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THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

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VOL. XVII.



LONDON:

PRINTED AND PUBLISHED BY R. AND J. E. TAYLOR.

SOLD BY S. HIGHLEY; SIMPKIN AND MARSHALL; SHERWOOD AND CO.; W. WOOD,
TAVISTOCK STREET; BAILLIERE, REGENT STREET, AND PARIS:
LIZARS, AND MACLACHLAN AND STEWART, EDINBURGH:
CURRY, DUBLIN: AND ASHER, BERLIN.

1846.

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



. hîc obitus rerum contemplor et ortus,
 Et quibus è causis ordine cuncta fluant.
 Et disco, quidquid varios mare gignit ad usus,
 Quidquid et omnifero terra benigna sinu.
 Sæpe juvat solem gelidâ vitare sub umbrâ,
 Multaque de plantis arboribusque loqui.
 Quid varios pisces, et nata corallia ponto
 Eloquar, et conchis ostrea tecta suis?
 Ille sed æquoreæ numerum subducatur arenæ
 Qui volet undivagos enumerare greges.

P. LOTTICHI Elegiarum lib. iii. eleg. 4,—lib. ii. eleg. 6.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

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

No. 109. JANUARY 1846.

I.—*Note on a new Genus of Nudibranchiate Mollusca.* By GEO. J. ALLMAN, M.B. &c., Professor of Botany in the University of Dublin.

IN the autumn of 1842 I obtained in a salt-marsh about three miles to the west of Skibbereen, county Cork, a small Eolidiform Nudibranch, which on examination appeared to possess characters entitling it to the construction of a new genus for its reception.

It existed in great numbers in the salt-marsh, which was never, except at the very highest spring tides, flooded by the sea. The day was bright and warm when I met with this curious little animal. Many had crept quite out of the water and were crawling over the moist fronds of *Enteromorpha intestinalis*, and seemed to delight in exposing their slimy bodies to the influence of the warm autumnal sun. Others swarmed on the mud in the little shallow pools of the marsh, where their ova were abundantly deposited in the usual gelatinous masses characteristic of the eggs of the Nudibranchiate Gasteropods, a fact which is of itself sufficient to prove that this strange semi-marine and even semi-aqueous habitat was quite natural to our little Nudibranch. Their bodies were enveloped in an exceedingly abundant mucous secretion, which was poured out more copiously than I recollect to have witnessed in almost any other Gasteropod, and which is perhaps

in some way connected with their singular, almost amphibious habits.

I collected several specimens which I placed in spirits, but I unfortunately neglected to examine with any accuracy the animal in its recent condition, and it was not till several months afterwards, when I was making a complete survey of my collection, that the salt-marsh Nudibranch received the attention to which it was entitled. On sending specimens to Messrs. Alder and Hancock, as the first authorities on the subject, their examination coincided with my own in proving our little mollusk to be a creature of great interest.

The specimens having been preserved in spirits (a circumstance which in the case of the invertebrate animals demands from the naturalist the greatest caution in his attempts to establish zoological characters), our examinations were by no means so satisfactory as we could have wished; not however being restricted in our investigation to a single specimen, we were enabled in some degree to counteract the difficulties which the state of the specimens threw in the way of our inquiries, and succeeded in establishing characters by which the Nudibranch of the salt-marsh appeared to be generically distinguished from all hitherto described.

Perhaps the most anomalous character is the absence of tentacula. Indeed so strange is this fact, that for a long time I thought it was only apparent, and the result of a badly-preserved state of the specimens. A most careful examination however of several individuals having failed to detect any trace of these organs, I have no hesitation in concluding that their absence is real, and this will therefore constitute an important generic character.

Another highly interesting character is the dorsal and median termination of the rectum, which opens near the posterior extremity of the body on the mesial line of the back by a small tubular orifice, a most unusual though not unprecedented condition in the *Eolididæ*.

Our mollusk has been dissected by Messrs. Hancock and Embleton, but neither these gentlemen nor myself could detect any trace of corneous jaws. They have succeeded however in demonstrating a linear, jointed tongue covered with spines, or what they are rather inclined to consider as flat plates. A system of gastric ramifications seems also to exist, but from the state of our specimens we could make out nothing satisfactory as to its distribution.

From the facts now mentioned I had little difficulty in convincing myself that the mollusk at present under consideration possessed characters which excluded it from all hitherto esta-

blished genera, and I accordingly noticed it at the York Meeting of the British Association in Sept. 1844, under the name of *Alderia amphibia*, an appellation under which it has been also recorded by Mr. Thompson in his Report on the Invertebrate Fauna of Ireland, and by Messrs. Alder and Hancock in their Report on the British Nudibranchiate Mollusca.

Shortly after my noticing the little animal in question as a new genus of Mollusca, I received a letter from Mr. Alder, accompanying an extract from a paper by Dr. Lovèn of Stockholm, which had just appeared in a foreign periodical, and which contains an account of a Nudibranchiate mollusk referred by Lovèn to the genus *Stiliger*, Ehrenberg, and described by the Swedish naturalist under the name of *S. modestus*.

On comparing Lovèn's description of *S. modestus* with the subject of the present communication, it was evident that Lovèn's animal and the Nudibranch of the Irish salt-marsh were the same. A reference however to the characters of Ehrenberg's genus *Stiliger*, rendered it by no means so apparent that Lovèn was correct in the generic location of his mollusk.

Under this difficulty Mr. Alder received a letter from Dr. Lovèn, in which is the following passage respecting *S. modestus*:—

“A very rare animal. It is now ten years since I found my two specimens, one of which was lost by accident. Fortunately I described and figured it alive, for I never met with any more. *Stiliger*, Ehren., has only one species, and as it requires but little to widen its characters enough to let in my new species, I thought it advisable to do so, and still think I was right in so doing. At least I have not a superfluous genus on my conscience. Nothing is more easy than to make new genera, but the question is to find out the true generic characters, which, particularly in the Nudibranchia, is rather difficult.”

On the above passage, Mr. Alder in a letter to me remarks: “So far Dr. Lovèn; and after his opinion, you will perhaps scarcely venture to institute your new genus, though Mr. Hancock and I, after mature consideration, think you would be right in doing so.” With the English naturalists I agree, and my original opinion with respect to the necessity of a new genus for the reception of the salt-marsh Nudibranch remains unaltered. The characters indeed of this mollusk can scarcely be confounded with those of *Stiliger*, and in order that this matter may be made more apparent, I here subjoin Ehrenberg's characters of the last-mentioned genus from the ‘*Symbolæ Physicæ*.’

“*STILIGER*, nov. gen.

“*Gen. Char.* Habitus *Eolidiæ*. Corpus oblongum, pallio discreto nullo. Latera corporis branchiarum stiliformium seriebus

longitudinalibus instructa. Tentacula duo tantum ante duos ocellos in vertice sita. Anus (et apertura sexualis ?) in medio dorso."

Ehrenberg's genus includes but a single species, namely *S. ornatus*.

It will here be seen that *Stiliger* is at once distinguished from the new genus by the presence of tentacula. In Lovèn's description of *S. modestus* he gives as a character, "tentacula lateralia, minuta tuberculiformia extrorsum vergentia." The organs however here called tentacula are certainly incorrectly so named; they are merely lateral prolongations of the head. *S. ornatus* on the contrary has two long genuine tentacula situated on the vertex, "tentacula duo longa ante oculos in vertice posita."

In Ehrenberg's figure the anus is represented as occupying a position considerably anterior to that assumed by this orifice in *Alderia*. In the latter it is placed near the posterior extremity of the body as in *Doris*, while in *S. ornatus* it is placed over that part of the animal usually occupied by the heart. This however, as Mr. Alder in a letter which I have from him observes, would not perhaps of itself afford a character sufficient for generic separation. Altogether Ehrenberg's figure is that of a very different-looking animal from Lovèn's *Stiliger modestus*, so that upon mature deliberation, and with the full concurrence of Messrs. Alder and Hancock, I have determined upon the retention of the genus which I originally established for the reception of the Nudibranch of the Irish salt-marsh.

It must always be borne in mind that the account now given is the result of an examination of spirit specimens, and therefore necessarily imperfect; the characters assumed as generic, however, I believe to be indubitably established, and we must only look forward to the detection of recent specimens throwing additional light upon the structure of this most interesting little animal.

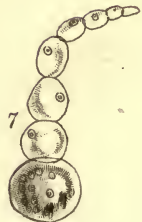
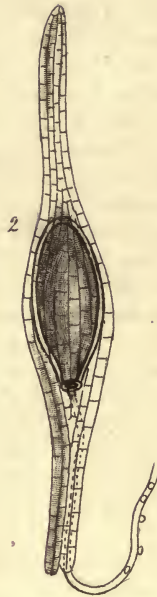
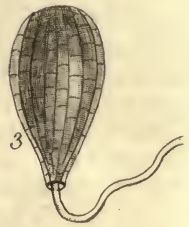
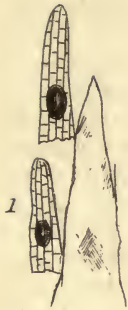
The genus which it is necessary to construct for the reception of the new Nudibranch, I have great pleasure in dedicating to Joshua Alder, Esq., whose researches among this curious tribe of Mollusca constitute one of the many striking features by which modern zoological research is characterized; and from whose labours, in conjunction with those of Mr. Hancock, natural science is now receiving so valuable a contribution in the beautiful work of these gentlemen on the British Nudibranchiate Mollusca.

The following are the characters of the genus:—

Nov. gen. ALDERIA.

Gen. Char. Corpus oblongum. Capitis latera utrinque in lobum producta; ore maxillarum experti linguam armatam in-





cludenti. *Tentacula* nulla. *Branchiæ* styliiformes dorsi lateribus utrinque affixæ. *Anus* subposticus in medio dorso. *Aper-tura sexualis* pone caput in latere dextro.

Species unica *A. modesta**, Lovèn.

Hab. in limo, locis maritimis parum profundis.

II.—Contributions to the Physiology of Fecundation in Plants.

By G. DICKIE, M.D., Lecturer on Botany in the University and King's College of Aberdeen †.

[With a Plate.]

ALTHOUGH many interesting observations respecting fecundation in plants were contributed by the older botanists, it is chiefly to observers of the present century that we owe the facts now known respecting the structure of the ovule, its development previous to, and further progress after impregnation. The contributions of Brown, Amici, Brongniart, Mirbel and others to this department are invaluable, and when Schleiden in 1837 announced the "grand doctrine" as it has been called, that the extremity of the pollen-tube reaches the embryo-sac, indents it, carries it before it, and is itself then actually converted into the embryo, physiologists who formerly had written on this subject were stimulated to repeat their inquiries, new observers also entered the field, and the rash generalization of the observer alluded to has actually been the means of furnishing important additions to our knowledge of this most interesting branch of vegetable physiology. It can scarcely be doubted that much still remains to be known respecting this subject, and judging from the history of its progress, an accurate and complete acquaintance with it can only be arrived at by degrees and by the efforts of different observers. The quaint remarks of Nehemiah Grew, in his 'Anatomy of Plants,' appear to be so applicable to this matter, that no apology need be made for quoting them; he says, "That nothing hereof remaineth further to be known is a thought not well calculated. For if we consider how long and gradual a journey the knowledge of nature is, and how short a time we have to proceed therein; as on the one hand we shall conclude it our ease and profit to see how far others have gone before us, so shall we beware on the other, that we conceive not unduly of nature, whilst

* Though Lovèn's specific name, *modestus*, was evidently given to contrast with *ornatus*, the name of Ehrenberg's species, I have nevertheless abstained from changing it, though the congeneric relationship with *Stiliger* has been broken, and the name been consequently deprived of its original significance.

† Read before the Botanical Society of Edinburgh, Nov. 13, 1845.

we have a just value for those who were but her disciples and instructed by her. Their time and abilities both being short to her; which, as she was first designed by Divine Wisdom, so may her vast dimensions best be adjudged of in being compared therewith. It will therefore be our prudence not to insist upon the invidious question, which of her scholars have taken the fairest measure of her; but to be well satisfied, that as yet she hath not been circumscribed by any. Nor doth it more behove us to consider how much of the nature of vegetation may lie before us yet unknown, than to believe a great part thereof to be knowable. Not concluding from the acknowledged, much less supposed unsuccessfulness of any man's undertakings, but from what may be accounted possible as to the nature of things themselves."

On the Ovule of Narthecium ossifragum.

It is unnecessary to give any minute account of the ovarium in this plant; suffice it to say, that about the time of impregnation, in general form it resembles a Florence flask, the stigma is perforated, a canal traverses the style and appears to communicate with each cell of the ovary. Some authors seem to have misunderstood the structure and mode of attachment of the ovules: thus Endlicher, in his 'Genera Plantarum,' says, "Ovula e funiculis longis erecta;" and again, "Semina plurima, longe filiformia, funiculo crassiusculo elongato." In Sir W. J. Hooker's 'British Flora,' the seeds are described as having "a very long *arillus* forming an appendage to each extremity." The ovules have clearly no attaching cord; the outer membrane, of a lax cellular texture, is very greatly produced beyond the secundine and nucleus; the point of attachment to the placenta is by the edge of the exostome, from which, in consequence of the excessive development of the primine, there is a canal of some length leading to the foramen of the secundine and to the nucleus. In only one instance have I seen a distinct funiculus as is represented at fig. 4, Plate I., the usual mode of attachment being that which has now been described and is illustrated by fig. 1. This highly-developed primine has been mistaken for an arillus, from which however it is very different—at least if we follow the usual acceptance of the term.

While engaged in examining the ovules of *Narthecium* shortly after the bursting of the anthers, I found numerous transparent slender-tubes on the surface of the placenta, and on careful examination was able to trace them to the mouths of ovules. I concluded at first that they were pollen-tubes, and proceeded to examine their connexion with the ovules. On dissecting off the primine, which is not a very difficult operation owing to its loose

adhesion to the other coats, I found the tubes to enter the mouth of the secundine, but after repeated observations was unable to detect any such connexion as that described by Meyen to occur between the end of the pollen-tube and the embryo-sac in some species of *Mesembryanthemum*, &c.; instead of which, the tube and the apex of the nucleus (as at present I suppose it to be) seemed perfectly continuous, the one being apparently a gradual prolongation of the other. This therefore induced me to examine the tubes in their whole course, and there were seen what I supposed to be the same tubes, terminating upwards in blind extremities. In one capsule the pollen grains which had fallen on the stigma were very few, while the ovules (in the same capsule) were most of them supplied with the organs described; I concluded, therefore, that they were not at all connected with the pollen. The position of the exostome in reference to the apex of the placenta (it is directed to the base of that organ, and consequently away from the descending pollen-tubes) appeared also to present an insurmountable objection, unless we suppose the pollen-tubes to be possessed of a remarkable instinct, which I presume physiologists would hesitate to ascribe to them. They must, in order to reach the nucleus after descending, find their way to the exostome and then ascend, passing along the canal leading to the endostome. The smallness of the aperture in the outer membrane and its irregular margin would render it difficult for a pollen-tube to hit upon it exactly, keeping out of view altogether its direction. On the outside of the tubes described, were numerous spherical molecules, some of which were in active motion, and occasionally a few similar particles were seen in their interior. I afterwards found that these molecules were abundant in the tissue of the placenta. The opinion first entertained about these organs (*ovule-tubes*), viz. that they had their origin from the pollen, was for these reasons abandoned. Supposing them to be prolongations of some part of the ovule itself, an objection having reference to the position of the exostome, and the passage of the tubes upward towards the apex of the placenta, might with great justice be urged; I found, however, that they in common have a great tendency to become tortuous and bent upon themselves: such a tube therefore, on issuing from the exostome, and on being bent from its original direction, would come in contact with the placenta, and might have its further course regulated by contact with that organ. Without however laying much stress upon this, or venturing to speculate more in the matter, it may be remarked that the mode of growth of the tube would assist materially in regulating its course, especially if its increase in length took place at

the extremity and not through its whole extent. The objections to the tubes being prolongations from the ovule will lose their force, when we call to mind the remarkable facts ascertained by the late Mr. Griffith respecting the ovule of *Santalum*. In this plant the nucleus is naked, primine and secundine being absent; at a certain stage "a tubular membrane protrudes from the centre of the apex of the nucleus, in which no opening can be detected previously. This tubular membrane passes down at first in the direction of the axis of the ovulum, but becomes immediately recurved, and passes up one side of the ovulum and in close apposition to the placenta;" again, "the tubes remain in apposition to the placenta, and continue to be simple, membranous, elongated, closed tubes." (Linn. Trans. vol. xviii. p. 60, &c.) This membranous tube Mr. Griffith believed to be the sac of the amnios, "which in ordinary structures lines the cavity formed in the nucleus at some period previous to fecundation, and which, at least in its earlier stages of development, is the only coat that is membranous." M. Ad. Brongniart many years ago announced the discovery in the interior of the nucleus of a special membranous tube often prolonged beyond the ovule, and which establishes a communication between the conducting tissue of the placenta and the point where the embryo is formed. This was observed in some *Cucurbitaceæ*, in several species of *Polygonum*, and other plants. The same structure had however been previously discovered by M. de St. Hilaire. These *ovule-tubes* are probably of more frequent occurrence than has been supposed: I have seen them in great abundance on the placenta of *Bartsia Odontites* and *Euphrasia officinalis*: I was unable to trace their origin from the pollen, but had no difficulty in seeing their connexion with the ovules, and their adhesion to or rather continuity with the apex of the nucleus. It was at first suspected that they were pollen-tubes; this idea was soon abandoned when they were found to terminate in blind extremities toward the upper part of the placenta. In young ovules they were seen protruding from the exostome in the form of minute transparent papillæ; in others further advanced their increase in length was very evident. Similar tubes were found in connexion with the ovules in *Parnassia palustris*. I believe them to be prolongations of the apex of the nucleus in *Narthecium*, *Bartsia* and *Euphrasia*.

In the 16th volume of the 'Transactions of the Linnæan Society,' Mr. Brown, in his essay on the Mode of Fecundation in the *Orchideæ*, has stated the existence of "mucous cords" or tubes on the placenta of several plants belonging to that family. In the first part of this essay Mr. Brown supposed that these tubes were actually derived from the pollen, but he had not been

able satisfactorily to trace them to the ovules. In an appendix, however, this opinion is essentially changed, and the direct origin of these tubes from pollen grains is doubted; it is also stated that in *Orchis Morio*, *Habenaria viridis* and *Ophrys apifera* they were traced into the apertures of the ovule. M. Schleiden spoke with greater confidence, and described the pollen-tube in the *Orchideæ* as entering the foramen of the ovule, its extremity becoming converted into the embryo; Meyen expressed himself to the same effect, and Link has represented this occurrence in *Gymnadenia conopsea*.

That "mucous tubes" are found in connexion with the ovules cannot be called in question; that these are pollen-tubes appears to be not yet satisfactorily proved.

Such tubes are abundant in *Habenaria viridis*, and from an examination of this plant I have reason to believe, but shall not at present positively assert, that the tubes are derived from the ovules themselves and not from the pollen.

The ovule in the *Orchideæ* is of exceedingly simple structure; a nucleus, at first partially, afterwards entirely covered by a single membrane, the two becoming ultimately so fused together that the testa appears composed of one layer only. Mr. Brown, in the essay already quoted, states that soon after this change a minute opaque body makes its appearance about the middle of the cavity of the testa; he also traced a jointed thread from its apex nearly to the open end of the testa. This thread, with its dilated extremity, Meyen and Schleiden have mistaken for a pollen-tube. Mr. Brown very accurately describes this thread as consisting of a simple series of short cells, "the lowest cell being probably the original state of what afterwards becomes the embryo." I believe that a prolongation of the uppermost cell of this thread, beyond the opening of the testa, accounts for the presence of the mucous tubes so abundant upon the placenta. The appearances described can be readily seen in *Habenaria viridis*, and the simple cellular structure of the embryo, even when nearly mature, is evident in *Goodyera repens*. The jointed thread in *Habenaria viridis* is at first straight, and the cells composing it have a firm adhesion to each other; when the lowest cell (the embryo) has attained considerable size and is nearly mature, the cord which issues from the mouth of the ovule breaks off at some joint near this opening; the rupture is preceded by an evident change in the mutual position and connexion of the cells, the whole cord becomes tortuous, the points of adhesion of the cells diminish in extent, and the joints easily separate from each other. Even in seeds to all appearance fully ripe I have seen the thread broken off at the mouth of the testa, while the remaining cells were still

attached to the embryo. The ripe seed of this plant, as well as other *Orchideæ*, is quite destitute of vessels* ; in *Narthecium* vessels do not appear until some time after fecundation.

