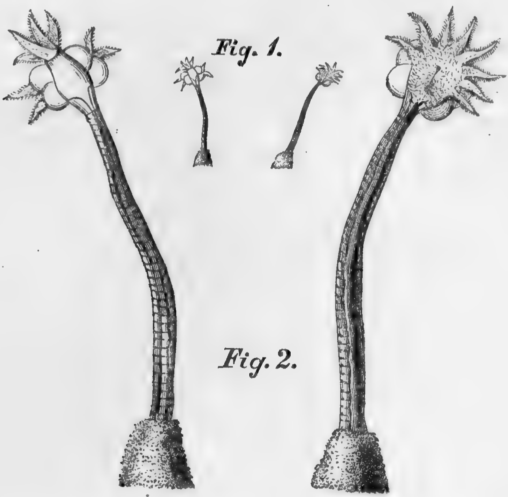


Fig. 1. *Proto digitata* (the Fingered Naïs), about the natural size.
Fig. 2. The same, magnified.

[After Müller.]

What is the exact position of this Annelid in the animal kingdom? Müller draws attention to the fact that in the general form of the body, which is furnished with lateral setæ, it resembles the *Naïs*; but in the possession of a digitiform tail, in its manner of living, and in its having red blood, it is unlike members of that genus. Grube has noticed the link which this species forms between the *Naïs* and the *Serpula*. I regret I am unable to contribute anything of value in the notice of this curious Annelid beyond the bare fact of establishing for it an undoubted right to claim a place in the British fauna. But this short notice of its occurrence in England may be the means of drawing the attention of British naturalists to a very interesting form of Annelid life.

I subjoin Müller's description of this worm:—

"Oculorum defectu, capite in limo condito, corpore et cauda digitata exsertis, venaque rubra a congeneribus differt. Cauda apice in sex lacinias subæquales, digitiformes, non granulatas dividitur.

Hæ plerumque sursum porrectæ, interdum reclinatæ, liquore vitali torrentis instar fluente spectabiles. Subtus series duplex verrucarum ciliatarum, seu setis tribus instructarum, pedum vices agit.

"*Hab.* In sedimento rivorum arenoso." (Verm.Terrestr. &c. i. 22.)

The figures which illustrate this paper are copied from Müller's 'Würm.' plate 5. The only locality in which I have found *Proto digitata* is a small strip of water in Malvern Park, Solihull. The worm is about $\frac{1}{2}$ inch long, and $\frac{1}{8}$ inch broad.

I remain, Gentlemen,

Truly yours,

Solihull, Oct. 16, 1860. WILLIAM HOUGHTON.

L.—*On the* Calyceraceæ. By JOHN MIERS, F.R.S., F.L.S. &c.

[Continued from p. 356.]

5. CALYCERA.

The type of this genus, *Calycera Cavanillesii*, was the earliest known species of this family, having been described and figured by Cavanilles in 1797, under the name of *Calicera herbacea*. The genus is distinguished by the extreme growth of its calycine segments, which become expanded into very long spines. In this respect it approaches *Anomocarpus* and *Acicarpa*. From the latter it is distinguishable only by its free achænia and by the much greater length which their spinescent lobes attain; from the former it is distinguished by the much greater length of the peduncles that support the capitula, and by the different form of its seeds.

The genus *Gymnocladus* has been proposed by Dr. Philippi (Linnæa, xxviii. p. 705) upon the slender character of the partial abortion of the leaves of the involucre and a globose receptacle, in a plant which otherwise possesses the habit and all the floral characters of *Calycera*. Upon these features we may remark that Richard (Mém. Mus. vi. 34), in his description of the typical species, *Calycera Cavanillesii*, shows that the leaflets of the involucre are wanting, and figures the receptacle as globose, both in that species and in *C. balsamitæfolia* (*l. c.* pl. 10 A and 10 B). There does not exist, therefore, a single feature in *Gymnocladus* distinct from *Calycera*. In DeCandolle's Monograph of the family, he enumerates only two species of this genus: four other species are here contributed, with the following amended generic character:—

CALYCERA, Cav., Rich.—Char. reform.: *Involucrum* polyphyllum; *foliola* 5–7, uniserialia, imo ad torum accreta, subinæqualia, lineari-lanceolata, integra vel serrata, patentia, sæpe abortiva. *Receptaculum* convexum, subglobosum, carnosum, amplum, *paleis* spathulato-linearibus acutis inter flores onustum. *Flores* dissimiles et promiscui. *Calyx* tubulosus, tubo ad ovarium omnino adnato, margine parvo libero 5-dentato, dentibus æqualibus, acutis, concavis, mucronatis, sæpe demum inæqualiter excrescentibus. *Corolla* ovario multoties longior, tubo gracili fauce campanulato, limbi 5-fidi laciniis oblongis, apice crassiusculis, acutis, paulo expansis. *Stamina* exserta, *filamenta* imo in tubum monadelphum contractioni corollæ insertum coalita, superne disjuncta; *antheræ* mediante connectivo crasso dorsali apicifixæ, imo syngenesæ, apice liberæ. *Ovarium* oblongum, 5-sulcatum, tubo calycino breviori adnatum, hinc apice conico liberum, uniloculare, uniovulatum. *Ovulum* pendulum. *Stylus* filiformis, longe exsertus, apice incrassato-clavatus. *Stigma* parvum, globosum, papillosum. *Achænia* plurima, congesta, omnino libera, oblongo-turbinata, 5-sulcata, lobis calycinis nonnullis (2–3–4) longissime elongatis, subulato-spinescentibus, divaricatis, aliis lobis squamaceis aut abortivis coronata. *Semen* ordinis.

Herbæ *Andicolæ et Chilenses*; radix *fusiformis*: folia radicalia *congesta, lineari-lanceolata, incisa vel dentata*; caulina *pauca, breviora.* Inflorescentia *in ramulis terminalis,* pedunculo *sæpius elongato, simplici, monocephalo*; capitulum *subglobosum.*

1. *Calycera Cavanillesii,* Rich. Mém. Mus. vi. 34, tab. 10; Remy in Gay, Chile, iii. 253; Weddell, Chl. And. ii. 7;—C. herbacea, *Cav. Icon.* iv. 35, tab. 358;—glaberrima, caulibus plurimis, subscapiformibus, remote 2-foliatis, substrictis; foliis radicalibus subsessilibus, longo-lanceolatis, acutis, remote semipinnatifidis, imo in petiolum angustum spathulatis, caulinis consimilibus, multo minoribus; capitulo terminali; achænio spinis 2–3-plo longioribus patentibus armato.—Chile, Concepcion.

Planta mihi invisa; folia radicalia ex descriptionibus 4–5 poll. long., et cum laciniis 6 lin. lat., petiolo lamina 3-plo longiore, 1 lin. lat.; caulis scapiformis, 8 poll. long., 1 lin. diam.

2. *Calycera balsamitæfolia,* Rich. Mém. Mus. vi. 38, tab. 10;—Boopis balsamitæfolia, *Juss. Ann. Mus.* ii. 350;—Scabiosa sympaganthera, *R. & P. Flor. Per.* i. 49, tab. 76 *a*;—Caule erecto, superne ramoso, ramulis suberectis, leviter pilosis, pedunculo nudo foliolatove monocephalo terminatis; foliis radicalibus congestis, caulinis sparsis, spathulato-lanceolatis, inciso-dentatis, laciniis remotis fere pinnatifidis, glabellis, mar-

gine ciliato-puberulis, imo in petiolum linearem complanatum cuneatis; capitulis majusculis; involucro multipartito, laciniis oblongis, acutis, puberibus.—Chile, Prov. Concepcion, *v. s. in herb. Mus. Paris.* (Cl., Gay).

Caules plures, fere 2-pedales, erecti, obsolete striati, virgati; folia radicalia $2\frac{1}{2}$ poll., caulina $1\frac{3}{4}$–$2\frac{1}{4}$ poll. long., cum laciniis 4–6 lin. lat.; capitula in flore 7–8 lin. diam., demum in fructu 14 lin. diam.; involucrum multipartitum, laciniis lanceolatis, integris, patentibus, inæqualibus; flores involucro excedentes; calycis dentes 5, parvi, subrotundi; corollæ tubus imo tenuissimus, viridis, superne infundibuliformis, 5-fidus, albus; paleæ inter flores plurimæ, spathulatæ, foliaceæ, involucro æquilongæ, margine ciliatæ.

3. *Calycera squarrosa*, n. sp.;—glaberrima; foliis radicalibus plurimis congestis, oblongis, irregulariter pinnatifido-incisis, summo segmentisque obtusiusculis, iterum sinuato-dentatis dentibus spinescenti-mucronatis, crassis, margine cartilagineo, in petiolum longissimum angustum alatum decurrentibus; pedunculo scapiformi, monocephalo, nudo, folio breviore; capitulo majusculo; involucro ad basin 5-partito, laciniis linearibus, patentibus, aceroso-denticulatis; paleis spathulatis, acerosis, crassis, viridibus, flores excedentibus.

Species duabus præviis affinis, sed planta multo humilior: folia (petiolo incluso) 3 poll. long., lamina pollicaris, 7 lin. lat.; segmenta 2–3 inferiora remota et squarrosa; petiolus alatus, $1\frac{1}{2}$–2 poll. long., 1 lin. lat.; pedunculus nudus, 1 poll. long., apice crassior; capitulum 1 poll. diam.*

4. *Calycera sinuata*, n. sp.;—glaberrima; foliis radicalibus plurimis, congestis, ovato-oblongis, irregulariter sinuato-dentatis dentibus brevibus, apice callosis, crassis, sub-3-nerviis, in petiolum longum cuneatis; caulinis paucis, alternis, conformibus, et multo brevioribus; capitulo terminali; involucri foliolis 5, spathulato-oblongis, subintegris, crassis, patentibus. —In Andibus Chilensibus, ora orientali (Puente del Inca, altit. 8000 ped.), *v.v.*

Planta anno 1825 mihi inventa, habitu præcedentis, 3-pollicaris; radix fusiformis, $1\frac{3}{4}$ poll. long., folia radicalia 2 poll. long., 4 lin. lat., lamina in petiolum complanatum alatum linearem subæquilongum decurrens; caulina similia, 9 lin. long., 2 lin. lat.; capitulum in fructu globosum, 9 lin. diam., spinis inclusis $1\frac{1}{2}$ poll. diam.; foliola involucri 4 lin. long., $1\frac{1}{4}$ lin. lat.; achænii spinæ rigidæ, patentes, subulatæ, superne subsulcatæ †.

* This species is represented in Plate 50 A of the 'Contributions.'
† A drawing of this plant is given in Plate 50 B.

5. *Calycera viridiflora*;—Gymnocladus viridiflorus, *Phil. Linn.* xxviii. p. 706;—glaberrima, caulibus paucis, e basi enatis, sæpius folio unico munitis, scapiformibus, teretibus, validiusculis, monocephalis, foliis radicalibus plusquam 2-plo longioribus, interdum subramosis, ramo etiam florigero, imo apiceque florifero; foliis radicalibus plurimis, crebre congestis, elongatis, limbo ovato aut oblongo, inæqualiter laciniato-dentato dentibus interdum erosis et mucronatis, glauco-viridi, crassiusculo, in petiolum loriformem elongatum alatum decurrente; capitulo globoso, involucro 5-fido, laciniis 2–3 linearibus, cuspidatis, reliquis brevioribus; receptaculo globoso, paleis plurimis, flore brevioribus, spathulatis, cuspidatis, viridibus, nonnullis filiformibus onusto.—In Andibus Chilensibus, Cordillera de Maule, Depart. Linares (Germain), sub. nom. *C. nudicaulis*, Phil. MSS.

Species sine dubio hujus generis, præcedenti et sequenti valde affinis; specimina communicata sub titulo *Calycera nudicaulis*, sed planta descripta sub nom. *Gymnocladus viridiflorus*: planta non semper nudicaulis, et igitur nomen vix idoneum. Folia radicalia (petiolo incluso) 2–3 poll. long., lamina ovata aut oblonga, 8–10 lin. long., 4–7 lin. lat.; pedunculus scapiformis, nudus, $4\frac{1}{4}$ poll. long.; capitulum globosum, 12–16 lin. diam.; calyx 1 lin. long.; corolla $3\frac{1}{2}$–4 lin. long., cum staminibus styloque intense viridis; achænii spinæ valde inæquales, longiores, 7 lin. et ultra long.*

6. *Calycera spinulosa*, Gill. MSS., n. sp.;—foliis radicalibus congestis, lanceolato-oblongis, sinuato-dentatis dentibus aceroso-spinosis, patentibus vel recurvis, infra medium cuneatis et integris, 5-nerviis, carnosulis, glaberrimis, imo in petiolum latum subamplexicaulem decurrentibus, hinc quasi sessilibus, cauli subscaposo æquilongis; caulinis paucis, multo minoribus; caule sæpius pedunculo unico longiusculo monocephalo terminato, interdum ramo altero foliifero et florifero donato; involucri foliolis 5–7, lanceolatis, acutis, pectinato-dentatis, dentibus spinulosis; paleis basi latis, apice subulatis.—Prov. Mendosæ ad Tortoral et Las Arboletas, in arenosis, *v. s. in herb. Hook.* (Gillies, sub nom. *C. spinulosa*).

Planta humilis, 3–$3\frac{1}{2}$ poll. alt.; radix fusiformis; folia pleraque radicalia, $2\frac{3}{4}$ poll. long., 4–7 lin. lat., imo cuneato-spathulata; caulina 9–12 lin. long., 3–4 lin. lat.; caulis sæpe scapiformis, fere nudus, 3 poll. long.; capitulum 9 lin. diam.; involucri foliola 5–6 lin. long., 2 lin. lat.; achænium $1\frac{1}{2}$ lin. long., 5-angulatum, spinis inæqualibus, divaricatis, longioribus 5–8 lin. long., subulatis †.

* A figure of this species is given in Plate 50 c.
† This plant is figured in Plate 50 D.

Var. *β. serratifolia*;—foliis elliptico-lanceolatis, submembranaceis, sinuato-serratis, dentibus calloso-mucronatis, imo integro cuneatis, 5–7-nerviis, glaberrimis; caule scapiformi, solitario (an semper?), monocephalo, nudo, foliis radicalibus breviore; paleis integris, acutis.—In Andibus Mendozinis, *v. s. in herb. Hook.*; circa Casa Pintada (Gillies).

Folia majora, textura tenuiora, 4 poll. long., 1 poll. lat., imo integra, latiora; scapus 2 poll. alt.; capitulum circa 1 poll. diam.

6. Acicarpa.

This genus, first established by A. de Jussieu, was named by him *Acicarpha* *, because of the spinose lobes of its achænia, which he erroneously attributed to the growth of the paleæ, and their accretion with the ovarium. Mr. Robert Brown first detected this error, and showed that the spinose excrescences were owing to the growth of the calycine lobes, and not of the paleæ; and hence he objected to the name of *Acicarpha* as being inadmissible, suggesting in its stead the far more appropriate epithet of *Acicarpa* †. DeCandolle and other botanists have disregarded this suggestion, and have retained Jussieu's name; but it appears to me that we are bound to adopt that of *Acicarpa*, so long ago recommended by Mr. Brown. The little difference existing between this genus and *Calycera* has been already pointed out, consisting principally in the much greater length of the excrescent calycine lobes, and in the accretion of the achænia with each other and with the receptacle; but this last-mentioned feature is not a constant character. Richard represents the ovaria as being immersed within a fleshy receptacle; this, however, is an erroneous view of the case: the receptacle is, in fact, merely a cylindrical axile column, upon which the ovaria are imposed, thus resembling an abbreviated spikelet, round which the flowers are densely crowded; from this receptacle a secretion exudes, which flows between the ovaria, and finally agglutinates them and all the lower portion of the spikelet into one compact mass. Sometimes, however, this agglutination is only partial, especially towards the middle and summit of the inflorescence; and it then occurs that many of the achænia, perfectly mature, are as free as in *Calycera*, which fact I have frequently observed in *Acicarpa tribuloides*: even in the typical species the ovaria of the upper florets always remain free, as Richard has described them ‡; but in that species these free achænia seldom perfect their seeds. In *Acicarpa* the calyx, which is adnate to the ova-

* Ann. Mus. ii. p. 347.

† Linn. Trans. xii. p. 132; Mém. Mus. vi. pl. 11 & 12. fig. B.

‡ Mém. Mus. vi. 46, tab. 11 B. fig. 5. achænia coalita, fig. 6. alia libera.

rium, is deeply 5-sulcate, the prominent midrib of its five free teeth being continuous with its salient angles; at first it is of delicately thin texture, and extremely transparent, consisting apparently of two integuments with a fluid or vacant mesodermal space between them; for the one can be made to move loosely over the other by pressure. The subsequent increment of the calyx seems to arise from the deposition of solid matter (probably derived from the receptacle) within the mesodermal space: the midribs of the calycine leaves seem to acquire the greatest amount of increment, becoming lengthened into thick pungent spines; the calycine lobes are at the same time expanded into the globose nodules that form the bases of the spines; while the external surface of the calycine tube becomes horny and solid, the mesodermal space, being much enlarged, is filled with compact cellular tissue, which dries into a light spongy or pithy substance. While this deposition is taking place within the integuments of the achænia, a similar exudation from the receptacle flows between the numerous achænia, and agglutinates them, together with the receptacle, into one solid echinate globose head, as before described. This appears to be the nature of the change in the development of the fruit in *Acicarpa*. There is an evident difference in the growth that takes place in the calyx of *Acicarpa* and in that of *Calycera*: in the former the excrescent spines are shorter, nodose at their base, subulate, with a small groove along their inner face; in the development of the spines in *Calycera* the calycine lobes disappear or become entirely expanded into divaricated spines of much greater length and thickness, subulate and semiterete in form, being flattened on their upper surface. The generic features of *Acicarpa*, as here given from my own observations, will be found to differ in many essential respects from the characters assigned to it by Richard and DeCandolle.

Acicarpa, R. Br.;—Acicarpha, *Juss.*;—Cryptocarpha, *Cass.*—Char. emend.: *Involucrum* polyphyllum; *foliola* 5, lineari-oblonga, inæqualia, persistentia, uniserialia, toro parvulo adnata; *receptaculum* lineari-cylindricum, toro suffultum, *paleis* obovatis ovario longioribus inter flores onustum. *Flores* consimiles, superiores nihilominus substeriles. *Calycis tubus* ovario 5-angulato arcte adnatus, *limbo* libero 4–5-dentato, dentibus parvis, ovatis, obtusiusculis, hyalinis, textura laxa, tubi angulis continuis, demum excrescentibus. *Corollæ tubus* gracilis, ovario 2-plo et limbo sesquiduplo longior, *limbo* infundibuliformi profunde 4–5-partito, laciniis oblongis, obtusiusculis, crassis, sub-3-nerviis. *Stamina* inclusa; *filamenta* imo in tubum monadelphum carnosum fauci insertum coalita,

apice brevissime disjuncta; *antheræ* oblongæ, basi emarginatæ, imo usque ad medium syngenesiæ, dehinc liberæ, connectivo crasso dorsali imo nodoso filamento continuo affixæ. *Ovarium* tubo calycis adnatum, 1-loculare, 1-ovulatum, apice conico nudum. *Achænia* plurima, congesta, brevia, profunde 5-sulcata, pleraque (præsertim inferiora) inter se et cum receptaculo in globum echinatum concreta, lobis calycinis excrescentibus et spinescentibus, divaricatis; pauca superiora, sæpe libera, vel interdum (sed non semper) sterilia. *Semen* ordinis.
Herbæ *perennes, Brasilienses, Bonarienses et Chilenses, subprocumbentes*; radix *subfusiformis*; caules *plures, ramosissimi*; folia *alterna*, radicalia *petiolata*, caulina *sessilia, oblonga vel linearia, integra vel inciso-dentata*; pedunculi *oppositifolii, monocephali, axillares et terminales.*

1. *Acicarpa spathulata*, R. Br., Linn. Trans. xii. 129;—Acicarpha spathulata, *Rich. Mém. Mus.* vi. 78, tab. 12;—Cryptocarpha spathulata, *Cass. Dict.* xii. 85;—Sommea calcitrapa, *Bory*;—Echinolema arenarium, *Jacq. fil.*;—Acanthosperma littorale, *Velloz, Flor. Flum. Icon.* viii. tab. 152;—Buphthalmum Bonariense, *Pers. Ench.* ii. 474;—glabra, caulibus decumbentibus, ramosis; foliis cuneato-oblongis, apice rotundatis et mucronatis, imo in petiolum longum decurrentibus, integris vel rarius paucidentatis, 3-nerviis, utrinque cano-glaucis; pedunculo monocephalo in ramulis axillaribus terminali, folio longiore; involucri foliolis inæqualibus, spathulato-oblongis, mucronatis, integris, patentibus, flores longe excedentibus.—Rio de Janeiro, in arenosis maritimis.

Planta bene cognita et auctoribus ampliter descripta; receptaculum in juniore ætate filiformi-cylindraceum; ovaria numerosissima, illinc cum paleis totidem brevioribus interspersa, crebriter circumposita, mox cohærent omnia in massam solidam, centralia (aut superiora) libera et sterilia, ut in aliis speciebus.