It is exceedingly probable that the emission of such prolongations, *ovule-tubes* as they may be called, to meet the descending *pollen-tubes*, may be of frequent occurrence. It is possible that some of those cases in which pollen-tubes are described as having been seen entering the foramen of the ovule, may have been instances of such prolongations as exist in *Narthecium*.

Supposing it to be a settled point that contact of pollen-tubes with some part or other of the ovules is necessary to secure the full development of the embryo,—and some authors are of this opinion,—there seem many physical difficulties in the way of the pollen-tubes reaching their destination ; these have reference to the length of the style, the nature of the tissue of which it consists, the form of the ovule, the position or direction of the exostome, the number of the ovules and other circumstances. Sure it is, that difficulties cannot stand before demonstration. True pollen-tubes have no doubt been in many instances traced into the tissue of the stigma and style, and in some cases to the placenta, and it may be, even to the ovule itself, but instances of this last are far from numerous. In order to secure the effect of the pollen upon the ovule, or at all events to diminish the chance of this action failing, it may not be unreasonable to expect that some such arrangement would be provided as that, the existence of which in *Narthecium* I have been attempting to prove. Observers so frequently meet evident instances of design in the structure of organs,—it may even be said of less importance than those under discussion,—that it is extremely probable the present may be a case in point.

It has been already remarked, that the number of the ovules presents a difficulty in the way of the contact of a pollen-tube with each ; and where they are very numerous and arranged in regular series from the base to the apex of the placenta, it is very evident that those occupying the latter position stand a better chance of being fecundated than those toward the lower part. The emission of tubes from the ovules to meet the descending pollen-tubes would evidently diminish the chance of failure. In such cases it would be interesting to ascertain whether all are usually impregnated or what proportion of them only, and whether those taken from the upper part of a capsule contain a greater proportion of fecundated individuals than those from the lower part of the same.

* *Callitriche verna* presents an instance of non-vascularity in filaments and anthers.

The position of the exostome in reference to the direction from which the pollen-tubes come, presents also a difficulty: *Narthe-cium* is a remarkable instance, and many others must be familiar to those who have been accustomed to dissect ovaries and ovules.

In certain cases, some ovules, owing to the direction of the exostome, are more favourably placed for fecundation than others in the same capsule; for example, in certain species of *Spiræa*, *Æsculus* and others. There are instances in which only one ovule reaches maturity, the other or others in the same capsule being abortive: a question arises whether this has any connexion with the development or non-development of certain parts of the ovule, or to the obstacles presented to the action of the pollen; some remarks on this will be found in the essay of the late Mr. Griffith, in reference to *Santalum* and *Osyris*, whose embryology he has so admirably illustrated. The question respecting the particular part of the ovule which sends off a prolongation to meet the descending pollen-tubes may be left for future consideration; suffice it for the present to say that *ovule-tubes* do exist in several families; their presence has been shown in plants belonging to the *Cucurbitacææ*, *Chenopodiaceæ*, *Polygonaceæ* and *Santalaceæ*, and to these may be added *Juncaceæ*, *Scrophularineæ* and *Parnassieæ*, probably also in *Orchideæ*. The mode of contact between *ovule-tubes* and *pollen-tubes*, and the subsequent changes, will also present an interesting field for investigation. The subject is one of considerable importance, and it is remarkable that in most physiological works, even the more recent, no allusion whatever is made to it, although Brongniart's observations were published many years ago. There is great reason to suspect that when transparent tubes have been seen attached to ovules, they have, without further examination, been set down as originating from the pollen.

EXPLANATION OF PLATE I.

- Fig. 1.* Fragment of placenta and two ovules of *Narthe-cium* some time previous to fecundation.
- Fig. 2.* Ovule from the same plant about the time of fecundation, showing *primine*, *secundine* and *nucleus* with its tube.
- Fig. 3.* *Secundine* and *nucleus* extracted from the *primine*. This figure must be considered more as a plan made out from several observations than an actual representation of the appearance seen in any one ovule.
- Fig. 4.* A solitary instance in which a distinct funiculus existed.
- Fig. 5.* Young embryo and its jointed thread from *Habenaria viridis*.
- Figs. 6 and 7.* The same at more advanced periods.

III.—*Notes, &c. on the genera of Insects Phyllobius, Polydrosus and Metallites.* By JOHN WALTON, Esq., F.L.S.

THE insects of these genera are pre-eminently distinguished by having the body adorned with shining or brilliant scales of various shades of green, whilst others have a splendid metallic lustre of various hues; nearly all the species are subject to considerable variation in the colouring of the scales and legs.

I sent specimens of each of the following to M. Schönherr and Dr. Germar, and I have their authority for the names and synonyms referred to them.

Fam. CURCULIONIDÆ.

Genus PHYLLOBIUS, *Schönh., Germar*; NEMOICUS, *Steph.*

§ A. *Femora dentate.*

1. *Phyllobius calcaratus*, Fab., Schönh., Steph. Man. p. 249.
 — *cæsius*, Marsh.
 — *Pyri et cæsius*, Steph. Illust. iv. p. 147.
 — *ærginosus et cæsius*, Kirb. MSS.*

This insect, from its very great similitude to the following, has frequently been confounded with it, and erroneously referred by many entomologists to *Curc. Pyri* of Linnæus; but the accurate and experienced eye of Gyllenhal detected the characters by which it may be discriminated: it differs from *P. Alneti* in having the scales setaceous-lanceolate; the antennæ and its articulations longer and more slender, the scape reaching beyond the base of the head; the third and fourth joints of the funiculus distinctly longer; the thorax less impressed and constricted anteriorly; the scutellum of the form of an isosceles triangle, having the apex deeply truncated and rounded; the legs and antennæ rufous, rufo-ferruginous or rufo-castaneous, very rarely nigro-piceous. Mr. Stephens has in his cabinet a splendid series of varieties, some of which are clothed with golden or coppery-coloured scales; these he refers to *Curc. Pyri* of Linnæus, and others with green scales to *cæsius* of Marsham; I presume he now considers them as the *P. calcaratus* of his 'Manual' and of Schönherr.

Found in the south in boggy woods, and on the banks of rivers on the alder (*Alnus glutinosus*) the beginning of June; and in Yorkshire on the common birch (*Betula alba*) in similar situations: it is rather local and not frequently met with.

* It must be understood that the names of insects cited from Kirby's MSS. are verified according to his museum, although not stated; and those with a note of interrogation he refers with doubt to Marsham.

2. *Phyllobius Alneti*, Fab., Steph.— *Pyri*, Gyll., Schönh.— *cnides*, Marsh., Kirb. MSS.— *angustatus*, Kirb. MSS.

Very closely allied to the preceding, from which it may be distinguished in having the scales subelliptical, the antennæ and its joints shorter and stouter, the scape scarcely reaching to the base of the head, the third and fourth joints of the funiculus distinctly shorter and stouter, the thorax broadly and deeply constricted in front; the scutellum triangular, with the apex acuminate; the legs generally black, sometimes dull rufo-ferruginous or piceous. The greater part have the scales green or bluish-green, very rarely of a brassy-copper; occasionally specimens are found of a dull ash-gray, but I have never seen one of a fiery coppery-gold.

Found abundantly upon the common stinging-nettle (*Urtica diæca*), and on *Umbellifera* at the sides of hedges in June.

3. *P. Pyri*, Linn. (Mus. Linn.), Marsh.— *vespertinus*, Fab., Herbst, Schönh., Kirb. MSS.— *Mali*, Fab., Herbst, Marsh., Gyll., Steph., Kirb. MSS.— *amaurus*, Marsh., Kirb. MSS.

This insect, which has some resemblance to the two preceding, may at once be discriminated by having the basal joints of the funiculus of the antennæ shorter and of equal length; it is variable in its habits: when found on trees the scales are commonly of a bright red copper-colour, with the legs and antennæ rufous or testaceous; and when found amongst grass the scales are of a silvery-gray, with the femora black at the apex, and the tibiæ and antennæ piceous or dull testaceous.

Considerable doubt and confusion have hitherto existed relative to the identity of *Curc. Pyri* of Linnæus, but the Linnæan cabinet and his description prove decisively that that name must inevitably be applied to this insect, and not to the preceding, with which the description does not agree. In the Linnæan museum there are two insects pinned to the name "*Pyri*," clothed with golden coppery scales of a fiery-red, and the legs and antennæ rufescent; the first on the left is *Curc. micans* of Fab., having the femora simple; the second on the right is *Curc. Mali* of Fab., with the femora distinctly dentate. Linnæus has thus clearly mixed two species, but from the peculiar colour of their scales ("*aureo-igneus*"), and the colour of their legs and antennæ ("*rufescentes*"), it is evident he had these two insects in his eye when he described his *Curc. Pyri*, and the term "*femoribus dentatis*" of his description decides unequivocally to which insect the name should be applied; the first, being larger and more shining, he supposed was the female. Donovan and Marsham

have also mixed the two species; the former has figured *Curc. micans* and described the "*thighs dentated!*"—the latter refers to Donovan and has copied the description of Linnæus. Stephens, in his 'Syst. Catal.,' refers *Curc. Pyri* of Donovan and Marsham to *Curc. micans*; but Kirby in his manuscript, although he also refers it to the same species, has placed a note of doubt—"an *Marshami*?" *Curc. amaurus* of Marsham, according to a specimen in the Kirbian collection, and which agrees with Marsham's description, is certainly a variety of this insect with silvery-gray scales, and the apical half of the femora black.

Abundant on oaks and other trees in or near woods, and sometimes amongst grass in June.

4. *Phyllobius argentatus* of authors.

Curc. argentatus, Linn., Mus. Linn.

P. flavidus et femoralis, Kirb. MSS.

This insect, although very liable to be confounded with the following, is readily distinguished from it, by having the eyes less prominent, the rostrum shorter, the antennæ entirely rufous or testaceous, with the basal joints of the funiculus unequal, the second joint being distinctly more slender and longer than the first; the legs rufous or testaceous, the femora sometimes piceous or black: the form of the thorax varies considerably in this and the succeeding species from subcylindrical to subglobose, with intervening forms, and the femora of some individuals are more robust—hence the name *femoralis* of Kirby; these however are only regarded as sexual disparities, and are all referred to this inconstant species.

Abundant throughout the country from May to August.

5. *P. maculicornis*, Germ., Gyll., Steph., Schönh.

—*nigripes et angustior*, Kirb. MSS.

This differs from *P. argentatus* in having the head depressed in front, the eyes distinctly more prominent; the rostrum longer and dilated at the apex, elevated and deeply furrowed above; the antennæ testaceous, with the apex of the scape piceous and the clava fuscous, the basal joints of the funiculus of equal length; the legs black; the tibiæ and tarsi sometimes obscure testaceous.

Rather rare in the south of England; I have found it in meadows at Mickleham and at Birch Wood in June, and abundantly in Yorkshire amongst grass on the magnesian limestone.

6. *P. oblongus* of authors.

Curc. oblongus, Linn., Mus. Linn.

—*rufescens*, Marsh., Kirb. MSS.

—*testaceus*, Kirb. MSS.

Nemoicus oblongus, Steph.

Some examples of this insect have the head and thorax entirely black, and others rufo-ferruginous.

I think there is too close a resemblance in general habit and affinity, as well as in the form of the head, and the analogous construction of the antennæ, between this and the insects of the present genus, to admit of a generic separation; it is therefore located here, in accordance with the views of Schönherr, followed by the continental entomologists.

Rather common in woods and hedges from May to July.

§ B. *Femora simple.*

7. *Phyllobius Pomonæ*, Oliv., Germ., Steph.

— *uniformis* et *albidus*, Steph.

— *obscurior*, Kirb. MSS.

M. Schönherr informed me that he considered this insect as not sufficiently distinct from the following, and quoted from a letter the opinion of Germar, that *Pomonæ* and *uniformis* were the same species; this I communicated to Germar, and he having previously received from me many specimens of both, remarked—“*Phyll. Pomonæ*, Germ., without doubt; I am of your opinion that it may be different from *uniformis*.” the two species are extremely alike, but they are different in their habits, and I have never taken them in company; they may also be separated by habit; I have therefore always regarded them as distinct species. The differences of form and sculpture are not very apparent, unless the extreme varieties of each species are contrasted; the shape of the thorax is more uniform or less variable than in *uniformis*, and it is comparatively longer and narrower in proportion to the breadth, less dilated at the sides, flatter above, and sometimes carinated in the middle; the elytra are also longer and narrower in proportion to the breadth, and somewhat different in form: but it is immediately distinguished by always having the breast and abdomen more or less densely clothed with scales, whilst *uniformis* has the same parts sparingly covered with fine short hairs; both species are exceedingly variable in size and in the colour of the parts of the legs and antennæ.

Very abundant amongst grass in Hackney marshes and in Yorkshire the latter end of June; but never, according to my experience, on trees.

8. *P. uniformis*, Marsh., Kirb. MSS., Schönh.

— *parvulus*, Gyll., Steph. (non Fab. secund. Germ. et Schönh.).

— *minutus*, Steph.

— *Pomonæ*, Schönh. Supp. vii. p. 35.

This insect generally has the thorax shorter in proportion to the length than the preceding, more dilated at the sides, and more convex above, with a tendency (like *P. argentatus*) to the

subglobose form; the elytra are likewise shorter in proportion to the breadth, the base elevated and slightly straightened behind the shoulders. I think that Mr. Stephens has not a typical specimen of *Curc. uniformis* of Marsham, but the examples in Kirby's MSS. and museum which he refers to Marsham agree with this species.

Found very abundantly in hedges on the black-thorn and on *Umbelliferae* from May to July.

9. *Phyllobius viridicollis*, Fab., Gyll., Steph., Schönh.

The form of almost every organ of this insect is extremely similar to the preceding; but it differs in having the scales elliptic-lanceolate; the head and thorax coarsely rugose-punctate, the latter glabrous above, and sprinkled with green scales at the sides; the elytra nearly glabrous.

I have received numerous specimens from Mr. R. N. Greville, found in the neighbourhood of Edinburgh, and Dr. Greville informs me, that it is in some years so abundant that a dozen specimens may be taken with one grasp of the hand on *Alchemilla vulgaris*; in Sweden, according to Gyllenhal, it inhabits *Artemisia campestris*.

GENUS POLYDROSUS, Germ., Schönh.

§ A. *Femora simple*.

1. *Polydrosus undatus*, Fab., Gyll., Germ., Steph., Schönh.

— *fulvicornis*, Steph.

Curc. selenius, Marsh., Kirb. MSS.

— *rufipes*, Linn., Mus. Linn.

Curc. fulvicornis, Fab. and Gyll., is nearly allied to this insect, from which, however, it may be instantly known by having, independent of other characters, the head black, the rostrum, thorax and elytra ferrugineous or rufo-castaneous. There are two authentic examples of *Curc. fulvicornis* in the collection of Kirby from Gyllenhal, and I possess several foreign specimens with that name from the collection of Billberg. *P. fulvicornis* of Stephens is, according to the two insects in his cabinet, a variety of *P. undatus*. I have never seen a British specimen of *Curc. fulvicornis* of Fabricius. Dr. Germar has recorded his opinion*, that the description of *Curc. rufipes* by Linnæus does not at all agree with this species.

Common on the oak underwood in the woods of Kent and Surrey in June.

* Ent. Zeit. Stettin, no. 5. p. 99, 1842.

2. *Polydrosus micans*, Fab., Herbst, Gyll., Germ., Steph., Schönh.
— *Pyri*, Linn., Mus. Linn., Kirb. MSS. ?

The general colour of the scales of this insect are of a coppery fiery-red.

Not frequently met with. I have taken it in Swanscombe Wood, near Gravesend, on the oak underwood in June.

3. *P. flavipes*, DeGeer, Gyll., Steph., Schönh.

Major Gyllenhal has described this insect with his accustomed accuracy and precision, and Mr. Stephens has given shorter descriptions in his 'Illustrations' and in his 'Manual of British Coleoptera'; but from its near affinity to *P. pterygomalis*, it has hitherto been confounded by British entomologists with that species; it differs principally in being clothed with fuscous hairs, the abdomen with scales, and in being distinctly different in the form of the head. I have specimens of *P. impressifrons* from Chevrolat, which is decidedly more closely allied to this species than *P. pterygomalis*, and with much difficulty distinguished from *P. flavipes*; yet I am satisfied it is sufficiently distinct; it differs chiefly in having the head narrower, the vertex less convex and slightly dilated behind the eyes, the frons very deeply impressed, the eyes less prominent, the rostrum elevated at the sides and much depressed above; the thorax flat above, with a deep oblong impression on each side behind the middle, and very sparingly clothed with shorter hairs.

Of *P. impressifrons* and *P. flavovirens* of Schönherr and of Stephens's 'Manual,' I have never seen indigenous specimens.

In the cabinets of Mr. Waterhouse, Mr. S. Stevens and myself.

Taken in Windsor and Henhault Forests, and also near Hammersmith Bridge, by Mr. S. Stevens, by brushing amongst grass the beginning of June: rather local and not frequently met with.

4. *P. pterygomalis*, Schönh. Supp.

— *flavipes*, Marsh., Kirb. MSS.

Oblong, black, clothed with brilliant green scales sometimes of a shining golden colour, and with erect pallid hairs. Head broad, the vertex transversely elevated and very distinctly carinated on both sides, narrowed at the base and thickly punctulated; eyes round and prominent, black; rostrum very short, scarcely half the length of the head and nearly as broad, the apex testaceous and emarginated. Antennæ reaching beyond the base of the thorax pallid testaceous, pubescent; clava oblong, acuminate. Thorax rather broader than long, narrowed and constricted anteriorly, moderately rounded at the sides, transversely convex in the middle, closely and thickly but not deeply punctulated, the punctures confluent. Scutellum triangular.

Elytra oblong, with the shoulders rounded, convex above, punctate-striate, the interstices rather convex, minutely granulated; the abdomen black, sparingly clothed with fine short hairs, but without scales. Legs moderate, pallid testaceous, pubescent; femora clavate. Length $2-2\frac{1}{2}$ lines.

This insect is dissimilar in its habits from the preceding; it is generally less, more slender, the scales more brilliant, the hairs on the body paler, and the abdomen without scales; the shape of the head is very different, being shorter and narrower at the base, the vertex transversely elevated and very distinctly carinated on both sides; the thorax also differs, but the above characters are sufficient to distinguish it from its congeners.

In many cabinets, but referred to *P. flavipes*.

Not very common, but occasionally found rather plentiful in woods on the birch, hazel, and other trees in June.

5. *Polydrosus sericeus*, Schall., Gyll., Schönh.

— *splendidus*, Herbst.

— *squamosus*, Germ.

— *speciosus*, Steph., Curt.

I possess foreign specimens of this beautiful insect from Germany, with the name "*Polydrosus sericeus* of Schaller."

It was discovered by the Rev. G. T. Rudd in a wood near Kimpton, Hants, in June, and as far as I know, has not hitherto been found in any other locality; it appears to be extremely local.

§ B. *Femora dentate*.

6. *P. planifrons* (Dej. Cat.), Schönh.

— *argentatus*, Oliv.

Oblong, black, densely clothed throughout (except the tarsi and antennæ) with rich green scales, the upper surface without hairs. Head rather large, subquadrate, closely punctulated, the frons more or less depressed, with a deep fovea in the middle; rostrum a little shorter and narrower than the head, the apex triangularly emarginated. Antennæ reaching to the base of the thorax, slender, the joints rufous or testaceous, with their apices piceous and the clava fuscous. Thorax short, transverse, a little narrowed and slightly constricted anteriorly, the sides moderately dilated and rounded, and nearly plane above. Elytra with the shoulders elevated, subrectangular, convex above, punctate-striate, the interstices broad and flat, and transversely strigated. Legs rather stout; the femora and tibiæ black, the former denticulated; the tarsi rufous. Length 3 lines.

There is a specimen of this insect in the cabinet of the British Museum, but I cannot learn where it was taken. I possess foreign examples from Chevrolat.