2. *Acicarpa crassifolia*, n. sp.;—glaberrima, caule subdecumbente; foliis inferioribus spathulato-lanceolatis in petiolum brevem latum cuneatis, superioribus subsessilibus, cuneato-ellipticis, subobtusis, carnosis, margine subrevoluto remote et obsolete sinuato-denticulatis, 3-nerviis, nervis subtus prominulis; pedunculo solitario, terminali, monocephalo; capitulo majusculo; involucri foliolis 5–7, obovato-oblongis, acutis, mucronatis, membranaceis, margine crassiusculo, integro.—Maldonado, in dumetis arenosis, *v. s. in herb. Hook.* (Tweedie).

Species præcedenti valde analoga, sed folia viridiora, breviora et latiora, margine denticulata; planta 5-pollicaris; folia alterna, 1–2 poll. long., 6–8 lin. lat., petiolo lato, subamplexicauli, brevissimo; pedunculus terminalis 1 poll. long., apice incrassatus; capitulum fere 1 poll. diam., semiglobosum; involucrum fere ad basin 5–7-partitum, laciniis patentibus; paleæ setaceæ vel spathulatæ, ovaria concreta excedentes; corollæ tubus gracilis, $2\frac{1}{2}$ lin. long.; limbus infundibuliformis, ultra medium 5-partitus, tubo fere æquilongus, segmenta oblonga, acuta*.

3. *Acicarpa bupleuroides*, Less. Linn. vi. 527;—erecta, glabra, dichotome ramosa; foliis oblongo-obovatis, basi in petiolum alatum subamplexicaulem angustatis, obtusis, integerrimis vel apice subdentatis, reticulato-venosis; capitulis terminalibus; involucro inæqualiter 5-foliolato, foliolis lineari-elongatis, calyce corollaque 4-lobis.—Brasilia meridionalis, in uliginosis (Sello).

Species mihi invisa, ex descriptione autem cl. Lessingii ab alteris manifeste distincta; herba perennis, $1\frac{1}{2}$–4 ped. alt., habitu *Bupleuri rotundifolii*; capitulum parvum, eo *Artemisiæ Absinthii* vix majus; folia alterna, remota, 6 poll. long., $1\frac{1}{2}$ poll. lat.

4. *Acicarpa procumbens*, Less. Linn. vi. 527;—glaberrima, caulibus plurimis, procumbentibus, valde ramosis; foliis lineari-spathulatis, in petiolum planum attenuatis, integerrimis, mucronulatis, glaucis, membranaceis, 3-nerviis, nervis superne immersis, subtus prominulis; pedunculis monocephalis, primum terminalibus, demum lateralibus, folio brevioribus; involucri segmentis 6, floribus brevioribus, integerrimis, oblongo-ellipticis, patentibus, inæqualibus.—Brasilia meridionalis, *v. s. in herb. Hook.* (Sello).

Planta habitu ad *A. spathulatam* accedens; folia remotiora, fusciora, angustiora, membranacea, et capitula multo minora; caules 6–12 poll. long., debiles; folia 1-$1\frac{3}{4}$ poll. long., 2–4 lin. lat.; petiolus angustus; pedunculi teretes, oppositifolii, fere 1 poll. long.; capitula semiglobosa, 5 lin. diam.; involucri foliola 2 lin. long., 1 lin. lat., acuta †.

5. *Acicarpa tribuloides*, R. Br. *l. c.*;—Acicarpha tribuloides, *Juss. Ann. Mus.* ii. 348, tab. 58. fig. 1; *Rich. Mém. Mus.* vi. 45, tab. 11; *DC. Prodr.* v. 3;—Cryptocarpha tribuloides, *Cass. Dict.* xii. 85;—subdecumbens, dichotome subramosa; foliis cuneato-oblongis, obtusis, sinuato-dentatis aut lacerato-incisis, laciniis mucronatis, glaberrimis, submembranaceis, valde reticulatis, inferioribus spathulatis, superioribus sessilibus, et basi latiore semi-amplexicaulibus.—In Provinciis Argentinis, *v. v.* ad Zanjon, Prov. Cordovæ.

Species ad præcedentem et sequentem proxime accedens; a priore

* A drawing of this plant is given in the 'Contributions,' Plate 51 A.
† This plant is represented in Plate 51 C.

differt foliis dentatis aut inciso-laciniatis, a posteriore foliis vix pinnatifidis et basi non auriculatis. Folia 3–3½ poll. long., 4–9 lin. lat.; pedicelli 6–9 lin. long.; involucri foliola linearia, integra, obtusa, 4–5 lin. long., ¾–1 lin. lat.; capitula fructifera globosa, (exclusis spinis) 3 lin. diam.; achænia arcte conglutinata; spinæ 3 lin. long.*

6. *Acicarpa pinnatifida*, n. sp.;—herbacea, glaberrima, caulibus e basi pluribus, angulato-sulcatis, dichotome ramosissimis; foliis lanceolatis, membranaceis, utrinque glaucis, radicalibus imo cuneatis et in petiolum longum decurrentibus, pinnato-laciniatis, laciniis late triangularibus, obliquis, caulinis sessilibus imo cordato-auriculatis et semiamplexicaulibus, sinuato-laciniatis, supremis late linearibus, subacutis, mucronatis, integerrimis vel subdentatis; pedunculis axillaribus, folio multo brevioribus et oppositifoliis; involucri foliolis 5, anguste linearibus, patentibus, integris, mucronatis, subinæqualibus, pedunculo fere æquilongis, et floribus 3–6-plo longioribus.—Buenos Ayres, *v. v.*

Planta in pascuis copiosa, bipedalis; folia radicalia 6 poll. long., laciniis inclusis fere 1 poll. lat.; caulina sessilia, imo late et acute auriculata, lobis amplexicaulibus, 3–4 poll. long., 5–9 lin. lat., suprema sæpius integra, 1–2 poll. long., 3–6 lin. lat.; pedunculus 3–6 lin. long.; capitulum 6 lin. diam.; involucri foliola 3–4 lin. long., 1–2 lin. lat.; achænia in globum conglutinata, spinæ 3–4 lin. long.†

7. *Acicarpa runcinata*, n. sp.;—subcæspitosa, humilis, caulibus paucis, scapiformibus, interdum nudis, rarius paucifoliosis, monocephalis; foliis radicalibus confertis, elongato-linearibus, irregulariter pinnato-laciniatis, laciniis grosse dentato-incisis et runcinatis, in petiolum alatum decurrentibus, membranaceis; capitulis terminalibus; involucri foliolis 5, spathulato-linearibus, elongatis, integris, obtusiusculis, patentibus vel reflexis, floribus 6-plo longioribus, subinæqualibus.—Banda Oriental, *v. s. in herb. Hook.* (Tweedie).

Planta pusilla, vix 2½-pollicaris; folia radicalia prona, radiantia, 1¼–2½ poll. long., laciniis inclusis 6 lin. lat., rachi alata 2 lin. lat., tenuiter membranacea, glaberrima. Caules scapiformes, suberecti, sæpius nudi, 1¼–1½ poll. long., monocephali, vel interdum foliiferi, 2¼ poll. long.; folia 2–3, alterna, 6–9 lin. long., 1–2 lin. lat.; capitula parva, 2–3 lin. diam.; involucri foliola 7–9 lin. long., 1 lin. lat.‡

* Details of this species will be found in the 'Contributions,' Plate 52 A.
† A figure of this plant will be given in Plate 52 B.
‡ A drawing of this species will be given in Plate 51 B.

LI.—*Notes on* Ianthina, *Bolten; and Indication of a new Species of the allied oceanic Genus* Recluzia, *Petit.* By W. H. Benson, Esq.

An examination of Reeve's Monograph of *Ianthina*, published in 1858, and of Mörch's "Matériaux pour servir à l'Histoire de la Famille des *Ianthines*," contained in the 'Journal de Conchyliologie' for the present year, has suggested a few observations with reference especially to the species in an extensive collection of pelagian shells made in 1834-35, during a voyage to Calcutta in the 'Malcolm.' My success in the construction of casting and towing nets of novel patterns, and the inspection of the curious forms captured, caused my example to be followed by other passengers in the ship; an opportunity was thus afforded for the examination of a larger number, and occasionally of finer specimens, of the shells obtained in my own nets, besides two genera which were missed by them.

The first *Ianthinæ* seen were accidentally enclosed in a casting net employed to procure specimens of the brilliant and active little *Glaucus Forsteri*, and proved to be a small variety of *Ianthina exigua*, Lamarck. This species was observed during two days before the island of Madeira was sighted. I succeeded in keeping the animal alive in sea-water for ten days. *Glaucus Forsteri* lived for a longer period, and was found to feed on its less active shell-bearing fellow-prisoners.

I. exigua was the most widely distributed species met with, occurring again near the equator, and continuing along the Brazilian portion of the Atlantic, towards the island of Tristan d'Acunha, where it attained a large size, as far as 39° of south latitude. Here it was again small; but a still larger variety, with a more rosy violet tint, appeared in the middle of the Southern Indian Ocean, north-east of the Isles of St. Paul and Amsterdam. Between this variety and *I. capreolata*, Montrouzier, I can find no sufficiently distinguishing character. Smaller specimens again occurred to the south of the equator, and at the head of the Bay of Bengal.

A small and delicate variety of *I. nitens*, Menke, made its appearance to the north of the Cape de Verde Islands. South of this group, the apical nucleus of the same species was taken; and in 6° of north latitude the shell was captured fully grown. The peculiarities of the spire and float will be noticed in another part of this paper.

In 14° north lat., south of the Cape de Verde Islands, a small shell, which I think must be the young of Reeve's *I. Smithiæ*, was found sparingly, as well as at the equator.

Between 4° and 5° of north lat., *I. planispirata*, Adams & Reeve (agreeing rather with the shell figured in the Voyage of the 'Samarang' than with the very different form assigned to the species in pl. 2. f. 9. of the 'Iconica'), first occurred in company with *I. nitens,* and continued at intervals as far as 35° S. lat. and 74° E. long., generally with *I. exigua.* I had not the good fortune to catch such large specimens of this species as were taken by one or two of my companions.

About midway between Sierra Leone and Paraiba, 3° north of the line, and in about 24° of west longitude, we sailed during half an hour, on the 10th of October, through a space occupied by a fine species, the more depressed forms of which appear to be Lamarck's *I. fragilis* (not *I. fragilis,* Reeve). The spire is variously elevated, until in one specimen it attains the exact figure of Reeve's *I. affinis,* considered by Mörch to be merely a variety of *I. fragilis.* Nine specimens were captured, of which four fell to my net. Several fine ones were missed. This species was not again seen until, in the Bay of Bengal, to the north-east of the Andamans, I took in my casting-net eight specimens of a variety in an immature state. *Trochus Ianthinus,* the original species of Chemnitz, which has a similar elevated spire, is assigned to Tranquebar, on the Coromandel coast of the same bay.

The next form obtained was a beautiful little purple *I. umbilicata,* D'Orb., the finest specimens exhibiting an incision in the outer lip nearly as deep as that to which *I. bifida,* Nuttall, owes its name. From its locality (about a degree north of the line), until we had attained 14° of north latitude in the Bay of Bengal, it was not observed. I then took a single specimen of a large solid variety; and some minute examples accompanied *I. exigua* to the head of the bay.

As we approached the Tristan d'Acunha group, in the Southern Atlantic, we sailed for several days through a tract, from 30° S. lat. and 18° W. long. to 33° S. and 10° W., inhabited by a fine white and violet-coloured *Ianthina pallida,* Harvey, in company with a large variety of *I. exigua.* On the last day of its appearance we passed specimens of a very large size; but the rate (8 knots) at which the ship was sailing through a strong swell, caused the loss of my casting and towing nets in the attempts made to procure them. On the following day, when the weather had become favourable, not a single specimen of *I. pallida* was visible; and it did not again appear until we had reached a point to the north-east of the Isles of St. Paul and Amsterdam, where a small pale variety was accompanied by the *Ianthina* next to be noticed: the species then disappeared for the rest of the voyage.

From the 1st to the 5th of December, between 33° and 30° south latitude and 81° and 83° east longitude, the 'Malcolm' sailed through a sea occupied by a large violet-blue species which varied in form, surface, and colour from the one named *Ianthina cæruleata* by Reeve, towards that which he has figured under the name of *I. grandis,* the spire increasing gradually in elevation. Larger specimens than those which I took were got by my companions, and still larger shells were missed by my casting net, or were passed while it was thrown after other objects. Associated with this fine *Ianthina* were the curious slaty-blue *Lepas fascicularis,* Darwin, radiating from a common spongy float, and furnished with coriaceous instead of testaceous armour; great numbers of a small blue swimming crab, using the free floats of the *Ianthinæ* as rafts, from which they darted on their prey, and returned to feed on it; a large kind of *Ianthina exigua,* and the little pale variety of *I. pallida.* The tract in question is about midway between Natal and Swan River.

Another species was a solitary shell taken west of the Island of Sumatra, about a degree north of the equator, and between 90° and 91° of east longitude. It appears to be a small variety of Mörch's *Ianthina Carpenteri,* figured in the 'Iconica' as *I. fragilis.* I omitted to take a note of the animal or of its float.

Between the neighbourhood of Madeira and the Sand Heads, at the mouth of the river Hooghly, I recorded the capture of *Ianthinæ* on thirty-five days. On one occasion attempts were made to secure *I. pallida,* but without success; and we passed large specimens of it on a Sunday. On two other Sundays, we observed large *Ianthinæ* which could not be identified in the water, nor guessed at, from their not appearing on the preceding or following days. Including *Hyalæa, Creseis, Cuvieria, Cleodora, Atlanta, Oxygyrus, Carinaria, Argonauta,* &c., shells entered our nets on sixty-seven days; and captures of small marine animals of some kind or other were made on seventy-five days,—a tolerable proof of the abundant employment afforded in a sailing voyage for a naturalist provided with suitable apparatus, when the numerous days on which, from various circumstances, nets were not used, are taken into consideration. Rapid progress and rough weather often prevented any attempt at fishing for several consecutive days, especially in the regions of the Trade-winds, and in the strong westerly gale which prevailed near the 40th degree of south latitude.

Reeve inadvertently states that the Atlantic and Pacific Oceans lay claim to all the *Ianthinæ* that have been actually captured. The first species figured by him is, however, assigned to the Nicobar group in the Bay of Bengal; and his *I. Africana* is referred to Zanzibar, on the African shore of the Indian Ocean. Localities mentioned by Chemnitz and Krauss would also have helped to prove a more extensive range for the known species of this ubiquitous genus.

I. exigua, Lamk.

Sketches were made, in different positions, of the animal taken near Madeira. Bunches of purple ovisacs adhered to the centre of all the floats, those towards the hinder extremity being flaccid and empty. When the float is broken off, the animal sets to work to supply its place in the mode described by Reynell Coates. A free float was captured with ovisacs attached, but without the shell and its inhabitant. The shell, from its small size and its position, is not visible in the water, but the float may be easily distinguished from the foam scattered from the bows of the ship, by its whiter appearance, resembling a minute flock of cotton, broad at one end and pointed at the other. No additional egg-sacs were deposited while the animals remained in confinement, although they continued to add to their floats. There are flexible cilia to the mouth; when the snout is extruded, these are extended and agitated with great rapidity, apparently in the search for food.

Confined with *Glaucus Forsteri, I. exigua* became the prey of the more active Mollusk; and portions of the *Ianthinæ,* hardly changed, were voided from a small papilla situated between the second and third branchiated fins of *Glaucus,* on the same side as the conspicuous organ of generation.

The tentacula of *I. exigua* are elongate-conical, not subulate as in Rang's figure of *I. violacea*?; and the apophyses, which he describes as ocular pedicles, are larger and broader in proportion than in his species, emulating the tentacula in size. Mörch places Rang's shell in the subgenus *Achates*, while *I. exigua* is included in *Iodina*. It is highly probable that a critical examination and dissection of the animals will establish generic differences among the *Ianthinæ*. An opportunity occurs on our own shores for comparing those which are brought to the western portions of the British Islands by the Gulf-Stream.

All the varieties of *I. exigua* from the Atlantic and the eastern seas presented a more rounded base than the British specimen figured by Reeve, which was probably imperfect in that part. The emargination of the outer lip is very variable in perfect specimens, some of the Madeiran and south-eastern shells exhibiting an incision nearly as deep as that observable in *I. bifida*. The Madeiran type has a bluer tint than the more southern forms. There is a greater or less tendency to perforation in all the varieties—a feature which appears to have been overlooked. The apex is more or less developed; and the paler band round the suture is present in some specimens, and deficient in others, from the same locality.

M. Montrouzier has omitted to state on what special grounds he proposed to separate *I. capreolata* as a species. Mörch has accepted it without question; but in none of the recorded characters, whether in respect to general form, subperforation, colouring, depth of the marginal sinus, form of columella and base, carination, structure of apical nucleus, or bifariate sculpture, does any distinctive character from *I. exigua* appear to be discoverable. The shell from the South-eastern Archipelago may be reckoned as the largest known variety. That from the vicinity of St. Paul varies much in figure, one specimen having the breadth equal to the length; others present the usual shape.

I. nitens, Menke.

This shell, of a uniform translucent purple colour, with a polished surface, only entered my towing net of a small size, my largest specimen being 7 mill. in length. I have, however, recorded the capture by one of my companions of fine examples with their floats, which were carinate above, and composed of large globules. No ovisacs were found attached to them. This variety is distinguished from the shell figured by Reeve by its somewhat depressed spire. The nuclei, which were taken on one occasion, are of a pale greyish violet, with a large rounded aperture, the columella not being elongated as in the more advanced state of growth.

I. Smithiæ, Reeve.

Having taken only two minute specimens of the shell, supposed from its form and colours to be the young of this species, I have neglected to record any particulars respecting the float or animal.

I. planispirata, Adams and Reeve.

My largest specimen of this shell is only $9\frac{1}{2}$ mill. in diameter; but one of my fellow-passengers took a large one, unprovided with ovisacs, but with a perfect float, which I noted as being elongate and convex, the globules composing it being large, oblong, and transversely disposed. I have remarked that the floats may always be referred to the species to which they belong, when once observed in attachment to a shell, each kind having its peculiar form and mode of construction; therefore in separating species it is of great moment to attend to the float; and it is desirable that this part should be preserved in a dried state.

It is quite sufficient to glance at the representation (pl. 11. fig. 10) in the Voyage of the 'Samarang,' to see that the fig. 9 of plate 2 in the 'Iconica' has no manner of resemblance to it, having a wide depressed-conoid spire with rapidly increasing whorls, instead of the depressed plano-convex spire with slowly increasing whorls of the true species. The chief character of the "discoid" *I. planispirata* consists, according to the original description, in "its narrow depressed mode of convolution," of which Reeve's figure No. 9 exhibits no appearance, the body of the shell in the latter exceeding in magnitude the area of the aperture, whereas in the 'Samarang' figure the aperture is larger than the body of the shell. Mörch refers Reeve's figure to *I. planispirata* as "var. γ. grandis," without further remark.

A. Adams says nothing of the sculpture. All my specimens are sculptured with undulate and radiate striæ, which are more closely packed and more sharply plicate on the basal portion. Mörch refers *I. planispirata* to the subgenus *Iodes,* Leach, the animal of which is stated to be viviparous.

I. fragilis, Lam. (including the variety *I. affinis,* Reeve).

The violet colour of the under side of the shell was visible in the water through the float, and assisted to distinguish it from the foam. The float was of strong texture, and was composed of large transverse polyhedrous globules arranged in a convex form on the surface exposed to the air; one proved to be dichotomous, evidently from some accident. The cilia within the animal's mouth were stiff and prickly. Mörch includes the species in the subgenus *Achates,* Gistel, recorded as being oviparous. Our specimens were destitute of ovisacs; whether in consequence of the season for their reaching maturity having passed, and of the animals having provided themselves with fresh floats, or from their being permanently deficient in those appendages, cannot be asserted. As soon as the water in which the specimens were placed for examination was changed, a quantity of beautiful carmine fluid ejected spoiled it, and all died on the following day, some of them casting off their shells, when the animal, including the spiral portion, remained attached to the float at the surface of the water. A gummy coat, which was easily rubbed off while the shell was wet, dried into a moderately polished surface.

The dimensions of four examples are as follow, tending to corroborate Mörch's suggestion regarding *I. affinis,* Reeve:—

	Long.	Lat.	
Specimen resembling *I. affinis*	$22\frac{1}{2}$	$25\frac{1}{2}$	mill.
Approximate form	21	25	,,
Depressed variety	19	24	,,
Smallest specimen	$17\frac{1}{2}$	20	,,

The last approaches in form Rang's figure, which Mörch refers, as a variety, to *I. violacea,* Bolten.

Respecting the younger examples of the variety taken in the Bay of Bengal, I only noted the number of individuals captured.

This shell has a more shining surface, and a more convex conoid outline, with a somewhat impressed suture. Mörch considers *I. roseola*, Reeve, found a few degrees further south, near the Nicobars, to be another variety of the type attributed by Chemnitz to the same Gulf.