7. *Polydrosus Chrysomela*, Oliv., Schönh. Supp. vi. p. 447, Germ.
 — *sericeus*, Steph., Curt., non Schaller.
 — *pulchellus*, Steph. Manual, p. 249.

In my long series of varieties of this insect I have recent specimens clothed with shining green scales, some golden-yellow or coppery-red, and others of a silvery-gray; older specimens are found with the scales more or less abraded, and the colour of the legs obscure testaceous, and sometimes the femora are piceous: the form of the elytra varies very remarkably; some are considerably narrowed, and the sides nearly straight, whilst others are much broader, having the sides regularly dilated and rounded from the shoulders to the apices, and very convex above; the second and sixth interstices from the suture on each elytron are more or less distinctly lineated, in consequence of being more densely clothed with paler scales than the others.

Specimens which I sent to Germar were referred to "*P. Chrysomela*, Oliv., Schönh." *P. sericeus* of Stephens and Curtis (according to the insects in their cabinets) is beyond all doubt identical with this species, and it is my opinion that *P. pulchellus* of Stephens (represented in his cabinet by one insect) is but a narrow variety with "*golden griseous scales*."

Apparently a littoral or sub-maritime insect: I have taken it on grassy banks, just above high-water mark, on the shores of the Thames below Gravesend, and at Burnham, on the coast of the Bristol Channel, the beginning of June.

8. *P. confluens* (Kirb. MSS.), Steph. Illust. (1831).
 — *amaurus*, Steph.
 — *Chrysomela*, Schönh. ii. (1834), Steph. Manual (1839).
 — *perplexus* (Dej. Cat.), Schönh. Supp. vi. (1840).

Mr. Stephens appears to be the first author who described this insect, since which he refers it in his 'Manual of British Coleoptera' to *Chrysomela* of Olivier after Schönherr; subsequently Schönherr, in his Supplement, changed the name for *perplexus* of Dejean Catal., and upon the authority of Schuppel, applies *Chrysomela* to the preceding species.

I possess two foreign insects from Chevrolat, with the name *perplexus* of Dejean, which are identical with the *confluens* of Kirby.

I have taken this insect rather plentifully near Lyndhurst, Hants, and also on the south side of Windmill Hill near Gravesend, and in other places, always on the furze (*Ulex europæus*), in July: on broom at Plumstead, Charlton and Weybridge from June to September, Mr. S. Stevens.

9. *Polydrosus cervinus*, Linn., Marsh., Gyll., Germ., Steph., Schönh.— *melanotus*, Kirb. MSS., Steph.

Curc. melanotus of Kirby, according to his collection, is a small green variety of this insect, with the legs black and the tarsi dull piceous; the scales on the upper surface are abraded.

This is a common and well-known insect, and found abundantly on the young shoots of the oak and birch in woods during the months of May and June.

GENUS METALLITES, Schönh., Germ., Latr.

“*Gen. Char.*—Antennæ somewhat short and stout; the scape clavate, slightly curved, overhanging the eyes; the basal joints of the funiculus rather long obconic, the rest nodose; the club oblong-ovate, acuminate. Rostrum short, narrower than the head, somewhat flat above, parallelopiped. Eyes small, rounded, rather prominent. Thorax either subtransverse or oblong, the base and apex truncated, moderately rounded at the sides, a little narrowest in front. Elytra oblong, suboval, their base when united subemarginate, the shoulders either obtusely angular or slightly rounded; a little convex above. Legs nearly equal; thighs toothed or simple.

“*Obs.*—Body oblong, scaly, furnished with wings; of small size. Allied to the genus *Polydrosus*, but differing in the structure of the rostrum and antennæ.”—*Extracted from Schönherr.*

This genus was established by Schönherr, and subsequently adopted by Germar and Latreille; at present it contains eight European species, one of which inhabits this country. I possess foreign specimens of *Metallites mollis* of Germ., and *M. atomarius* of Oliv., presented to me by Dr. Germar.

These insects differ from those of the genus *Polydrosus* in having the antennæ and its articulations considerably shorter, more robust, and of a dissimilar form; the eyes smaller, and the thorax elongate.

1. *Metallites marginatus*, Steph.— *ambiguus*, Schönh.

Birch Wood was for some years the only known locality for this insect, where it is found abundantly on the juniper and other plants in May and June; but the zeal and industry of Mr. S. Stevens discovered it in Windsor Forest and Black Park near Uxbridge, on the young shoots of the birch, oak, &c.





Delphinus Tursio Fabr.

IV.—*Observations on a specimen of the Bottle-nosed Dolphin, Delphinus Tursio, Fabr., taken at Great Yarmouth, October 1845.*
By THOMAS BRIGHTWELL, F.L.S.

[With a Plate.]

A CETACEOUS animal, which appears to me to be the *Delphinus Tursio* of Fabricius, was captured off Yarmouth this season by the herring fishermen and brought to Norwich. I saw it soon after its arrival, when it was in a fresh state, and have procured a good coloured figure of it, one-tenth the natural size, a reduced copy of which I send herewith (Plate II.). As the animal appears to be very rare on our coasts, and but imperfectly known to naturalists, I doubt not a good figure and description of it will be acceptable to your zoological readers.

This cetacean was eight feet two inches long, and four feet ten inches in circumference at the largest part. The colour of the upper part and sides a very rich deep purple-black. The external cuticle was of a soft and silky texture, and so thin and delicate that it was easily rubbed off. The nose, and a well-defined line along the upper jaw, and the whole of the lower jaw and belly, were of a cream-colour, varied in some parts by a chalky-coloured white, contrasting beautifully with the rich black of the body. The fins and tail were of the same colour as the back. The length of the mouth was nine inches and a half, with twenty-four teeth in the upper jaw and twenty-three in the lower jaw; the teeth small, conical, and rather sharp. The length from the tip of the nose to the eye thirteen inches. From the tip of the nose to the pectoral or lower fin, twenty inches: this fin was fifteen inches long. From the tip of the nose to the dorsal fin forty-one inches, and this fin was eleven inches and a half wide next the back, and ten inches high. The width of the tail twenty-two inches. The animal was a female, and weighed about thirty stone. Both the jaws were clearly but moderately elongated, the lower extending a little farther than the upper; and there was a well-defined depression between the elongation of the upper jaw and the forehead, the point of this depression being marked by a slight ridge. The blow-hole was of a horse-shoe form, with the convex part towards the head of the animal.

The *Delphinus Tursio* is not noticed in Sir William Jardine's very useful little work on the Cetacea, but it is figured and described in Mr. Bell's 'British Quadrupeds,' p. 469. On a reference to that work, it will, we think, appear that we have rightly concluded our animal to be of this species. The points of generic and specific distinction are the beaked prolongation of the head and the form of the teeth. The figure sent will

show the character of the head; and the skeleton of the head is in preparation for the Norwich museum, where the teeth and skull can be examined by those who may wish to test the above description.

V.—*Descriptions of new or imperfectly described Diurnal Lepidoptera.* By EDWARD DOUBLEDAY, Esq., Assistant in the Zoological Department of the British Museum, F.L.S. &c.

[Continued from vol. xvi. p. 308.]

Fam. PIERIDÆ.

Genus PIERIS.

Pi. Habra. Pi. alis omnibus supra albis, anticis costa ad basin, macula discoidali, alteraque marginis externi, magnaue apicis in qua maculæ tres albæ, nigris, posticis supra nervulis juxta marginem tenue nigris, subtus pallidis, fusciscenti, flavo, alboque variis, vitta ad basin miniacea. Expans. alar. 2 unc. 7 lin. vel 66 millim.

Hab. Honduras.

Anterior wings pure white, the costa at the base black, irrorated with white, the apex broadly and triangularly black, the outer margin marked below the middle with a rounded black spot united to the black of the apex, the disco-cellular nervule marked with a dot of the same colour. Posterior wings pure white, the nervules at their extremities slightly black. Below, the anterior wings are marked nearly as above, but the apical markings are very pale brown, and the light spots are of a pale yellow instead of white; the base is shaded with fuscous along the costal, subcostal and median nervures. Posterior wings below very pale brown, slightly pearly, the nervures and nervules, a series of lines along the cellular folds, two lines in the cell, a large spot about the middle of the anterior margin, and the outer margin broadly pale fuscous; four bright yellow vittæ extend from the base along the cellular folds for about two-thirds of their length, of which one is above the subcostal nervure, the others between the cell and the abdominal margin; between the median nervules are two spots of the same colour and opposite to the disco-cellular nervule is a third; the black outer margin is marked with a series of white spots, slightly tinted with yellow; the costa is miniaceous at the base.

Head black with a few white hairs on the vertex; palpi black above, varied with white below; antennæ black, the apex white.

Thorax clothed with long gray hairs. Legs white, with a black line on each side of the femora and tibiæ.

Abdomen white.

In the collections of the British Museum and W. W. Saunders, Esq.

The only specimens I have seen of this species were brought home by Mr. D. Dyson, who found them in an Indian cane at some distance from Balize.

Pi. Clemanthe. Pi. alis anticis utrinque nigris, albo irroratis vittisque, posticis supra albidis, fimbria lata marginali nigra, in qua maculæ sex albidæ; subtus luteis, macula baseos miniaceæ; nervis, fimbriaque lata marginali, in qua maculæ quatuor luteæ, tresque albidæ, nigris. Exp. alar. 3 unc. 6 lin. vel 90 millim.

Hab. Moulmein.

Anterior wings black, the base and inner margin irrorated with white, the cell with four not very well defined vittæ; two similar ones between the median and radial nervures, followed at some distance by a geminate spot near the outer margin; six others not well-defined, especially about the middle of their course, run between the subcostal, discoidal and median nervules. Posterior wings covered near the abdomen with very long hairs, of a very light cream-colour or whitish, the outer margin broadly bordered with black, the black colour extending along the nervules, this black border with six whitish spots between the nervules. Below, anterior wings slightly glossed with bronzy, less irrorated with white than above, the markings more defined, especially towards the inner margin, which is nearly white. Posterior wings bright yellow, the base with a round miniaceous spot, the nervures and nervules black, the fimbria rather narrower than above, marked with four large yellow spots, followed by three whitish ones.

Head and thorax grayish; antennæ black, marked with white below; abdomen white.

In the collection of the British Museum.

In the form of the wing and in the colouring of the upper surface this species resembles the female of *Pi. Hyparete*; but in the colouring of the under surface and the more important character of the neuration of the wing it is allied to *Pi. Autothisbe*. I have only seen the specimen in the Museum collection.

Pi. Lea. Pi. alis anticis maris supra albis, margine externo nigro, posticis albis, macula magna ad angulum ani læte aurantiaca, margine externo anguste nigro, subtus, anticis fuscis, vitta lata in cellulam, fascia pone cellulam maculari, margineque interno late, albis; maculaque intra apicem flava, posticis flavis, fimbria lata marginis externi, in quo maculæ luteæ, nervisque nigris: fœminæ alis anticis supra fuscis, basi flavescenti irroratis, maculis vittisque albis signatis, posticis supra flavis, margine externo fusco, macula magna ad angulum ani brunnea; subtus flavis, nervis, nervulis, fimbriaque lata, in qua maculæ quatuor flavæ, fuscis. Exp. alar. 2 unc. 6 lin. vel 63 millim.

Hab. Moulmein and Sarawak.

All the wings of the male above white, the anterior with the base slightly irrorated with black, the costa narrowly black, the outer margin with a border of the same colour broad and deeply dentate internally towards the apex, narrower and less deeply dentate towards the anal angle, median nervure and outer part of the subcostal black. Posterior wings white, with a narrow black border dentate internally, the base itself pale yellow, the space between the cell and the inner and outer margins as far as the cellular fold between the middle and outer median nervule bright luteous orange. Below, the anterior wings are fuscous, with purplish and bronzy reflections, irrorated with yellow along the costa; a vitta in the cell, a transverse macular band beyond it, and the whole inner margin as far as the cell white; the apex with a short yellow band divided into three parts by the nervules. Posterior wings bright yellow, orange towards the anal angle, with a broad fuscous border in which is a distinct yellow spot towards the outer angle, and also some slight clouds of the same colour; costal, subcostal and median nervures black.

Female with the anterior wings above fuscous, the costa irrorated with pale yellow, a vitta in the cell, five vittæ beyond, of which the third is the shortest, a submarginal series of six not well-defined spots, and a spot on the inner margin yellowish white. Posterior wing yellow at the base and along the inner margin, the anal angle occupied by a large tawny brown patch, the outer margin broadly fuscous except at the anal angle, costal and subcostal nervules bordered with the same colour. Below, nearly as in the male, but paler.

Head and thorax clothed with grayish white hairs; antennæ black, ringed with white.

Abdomen black above, side yellowish.

In the collection of the British Museum.

This beautiful species, of which I have only seen the pair in the collection of the Museum and a specimen sent from Borneo by H. Low, Esq., jun., is closely allied to *Pi. Judith*.

Pi. Rhena. *Pi. alis omnibus maris supra læte sulphureis costa anguste nigra, margine externo late nigro-fusco, supra, in anticis præsertim, flavo nebuloso, subtus, maculato; feminae supra albidis, anticis margine externo nigro, posticis serie marginali punctorum nigrorum; subtus, anticis albis margine externo fusco, lutescenti maculato, posticis lutescentibus puncto costali, margineque externo, fuscis, hoc lutescenti maculato. Exp. alar. 2 unc.—2 unc. 3 lin. vel 50—64 millim.*

Hab. Ashanti.

Above, the male is bright sulphur-yellow, the costa of the anterior wings narrowly black, the outer margin of all the wings rather broadly fuscous, very much clouded with yellow on the

anterior wings, slightly so on the posterior; below, all the wings are rather paler, the outer margin of the posterior is marked with a series of seven somewhat oval yellow spots, that of the posterior with six lunulate ones, the costa of the posterior wing has a round fuscous spot beyond the middle.

Female above yellowish white, the costa of the anterior wings fuscous, the outer margin broadly and irregularly of the same colour; the posterior wings have an irregular fuscous spot at the outer angle, and on the outer margin four cuneiform spots: below, the markings are nearly the same as in the male, but the ground-colour of the anterior wings is nearly white, the costa and spots in the fuscous border lutescent; the posterior wings are marked nearly as in the male, but the border is more broken by the light spots; the ground-colour is lutescent and the costa at the base is luteous.

Head varied with black and yellow; antennæ black, spotted with white.

Thorax clothed with light yellowish hairs.

Abdomen pale yellow.

In the collection of the British Museum and W. F. Evans, Esq.

The only specimens I have seen of this species are a male in the Museum collection which I had considered as a variety of *P. Hedyle*, Cram., and a female in the collection of Mr. Evans. Knowing now both sexes of *P. Hedyle* and this species, I am quite sure of their distinctness. It is near to these that my *P. Ianthe* must be placed, though for some reasons this last seems nearer to *P. Calypso*. It is the *P. Pisinoë* of Dr. Boisduval's cabinet.

Pi. Theora. Pi. alis anticis utrinque luteis, margine externo late nigro, nigredine intus dentato, posticis margaritaceis, albis, supra margine nigro, maculis utrinque submarginalibus nigris, subtus maculis marginalibus alteraque discoidali luteis. Exp. alar. 2 unc. 6 lin. vel 60 millim.

Hab. Ashanti.

Anterior wings above bright luteous, the inner margin slightly paler, the outer margin broadly black at the apex, gradually less so towards the anal angle; this black border deeply sinuate opposite to the cell, dentate below the uppermost median nervule. Posterior wings pearly white, the outer margin narrowly and irregularly black, preceded by a series of six indistinct fuscous spots, those nearest the outer angle best defined. Below, the anterior wings are coloured as above, but the black margin is divided by a macular band composed of six spots, of which two are ovate near the apex, having between them a small linear one, the three following lunulate or cuneate. Posterior wings beautifully pearly white, the outer margin with a series of black spots on the ner-

vures, alternating with luteous ones placed on the folds between the nervures, these preceded by a submarginal series of black spots; there is a luteous spot on the disco-cellular nervule, and a faint one of the same hue between the median and radial nervures:

Head varied with white and black; antennæ black, spotted with white.

Thorax and abdomen yellowish white.

In the collection of the British Museum.

Allied to *P. Calypso*, but easily distinguished by its bright luteous upper wings and the beautiful pearly whiteness of the under surface of the posterior.

VI.—*Notes on Birds*. By T. C. EYTON, Esq., F.L.S.

No. V.

[With a Plate.]

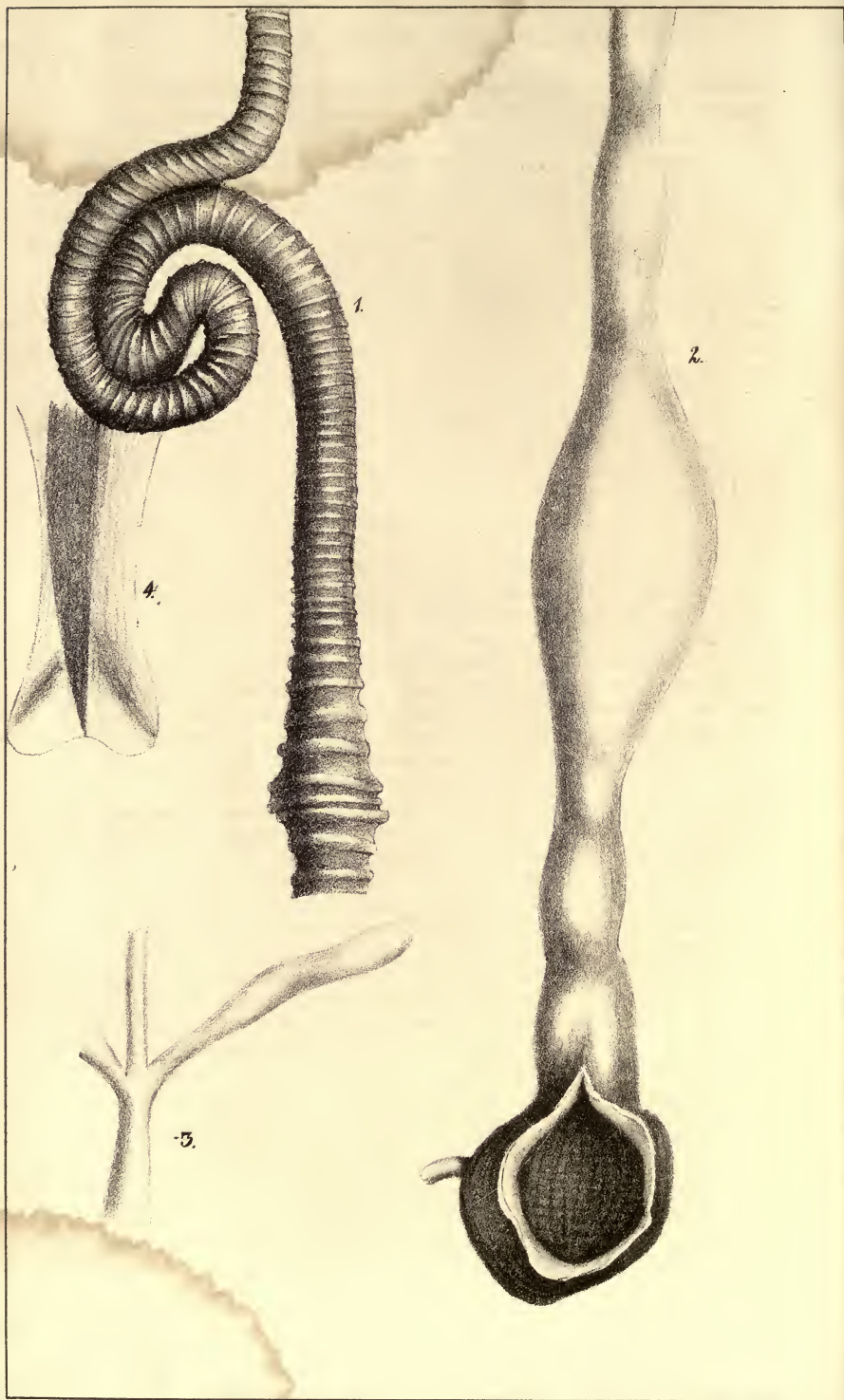
[Continued from vol. viii. p. 47.]

Aramus scolopaceus, Bon. (male).