I. umbilicata, D'Orb.

Mörch seems to have been in doubt regarding Reeve's figure. Although he cites it without comment among the synonyms of D'Orbigny's shell, yet, under the head of *I. globosa*, he had quoted it as the probable young of that species. *I. umbilicata* is referred by Mörch to the subgenus *Iodina*, one of the characters of which is the incised labrum. No trace of this is to be observed in Reeve's figure No. 22, from a shell in Mr. Cuming's collection, nor is it alluded to in the description. The conclusion to be derived from its appearance in the plate is that it was drawn from a broken shell, the want of correspondence between the right lip and the bifariate striæ at the periphery being obvious. I have already noticed the deep incision observable in the beautiful and perfect examples from the Atlantic. There is a silky lustre on the surface, which causes the shell to approach in polish nearly to *I. nitens*, from which the different character of the base and the general form of the shell distinguish it. A pale band is observable round the suture; and in the large solid variety of the Bay of Bengal, which attains 10 millim. in length, there is also a pale band at the angular periphery. I can find no note of the animal or ovisacs of this species in my journals.

I. pallida, Harvey.

The floats are circular and spiral when in good condition; but occasionally the sutural adhesion is lost, and the float, partially uncurling, assumes a semilunar form. The pendant cells of eggs are about the size and shape of small apple-pips, rough, and at first pink, but in a more advanced state purplish brown. Independent floats, provided with egg-cells, were also procured; and all the shells with perfect floats were similarly endowed. If Reynell Coates's observations really had reference to *I. globosa*, Swainson, and not to *I. pallida*, the floats of the former shell must be similar in spiral construction to those which I found attached to the latter.

The rounded base of the columella is not adverted to by Reeve in his description of *I. pallida*. It constitutes the character of the section *Amethystina*, Gistel, on which its separation from *I. globosa* and its allies is grounded.

Four out of six specimens of the Southern Atlantic form present a feeble lustre and a spiral sulcate striation, while the other two are deficient in sulcation and are covered with a peculiar bloom devoid of lustre. Of the former, three are pale externally, the violet tinge being more vivid within the aperture near the outer lip; the fourth is altogether of a violet tint, more saturated within the aperture. Of the two shells with a dull surface, one is suffused with violet, the other is paler at the upper part. My largest specimen is 18 mill. in length by 11 in breadth. Others were procured of a greater size. Specimens stated to be from the coast of Portugal exhibit a bluer tint than the rosy violet of the southern shell.

I. cæruleata, Reeve, and var.

In colour this shell was found to vary from that of *I. cæruleata*, Reeve, to that of *I. grandis* of the same author, and in form from *I. cæruleata* in the depressed type, through *I. communis*, R. (which, according to Mörch, is a variety of *I. bicolor*, Costa), towards *I. grandis*, the perfect form and full size of which Mörch affirms that *I. bicolor* attains occasionally. Of seven specimens, taken chiefly in my casting net, I retain five, the largest of which is 29 mill. in height and 33 mill. in diameter. In my journal, under date 2nd Dec. 1834, in 32° 26′ S. lat. and 82° 21′ E. long., I noted that I had missed some very large specimens at which I had thrown my net.

Mörch places *I. bicolor* (as *I. Costæ*, Mörch) and *I. cæruleata*, R., in the viviparous subgenus *Iodes*, Leach, while he includes *I. grandis*, R., in the oviparous subgenus *Achates*. The float of my species (under whatever name it may be retained) had a plane surface, and one side was thicker than the opposite edge. It was composed of large transverse bubbles. None of the specimens had egg-cells attached; but numerous large floats procured with them, and which, almost beyond question, belonged to the same species, were found bearing egg-cells, as noted in my journal on the 2nd and 3rd of December. The shells were taken daily, from the 1st to the 5th of that month; and as the *Ianthinæ* which accompanied them belonged to a little variety of *I. pallida*, and to *I. exigua*, the small size of those shells and the very different formation of their floats precluded the assignment of the large egg-bearing floats to those species. More shell-less floats were observed than those which bore shells.

The animal was dark blue, with the exception of the whitish tentacula, and it gave out a purple fluid which stained the nets with a greenish colour. The white basal band in the specimens which resemble *I. cæruleata* gives place in one conoid specimen to a pinkish-violet band; and in others the whole base is of a uniform deep-violet tint, which gradually fades into opake white towards the summit of the spire. The sculpture is more or less rough in different individuals. The right lip is rather deeply emarginate. Further observations are necessary to decide whether an obtuse or acute periphery is a sufficient character to enable us to pronounce an opinion on the viviparous or oviparous habit of a species. I may here remark that on one day *I. pallida* was taken without egg-cells, while two days after, the same species was provided with them,—a circumstance unfavourable to arguments derived from the negative character in other species.

Ianthina incisa, Philippi, has been overlooked by Mörch in his list of synonyms. It was described in the 'Zeitschrift für Malak.' for 1848. The character attributed to the suture is found both in *I. Carpenteri,* Mörch, and *I. fragilis,* Lamarck. Great stress is laid on the depth of the emargination of the labrum; but this is so variable in other species, that it cannot be relied on alone for specific distinction.

Recluzia, Petit.

Two species of this Ianthid are figured in the 'Journ. de Conch.' for 1853; a third species, figured by Adams, is supposed by Mörch to be *R. turrita,* V. d. Busch, described by Philippi as an *Ianthina* in the 'Zeitschrift' for 1848 (not 1847, as stated by Mörch). A shell found by Bennett in his whaling voyage, near the Kingsmill group, to the east of New Ireland, and which he names, without a description, *Ianthina lutea,* undoubtedly belongs to this genus. In a line of sea-drift, he says, "*Ianthinæ* were the most abundant of the floating Mollusks. Their number was immense, and their floats contributed greatly to the white appearance of the froth-line. One species of this family was new to me, and is certainly very rare; its shell was yellow, rather smaller and more elongated than *I. communis,* and the whorl more prominent and spiral. The contained animal was also of a yellow colour, but in the form of its float and in other respects it closely resembled the ordinary blue-shelled species*."

The species of *Recluzia* of which the habitats are recorded come from Mazatlan, in Mexico, and the Arabian Gulf. Two specimens of a small shell, which must evidently be classed with this genus, and differing from any species described, were captured in a towing net by one of my fellow-passengers, abreast of the opening between the Great and Little Nicobar, and about sixty miles to the west of it. Unfortunately he had cleared out the animals and thrown them away before informing me next day of his acquisition; and I was only able to note that it was a new, horn-coloured, shining, turreted shell, pointed at the base of the aperture, and with a sinus above the angular base towards

* Narrative of a Whaling Voyage, by F. D. Bennett, F.R.G.S., 1833–1836 (published in 1840); *vide* vol. ii. pp. 62, 63, and Appendix, p. 298.

the columella. In size it was equal to *Bithynia ventricosa*. Pieces of drift-wood, vegetating seeds, shells of *Spirula*, a small *Litiopa*, *Hyalææ*, *Loligopsis*, and one of the venomous sea-snakes of the Bay, with a keeled belly, black above and yellow below, and with a broad white zigzag line running along the laterally compressed tail, entered our towing nets on that night, borne by the tidal currents through the group of islands.

Mörch rejects Jeffreys's *Recluzia aperta* from the genus, and refers it to *Amauropsis*. The aspect of the shell is opposed to the supposition of its being a floating pelagian form.

Cheltenham, Oct. 19, 1860.

LII.—*On a new Genus and some new Species of Mollusca from Japan.* By ARTHUR ADAMS, F.L.S., &c.

Genus CINGULINA, A. Adams.

Testa subulato-turrita. Anfractus numerosi, cingulis elevatis spiralibus instructi, interstitiis sculptis. Apertura oblonga, antice integra; labio recto, simplici; labro acuto, arcuato.

This genus most nearly resembles *Monoptygma* in form and sculpture; but in the straight inner lip and absence of parietal fold it is like *Turbonilla*. The transverse ridges of the whorls likewise suggest *Aclis*, but the form of the aperture is very different. I have found the typical species (described below) both in the north of China and in the Sea of Japan.

Cingulina circinata, A. Adams.

C. testa subulato-turrita tenui, alba, opaca; anfractibus normalibus circa 11, planiusculis, cingulis spiralibus tribus, interstitiis longitudinaliter concinne striatis; anfractu ultimo cingulis quatuor instructo, basi convexo, liris spiralibus elevatis ornato.

Hab. Awa-Sima; in shell-sand. Loo-shan-Kou (Shan-tung); in shell-sand.

Genus PARTHENIA, Lowe.

Since writing my papers containing descriptions of new species of *Parthenia*, *Odostomia*, *Dunkeria*, &c., I have continued to investigate these interesting though somewhat diminutive forms, and am now enabled to record several additional species.

1. *Parthenia spirata*, A. Adams.

P. testa ovato-conica, tenui, sordide alba, rimata; anfractibus normalibus 4, spiratis, longitudinaliter costatis, costis rectis subdistantibus, interstitiis lirulis obsolete decussatis, suturis canaliculatis, costis in anfractu ultimo (basi liris convergentibus ornato) ad peripheriam evanidis; apertura ovata, postice acuminata; labio arcuato, tenui, plica parva dentiformi in medio instructo; labro postice angulato.

Hab. Korea Strait; 46 fathoms.

2. *Parthenia Pagodula,* A. Adams.

P. testa ovato-conica, acuminata, tenui, rimata, pallide fusca; anfractibus normalibus 5, planatis, longitudinaliter costatis, costis obliquis prominentibus, interstitiis lævibus, suturis profundis, anfractu ultimo costis ad peripheriam desinentibus, peripheria subangulata zonula foveolata circumcincta, basi lævi; apertura ovata, antice producta; labio arcuato, plica parietali superiore parva.

Hab. Tabu-Sima; 24 fathoms.

3. *Parthenia fenestrata,* A. Adams.

P. testa ovato-conica, subrimata, tenui, sordide alba; anfractibus normalibus 3, spiratis, postice obtuse angulatis, costellis tenuibus prominentibus et liris elevatis transversis late clathratis, costellis in anfractu ultimo subito ad peripheriam terminantibus, basi planis; apertura oblonga; labio arcuato, plica parietali obsoleta instructo.

Hab. Mino-Sima; 63 fathoms.

4. *Parthenia Mariella,* A. Adams.

P. testa ovata, alba, solidiuscula, subrimata; anfractibus normalibus 3, planatis, postice plicatis plicis parvis distantibus, antice cingulo elevato spirali ornatis, suturis canaliculatis; anfractu ultimo postice plicato, antice cingulis elevatis spiralibus (circiter novem) instructo; apertura oblonga; labio plica dentiformi parva mediana.

Hab. Mino-Sima; 63 fathoms.

5. *Parthenia bellula,* A. Adams.

P. testa ovato-conica, tenui, rimata, alba, opaca; anfractibus normalibus 4, planatis, longitudinaliter plicatis, plicis ad suturas interruptis, suturis zonula spirali elevata succinctis; anfractu ultimo plicis ad peripheriam desinentibus, peripheria rotundata zonulis spiralibus tribus ornato, basi radiatim plicato; apertura ovata; labio tenui, arcuato, plica parietali superiore instructo.

Hab. Tsu-Sima; 26 fathoms.

6. *Parthenia punctigera,* A. Adams.

P. testa ovato-conica, alba, solida; anfractibus normalibus 3, planulatis, costellatis, costellis validis obliquis regularibus, interstitiis punctatis; anfractu ultimo costellis ad peripheriam desinentibus, basi convexo, elevatim lirato; apertura ovata, plica parietali parva superiore vix celata.

Hab. Sado; 30 fathoms.

Genus Odostomia, Fleming.

1. *Odostomia vitrea,* A. Adams.

O. testa parva, imperforata, ovato-conica, solidiuscula, vitrea, pellucida, apice obtuso; anfractibus $3\frac{1}{2}$, planiusculis, suturis profundis, anfractu ultimo ad peripheriam rotundato, intus spiraliter sulcato; apertura ovata; plica parietali valida, mediana, transversa.

Hab. Korea Strait; 46 fathoms.

2. *Odostomia subangulata,* A. Adams.

O. testa rimata, ovato-conica, alba, opaca; anfractibus $5\frac{1}{2}$, planis, ultimo elongato, in medio subangulato, antice producto-acuminato; suturis canaliculatis; apertura ovata, antice effusa; labio incrassato; plica parietali valida, mediana, transversa.

Hab. Tsu-Sima; 26 fathoms.

3. *Odostomia ovoidea,* A. Adams.

O. testa subrimata, oblongo-ovata, tenui, alba, opaca; anfractibus $4\frac{1}{2}$, convexiusculis, suturis mediocribus; anfractu ultimo amplo, ad basin rotundato; apertura oblonga; plica parietali parva, obliqua.

Hab. Awa-Sima; low water.

4. *Odostomia producta,* A. Adams.

O. testa rimata, tenuicula, ovato-acuminata, alba, opaca; anfractibus planulatis, suturis profundis; anfractu ultimo elongato, ad basin rotundato; apertura oblonga; plica parietali superiore, parva, obliqua.

Hab. Sado; 30 fathoms. Tabu-Sima; 25 fathoms.

5. *Odostomia nivea,* A. Adams.

O. testa rimata, ovato-conica, alba, semipellucida; anfractibus $5\frac{1}{2}$, planis, suturis exaratis; anfractu ultimo amplo, ad peripheriam subangulato; apertura ovata, antice subproducta; plica parietali parva, obliqua.

Hab. Korea Strait; 46 fathoms.

Like *O. subangulata* in form, but thin and semipellucid; and the inner lip in the adult not thickened.

6. *Odostomia goniostoma,* A. Adams.

O. testa imperforata, ovato-conica, alba, opaca; anfractibus $4\frac{1}{2}$, planis, suturis canaliculatis; anfractu ultimo magno, ad peripheriam obtuse angulato; apertura rhomboidea, antice producta et angulata; plica parietali transversa, mediana.

Hab. Korea Strait; 46 fathoms.

7. *Odostomia cana*, A. Adams.

O. testa imperforata, ovato-conica, sordide alba; anfractibus $4\frac{1}{2}$, convexiusculis, suturis impressis; anfractu ultimo amplo, ovato, ad peripheriam rotundato; apertura oblonga, antice producta et dilatata; plica parietali valida, mediana, obliqua.

Hab. Korea Strait; 46 fathoms.

8. *Odostomia neglecta*, A. Adams.

O. testa parva, ovato-conica, imperforata, alba, opaca, suturis simplicibus; anfractibus $3\frac{1}{2}$, convexiusculis; anfractu ultimo ad peripheriam rotundato; apertura ovato-oblonga; plica parietali parva, obliqua.

Hab. Tabu-Sima; 25 fathoms.

9. *Odostomia pruinosa*, A. Adams.

O. testa imperforata, ovato-conica, pruinosa, semiopaca, apice obtuso; anfractibus $3\frac{1}{2}$, planulatis, suturis impressis; anfractu ultimo magno, ovato, ad peripheriam rotundato; apertura oblonga, antice producta; plica parietali parva, transversa, mediana.

Hab. Okosiri; 35 fathoms.

10. *Odostomia Achatinella*, A. Adams.

O. testa imperforata, ovato-pyramidali, solidiuscula, alba, semiopaca; anfractibus $5\frac{1}{2}$, convexiusculis, suturis impressis; anfractu ultimo elongato, ad peripheriam vix angulato; apertura ovata; plica parietali parva, transversa.

Hab. Tsu-Sima; 26 fathoms.

11. *Odostomia subdiaphana*, A. Adams.

O. testa imperforata, ovato-conica, alba, semipellucida; anfractibus $3\frac{1}{2}$, planatis, suturis profundis; anfractu ultimo magno, ad peripheriam obtuse angulato; apertura ovato-rhomboidea; labro in medio subangulato, plica parietali parva transversa.

Hab. Okosiri; 35 fathoms.

Like *O. goniostoma*, but smaller, thinner, semipellucid, and the spire more conical.

Subgenus Evalea, A. Adams.

12. *Odostomia* (*Evalea*) *sulcata*, A. Adams.

O. testa ovato-oblonga, alba, imperforata, solida; anfractibus $5\frac{1}{2}$, convexiusculis, transversim valde sulcatis, interstitiis punctatis; apertura ovata; plica parietali transversa, conspicua; labro subincrassato.

Hab. Tsu-Sima; 16 fathoms.

13. *Odostomia* (*Evalea*) *lirata,* A. Adams.

O. testa ovato-conica imperforata, alba, opaca; anfractibus $4\frac{1}{2}$, planis, transversim valde liratis, liris subdistantibus, interstitiis longitudinaliter creberrime striatis; apertura rhomboidea; plica parietali parva, mediana, transversa; labro in medio subangulato.

Hab. Tabu-Sima; 26 fathoms: Sado; 30 fathoms.

Genus TURBONILLA, Risso.

1. *Turbonilla perfecta,* A. Adams.

T. testa elongato-turrita, tereti, tenui, cornea, subdiaphana; anfractibus normalibus 14, rotundatis; costis obliquis, validis, æqualibus, interstitiis lævibus; anfractu ultimo costis ad peripheriam desinentibus, basi lævi convexo; apertura oblonga, subquadrata; labio vix recto.

Hab. Port Hamilton; 7 fathoms. I also obtained this species in the Korea Strait, near Mino-Sima; 63 fathoms.

2. *Turbonilla eximia,* A. Adams.

T. testa subulato-turrita, solida, alba, zona pallide rufa spirali obsolete cincta; anfractibus normalibus 9, planatis, in medio constrictis; costis validis, undulatis, prominentibus, interstitiis liris validis spiralibus decussatis; anfractu ultimo costis ultra peripheriam extendentibus, deinde evanidis, basi convexo, liris spiralibus ornato; apertura subquadrata; labio crasso, superne subtortuoso, antice reflexo.

Hab. Chosan Harbour; 6 fathoms.

3. *Turbonilla venustula,* A. Adams.

T. testa aciculato-turrita, alba, solida; anfractibus normalibus 11, planatis; costis validis, rectis, subconfertis; interstitiis liris elevatis spiralibus confertis decussatis; anfractu ultimo costis ad peripheriam desinentibus, basi convexo, lirulis spiralibus instructo; apertura oblonga, subquadrata; labio curvato, antice dilatato.

Hab. Chosan Harbour; 6 fathoms.

4. *Turbonilla macilenta,* A. Adams.

T. testa aciculato-turrita, gracili, alba, solida, opaca; anfractibus normalibus 7, convexiusculis; costis rectis, crassis, subdistantibus, interstitiis simplicibus; apertura ovata; labio recto.

Hab. Port Hamilton; 7 fathoms.

5. *Turbonilla monocycla,* A. Adams.

T. testa subulato-turrita, rimata, sordide alba, solidiuscula; anfractibus normalibus 8, planatis, suturis canaliculatis; costis undulatis, prominentibus, subconfertis, interstitiis simplicibus; costis in anfractu ultimo ad peripheriam desinentibus, peripheria lira spirali duplicata elevata apicibus costarum decussata ornata; apertura ovata, antice producta; labio tenui, arcuato, superne tortuoso.

Hab. Mino-Sima; 63 fathoms.

6. *Turbonilla nitida,* A. Adams.

T. testa subulato-turrita, nivea, vix opaca; anfractibus normalibus 10, convexiusculis, suturis profundis; costis prominentibus, subobliquis, distantibus, interstitiis liris evanidis spiralibus decussatis; anfractu ultimo costis ad peripheriam subito truncatis, basi lævi; apertura subquadrata; labio brevi, recto.

Hab. Mino-Sima; 63 fathoms.

7. *Turbonilla commoda,* A. Adams.

T. testa aciculato-turrita, gracili, sordide alba, solida; anfractibus normalibus 11, convexiusculis; costis validis, subdistantibus, interstitiis lævibus, costis in anfractu ultimo ad peripheriam desinentibus; apertura subcirculari; labio brevi, recto, crasso.

Hab. Tsu-Sima; 16 fathoms.

8. *Turbonilla sculptilis,* A. Adams.

T. testa subulato-turrita, sordide alba, solida; anfractibus normalibus 8, convexis; costis latis, rectis, subdistantibus, interstitiis foveolatis; anfractu ultimo costis ad peripheriam subito truncatis, basi lævi; apertura subquadrata; labio recto.

Hab. Tsu-Sima; 16 fathoms.

9. *Turbonilla fragilis,* A. Adams.

T. testa aciculato-turrita, gracili, alba, tenui, nitida, subdiaphana; anfractibus normalibus 10, convexiusculis; costis obliquis validis, distantibus, interstitiis lævibus, suturis inter apices costarum profunde canaliculatis; anfractu ultimo costis ad peripheriam obsoletis, basi lævi convexo; apertura subquadrata; labio arcuato, antice producto.

Hab. Tsu-Sima; 16 fathoms.

10. *Turbonilla bicincta,* A. Adams.

T. testa subulato-turrita, alba, tenui, subdiaphana; anfractibus normalibus 11, convexiusculis, fasciis duabus angustis rufescentibus ornatis; costis validis, vix obliquis, lirulis spiralibus elevatis decussatis; anfractu ultimo costis ad peripheriam desinentibus, basi lirulis spiralibus instructo; apertura subcirculari; labio arcuato.

Hab. Tsu-Sima; 16 fathoms.

11. *Turbonilla cincta,* A. Adams.

T. testa pyramidato-subulata, turrita, sordide alba; anfractibus normalibus 8, planatis, postice constrictis, in medio fascia rufa conspicua circumcinctis; costis validis, prominentibus, undulatis; interstitiis valde punctatis; costis in anfractu ultimo gradatim evanidis, ad peripheriam obsoletis; apertura oblongo-subquadrata; labio arcuato.

Hab. Mino-Sima; 63 fathoms.

12. *Turbonilla munda*, A. Adams.

T. testa subulato-pyramidali, turrita, alba, tenui, semipellucida; anfractibus normalibus 8, convexiusculis; costis obliquis, prominentibus, distantibus, interstitiis lævibus, costis in anfractu ultimo ad peripheriam subito truncatis; apertura subquadrata; labio recto, superne vix tortuoso.

Hab. Mino-Sima; 63 fathoms.

13. *Turbonilla speciosa*, A. Adams.

T. testa elongata, turrita, tereti, solidiuscula, opaca, sordide alba; anfractibus normalibus 12, convexiusculis; costis rectis, prominentibus, æquidistantibus, interstitiis lævibus; anfractu ultimo costis ad peripheriam subito truncatis, basi lineis spiralibus obsoletis ornato; apertura oblonga; labio recto, crasso, antice vix everso.

Hab. Mino-Sima; 63 fathoms.

14. *Turbonilla debilis*, A. Adams.

T. testa subulato-turrita, cornea, tenui, semipellucida, aureo-nitente, rufo-pallido obsolete fasciata; anfractibus normalibus 11, planatis, quibusdam varicosis; costis subtenuibus, undulatis, interstitiis valde punctatis; anfractu ultimo costis ad peripheriam subito truncatis, basi lævi convexo; apertura subquadrata; labio recto, tenui, antice producto.

Hab. Mino-Sima; 63 fathoms.

15. *Turbonilla modica*, A. Adams.

T. testa subulato-turrita, alba, opaca; anfractibus normalibus 7, convexis; costis validis, crassis, obliquis, interstitiis valde punctatis; anfractu ultimo costis ad peripheriam obsoletis, basi lævi convexo; apertura ovata; labio arcuato.

Hab. Mino-Sima; 63 fathoms.

16. *Turbonilla Scaliola*, A. Adams.

T. testa aciculato-turrita, solida, sordide alba, nitida; anfractibus normalibus 7, convexis; costis paucis, prominentibus, latis, rotundatis, postice nodosim angulatis, interstitiis lævibus; anfractu ultimo costis ad peripheriam desinentibus, basi lirulis spiralibus ornato; apertura circulari; labio arcuato.

Hab. Korea Strait; 46 fathoms.

17. *Turbonilla metulina*, A. Adams.

T. testa pyramidato-subulata, turrita, tenui, lactea, opaca; anfractibus normalibus 9, convexis; costis obliquis, prominentibus, æquidistantibus, interstitiis lirulis elevatis spiralibus decussatis; anfractu ultimo costis ad peripheriam desinentibus, basi lævi convexo; apertura subquadrata; labio recto.

Hab. Mino-Sima; 63 fathoms.

The species of *Turbonilla* obtained by me from the Japanese side of the Korea Strait and from other parts of the Sea of Japan are, with one exception (viz. *T. perfecta*, A. Adams), different from those I discovered at Chosan, in the Korea peninsula, and at Port Hamilton, one of the Korean archipelago. They are all very elegant and of delicate construction.

Genus Leucotina, A. Adams.

1. *Leucotina exarata*, A. Adams.

L. testa ovato-conica, alba, umbilicata, solidiuscula; anfractibus $4\frac{1}{2}$, convexiusculis, transversim liratis, interstitiis tenuissime longitudinaliter striatis; apertura ovata, postice acuta; plica parietali vix mediana, parva, obliqua.

Hab. Tabu-Sima; 25 fathoms.

2. *Leucotina insculpta*, A. Adams.

L. testa acuminato-ovata, alba, perforata, solidiuscula; anfractibus $4\frac{1}{2}$, convexiusculis, transversim liratis, interstitiis valde punctatis; apertura oblonga, postice angustata, antice dilatata; labio incrassato, plica parietali vix celato.

Hab. Korea Strait; 46 fathoms.

Genus Dunkeria, P. P. Carpenter.

1. *Dunkeria scabra*, A. Adams.

D. testa subulato-turrita, pallide fusca, imperforata; anfractibus $8\frac{1}{2}$, convexis, costis nodosis longitudinalibus et liris elevatis tribus transversis (circiter 7 in anfractu ultimo) cancellatis; apertura ovata; labio antice rufo tincto.

Hab. Tsu-Sima; 16 fathoms.

2. *Dunkeria ferruginea*, A. Adams.

D. testa perparva, pyramidato-turrita, imperforata, ferruginea; anfractibus $5\frac{1}{2}$, convexis, ad suturas angustatis, liris duabus transversis nodulosis costellis longitudinalibus validis distantibus decussatis; liris in anfractu ultimo 3; apertura ovato-quadrangulari, antice acuminata.

Hab. Sado; 30 fathoms.

3. *Dunkeria reticulata*, A. Adams.

D. testa subulato-turrita, imperforata, fusco-cinerea; anfractibus $8\frac{1}{2}$, convexis, costellis longitudinalibus et liris transversis tenuibus elevatis reticulatis; liris tribus ad costas nodulosis; in anfractu ultimo liris numerosis; apertura ovata, antice acuminata; labio rectiusculo.

Hab. Awa-Sima; low water.

Genus Capulus, Montfort.

Capulus dilatatus, A. Adams.

C. testa alba, lineis concentricis irregularibus instructa, transversim subquadrata, lateribus valde dilatatis, apice marginali postico recurvato; apertura transversim ovata, intus alba, nitida, margine foliaceo, reflexo, valde dilatato, postice vix recto, antice arcuato.

Hab. Mino-Sima; 63 fathoms.

Genus Agatha, A. Adams.

Agatha virgo, A. Adams.

A. testa subulato-turrita, eburnea, opaca, nitida; anfractibus $9\frac{1}{2}$, planulatis, ad suturas vix angulatis, longitudinaliter substriatis, transversim (sub lente) obsolete sulcatis; apertura oblongo-ovata, antice subproducta; labio inferne plica valida obliqua instructo; labro intus lævi, margine simplici acuto.

Hab. Korea Strait; 46 fathoms.

This species is as elegant in form as it is pure in colour; it is about an inch long, and may well be regarded as the queen of a genus of which all the species are lovely.

Genus Cemoria, Leach.

Cemoria nobilis, A. Adams.

C. testa ovata, depresso-conica; apice subcentrali, postice recurvo; dorso costis radiantibus tribus parvis cum uno majore alternantibus, lineis elevatis concentricis decussatis; foramine lanceolato, antice angustato, postice in sulcum desinente; septo interno valido, arcuato; apertura intus radiatim sulcata, margine dentato-crenato.

Hab. Okosiri; 35 fathoms.

This is the largest species of the genus, being nearly an inch long and half an inch high.

Shan-Tung, China, May 8, 1860.

LIII.—*Observations on the Development of the* Cirripedia. By Dr. August Krohn*.

[With a Plate.]

The results which we have lately obtained—thanks to the labours of Burmeister†, Spence Bate‡, and Darwin§—upon the development of the Cirripedia are so satisfactory, that we might already congratulate ourselves upon an insight into the manifold changes passed through by the young animal from its birth to the attainment of its perfect form, if there were not a sensible gap still vacant. It is still unknown by what intermediate steps the larva, which, during the first period of its development, agrees in so many respects with the young forms of the Entomostraca, especially the Copepoda, passes to the subsequent *Cypris*-like form. During my residence in Funchal, and afterwards at Messina, I was able to obtain some information upon this still unexplained point. Before communicating my observations on this subject, I think it will be necessary in the first place to describe the form presented by the larva during the first period of its development, and then to refer more particularly to individual organs which are peculiar to it in its later *Cypris*-form.

At a certain stage of development, when the larva has moulted two or three times after its escape from the egg, we distinguish in it a broad body (*Vorderleib*), frequently truncated in front, and diminishing posteriorly, followed by two slender processes extending backwards (Pl. VII. fig. 1). The superior process has the form of a straight, extended, and often very long spine; the inferior one, which is stouter, runs, gradually tapering, to a forked extremity, and is, especially in the later stages, capable of being bent and extended. I characterize it provisionally as the caudiform appendage ||. The body is covered on the dorsal surface with a carapace or shield, the anterior angles of which are produced into two thin horns, furnished with a few curved bristles at the apex ¶. On the lower surface the body is provided with three pairs of swimming feet, and with a proboscidiform process springing freely from the middle between the last pair. Close behind the anterior margin of the carapace, a small eye, provided with

* Translated from Wiegmann's Archiv, 1860, p. 1, by W. S. Dallas, F.L.S.

† Beiträge zur Naturgeschichte der Rankenfüsser, 1843.

‡ On the Development of the Cirripedia, Annals, ser. 2. vol. viii. p. 324, 1851.

§ Monograph of the subclass Cirripedia, 1851 & 1854.

|| From the figures to Spence Bate's memoir, I cannot but think that this observer regards the spinous process as a prolongation of the carapace next to be mentioned, which is certainly wrong.

¶ Burmeister and Darwin regard these horns as antennæ, but erroneously, as will hereafter appear.

a prominent lens and enveloped in dark pigment, shines through from the interior of the body. This ocellus rests upon the middle of the anterior margin of a distinctly marked structure closely applied to the ventral surface, and surrounding the œsophagus like a ring (Pl. VII. fig. 3), which I can regard as nothing but the central mass of the nervous system or as the œsophageal ring. The swimming feet, of which the foremost pair are simple, the intermediate and hinder pairs divided into two branches, are abundantly beset with long bristles, part of which are simple, part delicately plumose (fig. 2). In the middle of the extremity of the proboscidiform process is the mouth, leading into a narrow œsophagus, which extends through the axis of the process, and penetrates into the body through the orifice of the œsophageal ring. The rest of the alimentary canal passes straight through the body, swells in the middle of its course into a roundish dilatation, and terminates in an anus, situated dorsally at the base of the caudiform appendage (fig. 2) *.

In the second period of development, the larva, as is well known, is enclosed in a bivalved carapace or shell, in the same way as the genus *Cypris*. It possesses two compound eyes and one simple one, and is furnished on the lower surface of the hinder part of the body, corresponding with the thorax of the mature animal, with six pairs of swimming feet divided into two branches. At the extremity of this region of the body there is a short tail-like process (abdomen of Darwin), which is furnished with two appendages resembling the branches of the swimming feet. Two other strongly developed members are particularly worthy of notice; these spring from the fore part of the body, in the vicinity of the compound eyes. With their assistance the larva creeps about, and it is by means of them that it finally attaches itself to foreign bodies, when the time has arrived for its last metamorphosis †.

The two compound eyes lie quite laterally close under the

* Leaving out of consideration the horns of the carapace and the spinous process, the larvæ of the Cirripedes consequently agree closely, both in their external and internal structure, with the young forms of the *Cyclopidæ*, as these are made known to us by the admirable memoir of Claus (On the Anatomy and Developmental History of the Copepoda, Wiegmann's Archiv, 1858, p. 1). This agreement shows itself not only in the similar number and analogous nature of the swimming feet, but also in the structure of the eye (see Claus, *l. c.* figs. 64 & 66), in the arrangement of the alimentary tube, and in the presence of a so-called oral hood (*Mundkappe*), which is to be compared with the proboscidiform process. But the caudiform appendage of the Cirripede-larvæ corresponds with the posterior segment of the *Nauplius*-form of the Copepod-larvæ, as will appear hereafter.

† Upon this period see the extremely accurate and complete description of Darwin (vol. ii. pp. 110–123).

corresponding valves of the shell, in the anterior portion of the body, which, in the Lepadidæ, afterwards becomes for the most part developed into the peduncle. They consist of a dark mass of pigment, in which several roundish crystalline bodies are deeply immersed, and of an external envelope, which covers the crystalline bodies in the form of a cornea; they therefore agree in structure with the eye of the Daphniadæ.

The simple eye is situated in the median line, higher up towards the back than the compound eyes, and a little behind them. It is, as will hereafter appear, the ocellus of the previous period. It consists of a firm capsule filled with a mass of blackish-brown pigment, but apparently no longer contains a lens, and is thus reduced to a mere organ for distinguishing light and darkness. In the last metamorphosis it passes into the young Cirripede, and is always, as is well known, readily to be detected even in fully developed Cirripedes, especially the *Lepadidæ*.

The six pairs of swimming feet, which are subsequently converted into the *cirri*, consist of a peduncle, from which the two branches already mentioned are given off; the terminal joint of the latter bears several very long biplumose bristles. The two appendages of the caudal process or abdomen are beset at the extremity with exactly similar bristles.

The two walking or adhering feet consist of four joints, of which the third is dilated into a disk; the very short terminal joint is attached to the upper surface of the disciform joint, and indeed quite to one side and at a right angle (see Darwin, pl. 30. fig. 8). In walking, during which the legs are alternately extended and retracted, the disciform joint presses, like a sucker, so firmly to the object as to enable the animal even to creep up polished surfaces, such as the wall of a glass. By means of the same disciform joints the young animal attaches itself to foreign bodies when it is about to undergo its final metamorphosis *.

After these explanations, I may pass to my own observations.

I have observed the transition to the *Cypris*-form in two species of larvæ, one of which I met with in various stages of deve-

* As Darwin has already proved, a regular cementation, by means of a tenacious gluey substance issuing from the adhesive disks, takes place during this adhesion. This cement is conveyed to the adhesive disks by two canals (the cement-ducts), which may be traced through the axis of the ambulatory feet as far as two sausage-shaped masses situated in the body, which Darwin regards as the glands preparing the cement (see Darwin, pp. 116 & 122). Darwin's investigations show further that the cementation goes on uninterruptedly during the growth of the Cirripedia, and that in proportion as the surface of adhesion (the lower extremity of the peduncle in the Lepadidæ, or the base of the shell in the Balanidæ) increases in size, the cement-apparatus also becomes further developed.

lopment during my residence in Madeira. It is probably the young of a Balanide.

In the older larvæ of this kind (fig. 1) the anterior body is of considerable size, and the carapace is furnished at the anterior margin with two moderately long horns, and at the posterior margin with two spines directed obliquely upwards, which are wanting in younger larvæ. The caudiform appendage is armed, about halfway to its apex, with four lateral spines of considerable size arranged in two pairs, and is a good deal thicker than the spinous process, especially in its anterior incrassated half. In still further advanced larvæ the carapace appears enlarged and much arched.

One day a larger and still further developed larva of the same kind was captured; its close examination gave the following results:—The carapace was now so far changed from its former state, that it extended further down, and thus enclosed the body on both sides. The caudiform appendage appeared strongly inflated in its anterior longer portion, reaching somewhat beyond the above-mentioned pairs of spines. On the lower surface of this portion six pairs of processes, arranged close together in a row, could be distinguished *through the skin*; each of these consisted of a comparatively long peduncle and of two short branches terminating in rounded ends, issuing from it. Close behind the last pair, another much shorter process, with two projections similar to the branches of the longer processes, shone through the skin. Both the projections, as well as the above-mentioned branches, appeared to be set with thin offshoots or filaments, which were recognized as the rudiments of so many setæ. With regard to the signification of these processes I could not long remain in doubt; they were evidently the swimming feet in course of development, and the base of the caudal process the subsequent *Cypris*-like form. It followed, therefore, that the whole inflated part of the caudiform appendage was to be regarded as the rudiment of the future thorax. On each side, in the same line with the original simple eye, now become larger and enveloped by a very dark pigment, a roundish organ was distinguished, containing several scattered deposits of reddish-yellow pigment. The opinion forced itself upon me at once that these two structures could only be the rudiments of the compound eyes, which indeed was soon confirmed, as I succeeded in observing the gradual conversion into the *Cypris*-form in the same larva.

On the third day after the capture of the larva, I saw the carapace prolonged so far backwards as to form a roof over the entire anterior portion of the caudiform appendage. The simple eye had become still larger, whilst the pigment-deposits in the rudiments of the compound eyes appeared more crowded together and of a darker or blackish colour. The swimming feet had become further developed. On the morning of the fourth day I found the animal already metamorphosed, which, as was to be expected, did not take place without a shedding of the previous envelopes of the larva.

Although these observations evidently proved that in the transition to the second period of development the carapace becomes converted into the bivalve shell, and the whole anterior portion of the caudiform appendage into the thorax, it still remained quite uncertain from what parts the ambulatory or adhesive feet might have been produced. I only obtained accurate information upon this point subsequently in Messina, from the larva of another nearly allied species, which was captured in a very far advanced stage, and the metamorphosis of which took place as early as the evening of the same day. From this larva, in the compound eyes of which the individual crystalline bodies imbedded in the pigment-mass were distinctly recognizable, I believe I have ascertained with certainty that the adhesive legs are produced from the anterior pair of swimming feet [in the first stage of the larva]. The end of each of these feet was flattened into a disk, upon which a terminal joint appeared to be seated, exactly in the same way as in the adhesive feet*.

Judging from the above results, the larva of a *Lepas* observed by Burmeister (*l. c.* p. 16, tab. 1. figs. 3 & 4), and regarded both by that naturalist and by Darwin (*l. c.* p. 109) as the representative of a stage of development immediately preceding the *Cypris*-form, can no longer be taken as such. It is already, as shown by Burmeister's figure, attached by means of the adhesive feet, and possesses a bivalved shell, but differs essentially [from the ordinary form] in having, instead of six, only three pairs of swimming feet, of which the foremost is stated to be undivided. I can consequently regard this larva as nothing but an aborted, or, which is more probable, as a monstrous specimen.

In conclusion, I may call attention to a young Cirripede-larva observed in Messina, probably belonging to a Lepadide. The carapace, as shown in fig. 2, is pentagonal, and armed on the upper surface with a strong spine, the apex of which is bent backwards, and on the margins with several symmetrical longer

* The opinion of Burmeister and Darwin, that the horns of the carapace become metamorphosed into the adhesive feet ("prehensile antennæ" of Darwin), is consequently erroneous. The horns, as I convinced myself, are thrown off unchanged with the envelope of the larva. What becomes of the two posterior pairs of swimming feet in the change is entirely unknown to me.

and shorter teeth. The spinous process of the body is of extraordinary length; the caudiform appendage, which is still but little developed, terminates in a pointed extremity bent upwards. The length of the larva is 3 millim.

EXPLANATION OF PLATE VII.

Fig. 1. Larva, probably of a Balanide, seen from above. Of the swimming feet, only the middle pair and one of the anterior are seen extended: *a*, carapace; *b b*, horns of the carapace; *c*, eye; *d*, spinous process of the body; *e*, caudiform appendage of the body.

Fig. 2. Very young larva of a Cirripede, probably a Lepadide; from the back: *a* to *e*, as in fig. 1; *f*, alimentary canal.

Fig. 3. A portion of the body of the larva of *Lepas anatifera* after the first moulting, strongly magnified: *a*, central mass of the nervous system; *b*, ocellus; *c c*, the two horns of the carapace.

LIV.—*Note on* Psammophis Perroteti, *D. & B.* By Dr. ALBERT GÜNTHER.

[With a Plate.]

DUMÉRIL and BIBRON have omitted several important characters in their description of this remarkable snake, which is a truly intermediate form between *Psammophis* and *Dryophis*. One of its most important characters appeared to me to be the keeled scales of the coccygeal region *; but as nothing of it is mentioned by the French herpetologists, I failed to recognize the first specimens which came under my observation, and described them as a new species—*Dryophis tropidococcyx*. The latter specific name has been chosen with the view of its serving as the name of the genus, if the snake should be considered as a peculiar type. It cannot be referred either to *Psammophis* or to *Dryophis* without disturbing the natural characters of those genera; whilst, as a separate genus, it may be placed in the family of *Dryophidæ*, the characters being rather more in favour of its relation to this family than to the *Psammophidæ*.

TROPIDOCOCCYX.

Habit and physiognomy of *Psammophis*. Scales smooth, those of the coccygeal region keeled. Rostral shield far produced backwards. A single nasal, pierced by the nostril; posterior nasal and loreal absent, replaced by the anterior and posterior frontals, which are bent downwards on the side of the head. Pupil horizontal (*Dryophis*). The fifth of the anterior maxillary teeth and the hindmost longest, the latter grooved.

* A similar peculiarity occurs in *Aspidura trachyprocta*, Cope, and *Trachischium*, Gthr.

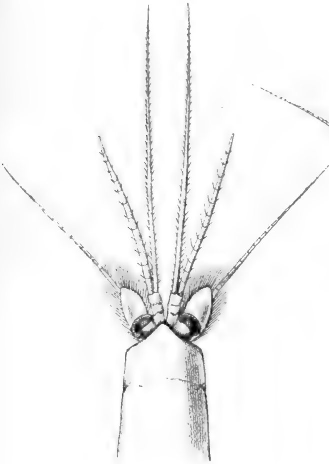


Fig: 4.