THE œsophagus at its upper extremity is when inflated half an inch in diameter, but is dilated near its middle into an oval crop fully two inches in diameter and three in length; there is also another slight enlargement immediately above the proventriculus: the total length of the œsophagus from the epiglottis to the proventriculus is thirteen inches. The proventriculus is one inch in diameter and nearly two in length when inflated; its upper portion is fleshy and thickened, but the coats become thinner as it becomes more expanded; it is contracted immediately above the stomach. The stomach is moderately muscular and slightly oval. The epithelium is hardened and rugose towards its lower portion. The greatest length of the gizzard is two inches, and its greatest diameter is one and a half inch. The small intestine is a quarter of an inch in diameter, and uniform from the gizzard to the rectum, and two feet three inches in length. The cæca are of moderate size, and consist of sacs three-quarters of an inch in diameter for two-thirds of their length and contracted to a quarter of an inch before their entrance into the rectum; they are slightly larger near the middle than at their upper extremity. The right cæcum measures three inches in length, the left two and a half inches. The rectum is seven and a half inches in length, and very slightly larger than the small intestine. The cloaca is of moderate size, measuring half an inch in diameter, and with the coats not much thickened.

The trachea is of small diameter for the size of the bird, and largest at its upper and lower extremities; at the distance of three inches above the bronchiæ, it is convoluted towards the right side on itself, the form of which will be best explained by the Plate. The bony rings become much stronger and more massive above the bronchiæ, and have a larger interval of membrane between them; they





are also laterally compressed. The bronchiæ are almost entirely membranous, having only seven or eight weak and narrow rudimentary rings externally.

The gizzard and œsophagus were filled with a species of zoophyte apparently allied to the common sea anemone. The tongue is long and taper, channeled in the middle and horny; from the epiglottis to its tip it measures five and a half inches.

The sternum of *Aramus* is long in proportion to its breadth, measuring three and a half inches in length, and at its broadest part, which is near its posterior extremity, one inch in breadth; its narrowest point is at the junction of the posterior ribs, where it is eight-tenths of an inch in breadth, from which point it gradually increases in breadth posteriorly and anteriorly. The posterior margin is entire, without any fissure or foramen, but has a slight undulation in the centre opposite to the point of the keel. The keel is eight-tenths in depth at its widest point, which is about one-third of its length from the anterior extremity; its inferior edge is much rounded and the anterior much scolloped.

The os furcatum, coracoids and scapulars are strong and massive; the former arched anteriorly, each branch flattened laterally at its junction with the coracoids, and in the opposite direction at its junction with the sternum, so as to have the appearance of being twisted on its axis; the point at which the branches unite is destitute of any process.

The coracoids are one inch and seven-tenths in length, and jointly occupy the whole breadth of the sternum, being much expanded at their junction with it; their interior edges are furnished with a thin process beginning at their junction with the scapulæ, where it is slightly deflected and continued for about two-thirds of their length, gradually narrowing to that point where it is eventually lost.

The scapulæ are two and a half inches in length, and of uniform breadth to within a short distance of their extremities, where they become pointed, the upper edge becoming deflexed.

The pelvis is two inches and seven-tenths in length from its anterior extremity to the junction of the caudal vertebræ. The upper surface on viewing it laterally presents a waved outline, being depressed near its centre, and somewhat raised between that point and its anterior extremity by means of the anterior branch of the ilium being much expanded. The breadth of the pelvis at its junction with the dorsal vertebræ is one inch; immediately posterior to the articulation of the femur, which is its widest point, the breadth is one inch and a half; between these points the iliac bones are slightly narrowed laterally, so as to present a nearly uniform curve between them. The ischium is placed nearly perpendicularly, the edge of the ilium projecting over it and forming a prominent ridge along the edge of the plane of the upper surface of the pelvis; the ischiadic foramen is of moderate size and oval, its greatest diameter being four-tenths of an inch, and its smallest little more than two-tenths; the obturator foramen is small, or about half the size of the ischiadic one. The os pubis is rather broad, not prolonged far backwards behind the

ischium, and united only to that bone at the upper extremity, so as to form a deep and unbroken fissure between it and the ischium from the obturator foramen along its whole length. The whole length of the cranium from the tip of the bill to the occiput is six inches and eight-tenths; its greatest breadth, which is immediately behind the eyes, is one inch and one-tenth; the frontal bones are elongated over the orbits of the eyes, and measure immediately above them half an inch in breadth; a larger portion of ethmoidal bone than is usual in the order Grallatores is apparent on the forehead. The lacrymal bones project laterally and posteriorly in the same plane with the nasal bones, forming two processes projecting backwards towards the orbits of the eyes. The septum between the orbits of the eyes is not complete, but has a large irregularly-formed foramen through it posteriorly.

The inferior maxillary bones are slightly curved downwards, flattened, broadest at their base and gradually tapering to their tips; the rami are ankylosed together for nearly one-third of their length towards the tip; the base of each ramus is perforated by a large oval foramen half an inch in length and two-tenths in breadth.

The femur is three inches in length and slightly curved in a downward direction. The trochanter is of moderate size and edged.

The tibia is six inches and three-quarters in length. The fibula extends down two-thirds of the length of the tibia; the internal crest is large, flattened laterally and rounded anteriorly; the tarsi measure four inches and eight-tenths in length, and are rather robust for the size of the bird.

The wing-bones are short and weak; the length of the humerus is four inches, that of the ulnar bones four inches and seven-tenths of an inch, and that of the metacarpus two inches.

The formula of the vertebræ is—

Cervical 16; Dorsal 7; Sacral 13; Caudal 7.

The ribs are nine in number, with one false one anteriorly and one posteriorly; they are light and weak, and all, with the exception of the false ones and the last posterior true one, furnished with long narrow osseous splints directed rather acutely upwards.

REMARKS.—In the anatomy of the intestines and œsophagus this bird approaches closely to the *Rallidæ*. The stomach however is not furnished with such powerful muscles, which would not be required in a bird which, judging from the contents of the present subject's stomach and œsophagus, feeds entirely on soft animals. I am not aware of any bird that has a similar convolution of the trachea to that represented in the Plate among Grallatores, or indeed in any other order; convolutions occur in the trachea of *Athropoides Stanleyanus*, Vig., *Ardea Virgo*, Linn., and in the Common Spoonbill, all of which have been figured by Mr. Yarrell in the 'Linnæan Transactions'; in the two former however the trachea enters the sternum, and in the latter the convolution takes place in the interior of the thorax, and is of a dif-

ferent character to that found in *Aramus scolopaceus*. In the form however of the inferior larynx and the trachea, a short distance above it, a resemblance is found to the trachea of *Tantalus*, described by Mr. Brookes in the 'Linnæan Transactions,' those parts being laterally compressed. The Courlan (*Aramus scolopaceus*) is described by Nuttall in his 'American Ornithology' "as being heard by night as well as by day, crying out in a sonorous voice *carau!*" He also states, "that it is well-entitled to the name of the supposed crying-bird of Bartram." In some parts also it is called the clicking hen, under which designation I have received it from Honduras, all which names however denote that it has a peculiar power of voice which the conformation of the trachea fully bears out.

Among the series of skeletons of Grallatorial birds in my possession*, there is not one that approaches to that of *Aramus* in the form of the sternum, the whole of them having either two or four deep fissures in the posterior margin of that bone. I have never seen the skeleton of *Tantalus*, but suspect that *Aramus* approaches very nearly to that genus.

The sternum of *Aramus* is much longer also than that of any of the Grallatorial genera named in the note.

In the structure of the pelvis, legs and ribs, *Aramus* agrees with *Porphyrio* and *Rallus*, but the coracoids, os furcatum, scapulæ and wings are much stronger considering the respective sizes of the birds. The os furcatum also differs in form.

Most Grallatorial birds have the septum between the orbits of the eyes more or less perforated; I cannot therefore derive any information from this character, and I have no grallatorial skeleton in my possession which has the lacrymal bones of the same form.

EXPLANATION OF PLATE III.

Aramus scolopaceus, male.

Fig. 1. Lower portion of the trachea, nat. size.

Fig. 2. Oesophagus and stomach half the natural size.

Fig. 3. A portion of the intestine and left cæcum.

Fig. 4. Posterior portion of the sternum, nat. size.

* I have in my collection the skeletons of species of the following genera: *Tinochorus*, *Porphyrio*, *Ardea*, *Egretta*, *Rallus*, *Botaurus*, *Nycticorax*, *Charadrius*, *Tringa*, *Totanus*, *Scolopax*, *Strepsilus*, *Vanellus*, *Squatarola*, *Limosa*, *Machetes*, *Gallinula*, *Rhynchæa*, *Crex*, *Numenius*, *Hoplopterus*, *Hæmatopus*, *Himantopus*, *Ibis*, *Fulica*, *Phænicopterus*, *Oedicnemus*, *Ciconia*.

VII.—*Notice of Spiders captured by Professor Potter in Canada, with descriptions of such Species as appear to be new to science.*
By JOHN BLACKWALL, F.L.S.

ON the return of my friend Professor Potter from Canada to England in the autumn of 1844, he obligingly transmitted to me specimens of spiders preserved in spirit, which he had captured in that and part of the preceding year in the vicinity of Toronto. The collection comprised twenty-six species, including numerous varieties occasioned by differences in age, sex, and other circumstances of a less obvious character; seventeen of them I have described in detail, under the impression that they are new to arachnologists; one is known to occur in the United States of North America; and the remaining eight species, which are common to the American and European continents, I have introduced as contributing in some measure towards the elucidation of a subject possessing a considerable degree of interest; namely, the geographical distribution of *Araneidea*.

Tribe OCTONOCULINA.

Family LYCOSIDÆ.

Genus LYCOSA, Latr.

1. *Lycosa Babingtoni*.

Length of the female $\frac{5}{6}$ ths of an inch; length of the cephalo-thorax $\frac{2}{3}$; breadth $\frac{7}{8}$; breadth of the abdomen $\frac{5}{16}$; length of a posterior leg $1\frac{1}{8}$; length of a leg of the third pair $\frac{7}{8}$.

Mandibles powerful, conical, vertical, very hairy in front, and provided with strong teeth and long hairs on the inner surface: maxillæ gradually enlarged from the base to the extremity, which is obliquely truncated and fringed with long hairs on the inner surface; they are somewhat curved towards the lip, which is almost quadrate: sternum heart-shaped, hairy: these parts are dark brown, the extremities of the maxillæ and lip being tinged with red. Cephalo-thorax hairy, compressed before, depressed on the sides and at the posterior part, with furrows diverging from the middle towards the lateral margins, and a narrow indentation in the medial line of the posterior region; it is of a brown colour, which is darkest at the anterior part, where the eyes are seated, and it has a narrow, longitudinal, yellowish brown band on each side and in the middle, the latter being the most conspicuous. Intermediate eyes of the anterior row larger than the exterior ones; anterior eyes of the quadrilateral the largest of the eight. Legs long, robust, provided with hairs and sessile spines; fourth

pair the longest, then the first, third pair the shortest; they are of a dark yellowish brown colour, the metatarsi and tarsi being the darkest, and the coxæ are dark brown on the under side. The palpi resemble the legs in colour. Abdomen thickly covered with hairs, oviform, rather larger at the posterior than at the anterior extremity, convex above, projecting over the base of the cephalo-thorax; the upper part is brown with a yellowish tinge, a brown rhomboidal band extending from the anterior extremity along the middle, about half-way towards the spinners; on each side of the broadest part of this band is a small indentation surrounded by yellowish brown hairs; sides and under part yellowish brown, spotted with brown, the spots being much the most numerous on the former. Orifice of the sexual organs bisected by a longitudinal septum, which, with the margins, is reddish brown. Plates of the spiracles brown.

The male is smaller and slenderer than the female, and its legs, palpi, mandibles, maxillæ and lip are paler. The radial joint of the palpi is rather longer than the cubital; the digital joint is of an oblong-oval figure, convex and hairy externally, concave within, at the base, which concavity comprises the palpal organs; they are neither highly developed nor very complicated in structure, the upper part being prominent and projecting a process which curves along the inner side and terminates in a point; their colour is reddish brown with yellowish brown intermixed. The compact extremity of the digital joint is densely covered with long, fine hairs on the under side.

I have much pleasure in dedicating this fine species to Charles Cardale Babington, Esq., M.A., St. John's College, Cambridge, to whom I am indebted for an extensive and highly interesting collection of British spiders.

2. *Lycosa propinqua*.

Length of the female $\frac{1}{2}$ an inch; length of the cephalo-thorax $\frac{1}{4}$; breadth $\frac{3}{16}$; breadth of the abdomen $\frac{1}{5}$; length of a posterior leg $\frac{5}{8}$; length of a leg of the third pair $\frac{7}{12}$.

Mandibles powerful, conical, vertical, and armed with teeth on the inner surface: maxillæ straight, gradually enlarged to the extremity, which is obliquely truncated and fringed with long hairs on the inner surface: lip nearly quadrate, being rather broader at the base than at the apex: sternum heart-shaped: these parts are dark brown, the extremities of the maxillæ and lip being tinged with red. Cephalo-thorax hairy, compressed before, depressed on the sides and at the posterior part, with furrows diverging from the middle towards the lateral margins, and a narrow indentation in the medial line of the posterior region; it is of a dark brown colour, with a broad grayish band extend-

ing along each side and the middle. Intermediate eyes of the anterior row rather larger than the exterior ones; anterior eyes of the quadrilateral the largest of the eight. Legs long, robust, provided with hairs and sessile spines; fourth pair the longest, then the first, third pair the shortest; they are of a reddish brown colour. The palpi resemble the legs in colour. Abdomen thickly covered with hairs, oviform, rather larger at the posterior than at the anterior extremity, convex above, projecting over the base of the cephalo-thorax; it is of a dark brown colour mottled with gray on the sides and upper part, a large gray band extending along the middle of the latter and tapering to the spinners; this band comprises in its anterior part a large, rhomboidal, dark brown figure, bifid at its posterior extremity, between which and the spinners are several transverse, curved lines of the same colour; under part dark brown. Sexual organs and plates of the spiracles reddish brown.

Lycosa propinqua, though nearly allied to *Lycosa andrenivora*, appears to be distinct from that species.

3. *Lycosa distincta*.

Length of the female $\frac{1}{4}$ th of an inch; length of the cephalo-thorax $\frac{1}{8}$; breadth $\frac{1}{10}$; breadth of the abdomen $\frac{1}{9}$; length of a posterior leg $\frac{1}{2}$; length of a leg of the third pair $\frac{3}{8}$.

Cephalo-thorax hairy, compressed before, depressed on the sides and at the posterior part, with a narrow indentation in the medial line; its colour is dark brown, with a broad yellowish brown band extending along the middle, which commences at the posterior pair of eyes, presents an irregular outline, and is narrower at its posterior than at its anterior extremity; a broad longitudinal band on each side, and the frontal margin are of the same hue as the medial band. Intermediate eyes of the anterior row rather larger than the exterior ones; anterior eyes of the quadrilateral the largest of the eight. Mandibles conical, vertical, and armed with teeth on the inner surface: maxillæ straight, gradually enlarged to the extremity, which is rounded; lip nearly quadrate, being rather broader at the base than at the apex: these parts are yellowish brown, the lip being much the darkest. Sternum heart-shaped, dark brown, with numerous whitish hairs. Legs long, provided with hairs and sessile spines; fourth pair the longest, then the first, third pair very little shorter than the second; they are yellowish brown spotted with black. The palpi resemble the legs in colour. Abdomen thickly covered with hairs, oviform, convex above, projecting over the base of the cephalo-thorax; it is brown, with a large band of yellowish brown along the middle, which is marked with some minute brown spots, and is intersected by several slightly curved

brown bars on its posterior half; sides yellowish brown spotted with brown; under part yellowish gray. Sexual organs red-brown. Plates of the spiracles brown.

4. *Lycosa modica.*

Length of the male $\frac{7}{8}$ ths of an inch; length of the cephalo-thorax $\frac{1}{8}$; breadth $\frac{1}{9}$; breadth of the abdomen $\frac{1}{9}$; length of a posterior leg $\frac{1}{2}\frac{3}{4}$; length of a leg of the third pair $\frac{2}{5}$.

Cephalo-thorax long, thinly covered with hairs, compressed before, depressed on the sides and at the posterior part, with a narrow indentation in the medial line; it is of a dark brown colour, with a yellowish brown band extending along each side to the frontal margin, where the two unite, and a longitudinal one of the same hue in the middle. Intermediate eyes of the anterior row slightly larger than the exterior ones; anterior eyes of the quadrilateral the largest of the eight. Mandibles conical, vertical, and armed with teeth on the inner surface: maxillæ straight, and gradually enlarged to the extremity, which is rounded: lip nearly quadrate, being rather broader at the base than at the apex: these parts are red-brown, the maxillæ, which are the palest, and the lip having their extremities yellowish brown. Sternum heart-shaped, dark brown with a faint tinge of red. Legs long, provided with hairs and spines; they are of a yellowish brown colour, with some dark brown streaks on the femora and tibiæ, particularly on the upper side; fourth pair the longest, then the first, third pair a very little shorter than the second. The palpi are browner than the legs, and the humeral joint is amply provided with long black hairs on the under side; the radial joint is larger than the cubital and is abundantly supplied with long black hairs; the digital joint is oval, convex and hairy externally, concave within, at the base, which concavity comprises the palpal organs; they are moderately developed, rather complicated in structure, prominent at the upper part, with a slightly curved, finely pointed spine directed from the inner to the outer side across the middle, and are of a red-brown colour. The compact extremity of the digital joint is densely covered with long fine hairs on the under side. Abdomen thickly clad with hairs, oviform, convex above, projecting over the base of the cephalo-thorax; the upper part is dark brown, with a yellowish brown band extending from its anterior extremity along the middle nearly half-way to the spinners; sides faintly tinged with yellow; under part yellowish brown. Plates of the spiracles brown. Spinners brownish black.

5. *Lycosa saccata*.

Lycosa saccata, Latr. Genera Crust. et Insect. t. 1. p. 120; Walck. Hist. Nat. des Insect. Apt. t. 1. p. 326; Hahn, Die Arachn. b. 1. p. 108. tab. 27. fig. 81.

Lycosa amentata, Sundevall, Vet. Acad. Handl. 1832. p. 177.

Araneus niger, Lister, De Aran. p. 77. tit. xxv. fig. 25.

Family SALTICIDÆ.

Genus SALTICUS, Latr.

6. *Salticus scenicus*.

Salticus scenicus, Latr. Genera Crust. et Insect. t. 1. p. 123; Hahn, Die Arachn. b. 1. p. 57. tab. 15. fig. 43, 44.

Attus scenicus, Walck. Hist. Nat. des Insect. Apt. t. 1. p. 406; Sundevall, Vet. Acad. Handl. 1832. p. 202.

Calliethera scenica, Koch, Uebersicht des Arachnidensystems, Erstes Heft, p. 30. tab. 4. fig. 56.

Araneus cinereus, Lister, De Aran. p. 87. tit. xxxi. fig. 31.

7. *Salticus decorus*.

Length of the male $\frac{1}{3}$ th of an inch; length of the cephalo-thorax $\frac{1}{10}$; breadth $\frac{1}{4}$; breadth of the abdomen $\frac{1}{4}$; length of a leg of the third pair $\frac{5}{4}$; length of a leg of the second pair $\frac{5}{20}$.

The legs of this handsome species are robust, and are supplied with hairs and black sessile spines; coxæ, femora, and tarsi yellowish brown; tibiæ and metatarsi brown; the femora of the first and second pairs have a longitudinal brown streak on the anterior side; third pair the longest, then the fourth, second pair the shortest; below the claws is a small scopula or climbing apparatus. Cephalo-thorax large and nearly quadrilateral, sloping abruptly at the posterior part; the anterior part, which is rather prominent, projects a little beyond the mandibles; its colour is dark brown, with a yellowish brown longitudinal band above the lateral margins, and an obtuse angle of the same hue, whose vertex is directed forwards, immediately behind the posterior eyes; it is provided with coarse white hairs which are densest in front, about the region of the eyes. Mandibles small, vertical, dark brown, with white hairs at their base. Maxillæ straight, enlarged and rounded at the extremity, of a yellowish brown colour. Lip oval, dark brown, with a yellowish brown apex. Sternum oval, yellowish brown, with dark brown margins. Eyes very unequal in size, disposed in three rows, constituting three sides of a square, in front and on the sides of the cephalo-thorax; the intermediate eyes of the frontal row are much the largest, and the intermediate eye of each lateral row

is much the smallest of the eight. Palpi short, yellowish brown, with the exception of the digital joint, which is oval, concave within, convex externally, and dark brown covered with white hairs; the radial joint is much shorter than the cubital, and has a large dark brown apophysis at its extremity, on the outer side; palpal organs highly developed, little complicated in structure, with a curved black spine at the upper part, which is directed downwards on the inner side. Abdomen oviform, thickly covered with hairs, projecting over the base of the cephalo-thorax; it is of a fine red colour on the upper side, with a broad curved transverse band at the anterior part, which extends along the sides to the spinners and becomes narrower as it approaches them, an oval spot near the middle, on each side of the medial line, and large heart-shaped spot at the posterior part, all of a rich dark blue colour; at the anterior extremity, adjoining the cephalo-thorax, is a transverse, crescent-shaped, whitish band; under side yellowish white, with a black longitudinal line in the middle of the posterior part, which is enlarged at the extremity near the spinners. Spinners dark brown, the superior pair being the darkest.

8. *Salticus borealis*.

Length of the female $\frac{7}{8}$ ths of an inch; length of the cephalo-thorax $\frac{1}{8}$; breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{9}$; length of a leg of the third pair $\frac{1}{4}\frac{5}{8}$; length of a leg of the second pair $\frac{3}{16}$.

Legs robust, particularly the anterior pair; they are of a reddish brown colour, and are furnished with white and black hairs and strong spines; third pair the longest, then the fourth, second pair the shortest; below the claws is a small scopula. The palpi are paler than the legs, and are more amply supplied with white hairs. Cephalo-thorax somewhat quadrilateral, abruptly sloping at the posterior part, depressed before, projecting beyond the mandibles in front; it is of a very dark brown colour, with red-brown hairs in the region of the eyes, and is surrounded by a broad band of yellowish white hairs, which are long and directed forwards below the anterior eyes; a narrow black line extends along each lateral margin. Mandibles small and vertical: maxillæ straight, enlarged and rounded at the extremity: lip oval: these parts are dark brown, with the exception of the extremities of the maxillæ and lip, which are yellowish brown. Sternum oval, provided with whitish hairs; it is of a brown colour, the margins being the darkest. Abdomen oviform, pointed at the spinners, densely covered with hairs, convex above, projecting over the base of the cephalo-thorax; the upper part is of a brown colour, with a yellowish brown dentated band extending along the middle; this band is crossed at its broadest

part, which is rather nearer the anterior than the posterior extremity, by a curved line of the same hue, having its convexity directed forwards, and on each side of the posterior part is a curved yellowish brown line, which extends to the spinners; all the yellowish brown marks are rather obscure, and are faintly bordered with black. Spinners brown. Sexual organs dark brown, with a large orifice. Plates of the spiracles dull yellow.

9. *Salpicus fuliginosus*.

Length of the female $\frac{1}{2}$ th of an inch; length of the cephalo-thorax $\frac{1}{12}$; breadth $\frac{1}{16}$; breadth of the abdomen $\frac{1}{12}$; length of a posterior leg $\frac{5}{16}$; length of a leg of the second pair $\frac{1}{8}$. Fourth pair of legs the longest, then the first, second pair a little shorter than the third; the femora and tibiae of the anterior pair are very robust, brownish black, and are densely fringed with long black hairs on the under side, those on the tibiae being the longest; their metatarsi and tarsi are red-brown; the second, third, and fourth pairs of legs are dark brown with reddish brown bands, the femora being the darkest; below the claws is a small scopula. The palpi are short and resemble the legs in colour. Cephalo-thorax somewhat quadrilateral, sloping abruptly at the posterior part, and projecting a little beyond the mandibles in front; its colour is brown-black, with some whitish hairs about the region of the eyes and on the posterior slope, and narrow white lateral margins. Mandibles short, strong, vertical, dark brown tinged with red, and having some whitish hairs in front, near the base. Maxillae straight, enlarged and rounded at the extremity: lip oval; these parts are dark brown with pale reddish brown extremities. Sternum oval, very dark brown. Abdomen oviform, projecting over the base of the cephalo-thorax; it is of a brown-black colour, the upper part being interspersed with light-coloured iridescent hairs, and encompassed by a zone of whitish hairs; two large depressions, placed transversely, occur near the middle of the upper part. Plates of the spiracles dark brown.

The male is smaller and darker-coloured than the female, and the relative length of its legs is different, the first pair being the longest, then the fourth, and the second pair the shortest. Palpi dark reddish brown; the cubital and radial joints are very short, the latter, which is the shorter, projecting a small pointed apophysis from its extremity, on the outer side; the digital joint is oval, convex and hairy externally, concave within, comprising the palpal organs, which are highly developed, not complicated in structure, gibbous and prominent at the base, which extends upwards to the articulation of the cubital and radial joints; their colour is red-brown.

10. *Salticus Sundevalla.*

Length of the female $\frac{1}{2}$ of an inch; length of the cephalo-thorax $\frac{1}{3}$; breadth $\frac{3}{10}$; breadth of the abdomen $\frac{3}{10}$; length of a leg of the fourth pair $\frac{1}{4}$; length of a leg of the second pair $\frac{1}{3}$.

Legs short and robust; the anterior ones, in particular, are powerful, and have the femora dilated; they are amply provided with hairs and strong spines, and are reddish brown marked with dark brown, the latter colour forming obscure annuli at the base of the tibiae and at each extremity of the metatarsi; fourth pair the longest, then the first, second pair slightly shorter than the third; below the claws is a small scopula. The palpi are short, red-brown, and are abundantly supplied with long whitish hairs. Cephalo-thorax large, depressed, and somewhat quadrilateral; it is red-brown, with black lateral margins, which taper from the posterior to the anterior extremity, and the area bounded by the eyes is dark brown; the red-brown parts are covered with grayish hairs, those below the anterior row of eyes being long and whitish. Eyes very unequal in size, disposed in three rows, constituting three sides of a square, in front and on the sides of the cephalo-thorax; the intermediate eyes of the frontal row are much the largest, and the intermediate eye of each lateral row is much the smallest of the eight. Mandibles short, strong, vertical, gibbous near the base, in front, and armed with a few teeth on the inner surface: maxillæ straight, enlarged and rounded at the extremity: lip oval: sternum oval: these parts are dark brown; the mandibles are the darkest, the sternum is much the palest, and the maxillæ and lip are tinged with red at the extremity. Abdomen of an elongated oviform figure, not quite twice the length of the cephalo-thorax, over the base of which it projects a little; it is thickly covered with hairs, and has a broad, dentated, grayish band, somewhat ramified at its posterior extremity, extending along the middle of the upper part, on each side of which is a longitudinal, brownish black band; sides yellowish brown, mottled with dark brown spots; under part yellowish brown, with a large brown band in the medial line, which tapers to the spinners. Plates of the spiracles dull yellow.

The male bears a general resemblance to the female, but it is smaller, darker-coloured, and the relative length of its legs is different, the first pair being the longest, then the fourth, and the third pair being rather shorter than the second. The maxillæ have a conical process at the extremity, on the outer side. The palpi are short; the humeral joint is curved, convex above, plain underneath, with long hairs fringing the edges; it has a short, fine, pointed, pale brown spine near its anterior extremity, in front, and a strong conical projection near its base, on the

under side; the radial joint is provided with an apophysis on the outer side, which has a long slender termination, obtuse at its extremity; the digital joint is narrow, oval, convex and hairy externally, concave within, comprising the palpal organs, which are highly developed, not very complicated in structure, convex and prominent at the base, with an obtuse protuberance on the outer side, and a slightly curved spiny process on the inner side whose point constitutes their anterior extremity; they are of a dark brown colour.

This remarkable species, which is nearly allied to *Salticus tardigradus*, but presents several obvious points of difference in structure and colour, I dedicate to Professor Sundevall of Stockholm, as a testimony of the grateful sense I entertain of the handsome manner in which he put me in possession of his excellent works on arachnology, and of the important information contained in the written communication which accompanied them.

FAMILY THOMISIDÆ.

Genus THOMISUS, Walck.

11. *Thomisus citreus*.

Thomisus citreus, Walck. Hist. Nat. des Insect. Apt. t. 1. p. 526; Latr. Genera Crust. et Insect. t. 1. p. 111; Sundevall, Vet. Acad. Handl. 1832. p. 219; Hahn, Die Arachn. b. 1. p. 42. tab. 11. fig. 32; Blackw. Linn. Trans. v. 19. p. 122.

Thomisus dauci, Hahn, Die Arachn. b. 1. p. 33. tab. 9. fig. 27;

The collection contained specimens with and without a red longitudinal band on each side of the anterior part of the abdomen.

Genus PHILODROMUS, Walck.

12. *Philodromus pernix*.

Length of the female $\frac{5}{10}$ ths of an inch; length of the cephalo-thorax $\frac{1}{8}$; breadth $\frac{1}{8}$; breadth of the abdomen $\frac{1}{7}$; length of a leg of the second pair $\frac{5}{8}$; length of a leg of the fourth pair $\frac{2}{3}$.

Eyes disposed on the anterior part of the cephalo-thorax in two curved transverse rows, in the form of a crescent, whose convexity is directed forwards; the lateral eyes of the posterior row are seated on minute tubercles, the intermediate pair of the same row being rather the smallest, and the intermediate pair of the anterior row rather the largest of the eight. Cephalo-thorax nearly circular, but compressed before, truncated in front, and abruptly sloping behind; it is convex, thinly covered with yellowish gray hairs, and is of a yellowish brown colour, with a large irregular dark brown band extending along each side to the region of the eyes, where a junction of the two takes place, and a longitudinal line of the same hue, whose anterior extremity is the longest, in

the middle of the posterior part. Mandibles subconical, vertical, hairy in front, brown, with two black spots near the base of each. Maxillæ gibbous near the base, on the under side, somewhat pointed at the extremity, inclined towards the lip, of a yellowish brown colour. Lip triangular, rounded at the apex, dark brown. Sternum heart-shaped, pale yellowish brown. Legs long, provided with hairs and sessile spines; they are of a yellowish brown colour spotted with brownish black, particularly on the upper side; second pair the longest, then the first, which a little exceeds the third, fourth pair rather the shortest. Each tarsus is terminated by two curved, pectinated claws, and is provided with a climbing apparatus. The palpi resemble the legs in colour. Abdomen broader in the posterior than in the anterior region, but pointed at the spinners; it is thickly covered with hairs, and its anterior extremity, which projects a little over the base of the cephalo-thorax, is notched in the middle; the upper part is yellowish gray, with a longitudinal dark brown band, which has an angular projection on each side, near the middle, extending from the anterior extremity about half-way towards the spinners; to this band succeeds two distinct, parallel series of oblique bars of the same hue, which diminish in extent as they approach the spinners, and are enlarged and confluent at the extremities; and the whole is encompassed by a brownish black band which does not quite extend to the spinners; four dark brown depressions, situated on the sides of the anterior, medial, dark brown band, two contiguous to its lateral, angular projections, and the other two, which are the largest, near its posterior extremity, form a trapezoid whose shortest side is before; sides and under part yellowish gray, the former being minutely spotted with dark brown. Sexual organs conspicuous, reddish brown. Plates of the spiracles yellow. The body and limbs are supplied with compound, sessile hairs.

13. *Philodromus maculatus*.

Length of the female $\frac{1}{2}$ th of an inch; length of the cephalo-thorax $\frac{1}{12}$; breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{10}$; length of a leg of the second pair $\frac{3}{8}$; length of a leg of the fourth pair $\frac{1}{4}\frac{3}{8}$.

Eyes disposed on the anterior part of the cephalo-thorax in two curved transverse rows, forming a crescent, whose convexity is directed forwards; the lateral eyes of the posterior row, which are seated on small tubercles, are rather the largest, and the intermediate eyes of the same row are rather the smallest of the eight. Cephalo-thorax nearly circular, but compressed before, truncated in front, and abruptly sloping behind; it is convex, thinly covered with yellowish gray hairs, and has a broad yellowish brown band extending along the middle; the sides are brown, with a fine, longitudinal, whitish line on the lateral mar-

gins. Mandibles subconical, vertical, hairy in front; maxillæ gibbous near the base, on the under side, somewhat pointed at the extremity, and inclined towards the lip: sternum heart-shaped: these parts are yellowish brown, the sternum being the palest. Lip triangular, brown, the apex, which is pointed, being paler. Legs moderately long, provided with hairs and sessile spines; they are of a yellowish brown colour, with red-brown annuli at the joints; second pair the longest, then the first, fourth pair rather the shortest. Each tarsus is terminated by two curved, pectinated claws, and is provided with a climbing apparatus. Palpi yellowish brown. Abdomen broader in the posterior than in the anterior region, but pointed at the spinners; it is convex above, covered with yellowish gray hairs, and its anterior extremity, which projects a little over the base of the cephalo-thorax, is notched in the middle; the upper part is yellowish brown, with numerous small, brown spots, four indented ones, more conspicuous than the rest, forming near its middle a trapezoid whose anterior side is the shortest, the two posterior ones being the largest of the four; between the trapezoid and the spinners is a series of transverse, curved, brown lines, formed of minute spots, which diminish in length as they approach the latter, and in the middle of the anterior part is an obscure, longitudinal, pale brown band, which has an angular projection on each side; an irregular dark brown band extends along each side to the anus, whose upper margin is penetrated by two oblique, yellowish white spots, the posterior of which is the larger; and the under part is yellowish gray, marked with four longitudinal lines of minute pale brown spots. Spinners brown. Sexual organs conspicuous, dark brown. Plates of the spiracles yellow. The body and limbs are supplied with compound sessile hairs.

The male resembles the female, but it is smaller and darker-coloured, and the relative length of its legs is the same, but their absolute length is greater, a leg of the second pair measuring $\frac{1}{2}\frac{1}{4}$ ths of an inch. Palpi rather long, of a yellowish brown colour, with the exception of the digital joint, which is pale brown; the radial joint is shorter than the cubital, and projects two apophyses from its anterior extremity, one on the outer side, which is long, straight, pointed, and dark brown, the other, which is situated underneath, is shorter, of a red-brown colour, and has a protuberance on its inner side, and a prominent brownish black process at its base, on the outer side; the digital joint is somewhat oval, being more curved on the inner than on the outer side; it is convex and hairy externally, concave within, except at the extremity, which is compact, and comprises the palpal organs; they are moderately developed, not very complicated in structure, with a black pointed spine curved round their extremity and

connected with a yellowish brown membrane situated within its curvature; their prevailing colour is dark brown.

Family DRASSIDÆ.

Genus DRASSUS, Walck.

14. *Drassus nocturnus*.

Drassus nocturnus, Walck. Hist. Nat. des Insect. Apt. t. 1. p. 615; Sundevall, Vet. Acad. Handl. 1831. p. 136. var. b.

15. *Drassus vasifer*.

Drassus vasifer, Walck. Hist. Nat. des Insect. Apt. t. 1. p. 620.

This species has been found in the United States of North America as well as in Canada.

Family CINIFLONIDÆ.

Genus CINIFLO, Blackw.

16. *Ciniflo Bennetti*.

Length of the female $\frac{7}{10}$ ths of an inch; length of the cephalo-thorax $\frac{1}{6}$; breadth $\frac{1}{8}$; breadth of the abdomen $\frac{1}{7}$; length of an anterior leg $\frac{5}{12}$; length of a leg of the third pair $\frac{1}{3}$.

Legs and palpi robust, provided with hairs and sessile spines; they are of a pale reddish brown colour. First pair of legs the longest, then the fourth, third pair the shortest; the metatarsi of the posterior legs are furnished with calamistra. Each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base, on each side of which a fine curved tooth occurs. Cephalo-thorax large, very convex, glossy, depressed in the posterior and anterior regions, broadly truncated in front, compressed before, with furrows on the sides diverging towards the margins, and an indentation in the medial line; mandibles powerful, conical, vertical, gibbous in front, near the base, and armed with two rows of teeth on the inner surface: sternum plain, oval, pointed at its posterior extremity: these parts, with the maxillæ and lip, are dark brown tinged with red, the cephalo-thorax and sternum being decidedly the palest. Abdomen oviform, hairy, convex above, projecting over the base of the cephalo-thorax; it is of a dark brown colour, palest on the under side; a short, obscure, blackish band extends along the middle of the anterior part, on the upper side, the interval between the posterior extremity of which and the spinners is occupied by a series of obscure angular lines of the same hue, whose vertices are directed forwards; the sides are thickly mottled with blackish spots. Spinners eight, the inferior pair being united to the extremity. Sexual organs dark brown faintly tinged with red, presenting the appearance

of two very prominent glossy lobes with a small process between them. Plates of the spiracles reddish brown.

I dedicate this interesting spider to John Joseph Bennett, Esq., F.R.S., British Museum, in acknowledgment of the obligation I am under for his valuable classical assistance in characterizing undescribed species of *Araneidea* for publication.

Genus *ERGATIS*, *Blackw.*

17. *Ergatis annulipes.*

Length of the female $\frac{1}{8}$ th of an inch; length of the cephalo-thorax $\frac{1}{16}$; breadth $\frac{1}{20}$; breadth of the abdomen $\frac{1}{16}$; length of an anterior leg $\frac{1}{6}$; length of a leg of the third pair $\frac{1}{8}$.

First pair of legs the longest, then the second, third pair the shortest; these organs and the palpi are pale brown with darker brown annuli. The metatarsus of each posterior leg is provided with a calamistrum. Cephalo-thorax compressed before, with furrows on the sides diverging towards the margins, and a depression in the medial line of the posterior region: it is of a dark brown colour, and the anterior part, which is very convex, is provided with several longitudinal lines of white hairs. The four intermediate eyes form a square; the other four are disposed laterally in pairs, each pair being seated obliquely on a projection of the cephalo-thorax. Mandibles powerful, somewhat conical, vertical, and armed with a few minute teeth on the inner surface: maxillæ strong, convex underneath, at the base, with the extremities more abruptly curved on the inner than on the outer side, and inclined towards the lip, which is large and somewhat triangular: sternum heart-shaped, thinly covered with white hairs: these parts are dark brown, the sternum being the darkest. Abdomen oviform, thickly covered with short hairs, convex above, projecting over the base of the cephalo-thorax; along the middle of the upper part a broad, dentated, brownish black band extends, which is generally bisected, or nearly so, by an irregular, transverse, yellowish white line, between which and the spinners is a series of obscure lines of the same hue, forming obtuse angles whose vertices are directed forwards; a deep border of yellowish white encompasses the brownish black band; the sides are brownish black mottled with yellowish white, and the under part is yellowish white, with a brown band in the medial line. Spinners eight, the inferior pair being united to the extremity. Plates of the spiracles brown.

The male, though smaller than the female, resembles her in colour and in the relative length of its legs; but the mandibles, which are longer, and curved boldly forwards at the end, have a large prominence on the under side and a minute one in front,

near their base; they are hollowed about the middle of the inner surface, leaving a strong prominence near their extremity, on the lower part of which a few small teeth are situated. The cubital and radial joints of the palpi are short; the former is the stronger, and the latter has a small pointed process projecting from the upper part, in front, and an obtuse apophysis at its anterior extremity, on the outer side; the digital joint is oval, convex and hairy externally, concave within, comprising the palpal organs; they are highly developed, with a strong process curving from below upwards, whose termination extends nearly to the articulation of the cubital and radial joints and has the appearance of being twisted; they are of a reddish brown colour.

This spider, though smaller than *Ergatis benigna*, bears a strong resemblance to it, but may be readily distinguished by the annuli with which its legs are marked.

Family AGELENIDÆ.

Genus AGELENA, Walck.

18. *Agelena Potteri*.

Length of the female, not including the spinners, $\frac{1}{2}\frac{3}{4}$ ths of an inch; length of the cephalo-thorax $\frac{1}{4}$; breadth $\frac{1}{6}$; breadth of the abdomen $\frac{5}{16}$; length of a posterior leg $\frac{1}{16}$; length of a leg of the third pair $\frac{1}{2}\frac{7}{8}$; length of a superior spinner $\frac{1}{10}$.