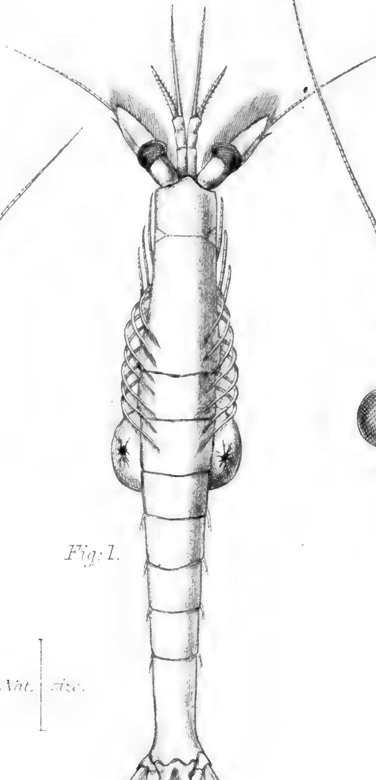


Fig: 1.

Nat. size.

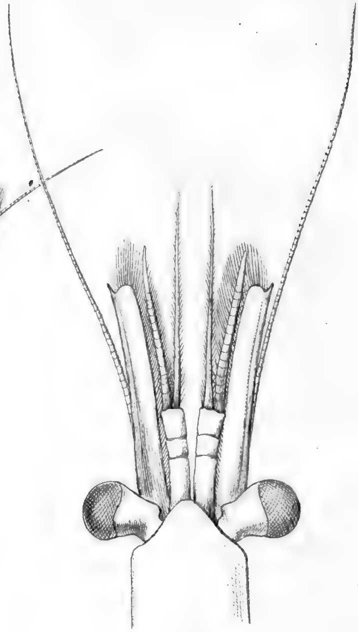


Fig: 2.

Fig: 3.

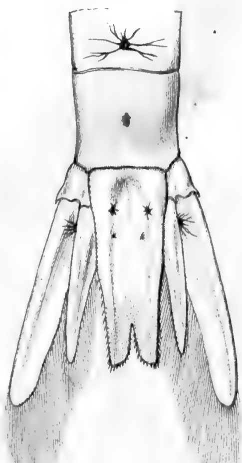


Fig: 5.

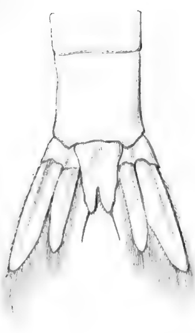


Fig: 1a.

Tuffen West, ad nat. sculp.

W. West, imp.

T. Perroteti. Pl. VII. figs. 5, 6, 7.

Psammophis Perroteti, Dum. & Bibr. vii. p. 898.
Dryophis tropidococcyx, Gthr. Catal. Col. Snakes, p. 157.

Brownish-green; without epidermis, green (*Dryophis*); a whitish line along the side of the belly (*Dryophis*). Upper labials eight, the fourth and fifth * coming into the orbit. One anterior and one posterior ocular. Scales in fifteen rows.

Hab. Madras.

LV.—*On an undescribed Crustacean of the Genus* Mysis. By the Rev. Alfred Merle Norman, M.A.

[With a Plate.]

Three members of the genus *Mysis* are described in 'Bell's British Crustacea.' Since the publication of that work, the number of British species has been doubled. In the year 1853, Mr. Gosse described a new form in this Journal under the name of *Mysis productus*†. In the spring of 1855, I met with two additional species in rock-pools at Falmouth; and these were described the following year by Mr. R. Couch, who had taken them at Penzance‡. The six above-mentioned species, together with that now to be characterized, may be divided into the following sections:—

A. *Telson (central lamina of the tail) with the apex bifurcate.*

Mysis flexuosus, Müller; *Mysis Lamornæ,* R. Q. Couch; *Mysis Spiritus,* n. s.

B. *Telson with the apex entire.*

Mysis vulgaris, J. V. Thompson; *Mysis Oberon,* R. Q. Couch; *Mysis Griffithsiæ,* Bell; *Mysis productus,* Gosse.

It will be necessary, in order to draw attention to the distinguishing characteristics, to describe the species of the first section.

Mysis flexuosus, Müller. Pl. VIII. figs. 2 & 3.

Cancer flexuosus, Müller, Zool. Dan. vol. iv. p. 34, tab. 66.
Mysis spinulosus, Leach, Linn. Trans. xi. p. 350; Desm. Consid. p. 242; M.-Edw. Crust. ii. p. 457.
Praunus flexuosus, Leach, Ed. Enc. vii. p. 401.
Mysis Chamæleon, J. V. Thompson, Zool. Researches, p. 28, figs. 1–10; M.-Edw. Crust. 457; Bell. Brit. Crust. p. 336; White, Pop. Hist. Brit. Crust. p. 143.
Mysis Leachii, J. V. Thompson, Zool. Researches, p. 27.

Mysis albescens, cinereus, viridis vel brunneus. *Thorax* cylindricus.

* My former statements, that the third and fourth (p. 157) or the fifth and sixth (p. 158) upper labial shields enter the orbit, are erroneous.

† Ann. & Mag. Nat. Hist. 2nd ser. vol. xii. p. 156, pl. 6. fig. 5.

‡ The Zoologist, vol. xiv. (1856), pp. 5284–5288.

Abdomen a thorace ad caudam gradatim diminuens. *Appendix antennarum squamiformis* oblongo-lanceolata, apice oblique truncato, spina ad marginis exterioris apicem munita; apex margoque interior dense ciliati; margo exterior sine ciliis. *Thoracis frons* rostrata; rostrum breve, obtusum, vix tertiam oculorum partem superans. *Oculi* appendicis antennarum tertiam partem vix æquant. *Antennæ* prælongæ. *Telson* (sive lamella caudalis media) apice fisso intermedias fere pervenit lamellas; fissura brevis.

Colour very variable, whitish, ashy, green or brown of various shades. Carapace cylindrical. Rostrum short, triangular, not exceeding one-third the length of the eye-peduncle. Antennal scale oblong-lanceolate, with an obliquely truncate apex, three times the length of the eye, and more than twice that of the peduncle of the internal antennæ; a spine at the apex of the outer margin, which is not ciliated; inner margin and apex densely ciliated. Antennæ long and slender. Telson about as long as the intermediate laminæ, bifurcate about one-third of its length.

The most widely diffused species on our coasts; common in rock-pools.

Mysis Lamornæ, R. Q. Couch. Pl. VIII. figs. 4 & 5.

Mysis Lamornæ, Couch, The Zoologist (1856), p. 5286; White, Pop. Hist. Brit. Crust. p. 143.

Mysis crassus, sanguineus vel aurantius. *Thoracis* latera pone multum dilatata. *Abdomen* lateribus fere parallelis, segmentisque subæqualibus. *Appendix antennarum squamiformis* obovata, brevis, utrinque dense ciliata, nulla spina instructa. *Thoracis frons* breviter rostrata. *Pedunculi* oculorum perbreves, attamen appendicis antennarum brevis plus quam dimidium superantes. *Antennæ* prælongæ. *Telson* breve, ad apicem atque per longitudinis tertiam partem fissum, intermediarum dimidium lamellarum tantum attingit.

Colour "arterial-blood-red" or orange. Carapace greatly widening behind, and "more enlarged posteriorly than in any other long-tailed Crustacean" (Couch). Abdomen of nearly equal diameter throughout. Rostrum short, triangular, one-third the length of the very short peduncle of the eye. Antennal scale ovate, with the apex rounded, very short, slightly exceeding the length of the peduncle of the internal antennæ, ciliated all round, and having no spine on the external margin. Antennæ long. Telson short, half the length of the intermediate laminæ, the bifurcation through half its length.

This species approaches very near to *M. oculatus* O. Fab. (*Cancer oculatus*, O. Fab. Faun. Grœn. p. 245; *Mysis Fabricii*, Leach, Linn. Trans. vol. xi. p. 350; Thompson, Zool. Researches, Part 1), and may prove to be synonymous with it.

Rock-pools: Penzance (Couch); Falmouth (Norman).

Mysis Spiritus, n. s. Pl. VIII. figs. 1 & 1*.

Mysis gracilis, pellucidus, vitreus. *Thorax* cylindricus. *Abdomen* a thorace ad caudam gradatim diminuens; abdominis segmentum penultimum longius quam cætera. *Appendix antennarum squamiformis* subtriangularis, apice acuto; spina in medio marginis exterioris posita; margo interior atque exterior supra spinam dense ciliati; margo exterior sub spina non ciliatus. *Thoracis frons* vix rostrata, fere subtruncata. *Pedunculi* oculorum longi, appendicisque antennarum dimidium superantes. *Antennæ* breves, thorace vix longiores. *Telson* apice fisso intermedias fere æquat lamellas; fissura brevis.

A perfectly colourless, glassy, transparent species, and, like *M. Oberon,* scarcely to be distinguished except by its black eyes; very slender and graceful in form. Carapace cylindrical, not widening behind. Abdomen gradually tapering towards the tail. The front margin of the carapace can scarcely be said to be rostrate, being very nearly truncate. Antennal scale subtriangular, with the apex acute, not twice as long as the very long peduncle of the eye, and slightly exceeding the peduncle of the interior antennæ; a spine placed half-way up the outer margin; internal and external margins above the spine densely ciliated; external margin below the spine plain. Antennæ remarkably short, not so long as the carapace; the peduncles of the interior exceed their filaments in length. Telson two-thirds the length of the intermediate lamellæ; the bifurcation is through about a third of its length.

Taken in sandy rock-pools at the "Black Hall Rocks," on the coast of Durham.

The following differential characters may be usefully borne in mind by the carcinologist:—

M. Lamornæ has no spine on the antennal scale.

M. flexuosus has a spine at the apex of a lanceolate, obliquely truncate scale.

M. Spiritus has a spine about the centre of the outer margin of a subtriangular pointed scale.

EXPLANATION OF PLATE VIII.

Fig. 1. *Mysis Spiritus* (Norman). [The spine on the antennal scale is represented too high up.]
Fig. 1*. Telson of *Mysis Spiritus.*
Fig. 2. Head of *Mysis flexuosus* (Müller).
Fig. 3. Tail of the same.
Fig. 4. Head of *Mysis Lamornæ* (Couch).
Fig. 5. Tail of the same.

Sedgefield, co. Durham, Oct. 22, 1860.

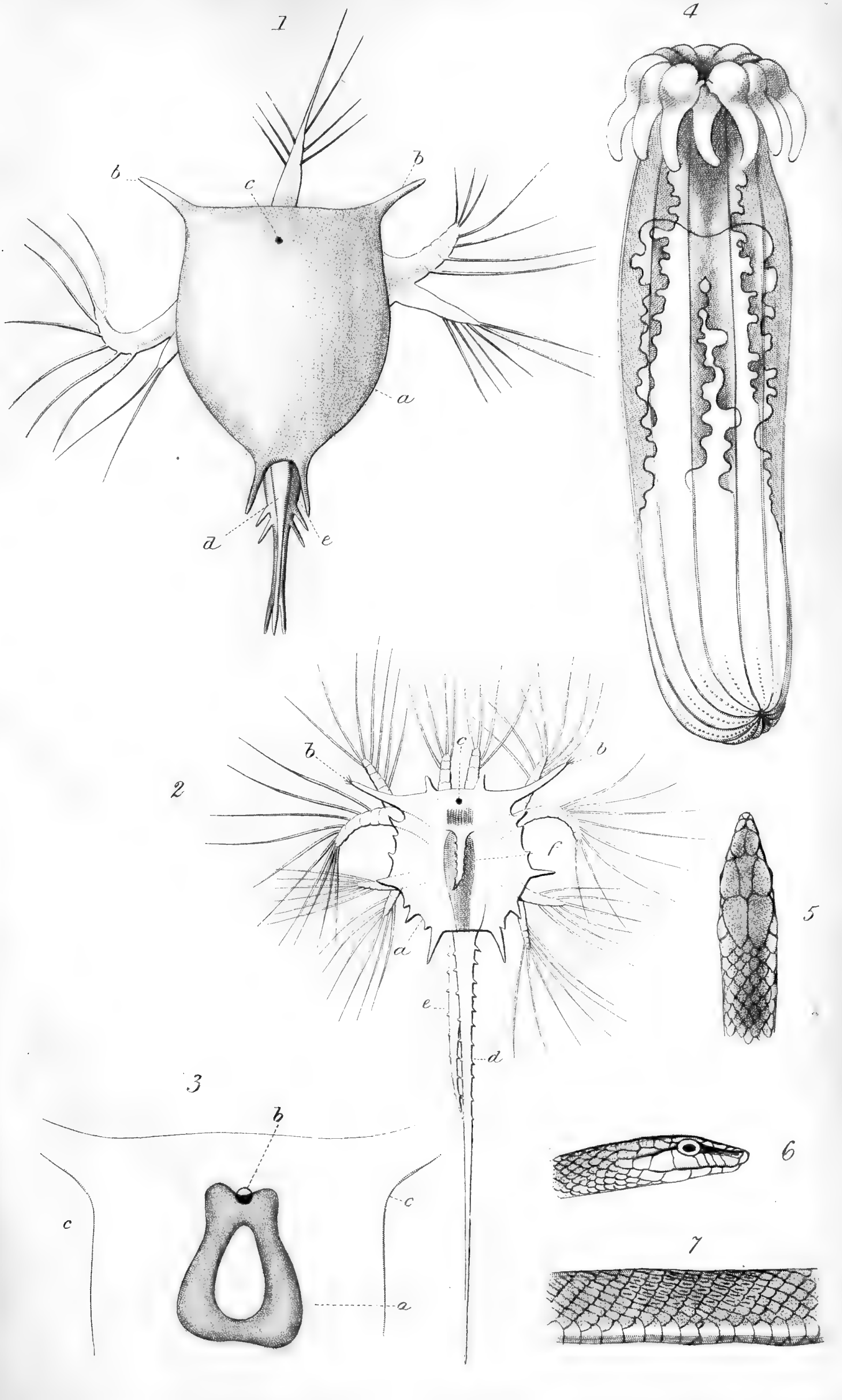
LVI.—*On* Philomedusa Vogtii, *a parasite on Medusæ.* By Fritz Müller, of Santa Catharina*.

[With a Plate.]

The Medusæ are infested by the most various parasites. Infusoria swim about in the testes of *Tamoya*; Trematoda and other Entozoa often occur in abundance in the gelatinous substance of different species; Isopoda, Amphipoda, and a *Palæmon* of glassy transparency, move about in the mucus of the disk and arms, the urticating filaments of which cause rapid death to other Crustaceans; and a Crab (*Libinia*?), of gigantic size compared with its host, is in the habit of taking up its abode between the four columns bearing the arm-plates of the Rhizostomidæ. But it appeared to me that the most remarkable of all these parasites, and one well worthy of a particular description, is the Helianthoid Polype to which the following pages are devoted, partly as it is the first parasitic species of its group, and partly because its almost Acalephoid transparency enables us to make an easy and certain inspection of its certainly very simple anatomical conditions.

Philomedusa Vogtii, which is the name I give to the animal, appears, when it has dilated the cavity of the body with water, in the form of a cylindrical sac, of about 30 millim. (rarely over 50 millim.) in length, and 5 millim. in thickness. The posterior extremity is usually slightly diminished, rounded-off in a spherical form, or more or less drawn in like a funnel. At the anterior extremity there is a circle of twelve short (about 4 millim. in length), thick, cylindrical tentacles with rounded, closed apices, which are sometimes carried expanded in the same plane, sometimes extended obliquely forwards, but most frequently bent back towards the posterior extremity. All the tentacles are nearly of the same length; nevertheless we may distinguish six longer ones, and six shorter ones alternating with these, although this inequality is frequently effaced by their different states of contraction. Commencing between each pair of tentacles, twelve shallow longitudinal furrows traverse the surface of the body, and meet together in a radiate form in the middle of the posterior extremity. The colour of the animal in this state is limited to a whitish turbidity; when the animal is most strongly contracted, which usually gives it the form of a fig with twelve longitudinal furrows and numerous transverse wrinkles, the colour is concentrated to a dingy yellow, with more or less of a reddish tinge. The tentacles sometimes appear of a slightly reddish colour; and at the base, on the inside, there is usually

* Translated from Wiegmann's Archiv, 1860, p. 57, by W. S. Dallas, F.L.S.



J. Basire sc.

an opake pale-yellow ring; less constantly there are similar spots on the outside at the base, and brownish spots between these.

The entire surface of the body bears a short-ciliary coat; and elongated-narrow thread-capsules, of 0·012 to 0·016 millim. in length, occur everywhere, but are especially numerous on the tentacles.

The form of the mouth is very variable. When the tentacles are bent obliquely backwards, it usually appears as a wide open funnel, surrounded by eleven pads separated by sharp furrows, preceding the same number of tentacles. One of the shorter tentacles thus remains without a representative pad; whilst the two neighbouring corresponding pads are distinguished by their breadth, as indeed the longer tentacles in general are represented by broader and the shorter ones by narrower pads. The mouth rarely appears nearly round, but is usually elongated in the direction of the diameter passing through the tentacle which is destitute of a basal pad. Corresponding to this tentacle, there remains between the two adjacent pads a tolerably deep channel, at the outer extremity of which each of these pads is drawn out into a small tongue-like process. A third similar process lies between these two, opposite to the padless tentacle. These three processes, which are usually white and opake, strike the eye particularly when, the tentacles being directed obliquely forwards, the mouth is nearly closed: the pads, which are nothing but peculiar inflations of the cavity of the body, are then a good deal flattened, and the tongue-like processes, being extended straight out, rise above their level.

The buccal pads, the furrows separating them, and the channel commencing at the tongue-like processes are continued into the short stomach, which attains about twice the length of the tentacles, and is the immediate continuation of the funnel of the mouth. The margins of the channel appear to be capable of laying themselves together to form a complete tube in the whole length of the stomach. At the bottom the stomach is in communication, by a wide orifice, with the body-cavity, into which one may not unfrequently look down from the mouth. When it closes by bringing its walls together, it appears flat—narrow when seen in the direction of the diameter passing through the channel, broad when seen in a direction perpendicular to this. In the latter lateral view it is seen to project into the cavity of the body further on the side of the channel than on the opposite side.

The wide body-cavity is clothed throughout with cilia. Around the stomach it is divided by muscular walls into twelve chambers, which correspond with the tentacles, and are continued into their cavities. The partitions do not reach quite to the anterior extremity, but there remains here a round aperture in each, serving as a communication between every two adjacent chambers. In this way a sort of annular canal is produced round the mouth at the base of the tentacles. The partitions are seldom seen perforated with holes in other places. Posteriorly the partitions are continued, following the longitudinal furrows, to the extremity of the body; but beyond the stomach they form very inconsiderable projections into the general cavity. They seem to be formed of two lamellæ,—at least, when looked at straight from the outside, they appear like two dark stripes, separated by a narrow, pale, intermediate one.

From their insertion upon the stomach to the beginning of the hindmost third or fourth of the length, the partitions are bounded by a broad, yellowish, moderately opake border, folded in an undulated or frilled manner, of which the margin floating freely in the body-cavity is thickened into pads or cushions. On this margin, about 0·1 millim. in breadth, and which is sharply separated from the frilled portion by a paler line, the ciliary movement is particularly lively; and an abundance of thread-capsules, of twice the length and thickness of those occurring in the external integument, are imbedded in it. These twelve frills differ in their anterior and posterior extension, and thus show still more distinctly the bilateral symmetry already indicated in the formation of the mouth, in relation to a plane drawn through the axis of the body and the oral channel. When considered in their posterior extension, the first, third, and fifth pairs (counting from the side of the oral channel) constantly appear to be the longest, the sixth pair is of intermediate length, and the second and fourth are the shortest. The two latter pairs, on the contrary, reach furthest anteriorly, the partitions belonging to them descending only to about the middle of the stomach; the third, fifth, and sixth pairs are inserted at the bottom of the stomach, whilst the two partitions of the first pair form a chamber closed towards the interior above the stomach. I believe that we may regard the thickened margins of the frills as analogous to the mesenteric filaments of the *Actiniæ,* which here only exhibit the peculiarity of being attached throughout their whole length. The frills themselves may prove to be the place of formation of the sexual materials, of which I have been unable to find any indubitable traces in numerous animals examined in the course of nearly a year.

In the larger *Actiniæ* the existence of small apertures in the cavity of the body is usually betrayed only by the squirting-out of fine streams of water when the animals are seized; in our animals these orifices themselves are easily detected. They appear, even to the naked eye, as *twelve radiating rows of pale dots* *on the hinder part of the body,* alternating with the longitudinal furrows. Their number increases with age, and rises, in the largest specimens, to about twenty in each row. Their diameter varies: the largest orifice that I have met with was 0·1 millim. in length, and half that breadth. Under the microscope, the minute particles driven about by the cilia of the body-cavity may sometimes be seen to issue from them. They are of course closed by the contraction of the wall of the body, but are also capable of contracting and closing independently: when contracting, they appear to be surrounded by a pale space; and when closed, a pale spot appears in their place.