Eyes disposed in two transverse, greatly curved rows on the anterior part of the cephalo-thorax, the convexity of the anterior row being directed upwards, and that of the posterior row backwards; the eyes of each lateral pair are seated obliquely on a small tubercle, but are not contiguous; the eyes of the anterior row are larger than those of the posterior row, the intermediate ones being the largest of the eight. Cephalo-thorax greatly compressed before, convex, hairy, with furrows on the sides diverging towards the lateral margins, and a long indentation in the medial line of the posterior region; it is of a pale reddish brown colour, with a broad, irregular, longitudinal dark brown band on each side, and brownish black lateral margins; the reddish brown spaces are usually covered with yellowish brown hairs. Mandibles powerful, conical, vertical, armed with two rows of teeth on the inner surface: maxillæ short, straight, increasing in breadth from the base to the extremity, which is rounded and fringed with long hairs on the inner side: lip short, somewhat quadrate, being rather broader at the base than at the extremity: these parts are reddish brown, the mandibles being the reddest, and the maxillæ and lip palest at the extremities. Sternum heart-shaped, with numerous short, pale yellowish brown and long erect blackish hairs; its colour is dark brown, the middle

and margins having a tinge of red. Legs long, robust, provided with hairs and sessile spines; fourth pair the longest, then the first, third pair the shortest; they are of a reddish brown colour. Each tarsus is terminated by three claws; the two superior ones are curved and pectinated, and the inferior one is inflected near its base, on each side of which are two or three fine teeth. The palpi resemble the legs in colour. Abdomen oviform, thickly covered with hairs, convex above, projecting over the base of the cephalo-thorax; along the middle of the upper part extends a broad, dentated, yellowish brown band, on each side of which is a brownish black band; sides and under part yellowish brown; the former is spotted with brownish black, and a broad, dark brown band extends along the middle of the latter. Superior spinners long, slender, hairy, with the spinning-tubes disposed along the under side of the terminal joint. The sexual organs exhibit an orifice having a red-brown margin. Plates of the spiracles dull yellow. The body and limbs are supplied with numerous compound, sessile hairs.

The male is smaller than the female, but resembles her in colour and in the relative length of its legs. The cubital and radial joints of the palpi are short; the former is not provided with an apophysis, but the latter has a large, obtuse one at its anterior extremity, on the outer side; the digital joint is oval, but elongated, the extremity being slender and compact; it is convex and hairy externally, concave within, comprising the palpal organs, which are highly developed, complicated in structure, with a large, spiral spine, brownish black on the outer and pale yellow on the inner side, which is very prominent and recurved at its extremity, and a strong, dark reddish brown process at the outer side projecting beyond the margin of the digital joint.

I have named this handsome species in compliment to Richard Potter, Esq., M.A., Queen's College, Cambridge, and Professor of Natural Philosophy in University College, London, through whose friendly zeal in promoting my zoological researches I have been supplied not only with the spiders introduced to notice in these pages, but also with numerous specimens of British species.

[To be continued.]

VIII.—Notice of what appears to be the Embryo of an Ichthyosaurus in the Pelvic cavity of Ichthyosaurus (communis?).

By J. CHANING PEARCE, F.G.S., M.R.C.S.

IN developing an *Ichthyosaurus* which I took up from the rock in the brown laminated lias clay of Somersetshire, and having reversed the animal so as to lay bare that surface which was

downwards in the quarry, I removed the clay with great care and exposed to view an *Ichthyosaurus communis*? about eight and a half feet long, lying on its back in the highest state of preservation, and with the exception of a slight dislocation in the middle of the tail and the deficiency of its point, every part is most perfectly preserved. In cautiously lifting the laminae of clay between the two hinder paddles, my attention was first arrested by a series of small vertebræ lying on three or four of the posterior ribs; on removing another portion of the clay, ribs, the rami of the jaw, and the other parts of the head were visible. In carefully cleaning this delicate little skeleton, it was found to rest on black, finely corrugated integument, which is preserved around the small skeleton; and passes underneath the posterior ribs and some other parts of the large animal.

The little animal, somewhat dislocated, lies at full length in the cavity of the pelvis, with its head towards the tail of the large one, and rests on the internal surface of its integument, and on the internal surfaces of three of its posterior left ribs, and is about five and a half inches long. The rami of the jaw and one of the longest ribs (of which only five or six are discernible) are each about an inch long; and of the thirty vertebræ which can be counted, the largest is the eighth of an inch in its longest diameter. It is bounded on either side by the ilium, ischium and pubis, and by the right and left posterior paddles, and on the right side by the vertebral column and right ribs; and while the posterior two-thirds of the little animal is within the pelvis, the head appears to protrude beyond it, and apparently in the act of being expelled at the time of death.

So singular a circumstance as the embryo being found in the pelvis of its parent in a fossil state, should lead to the greatest care in arriving at such a conclusion; but when we consider that the large animal was developed on its under surface—consequently it is nothing that has fallen upon it—and the remarkably correct position of the little skeleton in the pelvis, between the right and left ribs, with its head protruding, and the little vertebræ so exactly corresponding in shape to the large ones, and the other bones resembling those of a Saurian, it appears fair to conclude that it cannot be anything else but a foetal *Ichthyosaurus*; and if it be suggested that it may have been swallowed by the animal, this involves a much greater difficulty; for so delicate a structure would have been dissolved by the gastric juice, and could not have reached its present position.

The Rev. Dr. Buckland and Professor Owen, who have kindly written me on the subject, state, that there is no reason why the *Ichthyosaurus* should not be viviparous, although “analogy of the

nearest existing reptiles would point to its oviparity as the more probable kind of generation ; but the genus *Zootoca* and the Viper show that analogy is no safe guide in such a question ;” “and the European black and yellow Salamander of Bohemia once brought forth young ones half as long as the mother, either in the Doctor’s pocket or College rooms ;” therefore with such evidence it now appears fair to conclude that the *Ichthyosauri* were viviparous.

Montague House, Lambridge, Bath, Dec. 9th, 1845.

IX.—*Journey through Java, descriptive of its Topography and Natural History.* By DR. FR. JUNGHUHN*.

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

Journey to the Extinct Volcano of Tjermai.

THE author saw here large woods of *Tectonia*. The *Tectonia grandis* is one of the few tropical trees which occur in company, and expel all others. But it does not afford the cool shade, nor form such a beautiful vaulted foliage as other tropical trees ; no *Liane* climbs up its boughs ; its stems, destitute of bark, rise naked and barren, with only here and there a single leaf. The ground beneath it is covered only with dry grass ; no *Pothos*, no *Orchideæ* or *Scitamineæ* here raise their succulent stalks. Yet here also man appears to have contributed much to the barrenness of these woods ; for the Japanese, in order to drive away the tigers and to make the soil cultivable, yearly set fire to large districts of the grass Alang-alang (at the driest season), by which also the leaves of the *Tectonia* are at the same time singed. When the author had reached the coffee-plantations, he entered at the same time upon the lower limits of the forest tract, which is everywhere divided by sharp lines from the lower cultivated country. With the increase of cultivation the extent of the forests is more and more narrowed. The author saw thousands of trees felled in the coffee-plantations ; a few being left standing wide apart, to shade the young coffee-plants. “We thus explain,” he observes, “the sharply-defined limits by which the woods, almost on all the higher mountains in Java, are separated from the lower cultivated declivities,—a limit which is continually forced higher and higher by the advance of cultivation, which however on most of the mountains begins at a height of from 3000 to 4000 feet. At a distance, therefore, the upper half of such mountains appears of a dark bluish green, while the lower half has a bright greenish yellow aspect.

“We are inclined to think that the forests in Java originally extended to the foot of the mountains, and indeed to the sea-coast, and that they have been extirpated up to their present elevation solely by cultivation. We frequently observe forests cease suddenly in abrupt, sharply-defined limits on the lower side, on soft acclivities, whose

* From the *Botanische Zeitung*, Sept. 19th, 1845.

grassy surface still remains entirely the same, and this even in districts at present uninhabited by man. How can this be explained except by the operation of earlier cultivation, which in a short time destroys with fire and axe what nature can only create anew in centuries? It appears however that there is no cause for apprehending that the sanctuary of the higher forest tracts, lying at above 5000 feet, will ever be destroyed; partly because the want of water renders it difficult to dwell there, as the springs in most of the Japanese mountains rise below this region, generally at a height of 3000 feet, and often much lower; partly also because the Japanese, who love warmth, would be deterred by the great damp and coldness of those tracts, where for the greater part of the year the heights are enveloped in clouds, and where neither rice nor cocoa palms (their chief source of food) thrive; not to mention the steepness of the acclivities.

“We soon reached the highest limits of the young coffee-plantations, which are here laid out among the forest-trees, and we now entered the moist shady cover of the primitive forests, which clothe the increasingly steeper acclivities. Oaks (*Quercus pruinosa* and *depressa*, Bl.) and arborescent *Melastomæ* prevail in company with a species of fir (*Podocarpus amara*, Bl.), which became more and more plentiful as we ascended. Our way led us over a narrow steep ridge, which in some parts was scarcely a foot wide, and descended abruptly on both sides into deep rocky clefts; it would perhaps be impossible to climb over it, were it not, like everything here, overgrown with the most luxuriant forest-trees. Above this dangerous pass, the *Podocarpus amara* occurs more plentifully than in other districts, and gives to the woods a peculiar appearance; their trunks, which at the base are frequently more than six feet in diameter, rise perpendicularly from fifty to seventy feet, and separate high up into the round branched and leafy crowns: when the wind sighs through their needle-shaped foliage, and moves the whitish lichens which hang down yards long from all their branches, one might fancy he saw presented to him a northern winter-scene. Continually mists drift past, in which the thermometer falls from three to five degrees.

“In this region, at about the height of 6000 feet, where the gigantic firs gradually become less frequent, we begin to meet with a small tree (*Hedera divaricata*, Jungh.) which gives to the forests a peculiar character, and whose habit involuntarily recalls to mind that of *Dracæna*. From a short, knotty stem, often scarcely two to three feet high, spring many simple, undivided boughs, which attain a length of from twenty to thirty feet, and diverge on all sides in a straight or slightly curved direction, so that the outermost nearly attain a horizontal position. They are almost everywhere of the same thickness, naked, and only covered at their ends with blossoms and buds and with large petiolated leaves.

“The higher we ascend the smaller do the trees become, and we meet with *Podocarpus imbricata*, Bl., a species of fir, which covers many of the steepest acclivities, and whose young juniper-like (almost pyramidal) trees present to us here, nearly under

the equator, the true picture of a northern fir-wood. Soon however, as the tortuous rhinoceros-path greatly assists the ascent, these firs also leave us, and all the larger forest-trees disappear at about a height of 7000 feet. But now begins a variegated mixture of the most manifold and magnificent shrubs covering the acclivities, and the eye rests with rapture on the lovely blossom-covered bushes of *Gnaphalium javanicum* and *Hypericum javanicum*, Bl., of *Lonicera flavescens*, *Gaultheria punctata*, and others, under the shade of which the forms of northern plants, as *Valeriana*, *Ranunculus*, *Thalictrum*, *Swertia*, *Viola*, and *Plantago*, appear as old acquaintances. We now took our way through these bushes, and came, at near ten o'clock, to a small headland, from whence we looked down upon the clouds far below, appearing like a white moving sea: this headland resembles a plateau, which interrupts the continuous and steep side of the mountain; on the north-east it is bounded by a deep cleft, is moreover of only small extent, and soon rises again to the mountain-top, which is about 1000 feet higher. Beside small shrubs, it is especially overgrown with tall species of grass, amongst which several low-trodden rhinoceros-paths wind their course. But the acclivity of the mountain itself is clothed with small woods of a peculiar appearance, which ascend up nearly to the edge of the crater; in some tracts it is *Acacia montana* (Kamalandingang), whose slender stalks are pressed together; in others *Thibaudia varingiaefolia*, which we never saw so luxuriant and strong as here; it forms a shady wood, through which we made our way along a rhinoceros-path; its stems attain the thickness of a man's thigh up to that of a man's body, and rise in a sinuous, generally oblique direction, twenty to thirty feet high, before they branch out into the leafy crowns. The long *Usneæ*, which hang down from the branches—the thick layers of numerous mosses and lichens, which together fructifying in the most luxuriant manner, clothe the knotted sinuous stems—further, the enormous circumference of a species of plant which we are quite unused to meet with so large,—give to this forest an extraordinary, primæval, and as it were a solemn appearance. The ground in the wood is covered with grasses, among which here and there occurs a *Balanophora elongata*, Bl., which we found at such heights, parasitical on roots of *Thibaudia*."

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Transactions of the Botanical Society of Edinburgh.

Vol. ii. Parts 1 & 2. Edinburgh, 1845.

It will not be requisite that we should say anything more concerning this publication, since the papers contained in it are already known to our readers, they having appeared in vols. xi. to xvi. of these 'Annals.'

They are now resissued in the present form for the convenience of the Members of the Society, and in conformity with a resolution

passed on July 14th, 1842 (see Report of Bot. Soc. for that year, pp. 12 and 23), authorizing an arrangement to be made with the proprietors of this Journal, by which a much earlier publication of the papers is ensured to their author and the public, and also their ultimate distribution to the Members in a collected form is attained at a moderate expense to the Society.

Having heard it stated that some Members of the Society have obtained these Transactions under the idea that they contained previously unpublished papers, we have thought it right to call their attention to the above arrangement, and also, in justice to the authors of the papers, to add, that a large portion of the book has for many months been printed off, and that therefore it was not in their power to alter or cancel any part.

PREPARING FOR PUBLICATION.

The British Desmidiæ, with coloured Figures of the Species.

By J. Ralfs, M.R.C.S.

The author proposes to describe all the British *Desmidiæ*, and as correct figures will be essential to make the descriptions of such minute objects intelligible, he will spare neither care nor expense in rendering the plates, which will be executed under his own eye, as accurate as possible.

The engravings will be on copper, since experience has proved that the delicate markings of the *Desmidiæ* cannot be sufficiently displayed by lithography.

Upwards of 100 species will be introduced, many of them either altogether new or now first noticed as British.

The conjugated state of the *Desmidiæ* is interesting, sometimes from its resemblance to the same state in the *Conjugatæ*, sometimes from the similarity of the spores to fossil bodies found in flint, and considered by Ehrenberg and other naturalists as species of *Xanthidium*. On these accounts, and also because few instances have been hitherto recorded, it is intended to give not only full details of the process, but as far as practicable to show the different stages by figures. Examples will be taken from one or more species in each of the following genera: *Glæoprium*, *Didymoprium*, *Micrasterias*, *Euastrum*, *Cosmarium*, *Xanthidium*, *Staurastrum*, *Tetmemorus* and *Closterium*.

As their animal nature has been maintained by many able writers, this question will be examined and sufficient reasons produced for considering the *Desmidiæ* to belong to the vegetable kingdom. Their modes of growth and other facts which may illustrate their economy will receive particular attention.

That nothing may be wanting to the utility of this monograph, the Introduction will contain ample directions for finding and gathering these minute plants and the different methods of mounting them for the microscope.

Subscribers' names received by the author, Penzance. Price to Subscribers One Guinea.

Ann. & Mag. N. Hist. Vol. xvii.

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PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

June 3, 1845.—Edward Forster, Esq., V.P., in the Chair.

Read a paper entitled “Descriptions of some unpublished species of Plants from North-Western India.” By M. Pakenham Edgeworth, Esq., F.L.S., Bengal Civil Service.

This paper contains characters and descriptions of 142 species of Phænogamous plants presumed to be new to science. Several are described as forming new genera, which are characterized as follows:—

Ord. UMBELLIFERÆ.

Trib. AMMINEÆ.

Gen. *Acronema*, Falc. MSS.

Calycis margo obsoletus. *Petala* lanceolata, in apiculum filiformem rectum acuminata. *Stylopodium* bifidum, dilatatum. *Styli* divergentes, apice deflexi. *Fructus* subovatus, a latere compressus, subdidymus; *mericarpia* basi gibba, apice angustata, jugis 5 æqualibus tenuiter filiformibus, omnino evittata; *carpophorum* liberum, integrum, apice bidentatum. *Semen* teres convexum, antice planiusculum.

A. tenerum.—Sison? tener, *Wall. List*; *Helosciadium*? tenerum, *DeC. Prodr.* iv. p. 106.

Gen. *Petrosiadium*.

Calycis limbus obsoletus. *Petala* ovata, integra; lacinulâ inflexâ. *Fructus* a latere compressus, oblongus, *stylopodio* pulvinato *stylisque* divergentibus reflexis coronatus; *mericarpia* 5-juga, jugis filiformibus æqualibus, valleculis 1-vittatis, commissurâ bivittatâ; *carpophorum* bipartitum, adnatum. *Semen* planum, oblongum, basi angustatum.

P. cæspitosum.

Trib. ANGELICEÆ.

Gen. *Oreocome*.

Calycis limbus 5-fidus, laciniiis subulatis. *Petala* ovata, apiculo inflexo plus minus emarginato. *Fructus* a dorso compressus, *stylopodio stylisque* reflexis coronatus; *mericarpia* 5-juga, jugis alatis marginantibus amplis, valleculis univittatis, marginalibus quandoque bivittatis, commissurâ 2—4-vittatâ. *Semen* anticè planum, vel subconcaevum, dorso sub valleculis sulcatum. *Carpophorum* liberum, bipartitum.

1. *O. elata*, foliis 4—5-pinnatisectis; caulinis superioribus 3-pinnatisectis: pinnis primariis ad vaginæ apicem sessilibus: laciniiis inciso-dentatis acutis, involucelli foliolis linearibus, valleculis dorsalibus 1—marginalibus 1—2-vittatis; commissurâ 4-vittatâ, semine anticè plano.

2. *O. filicifolia*, foliis inferioribus 4—5-pinnatisectis; superioribus 3-pinnatisectis: pinnis omnibus petiolatis: segmentis pinnatifidis: lobis angustis lanceolatis acutis mucronatis, involucelli foliolis bififormibus lanceolatis pinnatifidisque, valleculis dorsalibus 1—marginalibus 1—2-vittatis; commissurâ 4-vittatâ, semine anticè subconvexo.

To this genus are referable *Selinum Candollii*, *DeC. Prodr.* iv. p. 165, *Peucedanum Wallichianum*, *DeC. Prodr.* iv. p. 181, and *Pleurospermum cicutarium* of Royle's Illustrations.

Trib. CAUCALINEÆ.

Gen. *Psammogeton*.

Calycis limbus obsolete. *Petala* obcordata; lacinulâ ex fissurâ ortâ inflexâ. *Styli* basi conicâ subrecti. *Fructus* teres; *mericarpia* jugis 5 primariis filiformibus setas glochidiatas gerentibus, secundariis simplici serie setosis, valleculis sub jugis secundariis 1-vittatis, commissurâ bivittatâ planâ. *Semen* albumine leviter excavato. *Carpophorum* bipartitum, liberum.

Subord. CÆLOSPERMEÆ.

Gen. *Schaphespermum*.

Calycis margo 5-dentatus, dentibus subulatis caducis. *Petala* obovata integra, apiculo inflexo. *Stylopodium* tumidum, depressum. *Styli* longi, reflexi. *Fructus* subglobosus; *mericarpia* 5-juga, jugis filiformibus æqualibus, valleculis 1-vittatis, commissurâ 2—4-vittatâ; *carpophorum* liberum, bipartitum. *Semen* anticè longitudinaliter concavum, dorso leviter sub valleculis sulcatum.

S. trilobum.

Ord. COMPOSITÆ.

Trib. SERRATULEÆ.

Gen. *Stictophyllum*.

Capitulum multiflorum, homogamum. *Involucrum* ovoideum, squamis regulariter imbricatis ex ovato-oblongis exappendiculatis. *Receptaculi* fimbriellæ in squamas integras furcatasve setosas productæ. *Corolla* 5-fida, subregularis, fauce sensim ampliata 5-nervi, basi incrassatâ bulbosâ. *Staminum* filamenta papillosa; antheræ appendice acutâ, caudis 2 brevibus sublaceris. *Pollen* globosum, echinulatum. *Stylus* basi bulbosus, coronâ epignâ denticulatâ ad nodum penicillatus; ramis brevibus extus puberulis; lineis stigmatosis filiformibus marginantibus. *Achenium* areolâ terminali centrali, basilari laterali, incurvum, angulatum, costatum, glabrum, læve, annulo integro brevi superatum; *pappus* pluriserialis, pilis inæqualibus plumosis basi liberis persistentibus. —Folia *punctata*.