The middle of the posterior extremity is completely closed in the animal when filled with water; but on rapid contraction, *a wide orifice for the escape of the water* opens at this point*, through which portions of the mesenteric frills not unfrequently pass at the same time. In a large specimen which I put into a test-tube in order to observe it more conveniently, I saw, after it had distended itself again with water, a slender cord stretched tightly from the end of one of the longer mesenteric frills to the middle of the posterior extremity, which, as I knew, was not there before. After a fresh slight contraction of the animal, caused by shaking the glass, the cord began to remove from the posterior extremity, and contracted itself with extraordinary slowness, still retaining its straight form: thus it proved itself to be a fragment of the mesenteric frill in question, which had been fixed during the first contraction, and set free by the opening of the terminal orifice caused by the second contraction.

I first found *Philomedusa Vogtii* adhering singly to the lower surface of the disk in *Olindias* (nov. gen. *Eucopidarum*), and subsequently in plenty upon *Chrysaora,* in which it dwells on the arms, in the sexual cavities, and in the stomach and its sacs. From a single Medusa of the last-named genus I have removed more than twenty of these Polypes. The animals taken from the Medusæ usually have fragments of the tentacular filaments, genitalia, stomachal filaments, &c., of the host in their stomachs; and urticating capsules of the Medusa are often met with in the body-cavity of the Polype. Like the Actiniæ, they bear captivity well; they will do without food for months, and will also take other food besides parts of Medusæ, exhibiting a preference for Annelides. If a large number be kept in the same vessel,

* This is also the case in *Cerianthus* (Jules Haime, in Ann. des Sc. Nat. sér. 4. tome i. p. 341), with which polype that above described has much affinity. The number and especially the position of the tentacles certainly does not agree, as *Cerianthus* possesses a double and *Philomedusa* a single row of tentacles. However, with regard to their systematic position, it must be borne in mind that the animals, as above stated, have not yet been observed in a state of sexual maturity (Max Schultze).

small individuals are sometimes swallowed by larger ones, when they will continue to live in the cavity of the body of their devourers for weeks, without any apparent mutual inconvenience.

The animals are able to adhere with any part of the body, probably by means of the urticating threads, which indeed appear, even in the tentacular filaments of the Medusæ, to be more serviceable as adhesive organs than by their venom. They not unfrequently climb up on the wall of the vessel, and then usually adhere by the mouth. Before they distend themselves in order to rest comfortably, their form is very changeable, according as one or another part of the body is more strongly contracted, the tentacles retracted or extended, and so forth. All their movements are very slow: when left quiet, they remain for days lying at the bottom of the vessel, or hanging from the same part of its wall, without any other movements than contractions of the annular muscles, which from time to time proceed from the anterior to the posterior part, in slowly advancing undulations.

EXPLANATION OF PLATE VII. Fig. 4.

Philomedusa Vogtii, in the distended state, magnified three times.

BIBLIOGRAPHICAL NOTICE.

Handbook to the Geology of Weymouth and the Isle of Portland; with Notes on the Natural History of the Coast and Neighbourhood. By Robert Damon. 12mo. E. Stanford, London, 1860.

A Supplement to the Handbook to the Geology of Weymouth and the Isle of Portland. By Robert Damon. 8vo. E. Stanford, London, 1860.

"When George the Third was King," and Weymouth the royal watering-place, few indeed of its visitors cared for amusing themselves by natural-history pursuits more definite than the finding or buying a few odd fossils, or collecting some shells and sea-weeds as curiosities. But modes are much altered with the times; and a large proportion of the visitors and residents at Weymouth, as at nearly all other places of resort for invalids and tourists, have some knowledge of the common things around them, or at least know that real pleasure is to be obtained by the proper exercise of that almost instinctive faculty we all possess of examining for ourselves every animal, plant, and mineral we can find, and getting a systematic knowledge of them. Most guide-books, therefore, now-a-days have some sort of geological appendix for the benefit of those whose eyes are open to the many points of interest, in the structure and physical history of a district, which are invisible to the uninitiated; but here we have a *Geological Handbook*—and a very good one too—for a pleasant locality, rich with a variety of interesting geological phænomena. Just, however, as geology is a combination of all other natural-history sciences, so the Handbook before us gives a fair proportion of botanical and conchological information for the district.

Weymouth has had its scientific observers for many years (as Mr. Damon's list of authors shows), but their writings have been too technical for the world at large; and Mr. Damon has now brought together, in a neat and convenient form, pretty well all about the neighbourhood that is of interest to the general inquirer, and has prepared this information in a clear, systematic, and satisfactory manner. Its speciality, as descriptive of the Weymouth, Portland, and Purbeck coast, its greater conciseness, and more definite treatment of the strata and fossils, distinguish it from the only other purely geological guide-book for this district, namely Mantell's 'Geological Excursions around the Isle of Wight and along the adjacent Coast of Dorsetshire.' Austen's 'Guide to the Geology of Purbeck,' 1852, and Brannon's 'Guide to Swanage and the Isle of Purbeck,' 1859, are less elaborate aids for geologists visiting some parts of the district in question.

The 'Handbook' commences with remarks on the physical features of the Dorsetshire Coast, and on the place in the series of rock-formations that the strata of Dorsetshire hold. These strata (from the Fuller's-earth of the Oolite to the superficial gravel) and their characteristic fossils are then concisely described; the places where the latter can best be got at are noted; the most important of the fossils are well portrayed in good-sized woodcuts, as well as sections and views; and considerable information is given respecting the iron, coal, gypsum, alum, clays, cement-stone, building-stone, &c., occurring in the strata. Illustrative notes and explanations of technical words are not wanting.

Special information on some points interesting to the geological observer is given—relating to the faults or cracks whereby the strata have been shifted along extensive lines across the country, also as to the foldings or bendings of the beds of rock, the land-slips, the waste of the coast, Chesil Beach, &c. Popular Notes on Fossils are added; and a short summary or retrospective survey of the Pre-adamitic history of the district (somewhat after the style of Dr. Mantell's eloquent "Retrospect," in the work above alluded to) is offered at page 149. Some previously unpublished species of fossil shells (partly figured in woodcuts in this work) are carefully described, with the aid of Messrs. Morris and Lycett, at pages 172 to 174, and are also figured in lithograph and described in the 'Supplement.' Lists of the sea-, river-, and land-shells of the neighbourhood, the marine crustaceans, the sea-weeds, the rarer land-plants, and of the ferns, complete the 'Handbook.'

Mention of the much-talked-of stone tools of the old Flint-folk of the Valley of the Somme is not omitted (p. 134): and here we may correct Mr. Damon in his referring the "Stone-beads" to "Lunulites," by directing his attention to No. 31 of these 'Annals' (July 1860), p. 35, where their true relationship, as *Orbitolinæ*, amongst the Foraminifera, has been shown by Messrs. Parker and Jones.

The errata to be found in this book, especially in the lists of fossils, are rather too numerous. We may remark, too, that *Serpula*, *Vermilia*, and *Lignite* should not be classed under "Conchifera" (p. 33), nor *Pentacrinus, Serpula, Vermilia, Lignite, Selenite*, and *Septaria* be grouped as "Mollusca" (p. 31) by a professed naturalist like our author.

Mr. Damon has conscientiously given references to his authorities; but a revision of the numerous references to what he terms "Geol. Proc." would be desirable; for he confuses together the 'Geol. Proceedings' and the 'Geol. Journal,' and some are obviously incorrect.

It is a pity that the little map attached to this Handbook does not indicate the geological structure of the district. The author, it seems, expects his readers to have Sheet 17 of the Geological Survey Map of Great Britain always in hand when they consult his book. We would suggest that, in the next edition, Mr. Damon should add an illustration, with a fuller account, of the curious "fault" of the Ridgway, of which the railway makes a section at Upway. The author might also draw attention to the great mass of stony material in the Purbeck strata, due to the accumulation of multitudes of the tiny shells of Cypridæ—a fact of corresponding importance to the existence of rocks made up of equally minute Foraminifera, which he has noticed at pages 41 and 153.

The woodcuts in this little work are of superior execution, both as to drawing and engraving. The sections have evidently been prepared by practised surveyors. The plates in the 'Supplement,' nine in number, illustrative of Oolitic Fossils, have been drawn by one of the best of English palæontographists, Mr. C. R. Bone, and are elegant, truthful, and carefully finished. It is to be regretted that this 'Supplement' is of a larger size than the 'Handbook' itself; for they ought to be bound together.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 12, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

Description of a New Species of Manakin from Northern Brazil. By Philip Lutley Sclater, M.A., Secretary to the Society.

Our Corresponding Member, M. Jules Verreaux, of Paris, has kindly sent to me for examination a specimen of a Manakin lately received by one of his correspondents from Para, which seems to belong to a different species from any heretofore described. Its nearest ally is certainly *Pipra filicauda* of Spix; but it is readily distinguishable from that and every other member of the group, with which I am acquainted, by the form of the tail-feathers. The outer rectrices are acuminated and produced; the second, third, and succeeding pairs in a less degree than the first; the outer pair exceeding the medial rectrices, which have nearly the ordinary normal form, by nearly half an inch. In *P. filicauda*, as is well known, the rectrices are nearly of equal length, and terminate in a long hair-like filament. Further differences from *Pipra filicauda* are observable in the crimson colour descending lower down the back above, and pervading the breast and upper part of the belly. In the latter respect this species approaches to *P. aureola* and its scarcely separable ally, *P. flavicollis* of the Rio Negro, an example of which was in the same collection.

I propose to call this Manakin

Pipra heterocerca, sp. nov.

Velutino-nigra: dorso superiore pileoque toto cum nucha coccineis: fronte, ciliis oculorum et corpore subtus flavis, pectore coccineo perfuso: tectricibus subalaribus et macula in pogonio interiore remigum albis: caudæ rectricibus lateralibus elongatis, acuminatis, medias valde excedentibus: rostro plumbeo: pedibus obscure carneis.

Long. tota 4·25, alæ 2·5, caudæ rectricum lateralium 1·75, mediarum 1·3.

Hab. In ripis fl. Amazonum sup.

Obs. Affinis *P. filicaudæ* et *P. aureolæ*, sed caudæ forma primo visu distinguenda.

Description of a New Tyrant-bird of the genus Elainea, from the Island of Saint Thomas, West Indies. By Philip Lutley Sclater, M.A., Secretary to the Society.

Mr. Osbert Salvin landed at St. Thomas for a few hours on his way out to Guatemala in the spring of last year, and with characteristic energy took out his gun for a ramble. The first shot fired secured two examples of a bird not previously known as an inhabitant of this island*, and, I believe, new to science—a species of Tyrant-bird of the genus *Elainea*†. Mr. Riise, so well known for his collections in different branches of Natural History made in this island, having had his attention drawn to the existence of this bird by Mr. A. Newton, caused a search to be made, and obtained six other specimens, which I now exhibit. It is to this gentleman that I propose to dedicate this species, in commemoration of his exertions in confirming Mr. Salvin's discovery, by the name of

Elainea Riisii, sp. nov.

Fuscescenti-olivacea: pileo cristato intus albo: loris albescentibus: alis nigricantibus, primariis olivaceo stricte, secundariis et tectricibus flavicanti-albo latius marginatis: cauda nigricanti-fusca, marginibus externis olivacescentibus: subtus cine-

* See Messrs. A. and E. Newton's articles on the Birds of St. Croix and St. Thomas in the 'Ibis,' 1859, pp. 59, 138, 252, 365.

† This genus of Sundevall has been written in many different ways (sc. *Elænia*, *Elainia*, &c.); but the proper orthography is certainly *Elainea*, from ἐλάϊνος or ἐλαΐνεος, *oleagineus*.

racescenti-alba, abdomine flavido lavato : rostro superiore obscure corneo, inferiore rubello : pedibus nigris.

	Long. tota.	alæ.	caudæ.
Spec. *a*, ♂,	5·4	3·0	2·7
—— *b*, ♀,	5·0	2·7	2·2
—— *c*, ?	6·0	3·1	2·8
—— *d*,	6·0	2·9	2·7
—— *e*,	5·7	2·8	2·5
—— *f*,	5·8	3·0	2·8
—— *g*,	5·8	3·0	2·8

Hab. In ins. S. Thomæ Antillensium.

Mus. P. L. S.

Obs. Affinis *Elaineæ paganæ* et ejusdem formæ, sed rostro longiore, compressiore, et corpore subtus pallidiore distinguenda.

I have specimens of two species of this genus of *Tyrannidæ* in my collection from Jamaica. One of them is *E. Cottæ* of Gosse; the other, as far as I know, undescribed, but quite different from the present. I have also an *Elainea* from Tobago, which I cannot refer strictly to any known species.

On the African Trionyces with hidden feet (Emyda). By Dr. J. E. Gray, F.R.S., V.P.Z.S.

Five species of my genus *Emyda* (which MM. Duméril and Bibron afterwards most unnecessarily named *Cryptopus*) have been described as found in Africa, viz.—

1. *Cryptopus senegalensis*, Dum. & Bib., from Senegal.
2. *Cyclanosteus Petersii*, Gray, from the Gambia.
3. *Cyclanosteus frenatus*, Peters, MSS., from Mozambique.
4. *Cryptopus Aubryi*, Duméril, from Gaboon.
5. *Aspidochelys Livingstonii*, Gray, from Mozambique.

Now it is very doubtful if several of these names are not synonymous, not because there is any doubt as to the distinctness of species, as some neophyte belonging to the Darwinian School might suspect, but simply because the materials on which they are founded do not afford us sufficient information or means of comparison.

Cryptopus senegalensis was described from a very young specimen in the Paris Museum before it had any of the sternal callosities developed. The specimen of *Trionyx*, with flaps over its feet, which we have received from the same locality, is unfortunately in the same condition; and though it affords very good evidence that it is destitute of any bones on the margin of the shield, and therefore does not belong to the same genus as the Asiatic animal with which M. Duméril associated it, yet it does not give us the means of knowing to which, if to either, of the two African forms, viz. *Cyclanosteus* and *Aspidochelys*, it should be referred.

The description of Duméril, and the colouring of the head, &c. of the specimen in the Museum, show that it must be distinct from *Cyclanosteus frenatus* and from *Cryptopus Aubryi* (which may be synonymous), as it has small white dots on its head, while *C. frenatus*, as its name implies, and *C. Aubryi*, as its figure shows, are not spotted, and have black lines on the side of the head and neck.

Cyclanosteus Petersii and *Aspidochelys Livingstonii* have been described from shells of adult animals only, without any remains of the bodies attached to them; so that it is not possible to know whether either of them be the adult form of *Emyda senegalensis*, or what is the colouring of their head, which is a very distinctive character in the animals of this family.

Cyclanosteus frenatus is known only from a note which Dr. Peters sent home in 1848, shortly after his return from Mozambique.

Cryptopus Aubryi is well described and figured by M. Duméril in the Rev. Zool. for 1856, p. 374, t. 20, and it appears to be very nearly allied to the shield which I have lately described and figured in the 'Proceedings' of the Society, under the name of *Aspidochelys Livingstonii* (A. N. H. p. 68); but we cannot be certain that the animal from Gaboon and that from Mozambique are identical, until we know what are the peculiarities of the head of the Mozambique species. I may state that Mr. Cope, in the 'Proceedings of the Academy of Natural Sciences of Philadelphia' for 1859 (p. 295), has formed M. A. Duméril's species into a genus, under the name of *Heptathyra*, in which he evidently intended to include my genus *Aspidochelys*. As his paper was read in 1859 and mine in 1860, his name ought to have priority, unless it should be found desirable, as there is a considerable difference between them in the form of the sternal callosities, to preserve both the names.

The African species known in their adult stage may be arranged thus:—

A. *Sternal callosities* 9; *hinder pair small.*

1. Cyclanosteus. The hinder pair of callosities very small, and far apart.

C. Petersii, Gray, Cat. Tortoises, B.M. 65. t. 29. Gambia.

B. *Sternal callosities* 7; *hinder pair large.*

2. Heptathyra. The hinder pair of callosities rhombic, united together by their whole inner edge.

H. Aubryi, Dum. Rev. Zool. 1856, 364. t. 20.

Neck with three black streaks, the lateral ones from the eye; occiput with two short black streaks. Gaboon.

3. Aspidochelys. The hinder pair of callosities oblong, united by their hinder edge only.

A. Livingstonii, Gray, P. Z. S. 1860, 6. t. 22. River Zambesi.

The only specimen of the Senegal species yet known to me is very young; it does not show the sternal callosities, and has still remains of the umbilical slit. It may be described as follows:—

EMYDA SENEGALENSIS, Gray.

Cryptopus senegalensis, Dum. & Bibr.

In spirits. Grey; beneath, white. Head above with many symmetrical roundish white spots, and a short white streak in the centre of the crown; upper part of the neck with symmetrical white marbling. Upper shell grey, with small round scattered black spots, with a distinct central keel, which is rather broad and smooth in front, becomes suddenly narrow, and is converted into a series of close tubercles at the middle of the back. Back with rather irregular, often interrupted, somewhat concentric lines of small tubercles, which converge towards the central keel behind, and with a number of larger, isolated, but rather crowded tubercles on the middle of the front edge; sternum blackish, white on the margin.

Hab. Senegal.

ON NEW REPTILES AND FISHES FROM MEXICO. BY DR. ALBERT GÜNTHER.

A collection of Reptiles and Fishes made by one of the correspondents of M. Sallé in Mexico, and purchased for the British Museum, contains, besides many other scarce species—as *Cubina grandis*, Gray, *Gerrhonotus imbricatus* and *tessellatus*, Wiegm., *Geophis* (*Catostoma*) *chalybæa*, Wagl. (scales keeled), *Conopsis nasus*, Gthr., *Zamenis mexicanus*, D. & B., *Atropus undulatus*, Jan, &c.,—the following new species.

SAURIA.

MABOUIA BREVIROSTRIS.

Diagnosis.—The snout (from the anterior margin of the eye) is a little shorter than the width between the orbits. Twenty-four longitudinal series of scales round the middle of the trunk, two entire and two half series along the back between the white streaks. Two large anal shields in front of the vent, with a small additional one on each side. A series of large shields along the lower part of the tail. Back brown, separated from the sides, which are black, by a white streak, running from the snout, above the eye, to the origin of the tail, where it is gradually lost. Another streak, less distinct, borders the lower lip, and the black coloration of the side. Belly whitish, the centre of each scale being minutely dotted with greyish.

Hab. Oaxaca (Mexico).

The general arrangement of the shields of the head being the same as in *Mabouia agilis*, it does not appear necessary to give a detailed description of them. The present species is very similar to the latter, but distinguished by a considerably shorter snout. The large scales on the back and the large anal shields are sufficient characters to distinguish it from *M. Lacepedii*, &c.

OPHIDIA.

LEPTODEIRA DISCOLOR.

Diagnosis.—Anal bifid; scales in nineteen rows. Posterior maxillary tooth longest and strongest, in a continuous series with the other teeth, not grooved. Dirty-white, with numerous black cross-bands extending on to the ventral plates; belly uniform whitish.

Hab. Oaxaca (Mexico).

Description.—The head is rather broad and depressed, the snout rounded; the eye is of moderate size, its vertical diameter being about one-third the width between the eyes; the trunk is rounded, and, like the tail, somewhat slender. The rostral shield reaches just to the upper surface of the snout; the frontals are nearly square: the anterior pair are one-third the size of the posterior, which are slightly bent downwards to the side of the head; the vertical is pentagonal, longer than broad; the occipitals rounded posteriorly. Nostril situated between two nasals; loreal quadrangular; one anterior and two posterior oculars; seven or eight upper labial shields, the third and fourth or the fourth and fifth entering the orbit. There is one elongate temporal shield in contact with both the oculars; the other temporals, five in number, are scale-like. The medial lower labial is triangular and rather small; nine lower labials, the first of which is in contact with its fellow behind the median shield. There are two pairs of chin-shields, of nearly equal size. The scales are in nineteen rows, smooth, rhombic, those of the sides similar to those on the back. The number of the ventral plates varies between 182 and 179, that of the caudal between 88 and 87.

The ground-colour of the upper parts is dirty-white: the upper part of the head is brown; there is a whitish collar behind the occipitals. Fifty-one or fifty-four black bands cross the trunk and extend on to the edge of the belly; they are broader than the interspaces between, and become interrupted and spot-like on the tail. All the lower parts are uniform whitish.

	in.	lin.
Total length	21	1
Length of the head	0	7
Greatest width of the head	0	$5\frac{1}{3}$
Length of the trunk	14	6
——— of the tail	6	0

This species might be easily taken for a variety of *Leptodeira annulata* or *Leptodeira torquata**, exhibiting nearly the same physiognomy, and externally differing only in its more slender body, fewer scales, and somewhat modified coloration. Nevertheless we should be obliged to refer these snakes to different genera, if we were to adopt the dentition as the chief systematic principle: namely, *L. annulata* to *Dipsas*, *L. torquata* to *Liophis*, and *L. discolor* to *Coronella*.

PISCES.

CHROMIS NEBULIFERA, sp. nov.