Ord. COMMELINEÆ.

Gen. *Streptolirion*.

Sepala 6, hyalina, persistentia, exteriora latiora, interiora linearia. *Stamina* 6, perfecta; filamentis supra medium barbatis; antheris bilocularibus, loculis brachiatis divaricatis apice dehiscentibus. *Stylus* erectus; stigmatate capitato, puberulo. *Ovarium* 3-loculare; loculis biovulatis; ovulis ad medium placentæ centralis affixis. *Capsula* chartacea, trilocularis, trivalvis, loculicidè dehiscentis. *Semina* in quoque loculo duo superposita, inferius pendulum, superius erectum, angulata, irregulariter rugoso-sulcata; hilo lineari, papillâ (embryostegâ) parvâ depressâ ei oppositâ. *Embryo* testâ sub papillâ productâ latiori circumdatus, in albumine carnosio subfarinaceo excavato nidulans.—Herba *volubilis*, habitu et perianthio a *Tradescantiâ distinctissima*, caractere carpologico maximè affinis.

S. volubile.

Read a paper entitled “*Caricis species novæ vel minùs cognitæ*.”
By Francis Boott, M.D., F.L.S. &c.

The species described in this paper are eighteen in number, and they are characterized as follows:—

1. C. ALTA, spicâ compositâ elongatâ e spiculis basi masculis pluribus oblongis simplicibus: superioribus contiguis alternatis: inferioribus remo-

tiusculis bracteatis, stigmatibus 2, perigyniis parvis ellipticis marginatis ciliato-serratis utrinque nervosis breviter rostratis bidentatis squamam pallidam ovato-acuminatam subæquantibus.

Hab. in Insulâ Java, *Dr. Horsfield.*

Affinis *C. remotæ*, L.

2. *C. socia*, spicis 8 v. 9 cylindricis solitariis geminatisque ferrugineis concoloribus: terminali masculâ breviori erectâ; fœmineis 7 v. 8 apice masculis pendulis: superioribus approximatis geminatis: inferioribus remotis solitariis: omnibus evaginatibus bracteatis, stigmatibus 2, perigyniis orbiculatis abruptè brevi-cylindrico-rostratis ore integro enerviis squamâ lanceolatâ acuminato-cuspidatâ lævi brevioribus.

Hab. in Insulâ Ceylon, *Col. Walker (v. in Herb. Hooker).*

Affinis *C. geminatæ*, Schk.

3. *C. orbicularis*, spicis 4 parvis congestis sessilibus ebracteatis; terminali masculâ oblongâ fusco-ferrugineâ; reliquis fœmineis apice masculis ovatis atro-purpureis, stigmatibus 2, perigyniis compressis orbiculatis abruptè rostellatis ore integris enerviis atro-purpureis basi pallidis squamâ lanceolatâ obtusâ nigro-purpureâ concolori vix longioribus triploque latioribus.

Hab. in Indiâ Orientali, *Prof. Royle.*

Affinis *C. saxatili*, L. (*C. pullæ*, Gooden.)

4. *C. pruinosa*, spicâ masculâ 1 subclavatâ; fœmineis 4 cylindricis pedunculatis evaginatibus erectis contiguïs; superioribus apice masculis: inferioribus longissimè bracteatis, stigmatibus 2, perigyniis ovatis rostellatis emarginatis obsolete nervosis albo-tuberculatis squamâ lanceolatâ mucronatâ longioribus latioribusque.

Hab. in Insulâ Java, *Dr. Horsfield.*

C. glaucescenti, Ell. (quæ tamen stigmatibus 3 gaudet) habitu et aspectu similis.

5. *C. subdola*, spicis 5—7 cylindricis erectis ferrugineo-purpureis solitariis v. geminatis; masculis 1—3: terminali longiore longè pedunculatâ: infimâ cum spicâ supremâ fœmineâ v. androgynâ apice masculâ geminatâ; fœmineis 3—4 strictè erectis solitariis v. supremis geniculatis longissimè bracteatis: superioribus approximatis sessilibus: infimâ plûs minùs remotâ vaginatâ vel radicali basi attenuatâ laxiflorâ longè exsertè pedunculatâ, stigmatibus 2, perigyniis ovalibus rostellatis ore integro stipitatis nervosis stramineis squamâ oblongâ emarginatâ hispidò-aristatâ v. muticâ obtusâ ferrugineo-purpureâ nervo lato viridi longioribus latioribusque vel eam subæquantibus.

Hab. in Novâ Zealandiâ, *Dr. J. D. Hooker.*

Primo aspectu *C. Goodenovii*, Gay, similis.

6. *C. decidua*, spicis 4—7 erectis; supremâ masculâ vel androgynâ basi v. apice basi que masculâ; reliquis fœmineis: superioribus sessilibus contiguïs oblongis: inferioribus cylindricis pedunculatis bracteatis evaginatibus rariùs geminatis v. compositis: infimâ interdùm subremotâ, stigmatibus 2, perigyniis oblongo-ovatis rostellatis ore integro utrinque nervosis stipitatis pallidis deciduis squamâ oblongâ obtusâ atro-purpureâ nervo pallido deciduâ longioribus latioribusque.

Hab. in Insulis Falkland, *Dr. J. D. Hooker*; in Fretu Magellanico, Port Famine, *Anderson.*

Habitu *C. Goodenovii*, Gay, affinis.

7. *C. dura*, spicâ decompositâ e spiculis 7—20 oblongo-ellipticis ferrugineo-purpureis androgynis apice masculis: superioribus simplicibus confertis sessilibus: inferioribus subremotis pedunculatis bracteatis emar-

ginatis basi compositis, stigmatibus 2, perigyiniis obovatis rostellatis bidentatis atro-purpureis lucidis enerviis estipitatis squamâ lanceolatâ acutâ apice ciliatâ v. hispido-mucronatâ nervo pallido brevioribus.

Hab. in Columbiâ, Pillylum, ad alt. 13,000 ped., *Jameson* (v. in *Herb. Hooker*).

Aspectus *C. atratæ*, L.

8. *C. Pichinchensis*, spicâ decompositâ e spiculis 20—35 ovatis v. oblongo-cylindraceis inæqualibus fuliginoso-purpureis androgynis apice extremo masculis : supremis 8—12 congestis sessilibus simplicibus : reliquis in spicas primùm simplices deinde deorsum magis compositas pedunculatas inferiores brevi-bracteatas subnutantes? insidentibus, stigmatibus 2, perigyiniis (floriferis) glabris enerviis ovalibus cylindrico-rostratis bidentatis stipitatis basi pallidis squamâ lanceolatâ acuminatâ acutâ muticâ fuliginoso-purpureâ concolori brevioribus.

C. Pichinchensis, *Kunth*.

Hab. in montibus Quito, *Humboldt*, *Jameson*, no. 143 (v. in *Herbb. Hooker et Lemann*).

Affinis *C. Lemannianæ*.

9. *C. LEMANNIANA*, spicâ decompositâ e spiculis 20—40 cylindricis inæqualibus ferrugineo-purpureis androgynis apice extremo masculis : supremis 6—12 congestis sessilibus : reliquis in spicas 4 v. 5 alternas pedunculatas erectas plûs minùs compositas foliaco-bracteatas insidentibus, stigmatibus 2, perigyiniis ovalibus brevi-cylindrico-rostratis subbifurcatis stipitatis nervosis viridibus supernè ferrugineo-tinctis ad margines aculeatis squamâ lanceolatâ longè acuminatâ acutâ vel rariùs hispido-mucronatâ purpureo-ferrugineâ nervo pallido subduplò brevioribus.

Hab. in locis humidis Montis ignivomi Cotopaxi Columbiæ, *Hartweg*, no. 1446 (*Herb. C. M. Lemann*); Columbia, *Jameson*, no. 220 (*Herb. Lemann*).

Affinis *C. Pichinchensi*, *Kth*.

10. *C. Mertensii*, spicis 4—10 cylindricis androgynis basi masculis pedunculatis nutantibus approximatis : inferioribus remotis, stigmatibus 3, perigyiniis ovatis acutis rostellatis ore integro tenuissimis compressis binerviis squamâ oblongâ muticâ v. mucronulatâ longioribus latioribusque.

C. Mertensii, *Prescott, Hook. Fl. Bor.-Amer.* t. 217.

C. Columbianæ, *Dewey*.

Hab. in Americæ Orâ Boreali-Occidentali, *A. Menzies, Esq.*; ad fl. Columbia, *Dr. Scouler*; in Insulâ Sitcha, ex *Bongard*.

11. *C. CRINALIS*, spicis 3—5 oblongis congestis sessilibus erectis olivaceo-ferrugineis : terminali majore androgynâ basi masculâ : reliquis femineis bracteatis evaginatissimis, stigmatibus 3, perigyiniis ellipticis triquetris conico-rostratis bifidis glabris striato-nervosis ferrugineis squamâ æquilatâ ovatâ obtusâ v. acutâ rariùs mucronulatâ longioribus.

Hab. in Columbiâ prope Antisana, *Hartweg*, no. 1461 (*Herb. Bentham*); Pillylum, *Jameson* (*Herb. Hooker*).

Affinis *C. hirsutæ*, *Willd.*

12. *C. NIVALIS*, spicis 4 atro-purpureis cuneatis v. ellipticis contiguis; superioribus androgynis basi masculis; infimâ foemineâ exsertè pedunculatâ subremotâ brevi setaceo-bracteata, stigmatibus 3, perigyiniis ellipticis erostratis bidentatis supernè ad margines scabriusculis enerviis compressis atro-purpureis basi albidis tenuissimis squamâ atro-purpureâ lanceolatâ mucronatâ longioribus latioribusque.

Hab. in Indiâ Orientali, supra Dhunrao, versus fauces Montium Himalensium *Mana* dictas, ad altitudinem 16,000 ped., *M. P. Edgeworth, Esq.*

Facies *C. atratæ*, L.; *C. coriophoræ*, Fisch. affinium.

13. *C. CINNAMOMEA*, spicis 5 cylindricis nutantibus basi attenuatis ferrugineis concoloribus; terminali androgynâ basi masculâ reliquis fœmineis: superioribus contiguis sessilibus: inferioribus pedunculatis: infimâ remotâ longè exsertè vaginato-bracteâtâ basi compositâ, stigmatibus 3, perigyniis ovalibus bidentatis enerviis compressis ferrugineis basi albidis supernè marginibus pallidis scabriusculis squamâ oblongâ acutâ vel cuspidatâ ferrugineâ longioribus latioribusque.

Hab. in Indiâ Orientali, *Prof. Royle*.

C. coriophoræ, Fisch. affinis.

14. *C. BANKSII*, spicis 3—7 oblongis ovatisque crassis atro-purpureis exsertè pedunculatis nutantibus; supremâ basi masculâ; reliquis fœmineis infimâ remotâ, stigmatibus 3 longis, perigyniis hyalino-tenuissimis latè ovatis compressis leviter nervosis cylindrico-rostratis glabris ore obliquo bifido squamâ oblongo-spathulatâ emarginatâ cristatâ brevioribus latioribusque.

C. atrata et *C. Magellanica*, *Herb. Banks*.

Hab. in Terrâ del Fuego, *Banks et Solander (v. etiam in Herbb. Henslow et Hooker e cel. Darwin, sub num. 300 et 301)*.

15. *C. WALKERI*, spicâ compositâ e spiculis pluribus androgynis apice masculis fasciculatis cylindricis laxifloris inæqualibus exsertè setaceo-pedunculatis, stigmatibus 3, perigyniis angustis triquetro-lanceolatis longè-rostratis bicuspidatis stipitatis nervosis marginibus supernè serrato-scabris squamâ lanceolatâ cristatâ longioribus.

C. Walkeri, *Arnott MSS.*

Hab. in Insulâ Ceylon (*Herb. Arnott*).

C. validæ, Nees proxima.

16. *C. HORSFIELDII*, glaucescens concolor, spicis 4 v. 5 decompositis erectis strictis alternis: inferioribus longè exsertè pedunculatis remotis: terminali majore evaginatâ; spiculis apice masculis oblongis alternis patentibus, stigmatibus 3, perigyniis triquetro-ellipticis acuminato-rostratis bidentatis obliquè fissis arcuatim recurvis nervosis supernè parcè serrato-denticulatis squamâ ovatâ albo-membranaccâ hispidaristatâ nervo viridi scabriusculo longioribus.

Hab. in Insulâ Java, *Dr. Horsfield*.

Affinis *C. polystachyæ*, Willd.

17. *C. LEUCANTHA*, spicâ decompositâ e spiculis parvis androgynis apice masculis; terminalibus et infrâ ad apicem pedunculorum congesto-sessilibus axillaribus; spicis partialibus 4—6 alternis plûs minûs compositis: inferioribus remotis elongatis exsertè pedunculatis: superioribus approximatis abbreviatis sessilibus, stigmatibus 3, perigyniis trigono-ellipticis acuminatis rostratis altè obliquè fissis striato-nervosis scabris squamâ ovatâ hispido-mucronatâ pallidâ nervosâ duplò longioribus.

C. leucantha, *Arnott MSS.*

Hab. ad Courtallum, in Penins. Indiæ Orientalis, *Wight (Herb. Wight, 2379 a, "July 1838, no. 993," juvenilis; 2379 b. var. composita; "Aug. 1835, no. 992, 998," senilis)*.

18. *C. JAMESONI*, spicis circiter 20 fusco-nigris cylindricis androgynis apice masculis inæqualiter longè pedunculatis bracteatis evaginatibus pendulis simplicibus compositisque: extremis solitariis: reliquis geminatis ternatisve, stigmatibus 3, perigyniis lanceolatis utrinque nervosis in rostrum breve attenuatis bidentatis glabris atro-purpureis squamâ lan-

ceolatâ hispido-cuspidatâ fusco-nigrâ margine albo-membranaceâ brevioribus angustioribusque.

Hab. in Montibus Columbiae, ad altit. 13,000 ped., *Jameson* (*Herb. Hooker*).

Proxima *C. Boryanæ*, Schk.

June 17.—Edward Forster, Esq., V.P., in the Chair.

Read a continuation of Dr. Boott's paper entitled "Caricis species novæ vel minùs cognitæ."

The species now described are fifteen in number, characterized as follows :—

1. *C. GUNNIANA*, spicis 4 v. 5 oblongis v. cylindricis erectis; terminali masculâ sessili; fœmineis 3 v. 4 superioribus sessilibus contiguis: inferioribus remotis foliaceo-bracteatis exsertè pedunculatis, stigmatibus 3, perigyniis trigono-ellipticis subinflatis acuminato-rostratis bidentatis ad margines supernè scabriusculis stramineis æqualiter utrinque nervosis squamâ latè ovatâ mucronatâ v. hispido-cuspidatâ longioribus.

Hab. in Insulâ Van Diemen, *D. Gunn* (*Herbb. Hooker et Lindley*).

Affinis *C. laxifloræ*, Lam., et *C. lævigatæ*, Smith.

2. *C. COMOSA*, spicis 4 cylindricis densifloris; masculâ 1 erectâ gracili bracteatâ; fœmineis 3—5 crassis demùm nutantibus v. pendulis longissimè bracteatis: superioribus contiguis: infimâ remotâ longiùs pedunculatâ interdùm plùs minùs vaginatâ, stigmatibus 3, perigyniis triquetrolanceolatis longè rostratis altè bicuspidatis: laciniis elongatis patentissimis subrecurvis: stipitatis glabris nervosis demùm divergentibus retroflexisque squamâ lanceolatâ hirsutâ ciliatâ nervosâ longè hispido-aristatâ longioribus.

C. furcata, *Ell.* (*non Lapeyr.*)

C. pseudo-cyperus, *Torr.*, *Dew.* (*non L.*)

Hab. in Georgiâ et Carolinâ, *Elliott*; Ohio, *Sullivant*; Philadelphîâ et Uticâ, *Torrey*; Boston, *Boott*.

Satis (*Elliottio* Nuttallioque monentibus) à *C. pseudo-cypero*, L., etiam Americæ Septentrionalis incolâ, distincta.

3. *C. TRIQUETRA*, spicis 3 v. 4; masculâ 1 elliptico-cylindricâ; fœmineis 2 v. 3 approximatis laxis apice masculis: supremâ ovatâ sessili: infimâ cylindricâ basi attenuatâ longè vaginatâ inclusè pedunculatâ, stigmatibus 3, perigyniis ellipticis acutè triquetris pubescentibus bidentatis sub-4-nerviis squamâ ovatâ mucronatâ ferrugineâ margine scariosâ longioribus.

Hab. in Californiâ, *Nuttall*.

Proxima *C. gynobasis*, Vill. (*C. alpestris*, All.)

4. *C. GLOBOSA*, spicis 4—6; masculâ 1 cylindricâ; fœmineis 3—5 ovatis oblongisve erectis evaginatissimè laxè paucifloris: superioribus 1 v. 2 subsessilibus masculâ approximatis: inferioribus remotis subradicalibus longè pedunculatis, stigmatibus 3, perigyniis globosis conico-rostratis ore membranaceo obliquo longè stipitatis hirsuto-scabris nervosis squamâ lanceolatam mucronatam subæquantibus.

Hab. in Californiâ, *Nuttall*.

Affinis *C. bispicatæ*, Hook. (*C. longerostrata*, Meyer, *C. camtschaticense*, Kunth.)

5. *C. Tweediana*, spicis 8 cylindricis erectis; terminali masculâ simplici; reliquis androgynis apice masculis compositis: superioribus approximatis sessilibus: inferioribus pedunculatis evaginatissimè: infimâ remotâ longissimè exsertè pedunculatâ, stigmatibus 3, perigyniis ovatis acumi-

natis brevi-rostratis bifurcatis basi abruptè productis quasi stipitatis scabris nervosis stramineis purpureo-maculatis vel olivaceis squamam ovatam pallidam hispido-aristatam trinervem subæquantibus.

C. Tweediana, *Nees in Hook. Journ. Bot.* ii. p. 398.

Hab. ad Buenos Ayres, *Tweedie (Herb. Fielding)*.

Affinis *C. hirtæ*, L., et *C. Houghtonii*, Torr.

6. *C. PALEATA*, spicis 7—10 cylindricis erectis; masculis 2—4 sessilibus contiguis: infimâ bracteâtâ; fœmineis 5—7 remotis foliaceo-bracteatis exsertè pedunculatis, stigmatibus 3, perigyniis triquetro-obovatis brevi-rostratis bifidis apice hispidis nervosis impresso-punctulatis squamam ovatam hyalino-paleaceam hispido-cuspidatam subæquantibus.

Hab. in Insulâ Juan Fernandez, *Dr. Scouler (Herb. Hooker)*.

Affinitas dubia.

7. *C. LANGSDORFFII*, spicis 3 v. 4 oblongis; masculâ 1; fœmineis 2 v. 3 laxifloris bracteatis exsertè pedunculatis: superioribus contiguis: infimâ subremotâ, stigmatibus 3, perigyniis triquetro-fusiformibus bidentatis nervosis hirtis-scabris squamâ lanceolatâ hispido-cuspidatâ brevioribus.

C. Japonica, *Fisch. in Herb. Boott*.

Hab. in Insulâ Nangasaki Japoniæ, *Langsdorff. A C. Japonicâ*, Thunb. (*Schk. Car. t. W.W.*) perigyniis scabris spicisque gracilibus distincta.

8. *C. BONGARDI*, spicis 4 cylindricis erectis alternis stramineo-pallidis concoloribus; masculâ 1 pedunculatâ; fœmineis 3 apice masculis basi attenuatis laxè imbricatis: inferioribus exsertè pedunculatis bracteatis, stigmatibus 3, perigyniis ellipticis stipitatis latè rostratis bicuspidatis supernè serrato-hispidis striato-nervosis squamâ oblongâ emarginatâ hispido-aristatâ brevioribus angustioribusque.

Hab. ad Bonin Insul. Loo Choo, *Bongard*, no. 70 (*Herb. Hooker*).