D. $\frac{13}{12}$. A. $\frac{6}{9}$. V. 1/5. L. lat. 35. L. transv. 6/13.

Mouth narrow, protractile; teeth of the jaws cardiform, in a short

* Ann. & Mag. Nat. Hist. March 1860, p. 169, pl. x. fig. A.

band, those of the outer series larger, somewhat compressed, brown at the tip; palate smooth. Opercles scaly; præopercular margin entire. Nostril simple.

The height of the body is contained three times and one-half in the total length, the length of the head four times and two-thirds. The interorbital space is convex, and its width rather more than the diameter of the eye, which is one-half the length of the snout. There are six series of small scales between the præorbital and the angle of the præoperculum. The dorsal fin and the lateral line commence on the same vertical; caudal truncated; the commencement of the anal falls vertically below the sixteenth dorsal spine; the ventral is inserted behind the pectoral, and extends on to the vent. Greenish, the middle of the body clouded with blackish, in form of indistinct vertical bands; a round black spot at the root of the caudal; the outer parts of the fins blackish.

This species would be placed in the genus *Heros* of Heckel.

Hab. Fresh waters of Mexico.

	in.	lin.
Total length	7	0
Height of the body	2	0
Length of the head	1	6
Diameter of the eye	0	$3\frac{1}{2}$

Chromis fenestrata, n. sp.

D. $\frac{17}{12}$. A. $\frac{6}{9}$. V. 1/5. L. lat. 33. L. transv. 6/13.

Mouth narrow, protractile; teeth of the jaws cardiform, in a short band; those of the outer series larger, somewhat compressed, brown at the tip; palate smooth. Opercles scaly; præopercular margin entire. Nostril simple.

The height of the body is contained two and three-fifth times in the total length; the length of the head four times. The interorbital space is convex, and its width more than the diameter of the eye, which is one-half the length of the snout. There are five series of scales between the præorbital and the angle of the præoperculum. The dorsal fin and the lateral line commence on the same vertical; caudal truncated; the commencement of the anal falls vertically below the fifteenth dorsal spine; the ventral is inserted behind the pectoral and extends on to the anal. Blackish-green, with six black vertical bands, crossing a deep black longitudinal band, which runs from above the pectoral to the root of the caudal. Vertical and ventral fins blackish, darkest at the base and margins.

This species would be placed in the genus *Heros* of Heckel.

Hab. Rio de la Lana (Mexico).

	in.	lin.
Total length	3	8
Length of the head	0	11
Height of the body	1	5
Diameter of the eye	0	$2\frac{1}{2}$

TETRAGONOPTERUS ÆNEUS.

D. 11. A. 26. V. 8. L. lat. 35. L. transv. 7/6.

The height of the body is contained three times or three and a half times in the total length, and the length of the head four and four-fifth times. The interorbital space is convex, and its width more than the diameter of the eye, which equals nearly the extent of the snout. Uniform bronze-coloured, with a brownish spot at the root of the caudal.

Hab. Fresh waters of Oaxaca (Mexico).

	in.	lin.
Total length	3	5
Height of the body	1	1
Length of the head	0	$8\frac{1}{2}$
Diameter of the eye	0	$2\frac{1}{4}$

June 26, 1860.—E. W. H. Holdsworth, Esq., F.L.S., in the Chair.

ABSTRACT OF NOTES ON THE OSTEOLOGY OF BALÆNICEPS REX. BY W. K. PARKER, MEMB. MICR. SOC.*

The first view of the living *Balæniceps* at once suggests the idea of the Boatbill (*Cancroma*), the Heron (*Ardea*), and the Adjutant (*Leptoptilus*). Other large-headed birds occur to the mind on a longer observation; for one instinctively thinks of the Pelican (*Pelecanus*), the Toucan (*Ramphastos*), the Hornbill (*Buceros*), and the *Podargus*, although these birds belong to distinct and very remotely related groups. Nor does the internal structure of this noble but strange and weird-looking bird contradict the first external impressions; for the very unusual size of the head, and its great strength, require certain modifications of a teleological character, such as occur in the large-jawed species of other widely separated groups. The difference in the structure of the skeleton between the *Balæniceps* and its small New World relative, the *Cancroma cochlearia*, is greatly exaggerated by the necessary modification of the bones in the giant species, by their thickness, and by the size of the ridges and out-standing processes for muscular attachment; but the two birds are, nevertheless, near allies. In the skull, especially, is this difference exhibited; and any large bird may differ osteologically from its small relations from this cause, much more than from any necessary specific or generic distinction of character.

Again, any peculiarity of habit in an aberrant species, or genus, will make, as it were, large demands upon the structure of those parts or organs which are subservient to this (as it regards the group or family) eccentric mode of life. The Secretary-bird (*Serpentarius*) amongst the Vultures, the Spoonbill (*Platalea*) and the Oyster-catcher (*Hæmatopus*), the Pelican and the Scissors-bill (*Rhynchops*), each form so different from its relations, are familiar instances of this law.

* This paper will be printed entire in the 'Transactions,' accompanied by illustrative plates.

Perhaps we ought to expect the skull of a bird to be the seat of more extensive teleological modifications than any other part of the skeleton, seeing that it must perform such varied duties, learn so many trades, and be the servant and caterer to the whole body; whilst the hands, which in some of the higher mammals minister to the necessities of the creature, are here necessarily restricted to one or two functions. If a rule like this could be clearly made out, it would go far towards settling many a disputed point of relationship; the Hornbills and the Kingfishers would not then startle the student of the Insessores; and the Flamingo (*Phœnicopterus*), notwithstanding its lamellirostral character, might be allowed to stalk amongst the Herons.

The broad expanded occiput of the *Balæniceps* differs but little from that of the Adjutant; but the upper surface of the skull, instead of being generally rough and convex, as in the latter bird, is smooth, flat, and even concave at its anterior half. In the *Balæniceps*, as in the Heron and Boatbill, the large eye-ball has elevated the upper orbital margin above the level of the mesial part of the skull, whilst in the Adjutant that margin is some distance below. Moreover, the skull of the *Balæniceps* is very short as compared with that of the Adjutant, and in density and polish of the bone is more like that of the great Maccaws (*Ara*); its transverse hinge, too, with the upper jawbone, is more like that of these birds than that of its own congeners. There is no bony bridge over the temporal fossæ in this bird, in which respect it agrees with the Heron and Boatbill, and differs from the Adjutant. The eye-ball being very large and the skull very short, the anterior orbital margin is one-third of an inch in front of the great transverse hinge; whilst in the Adjutant, and even in the Heron, it is half an inch behind that hinge. This modification has caused a displacement of the lacrymal bones, which, although they form the anterior boundary of the orbit, as in other birds, are in front of the great hinge, instead of behind it. The nostrils are high up on the jaws, two-thirds of an inch in front of the hinge, and more than one inch apart; at their anterior end they are continuous with the deep submesial grooves that mark out the strong bony ridge of the upper jaw, and pass forwards to mark the boundary of the great terminal beak. On the mid-line, a little behind the nasal fossæ and in front of the hinge, the upper jaw-bone rises into a rough boss.

Now in most birds the highest part of the upper jaw is between the nasal fossæ, and not behind as in the *Balæniceps*. This character, with the backward extension of the jaw, the shortness of the frontals, and the very forward position of the enormous well-margined orbits, helps to give a solemn, wise, but somewhat sinister aspect to the bird. Looking at him in his paddock, the first impression is that we have before us some strangely ancient form with "the breath of life" in it, and "standing upon its feet," concerning which geology had taught us that "its bones were dried up, and its hope lost."

The marginal outline of the great upper jaw of the *Balæniceps* much resembles that of the leaf of *Magnolia grandiflora*. Its length is more than twice its breadth; whilst in the Boatbill the breadth is more than half the length, the upper jaw of the latter being more outspread. The degree of arching of the upper jaw is intermediate between that of the Boatbill and that of the Stork (*Ciconia*). The gradual rise of the mesial ridge to form the great terminal hook, the crescentic notch forming the inferior margin of that beak, and then the graceful outward curve of nearly the entire mandibular margin, give great elegance to the lateral aspect of the upper jaw. At the end of that margin we have the commencement of the great cheek-bone, which is nearly two inches long, half an inch broad, and one-quarter of an inch thick.

Such a magnitude of the zygomatic arch as this is perfectly unique in the class of Birds, being more like the development of the same part in most Mammalia, in the Crocodiles, and in the Turtles. In the enormous heads of the larger Hornbills, the cheek-bones are not half the size they attain in the *Balæniceps*.

The os quadratum, or tympanic bone, which forms so beautiful an articular medium between the cranium and lower jaw in birds, is strong and well-developed. This bone and the little pterygoid, which intervenes between it and the palatines, have very much the character of the same bones in the Heron and the Adjutant; but the palatine bones themselves, coalescing at the mid-line, and sending downwards a strong keel at that part, are exactly intermediate in structure between those of the Adjutant and Pelican. These bones and the pterygoid at their point of junction are beautifully scooped out to receive and glide under the strong beam of bone which forms the base of the interorbital septum.

The great strength of all the bones forming the upper maxillary apparatus is in perfect harmony with what is known of the habits of the creature. In this respect it has no peer amongst its congeners, and no superior except amongst some of the larger Parrots. But the latter birds, although they possess the most perfect fronto-maxillary hinge, have nothing in their tympanics, or malar bones, at all comparable to those of the *Balæniceps*. Perhaps the most elegant part of this bird's structure is the hard palate, formed for the most part by the coalesced premaxillary bones,—the maxillaries in birds, as in typical fish, having a very backward position and often inferior development. The mid-line of this highly arched hard palate is occupied by a partially open canal for a large venous sinus, which receives on either side numerous vein-grooves at right angles. This gives a beautiful leaf-like appearance to this structure.

Just inside the margin of the posterior angle on the under surface of this great upper jaw the bone is cut away, as it were, to receive the coronoid portion of the lower jaw. This excavated part is continuous anteriorly with a deep groove, margined internally by a sharp ridge, which gradually rises inside the palate to pass forwards in a sigmoid manner to the base of the great terminal beak, where it meets the submesial groove on the upper surface of the jaws. In the Common Heron these palatine submarginal lines exist, being covered in the horny sheath by sharp ridges. These ridges have their fullest development in the Green Turtle. The occipital condyle is hemispherical and large; and the base of the skull has a very exquisite structure, which deserves full description, as it exceeds anything we have seen in birds, the Heron making the nearest approach to the *Balæniceps* in this particular. Many other birds, however, show traces of this peculiar structure. The lower jaw is exceedingly strong and thick, as compared with that of the Adjutant. Less elliptical and more triangular than that of the Boatbill, it has, nevertheless, many of the characters of the latter. Its tip is curiously emarginate, as is also the tip of the upper jaw—the bony basis of the great hooked beak. The traces of suture between the dentary and other elements of the mandible, which are persistent in the Boatbill, Adjutant, and most other birds, are all filled up with bony matter, as is the case in the Parrot tribe, in the Hornbills, and in the Toucans. The anterior part of the mandible passes within the maxilla, the edge of its horny sheath fitting between the marginal and submarginal ridges of the latter. Where the upper jaw begins to narrow towards its angle, there the mandible rises high (its height or depth here being $1\frac{1}{3}$ inch), and it is rounded, rough, and strong. It then lowers again, and becomes rapidly broader, to form the deep and wide articular cavities for the tympanic bone above, and the broad flat angular processes behind and below.

Each ramus of this great *inelastic* mandible is united to its fellow at the symphysis by complete bony union to the extent of $1\frac{1}{3}$ inch. In the extremely *elastic* mandible of the Pelican this line of bony union is one-eighth of an inch in length, in the Boatbill one-fourth of an inch, in the Adjutant $4\frac{1}{2}$ inches, and in the Hornbill, *Buceros bicornis*, more than 7 inches.

In the Boatbill and Grey Heron there are twenty-three separate vertebræ between the head and the pelvis; in *Balæniceps rex* and the Adjutant twenty-one, and in the White Stork twenty.

In the Boatbill there are nine pairs of free ribs. The last, or pelvic, does not reach the sternum, nor do the first four; so that there are four true dorsal ribs. In the Heron there are eight pairs; the anterior three and the last (which is pelvic) do not reach the sternum: here there are only four true dorsals. The *Balæniceps*, the White Stork, and the Adjutant have each seven pairs of free ribs, the last five reaching the sternum; in *Balæniceps* and the Adjutant the last pair are pelvic; in the White Stork the last two pairs. Until the birds are adult, the anterior vertebræ of the pelvis are but partly united. In the Storks, Herons, Boatbill, and *Balæniceps* the dorsal vertebræ continue distinct throughout life; but in many of the Cranes the tendons of the dorsal muscles are ossified, and fasten the bones more or less together, and two or three contiguous centra coalesce. Among the cervical vertebræ of the true Herons and their nearest allies, *e. g. Ardea, Botaurus, Cancroma*, and *Balæniceps*, there are several which have elegant bridges under their upper or cranial end for the carotid arteries, which bony bridges are not true hæmal arches, but are formed by exogenous processes*. In these ver-

* See Prof. Owen's article in Orr's 'Circle of the Sciences,' entitled "Structure of the Skeleton and Teeth," p. 182, fig. 10. iv.

tebræ there are four canals—the one under consideration, one for the spinal chord, and a pair for the vertebral arteries. In the *Balæniceps* the vertebræ, from the seventh to the thirteenth inclusive, are thus constructed. The only *Stork* in which we have seen this structure is the Australian Jabiru, *Mycteria australis*; for a knowledge of which fact we are indebted to the kindness of Mr. Edward Gerrard. These pairs of inferior processes meet together in but few birds; nevertheless this is the case in the White Pelican (*Pelecanus onocrotalus*) and in the Gannet (*Sula bassana*). In the former bird also there is no cup-and-ball articulation of the dorsal vertebræ, which reptilian character occurs in the Gannets, Cormorants, and Penguins. Notwithstanding their great size, the vertebræ of *Balæniceps* agree better with those of the Heron than with those of the Stork; but in their shortness, better with those of the Boatbill than with those of the longer-necked Heron: for the Heron, like the Giraffe, gains its great length of neck by elongation of the individual vertebræ rather than by an increase in their number. The ribs of the *Balæniceps* are lighter, weaker, and more cellular than those of its congeners. The oblong, narrow, neat pelvis of this bird is more like that of the Boatbill than that of the Stork, or even of the Heron. It differs, however, from that of either of these in not being expanded in a broad foliaceous manner over the top of the posterior ribs. This part again agrees with the pelvis of the Heron, inasmuch as the ischium passes much further backwards than the posterior part of the ileum. In *Ciconia alba* these two pelvic bones terminate in the same vertical line, whilst in the Adjutant and Boatbill the ileum projects backwards and furthest. The pubic bones are unusually broad. There are seventeen sacral vertebræ, the first of which has a pair of ribs. The caudal vertebræ are six in number, the last being composed of eight or ten embryonic vertebræ.

The sternal apparatus of this bird is very interesting. In shape the sternum is intermediate between that of the White Stork and that of the Cormorant, the keel, as in the latter bird, projecting evenly forwards anterior to the articulations with the coracoids, for a greater distance than in the Stork and Heron. Moreover, the keel is not quite so deep as it is in the congeners of this bird. It passes, however, to the end of the sternum, as in them; whereas in the Pelicans, Gannets, and Cormorants it scarcely continues beyond the middle of that bone. The episternal process is obsolete in this bird; it exists in the *Pelecanidæ*, Herons, and Boatbill, and is nearly obsolete in the Storks. The hyposternal processes are unusually long and arcuate; and there is on each side of the end of the keel another rather smaller emargination which is obsolete in the Storks, Herons, and Boatbill, but is well shown in the Spoonbill and the *probing* waders, *Numenius, Himantopus, Limosa*, &c. The tips of the furculum are subtriangular and rather flat; the bone then becomes very thick and trihedral, having at the top of the thick part a large oval facet, which is adapted to the under part of the head of the coracoid. This thick part is very short, for the bone suddenly lessens, bends backwards, and passes on, rounded below and angular above, to thicken again at the angle, where it makes a most complete anchylosis with the tip of the sternal keel. This structure of the furculum is similar to what is found in *Pelecanus, Phalacrocorax*, and *Sula*; but we have seen no such "merry-thought" bone in any Ardeine bird. In these, as in *Balæniceps*, the rami of the bone are not only flat as they pass in between the heads of the coracoids, but this thin condition of the bone is continued throughout one-half of their extent. They have no such sudden bend at the upper third, the arch being gentle, and the lessening size of the bone gradual. Nevertheless, in the Boatbill there is a slight tendency to this state of things. The blending of the furculum with the sternal keel seldom takes place in the true Herons and Storks; there continues even in old birds a synovial gliding joint, and in the Boatbill and some of the smaller Herons the furculum does not quite reach the sternum. This articulated condition is generally found in Gannets and Cormorants; but in old Pelicans anchylosis of the joints takes place. This occurs too in the Secretary bird, which is unique among the birds of prey in having a joint there at all, so that this last-mentioned bird is a raptorial isomorph of the Cranes. In the latter birds (the *Gruidæ*) there is great difference in the structure of these parts; for whilst in such species as *Grus Antigone* and *G. americana* we have in the adult bird complete coalescence, in the Balearic Crane, *G. pavonina*, and in the Trumpeter, *Psophia* (a Crane becoming slightly gallinaceous), the furculum does not reach the sternum at all.

Any lengthy remarks upon the bones of the limbs need not be made at present. They are about three-fourths the size of those of the Adjutant; but as the limbs had not enjoyed much liberty of exercise, they have not that robustness which is seen in the skeleton of old wild birds. The humerus is longer relatively, and the fore-arm shorter in proportion than in the Adjutant; the thigh-bone is longer in proportion to the tibia and tarso-metatarsus in the *Balæniceps* than in its larger relation. The toes are very long, reminding one of those of the Jacanas (*Parra*); and the most ridiculous care which this stilted, stalking bird takes, both in taking up and setting down its feet, makes it worth while to compare the length of the bones of its toes with that of the bones of the toes of the Great Adjutant.

	Hallux. in.	Inner toe. in.	Middle toe. in.	Outer toe. in.
Adjutant	2·3	4·15	5·7	4·7
Balæniceps	3·3	3·8	6·5	6·4

To conclude, I may remark that upon a careful examination of the osteology of the *Balæniceps*, after eliminating the teleological from the relational characters, I am decidedly of opinion that it is strictly an *Ardeine* bird, and more nearly related to *Cancroma* than to any other known type.

Note I.—Amongst the bones of the limbs, the humerus alone is pneumatic,—the cavity of the os femoris being filled with medulla, as are all the more distal bones.

Note II.—The tongue is extremely small—an important *Pelecanine* character.

On a New Form of Grallatorial Bird nearly allied to the Cariama (Dicholophus cristatus). By Dr. G. Hartlaub, Foreign Member.

Professor H. Burmeister of Halle, who has lately returned to Europe after an absence of about three years in the southern portion of South America, has communicated to me the following notice of a new species of Grallatorial Bird, very nearly allied to the *Cariama*, which he met with in the woody parts of the Argentine Republic, and which I have the pleasure to name after him *Dicholophus Burmeisteri*.

This discovery is the more important and interesting, inasmuch as the *Cariama* has, until now, remained rather an isolated type, widely separated from even its nearest relatives.

The *Chunga*, as this bird is called by the Spanish inhabitants of the Republic, seems to differ subgenerically from *Dicholophus* in the following points :—The lores are equally and thickly plumose ; there is no conspicuous frontal crest ; the tail is comparatively longer, and the tarsus comparatively shorter ; the nails are nearly uniform on all the toes, and are stronger, larger, and more curved than in the *Cariama*. A very important difference, perhaps the most important, consists in the totally different habits of the more northern representative. Professor Burmeister proposes for it a subgeneric division, under the name of *Chunga*.

The *Chunga* is a large bird, of about 29 inches in length ; it is found in the wooded districts of the province of Tucuman and Catamarca ; it nests on the ground. Its eggs are white, slightly spotted with rufous. It feeds upon insects, and more especially upon locusts. The young have a rufous dress, thickly undulated with black : they very soon begin to take care of themselves. The *Chunga* is easily domesticated, and seems, even after a few days of captivity, attached to its master. Professor Burmeister saw two of them on a farm, which were of the size of an *Œdicnemus*, and still bore their downy plumage. They were fed upon little morsels of beef, but rejected larger pieces, as well as the entrails of fowls. They delighted in collecting bones, which they were in the habit of striking upon a stone and breaking to pieces. During the day they stalked gravely about, visited the house, jumped upon the tables and chairs, always collecting food, and slept at night at certain elevated stations, for instance on the projecting roof of the verandah. Professor Burmeister obtained a living bird at Catamarca, and observed it for some length of time. He saw it for the first time at the foot of the Sierra de Aronguiga, where it ran very quickly and shyly over the road and disappeared in the forest. In its wild state it is very difficult to kill ; therefore it is preferable to search for the nest, and bring up the young birds by hand. The cry of this bird is heard very frequently in the district where it is found ; it resembles that of the *Dicholophus cristatus*, and sounds like the bark of a young dog, but not quite so loud. The internal structure is quite the same as that of *Dicholophus*.

Dicholophus Burmeisteri, Hartlaub.

Statura et ptilosi ut in D. cristato*; crista frontali vix ulla.*

Totus pure cinereus, singulis plumis annulis alternantibus albidis et nigrescentibus tenuissime notatis; striga supra-oculari a loris inde ad aures usque producta alba; epigastrio pallidiore; abdomine imo crisso et cruribus flavescenti-albidis; remigibus nigro-fuscescentibus pogonio interno ferrugineo-fulvescente fasciatis; cauda dorso concolore, distinctius transversim lineolata; rectricibus duabus intermediis unicoloribus, reliquis fasciis duabus latis nigris ante apicem notatis, omnibus subtus pallidioribus; rostro et pedibus nigris; iride obscure grisea.

Long. tot. circa 28″; rost. a nar. 13‴; al. 12″; caud. 10″; tars. 5″ 2‴; dig. med. 2″; dig. int. 1″ 3‴; dig. ext. 1″ 5‴; pollic. 7‴.

Remarks on the Anas (Anser) erythropus of Linnæus. By Alfred Newton, M.A., F.Z.S.

The determination of the species established by Linnæus has always been held by naturalists a matter of so great importance, that I have no scruple in occupying a portion of your time this evening with a few remarks respecting the bird which, in the 12th edition of his 'Systema Naturæ' is designated by the name of "*Anas erythropus*;" especially also as one of his editors (the late learned Professor Retzius), though noticing the "mira circa hanc avem confusio," has, in my opinion, failed to give a satisfactory solution of the difficulty. It will be, I think, universally admitted that the names employed by Linnæus, when, as in the present instance, they are drawn from any physical character, are remarkably apposite. This consideration of itself should have served as a warning to ornithologists against their imagining, as many have done, that he could possibly mean to apply the name "*erythropus*" to a species like the Bernicle Goose, with which he was sufficiently familiar, and to which it was in no degree suitable.

It will, perhaps, be convenient to examine first on what foundation "*Anas erythropus*" was established.

In the 12th edition of the 'Systema Naturæ' (Holmiæ, 1766) we find (vol. i. pars 1. pp. 197–8) the species as the eleventh in order of the genus *Anas*, and the account given is:—

"A. cinerea, fronte alba. Faun. Svec. 116." [I omit all the synonyms borrowed from other authors.] "Rostrum *rubrum*. Pedes *rubri*."

Now these latter characters clearly can have no reference to the Bernicle Goose, even if that species were not elsewhere included as *Anas bernicla*, var. *β*.

Turning then to the edition of the 'Fauna Suecica' cited (Stockholmiæ, 1761), we have (p. 41) as follows:—

"116. Anas *erythropus* cinerea; fronte alba. Fn. 92. ...... Anser cinereus ferus, torque inter oculos et rostrum albo, erythropus. W. Botniensibus Fjæll-gås. Habitat in Helsingia, Lapponiæ alpibus."

To this succeeds a description of the male, which I admit is open to objection; but the matter, in my opinion, is rendered conclusive by the description of the female, which, in the edition of the 'Fauna Suecica' here referred to, and published fifteen years previously (Lugd. Bat. 1746), is alone given. It is this:—

"Rostrum sordide carneum, frons alba. Caput, collum, dorsum, cauda cinerea; pectus et abdomen candida: maculæ in sterno nigrescentes: Pedes sanguinei."

It is therefore plain that by *Anas erythropus* Linnæus did not intend to designate the Bernicle Goose, but a bird known in his time to the Swedes of Westro-Bothnia by the name of Fjæll-gås—*i. e.* "Fell" or "Mountain Goose." It accordingly remains to be seen what that species is.

It appears by the note-books of the late Mr. John Wolley, which are now in my possession, that in all his researches he was able to find only two species of Wild Goose inhabiting the extensive district in Lapland which he so carefully explored, and of which part was comprehended in the ancient province of Westro-Bothnia. These species are known to the Finns, who form the great bulk of the population, respectively as the "Iso-hanhi" and "Killio-hanhi," the former signifying "Great Goose," the latter "*Mountain* Goose." The Iso-hanhi he had several opportunities of identifying as the well-known Bean Goose (*Anser segetum*); the other he found, somewhat to his surprise, to be, not, as he had been told by Swedish ornithologists, the Bernicle Goose, but a bird of about that size, and at the same time closely resembling, in plumage and other physical characters, the White-fronted Goose (*Anser albifrons*). Not to extend the present remarks, I may state briefly that he was not able to discover that the Bernicle Goose was known to any of the inhabitants of the interior of the country,—a statement which is singularly corroborated by Mr. Dann's note communicated to Mr. Yarrell (B. B. iii. p. 73) in reference to the last-named species:—"A skin of this Goose was shown me by some Laps near Gillivara, who were ignorant of the bird, never having seen it before. It was shot at Killingsuvanda." Accordingly, in the Catalogue of his Eggs sold by Mr. Stevens in 1856, he stated, under the head of "*Anas albifrons*," that "this interesting bird is the proper Fjell-gas of the Swedes, which name has, however, been applied to the Bernicle in their works on Natural History. The Lapland specimens seem to be of the small-sized race, which has been named *Anser minutus* by Naumann." I must here take exception to part of Mr. Wolley's statement, some Swedish writers being quite aware that the "Fjæll-Gås" was not *Anser leucopsis*, as, for instance, Professor Zetterstedt, in the account of his travels in Lapland * (vol. ii. p. 161).

In the Catalogue of his Eggs sold in the following year (1857), Mr. Wolley further identified "the only White-fronted Geese which breed in Lapland," with the *Anser finmarchicus* of Bishop Gunner, described in one of the notes (pp. 264–5) of Professor Leem's great work †, "as distinct from the larger White-fronted Goose."

I can only say that I entirely coincide with the views thus expressed by Mr. Wolley, while I also identify the "Killio-hanhi ‡" or

* 'Resa genom Sweriges och Norriges Lappmarker, af Joh. Wilh. Zetterstedt.' Two vols. 8vo. Lund, 1822.

† 'Canuti Leemii de Lapponibus Finmarchiæ Commentatio, una cum J. E. Gunneri notis, &c. &c.' Kjöbenhavn, 1767.

‡ In Europæus's "Svenskt-Finskt Handlexikon" (Helsingfors, 1853), the word is spelled "Kallio" (*vide* page 42, *sub voce* 'Berg.').

"Fjæll Gås," with the *Anas erythropus* of Linnæus; and I here subjoin a concise summary of the principal synonyms of this bird.

Anser erythropus (Linn.).

Anas (*Anser*) *erythropus*, Linn. Syst. Nat. ed. 12 (1766), vol. i. pars 1. p. 197 (non Auct.).

Anser finmarchicus, Gunner, in Leemii de Lappon. Comm. notis (1767), p. 264.

Anser Temminckii, Boié, Isis, 1822, p. 882.

Anser minutus, Naum. Naturgesch. der Vög. Deutschl. (1842) vol. xi. p. 365, tab. 290.

MISCELLANEOUS.

Note on the Tetrapedos Smithii *of Jan.* By Dr. J. E. Gray, F.R.S., V.P.Z.S., &c.

In a recent Number of the 'Archiv für Naturgeschichte' (vol. xxv. p. 69, t. 2), a reptile from Ceylon is described by Prof. Jan of Milan, under the name of *Tetrapedos Smithii*: it is the same as *Evesia monodactyla*, described by me in the 'Annals of Natural History,' ser. 1. vol. ii. p. 336, in 1839, and in the 'Catalogue of Lizards in the Collection of the British Museum,' 1845, p. 127; and identical with *Evesia Bellii*, described by Duméril and Bibron, 'Erpétologie Générale,' vol. v. p. 783. Both these descriptions are from the same specimen, which was in the collection of Mr. Bell, and which he presented to the French Museum.

Freshwater Polyzoa in Australia. By C. D'Oyly H. Aplin, Esq.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,—As I believe that up to this time the existence of freshwater Polyzoa in any part of Australia, or even in the southern hemisphere, is quite unknown to naturalists, I am gratified at being able to announce that within the last week I have found several specimens, comprising at least two species, each belonging to a different genus.

One is a *Plumatella*, with elongated statoblasts (free), closely resembling the figure of those of *P. emarginata* in Dr. Allman's Monograph, pl. 7. fig. 7.

The other is unlike any figure in the above-named work.

Both were found adhering to the under surface of fragments of basalt, near the margin of a clear sheet of water occupying the site of a deserted quarry close to the river Yarra, at Richmond, about two and a half miles from Melbourne,—the former also adhering to the inner surface of the bark of a dead stump of *Eucalyptus*, in a lagoon in the Zoological Gardens near Melbourne.

They will both, I hope, be described and figured at an early date. In the mean time, I must content myself with this notice of their discovery, which is in itself an interesting fact, and will, no doubt, lead to an acquaintance with many new forms of these elegant little Molluscoids, as it has already added a new area beyond the hitherto known limit of their geographical distribution.

I remain, Gentlemen,
Your obedient Servant,
C. D'OYLY H. APLIN.

Geological Survey Office, Melbourne,
Sept. 24, 1860.

HELIX MOUHOTI.

To the Editors of the Annals of Natural History.

GENTLEMEN,—At p. 203 of the present volume of your Journal you did me the favour to insert the descriptions of two new land-shells from Cambojia. For one of them (*Helix Mouhoti*) I beg permission to alter the name to *Helix Cambojiensis*, the name *Mouhoti* having been assigned already by Dr. Pfeiffer to another species of *Helix*.

I am, Gentlemen, Yours, &c.,
LOVELL REEVE.

Nov. 5, 1860.

CORBULA ROSEA.

To the Editors of the Annals of Natural History.

GENTLEMEN,—By inserting the enclosed in your 'Annals,' you will much oblige

Your obedient Servant,
BEN. WM. ADAMS.

1860. July 30th and August 2nd. When dredging in Dalkey Sound, I discovered, off the south-west of the island, on a gravelly bottom, forty-one live specimens of *Corbula rosea*. I have carefully compared them with Forbes and Hanley's description, and also shown them to Dr. Farran of Feltrim, so that no doubt exists as to their identity; and all doubt as to their being a British species is now removed.

The Rectory, Cloghrar,
Nov. 1, 1860.

On the Morphology of the Compound Eyes in the Arthropoda. By E. CLAPARÈDE.

In order to complete the important investigations already made upon the histology of the compound eyes of insects, the author has undertaken the study of the evolution of these organs. In those insects with a complete metamorphosis which possess compound eyes, it is well known that the larvæ are either blind or furnished only with simple eyes. It is therefore in the pupæ that the genesis of the compound eyes must be studied.

The author soon found that the investigation of the eyes during their formation threw an unexpected light upon their histological composition. In fact, at first a multitude of elements are distinct and easy of investigation, which subsequently become soldered together, indistinct, and unfit for investigation. Each of the divisions of the eye corresponding with a facet of the cornea is formed by a certain number of perfectly definite cells, of which the greater part are arranged in fours. Thus in the Peacock Butterfly (*Vanessa Io*) there are seventeen cells, of which sixteen are in fours. These cells are arranged in the following manner. Four of them form a globular mass, flattened at its upper part, which is adherent to the cornea; these are the four cells which secrete the corresponding facet of the cornea, which proves, like all chitinous membranes, to be an extracellular production. The four nuclei of these cells are still easily recognized in the adult, in which they are adherent to the cornea. Each of these cells secretes in its interior a very refractive globule, which is nothing but the rudiment of one quarter of the crystalline body. In fact, this body, which is single in the adult, is always (in all Insects and Crustacea) composed originally of four distinct parts, which subsequently become united. After these four cells come four others, forming a pyriform mass. This is the rudiment of the nervous baton, which will afterwards attain much greater dimensions, at a period when it will be no longer possible to recognize the four cells composing it, although its production at the expense of these four cells is still indicated by the four-sided prismatic form which it presents in the adult. The point of the pyriform mass rests upon a large single cell, which the author calls the fundamental cell (*Grundzelle*), because it forms the base of the eye properly so called. This cell itself is placed at the extremity of a nervous filament arising from the optic ganglion, and the nine cells form the axis of the optical element corresponding with a single facet. The other eight are destined subsequently to become its enveloping coat. Four of them are placed in the constriction which separates the mass in which the four quarters of the crystalline body are formed from the pyriform mass placed below it; the others in that separating the pyriform mass from the fundamental cell. During evolution the former always become filled with a pigment, the colour of which, in many species, is different from that of the pigment deposited at the same time in the top of the nervous baton.

Sometimes the number of cells composing the optical element is much greater, but this multiplication affects exclusively the cells of the enveloping coat. This takes place, for example, in *Æschna grandis*, in which the number of cells of the envelopes properly so called is raised from four to thirty-two, and the pigment-cells are also greatly increased in number.

In a physiological point of view, the author shows that the theory of vision in the Arthropoda, as established by Müller, cannot be sustained, however ingenious it may be. In fact, if this theory were well founded, those insects which have only a small number of facets in the cornea (such as the Ants, which have only fifty) would be utterly incapable of perceiving images. Even those which have the greatest number would be extremely short-sighted; and M. Claparède calculates that a Bee would be unable to discern the opening of its hive at the distance of a few feet. Now everyone knows that the sight of a Bee is much longer than that. The author concludes that each element corresponding with a facet must be regarded as a complete eye. But it is clear that in this case the principle of identical points does not exist for these eyes, and that we must suppose the animal to possess the power of perceiving impressions in the direction of the rays which strike each facet.—*Siebold und Kölliker's Zeitschrift,* 1859, p. 191; *Bibl. Univ.* June 20, 1860; *Bull. Sci.* p. 161.

Results of Soundings in the North Atlantic.

To the Editors of the Annals of Natural History.

Gentlemen,—During the recent survey of the proposed North Atlantic Telegraph route between Great Britain and America, conducted on board H.M.S. Bulldog, some important facts have revealed themselves, from which it would appear that all preconceived notions as to the bathymetrical limits whereby animal life is circumscribed in the sea are more or less erroneous. The mighty ocean contains its hidden animate as well as inanimate treasures; and it is probable that, under proper management, the former may speedily be brought to light, whatever may be the ultimate fate of the latter. In short, we are almost warranted, from the evidence already at our command, in inferring that, although hitherto undetected, a submarine fauna exists along the bed of the sea, and that means and opportunities are alone wanting to render it amenable to the scrutiny of the naturalist.

In sounding midway between Greenland and the north-west coast of Ireland, at 1260 fathoms—that is, at a mile and a half below the surface, in round numbers—several *Ophiocomæ* were brought up, clinging by their long spinous arms to the last fifty fathoms of line. They were alive, and continued to move their limbs about energetically for upwards of a quarter of an hour after leaving their native element. The species seems allied to *O. granulata,* Link, the specimens varying from 2 to 5 inches across the rays. Lest it be supposed that these *Ophiocomæ* were floating or drifting in the water at any point intermediate between the surface and bottom, it is only necessary to mention that the determination of depth having been effected by a separate operation and apparatus, the more tedious process of bringing up the sample of bottom is entered on; and, owing to the difficulty of finding out the exact moment at which ground is struck, a considerable quantity of line in excess of the already ascertained depth is usually paid out. This quantity therefore rests on the bottom for a short time until the sounding-machine is again hauled up. The *Ophiocomæ* were adherent to this last fifty fathoms only, and were not secured at all by the sounding-machine. It is quite clear therefore that they were met with on the surface-layer of the deposit. The distance from the nearest point of Greenland to the spot at which this sounding was made is 500 miles, and to the nearest point of Iceland (namely an isolated rock called the 'Blinde Skier,' about seventy miles from the mainland) 250 miles; so that, admitting the possibility of the Starfishes having been drifted by currents, for argument's sake, the character of the fact would be in no way affected. The structure and habits of the Echinoderms generally are too well known, however, to render such a mode of accounting for their presence in the position referred to possible.

On careful dissection, I found no appreciable anatomical difference between these *Ophiocomæ* and the species frequenting shoal waters. The deposit on which they rested consists of *Globigerinæ*, so pure as to constitute 95 per cent. of the entire mass. Their occurrence where the *Globigerinæ* are to be met with both in greatest quantity and purity, together with the circumstance that in the stomach of the *Ophiocomæ* the *Globigerinæ* were detected in abundance as alimentary matter, corroborates the evidence I have obtained from other facts as to the normal habitat of the latter organisms being on the immediate surface-layer of the deeper oceanic deposits, and not in the substance of the superincumbent waters. At the same time it substantiates the truth of the Starfishes having been captured on their natural feeding-ground.

I also detected, in a sounding made at 1913 fathoms, a number of small tubes varying in length from $\frac{1}{16}$th to $\frac{1}{4}$th of an inch, and about a line in diameter, which, on being viewed under the microscope, turned out to be almost entirely built up of young *Globigerina*-shells cemented side by side, just as we find to be the case in the tubular cells of some of the Cephalobranchiate Annelids, where sandy or shell particles are employed in their formation. There can hardly be a doubt, therefore, that some minute creature, probably an Annelid, lives down at this enormous depth, and feeds on the soft parts of the Foraminifera, whilst he houses himself with their calcareous shells. As yet, I have been unable to determine the nature of these creatures, but hope to be enabled to succeed on a more lengthened survey of the material in which they occur.

Lastly, I would mention having met with the minute bodies termed "Coccoliths" by Professor Huxley. They occur in vast numbers, associated with larger cell-like bodies on the surface of which Coccoliths are arranged at regular intervals, so as to lead to the inference that the latter are in reality given off from the former in some way. The larger cell-bodies and the Coccoliths on them are imbedded in a gelatinous envelope. The presence of these organisms in largest quantity in those deposits in which the *Globigerinæ* occur alive in the greatest profusion and utmost state of purity, would also seem indicative of their being a larval condition of the latter.

I remain, Gentlemen, very faithfully yours,

G. C. WALLICH.

DR. HILGARD'S "*Organotaxis.*"

The *à-priori* or transcendental method in anatomy has evidently strong charms for some of our transatlantic brethren. In the 'Transactions' of the Academy of Science of St. Louis for 1859, vol. i. no. 3. p. 416, there is a paper by one of the curators, Dr. Theodore C. Hilgard, M.D., "on Organotaxis," in which the dreamy and imaginative Oken is out-Okened. One good effect of this curious production of our voluble contemporary will be to show what may be done by a good tall fellow in this line of business, especially when such a worker is unyoked from reason and judgment. We shall give a specimen of Dr. Hilgard's paper—not to instruct, but to warn the student; whilst the mere quotation of the author will be tantamount to putting him in the pillory.

Thus, in page 418, speaking of what he calls "the pterygo-maxillary extremity" (of the cranium), Dr. Hilgard says *: "The fin or hand to this extremity we find in perfect likeness to a bat's hands, in the lake muscalounge (masque-allongée, Esox sp., length 5 feet). The interior ones, agglutinated to the nasal vertebra, constitute the *nasal bones* of the face; the stout second forms the *true maxillaries*, with teeth, like the nasal bones inclusive of sesamoids; the third, a finger of five bones, forms the infra-orbital osselets, in likeness of a cartilaginous *nostril-wing* surrounding the jawless orbit; the fourth is a long arcuate beam, with a terminal phalanx agglutinated, a *labial* forming the outer mask-bone of the upper jaw; and the fifth or thumb, a labial *stump* as the thumb of bats and birds. The numbers of digital phalanges, as of cyclar elements, may vary among the different cyclar numbers." And in page 427 we have this profound utterance:—"The eye is the representative of the seed or focal cycle, forming the centre and climax of floral as well as visceral cyclosis."

Under the heading "Somatic Strata, Visceral Cycles, and Cryptogamæ," at page 424, we have the *cytosporous*, *aërifero-membranous*, *scatent*, *incrustate-cancellate*, and *spiral* elements, types, characters, and functions. To the first the following lucid passage applies:—"The *cytosporous* or cell-shedding, pulverulent cycles' function—the fervid and vital, fermentative and effervescent action—, we find largely and emphatically represented in the diffuse, cytogenetic, and, *par excellence*, eremacaustic fungine thallus, mouldy, pervasive, katalytic, chafing and consuming, under the form of fermentation, the noctilucent decay of wood and of putrid decomposition. Like the central caloric of Earth, it inhabits the *bulk* of substances. In animate organisms, we find its function repeated in the (fermentatively) specific action of cellular contents, of the glands, olfactorio-intestinal crypts, the brains and ganglia, the fat and marrow. The nerves supplying organs once severed, says Reclam, the specific action of the glands becomes tempestuously paramount, producing heat and excitement; a proof of the inherency of bio-chemical action in the glands, while to the nerves, brains, and the ganglionic masses belong the specifically *bio-dynamic* energies. The antheral process of fructification in Aroids is known to produce considerable heat. The sudatory mucorine spores, like a moist dew, fore-fashion perspiration; their fermentative exhalation of carbonic acid gas, respiration," &c. &c. &c.

The art of finding silly similitudes and aptless analogies can neither be advanced much further than the author pushes it, nor more flauntingly arrayed in sounding words than in this classico-technico-American garment of wordy nonsense.

* The *italics* are the author's own.

INDEX TO VOL. VI.

END OF THE SIXTH VOLUME.

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