C. trichocarpæ, Muhl. et affinis proxima.

9. *C. JACKIANA*, spicâ masculâ 1 oblongo-cylindricâ; fœmineis 4 v. 5: superioribus oblongis contiguis sessilibus: inferioribus vaginatis longè exsertè pedunculatis: infimâ remotissimâ elongatâ laxiflorâ interdum compositâ, stigmatibus 3, perigyniis triquetro-lanceolatis acuminatis striato-nervosis emarginatis squamâ ovato-acuminatâ aristatâ longioribus.

Hab. in Insulâ Java, *Dr. Horsfield*.

Habitu et aspectu *C. pubescenti*, Muhl. affinis.

10. *C. ÆTHIOPICA*, spicis 4 v. 5 cylindricis erectis castaneis concoloribus; masculâ 1; fœmineis 3 v. 4: superioribus approximatis inclusè reliquis exsertè pedunculatis: infimâ remotâ, stigmatibus 3, perigyniis ovatis triquetris rostratis bifurcatis nervosis sanguineo-maculatis squamâ ovato-lanceolatâ emarginatâ hispido-aristatâ brevioribus angustioribusque vel longioribus.

C. Æthiopica, *Schk. t. Z. f. 83*.

Hab. in Africâ Australi; Caffer-land, *Dr. Gill (Herb. Hooker)*; Uitenhage, *Zeyher*, no. 684 (*Herb. Hooker*).

11. *C. ARNOTTIANA*, spicis 5 cylindricis erectis contiguis; terminali masculâ; reliquis fœmineis: inferioribus vaginatis insertè pedunculatis: superioribus sessilibus ebracteatis, stigmatibus 3, perigyniis subinflatis ellipticis acuminatis cylindrico-rostratis bidentatis nervosis glabris olivaceo-viridibus squamâ lanceolatâ aristatâ longioribus.

C. Neesiana, *Arnett MSS. (non Endlich.)—(Herb. Arnott)*.

Hab. in Insulâ Ceylon, *Dr. Wight*, "1836, no. 1295."

Affinitas cum *C. paludosâ*, Gooden.

12. *C. SINAI*, glauca, spicis cylindricis gracilibus erectis; masculâ 1; fœmineis 4 inferioribus remotis exsertè pedunculatis, stigmatibus 3, perigyniis elliptico-lanceolatis triquetris nervosis brevi-rostratis bifidis apice hispidis squamâ ferrugineâ emarginatâ obtusâ mucronatâ longioribus.

C. distans, L. var., *Unio Itin.* no. 176, 1835.

Hab. "in fontanis ad radices Montis Sinai," *Schimper*.

C. dilutæ, Bieb. affinis.

13. *C. ABBREVIATA*, hirsuta, spicis 3 v. 4 oblongis approximatis sessilibus; terminali masculâ; reliquis fœmineis: inferioribus brevi-bracteatis evaginatiss, stigmatibus 3, perigyniis trigono-obovatis abruptè brevi-rostratis ore integro nervosis squamâ ovatâ mucronatâ ferrugineâ margine membranaceâ longioribus.

C. abbreviata, *Prescott MSS.*

Hab. in Sibirîâ Altaicâ (*Herb. Fielding, olim Prescott*).

Proxima *C. striatæ*, Br.

14. *C. GEBLERI*, spicâ masculâ 1 v. 2 cylindricâ; fœmineis 2 v. 1 oblongis v. cylindricis remotis pedunculatis erectis evaginato-bracteatis, stigmatibus 3, perigyniis ovatis brevi latiusculèque rostratis bicuspidatis lucidis nervosis purpureis squamâ ovatâ mucronatâ v. hispido-aristatâ purpureâ margine membranaceâ longioribus.

C. Gebleri, *Prescott MSS.*

Hab. in Sibirîâ Altaicâ? *Gebler (Herb. Fielding)*.

C. rotundatæ, Wahlenb. similis. *C. vesicaria*? Bunge MSS. e Chinâ Boreali differt solùm perigyniis ellipticis, squamis masculis muticis (*v. s. in Herb. Fielding*).

15. *C. DARWINII*, spicâ masculâ pedunculatâ solitariâ?; fœmineis 6—10 cylindricis elongatis nutantibus remotis foliaceo-bracteatis evaginatiss inæqualiter pedunculatis geminatis ternatisque: inferioribus solitariis, stigmatibus 2, perigyniis ellipticis stipitatis nervosis brevi-rostratis ore integro papilloso asperatis squamâ lanceolatâ acuminatâ ferrugineâ latioribus brevioribusque.

Hab. in Archipelago Chonas Americæ Australis, *Darwin*, no. 304 (*Herb. Henslow*).

ENTOMOLOGICAL SOCIETY.

April 1st, 1844.—G. Newport, Esq., President, in the Chair.

Mr. S. Stevens exhibited a minute species of *Hylesinus*, together with a piece of bark, showing the mining habits of the preparatory states of this beetle.

Mr. Westwood exhibited both sexes of two species of the genus *Ynca*, *Y. Sommeri* (a new species closely allied to *Y. Fabricii*, if it be not a geographical variety thereof,) and *Y. Beskii*, from tropical America, sent to him from Hamburgh by M. C. Sommer, Esq.

He likewise exhibited specimens of a species of *Cossonus* found in great numbers imbedded in a black brittle mass of matter, discovered in the interior of a barrow recently opened in Lancashire, and accompanied by notes from the Rev. Mr. Sibson, by whom they had been communicated to Dr. Holme of Manchester. Likewise drawings of the transformations of an Indian species of *Anthrenus*, and of *Paussus (Ceratoderus) bifasciatus*, Kollar, forwarded to him by Captain Boys.

The Rev. F. W. Hope exhibited a case of insects recently received from Ezra Downes, Esq., captured in his garden near Bombay, including a new species of *Derbe* and other insects, accompanied by notes on the habits of a species of *Cassida*; another of a *Cercopis*, called the Cow-ant, (from emitting a saccharine fluid which the ants greedily drink,) and on several species of parasitic *Hymenoptera* (including a species of the genus *Elasmus*) reared from the cocoons of a small moth.

The following memoirs were read:—

Continuation of a memoir containing descriptions of New Holland *Cryptocephalides*. By W. W. Saunders, Esq., F.L.S. &c.

Div. 2. *Lateral margins of thorax dentate or uneven.*

PRIONOPLEURA, W. W. S. *Head vertical; eyes reniform; antennæ as long as or longer than the body, filiform, with the six terminal joints somewhat more robust than the others; thorax subquadrate, with the lateral margins dentate or rugose, and the disc with elevated spaces; scutellum quadrate, elevated behind; elytra rugose.* Type *Cryptocephalus rugicollis*, Gray.

Subdivision 1. *Elytra with longitudinal elevated ridges more or less distinct.*

Sp. 1. *Prionopleura bifasciata*, Hope MSS. *Head rufous-brown, black above; antennæ black, with the 2nd, 3rd and 4th joints varied with rufous; thorax rufous-brown, with a black central longitudinal patch, and two lateral lunate ones of black; scutellum black; elytra rufous-brown, deeply punctured with eight somewhat elevated longitudinal ridges, and two broad black transverse bands; femora black, rufescent at base; tibiæ rufescent, with the apex black; tarsi black.* Length $\frac{3}{10}$ ths of an inch.—Hab. New Holland. Mus. Hope.

Sp. 2. *Prionopleura crucicollis*, Boisduval. *Head chestnut-brown, with a black frontal fascia; thorax rufous-brown, with a transverse black band, produced in front and behind into a short cross; scutellum black, shining; elytra deep rufous-brown, coarsely punctured with five distinct and three less distinct longitudinal ridges, with three short longitudinal black patches at the base, and an irregular transverse black central band less rufous brown; femora with a black streak.* Length $\frac{3}{10}$ ths of an inch.—Hab. New Holland and Van Diemen's Land. Mus. Hope and Westwood.

Sp. 3. *Prionopleura Hopei*, W. W. S. *Deep rufous-brown; head with a black band and spot; antennæ rather longer than the body; thorax black, with a narrow rufous-brown margin; scutellum black; elytra deep rufous-brown, deeply punctured with eight slightly elevated ridges and two black patches at the base, and a transverse central fascia.* Length $\frac{2.2}{100}$ ths of an inch.—Hab. Van Diemen's Land. Mus. Hope and Westwood.

Sp. 4. *Prionopleura Crux nigra*, Hope MSS. *Dark rufous-brown; antennæ with the terminal joint black; thorax with a transverse black central band produced in the middle both before and behind,*

forming a cross; elytra with nine longitudinal ridges, the five nearest the suture well-defined, with a narrow longitudinal black streak on the shoulders, and a sickle-shaped patch near the suture extending nearly to the middle of the elytra, and then curving in a transverse direction to the outer margin. Length $\frac{1}{4}$ th of an inch.

—Hab. New Holland. Mus. Hope.

- Sp. 5. *Prionopleura flavocincta*, W. W. S. Head rufous-brown, with a transverse black mark on the hind part of the forehead; thorax bright rufous-brown, with a broad transverse central band, dilated in the middle into a diamond shape; scutellum dark brown; elytra minutely punctured with nine distinct, somewhat elevated ridges, deep rufous-brown crossed by a broad orange band, margined with a black line on each side. Length $\frac{2}{10}$ ths of an inch.
- Hab. New Holland. Mus. Hope.

Continuation of a memoir containing descriptions of new exotic *Lucanidæ*. By J. O. Westwood, F.L.S.

Lucanus faunicolor, Hope. *L. mandibulis magnis porrectis, dente valido ante alteroque pone medium apicibusque serratis, totus supra luteo-fusco-pulverosus; antennis longis; tibiis omnibus inermibus.*

♂ Long. corp. cum mand. unc. $1\frac{1}{2}$.—Hab. in Oriente. In Mus. Buquet. An varietas *L. metallici*, Bdv.

Lucanus Rafflesii, Hope. *L. castaneo-rufus, nitidus; mandibulis scutello et sutura elytrorum nigris; capite et pronoti lateribus punctatis; tibiis 4 posticis in medio 1-dentatis, anticis 6-dentatis.*

♀ Long. corp. unc. 1.—Hab. — ?

Lucanus sericeus, Hope. *L. niger, lateribus latè piceo-castaneis luteo-sericeis; mandibulis brevibus; tibiis anticis extus serratis et 3-dentatis, pronoto in medio angulato.* Long. corp. lin. 10.—Hab. in insulâ Javâ.

Lucanus reticulatus, Buquet MS. inedit. *L. mandibulis brevibus, crassis, intus obtusè dentatis; subdepressus; niger, pronoto subquadrato, elytris squamoso-reticulatis.* Long. corp. lin. 6. Hab. in Novâ Zealandiâ. Mus. Buquet.

Platycerus origonensis, Westw. (an *Pl. securidens*, Say?). *Pl. chalybæus; elytris violascentibus, mandibulis capite parùm longioribus, versus basin curvatis, dente supero alteroque interno versus apicem armatis, pronoti lateribus marginatis.* Long. corp. lin. 6.—Hab. Oregon. Mus. Guérin.

May 6th.—G. Newport, Esq., President, in the Chair.

Mr. J. F. Stephens exhibited a specimen of *Yponomeuta sedilla*, Duponch., a moth new to this country, which he had captured on the 25th of April at Norwood.

Mr. W. W. Saunders exhibited the larva of a Longicorn beetle which was found in casks of gum imported from South America, to which it had proved injurious.

Mr. S. Stevens exhibited specimens of *Lytæa leucographa*, taken in blossoms of sallow at Leith Hill in April. Also specimens of

Dendrophilus Cooperi, taken in numbers in a decayed apple-tree at Hammersmith.

Mr. Inghen exhibited a specimen of *Pacilus cupreus*, taken in a pea-field, carrying a piece of a pea in its mouth.

The following memoirs were read:—

“Description of the habits of *Plectropteron Dianæ* (*B. Selene*), a large Indian moth.” By Captain Hutton.

In this communication the author gives a careful detail of his observations upon a brood of this splendid moth, a female of which had deposited 246 eggs whilst in his possession, the caterpillars of which are hatched in 18 days. The changes which the insect undergoes in this state are described; the food consisting of a tree called by the native Indians “Munsooree.” The peculiar mode in which the insect makes its escape from its cocoon is remarkable: a sharp scraping noise is first heard issuing from the cocoon, produced by a sharp instrument drawn across the threads for the purpose of cutting a hole, the black point of which is occasionally thrust through the cocoon; the cutting proceeding in two directions, so as to form a cross, through which a passage is effected by the inclosed and newly-hatched moth.

“Descriptions of the eggs and young larvæ of *Sialis lutarius*.” By W. F. Evans, Esq., by whom living specimens were exhibited.

The eggs of this insect are observed upon the rushes in the margins of ponds, in patches from two to three inches long, encircling the rush near the top; 100 eggs were counted in a square line, so that each patch contains between 2000 and 3000 eggs, which are of a singular form and arranged in a slanting direction. The larvæ are hatched at the beginning of May: they tumble about with their bodies erect like the *Staphylinidæ* and swim with great activity, wriggling their bodies about, and at the same time using their long legs. Their heads are of a large size.

“Notes on the habits of *Osmia Tunensis* and *bicolor*, which occasionally construct their cells in the shells of snails.” By F. Smith, Esq., by whom specimens of the nests and insects were exhibited.

June 3rd.—G. Newport, Esq., President, in the Chair.

Mr. Thrupp exhibited some pieces of lime-trees infested by a species of *Coccus* from the neighbourhood of London.

The President exhibited some specimens of a species of the same genus which attacks the orange-trees in the Azores, which led to an extended discussion, and to the appointment of a committee to investigate the nature of its attacks, and also to suggest the means of preventing the injurious effects of this insect.

The following memoirs were read:—

“Notes on the Habits of *Odynerus Antilope*.” By F. Smith, Esq.

On the 10th of August 1843, the author observed several females of this insect burrowing into a sand-bank. At the termination of one of the burrows he found a circular chamber about half an inch in

diameter, filled with small green caterpillars, the larva of the wasp not being then visible; but on removing the contents of the chamber into a pill-box, it was discovered two days afterwards, being about one line long: it fed voraciously, increased in size rapidly, and on the fourteenth day had consumed the whole of its store of food except three of the caterpillars, which had been previously attacked by *Ichneumons*, the larvæ of which parasites had spun their cocoons before the *Odynerus*-larva was full-fed. The latter, after remaining quiescent for two more days, then spun a globular silken cocoon, within which it remained unchanged till the first week in the following April, when it cast off a thin skin and assumed the pupa state, the larva skin remaining attached to the anal segment. At the end of the third week it began to acquire some tint of its natural or perfect colouring, the head becoming dark-coloured, as well as the tips of the wings and femora; day by day it progressed in its gradual approach to a perfect state, and on the 26th of May it became active, but it was two or three days before it finally took wing. The sex of the insect developed was male. Mr. Smith made a sketch of the larva in January; it had thirteen segments and an anal tubercle, including the head; some hymenopterous larvæ have apparently fourteen, as in *Epipone lævipes*, but he believes the correct number to be ten, having lateral spiracles; the head and following segment destitute of a spiracle, as well as the anal segment, which makes up the true number thirteen, including the head. The larva of *Osmia leucomelana* would, if the constrictions were numbered, have fifteen segments, including the head: it is very deeply constricted; and without taking the spiracles as a guide, the number of segments would be puzzling to enumerate.

The larva of *Osmia leucomelana* after spinning its cocoon remains in a state of lethargy until the beginning of March, when it assumes the pupa state, and is afterwards about six weeks arriving at its perfect condition. The pupa-case spun by the larva of this species of *Osmia* closely resembles that spun by some species of fossorial Hymenoptera of the genus *Crabro*.

“Descriptions of some new species of *Halticidæ* from the Philippine Islands.” By G. R. Waterhouse, Esq.

July 1st.—G. Newport, Esq., President, in the Chair.

Captain Parry exhibited an interesting collection of insects received by him from New Zealand. Also a specimen of *Sirex gigas*, recently captured by himself at Sunning Hill.

The President exhibited specimens of *Saropoda furcata*, and its parasite *Calioxys conica*, reared by himself from the nests made in posts at Canterbury.

Mr. Westwood exhibited some drawings made by Dr. Templeton of various apterous insects of Ceylon, accompanying his memoir on those insects printed in that island.

Mr. Yarrell presented a leaf of the lime-tree, thickly covered with small conical fleshy protuberances, apparently the result of the puncture of insects.

The Rev. F. W. Hope exhibited some specimens and drawings of fossil insects from Aix. He also exhibited specimens of both sexes of *Goliathus Savagei*, recently received by him from Western Africa from Mr. Savage.

The following memoirs were read:—

“Descriptions of new species of *Buprestidæ* from New Holland.”

By the Rev. F. W. Hope.

Sp. 1. *Chrysodema gigas*, Hope. *Viridis, thorace ferè quadrato rugoso-punctato, elytris quadricostatis marginibusque externis elevatis, tarsisque infra flavis.* Long. lin. 19, lat. lin. $6\frac{1}{2}$.—From Swan River.

Sp. 2. *Stigmodera signaticollis*, Hope. *Flava, thorace viridi-violaceo, utrinque flavo-maculato, elytris tribus fasciis violaceis, pedibus viridibus.* Long. lin. 14, lat. lin. 6.—From Swan River.

Sp. 3. *Stigmodera Mitchellii*, Hope. *Flava, thorace olivaceo-æneo, marginibus croceis, fossulâ utrinque parùm distinctâ, elytrisque violaceis et quatuor fasciis flavis ornatis, corpore infra cyanea, pedibusque concoloribus.* Long. lin. $11\frac{1}{2}$, lat. lin. 5.—From Swan River.

Sp. 4. *Stigmodera sanguinosa*, Hope. *Ænea, thorace nigricante, elytris sanguineis punctis viridibus fortiter excavatis, corpore infra aurato-æneis griseisque pilis obsito, pedibus antennisque cupreis.* Long. lin. 10, lat. lin. 4.—From Swan River.

Sp. 5. *Stigmodera hæmatica*, Hope. *Sanguinea, capite atro-æneo, thorace in medio nigro-maculato, corpore infra sanguinoso pectore, pedibusque cyaneis.* Long. lin. 15, lat. lin. 6.—From Swan River.

Sp. 6. *Stigmodera Parryi*. *Brunneo-rubra, thorace æneo rubroque colore variegato, elytris brunneo-rubris, corpore infra eroso-punctato et æneo, pedibusque concoloribus.* Long. lin. $14\frac{1}{2}$, lat. lin. 6.—From New Holland.

Sp. 7. *Stigmodera cyanura*, Hope. *Flava, thorace viridi nitido, maculâ flavâ parvâ utrinque positâ, elytris flavis, apicibusque latè cyaneis, corpore infra flavo viridique colore variegato.* Long. lin. 11, lat. lin. $4\frac{1}{2}$.—From Swan River.

Sp. 8. *Stigmodera Hoffmansseggii*, Hope. *Violacea, thorace æneo, elytris purpurascensibus striatis, apice subserratis, humeris flavo-maculatis fasciisque duabus concoloribus ornatis, corpore infra chalybeo-violaceo, pedibusque æneis.* Long. lin. 9, lat. lin. 4.—From the neighbourhood of Swan River.

Sp. 9. *Stigmodera perplexa*, Hope. *Ænea, thorace nigricante, elytris flavis tribus fasciis atro-violaceis signatis, corpore infra atro-æneo, pedibus concoloribus.* Long. lin. 7, lat. lin. 3.—From Western Australia.

Sp. 10. *Stigmodera assimilis*, Hope. *Violacea, thorace olivaceo-æneo, elytris tribus fasciis flavis, corpore infra purpurascens, pedibus concoloribus.* Long. lin. $5\frac{1}{2}$, lat. lin. 2.—From Port Philip.

Sp. 11. *Stigmodera Adelaidæ*, Hope. *Purpurascens, thorace flavo-marginato, disco viridi crebrissimè punctulato, elytris violaceis et*

- decem-maculatis, corpore infra flavo, pedibus violaceis.* Long. lin. 5, lat. lin. 2.—From the settlement at Adelaide.
- Sp. 12. *Stigmodera purpurea*, Hope. *Purpurea, thorace lateribus flavo-marginatis, elytrisque violaceis et octo maculis notatis, corpore infra flavo et violaceo.* Long. lin. 4, lat. lin. $1\frac{1}{2}$.—Received by Mr. Gould from Western Australia.
- Sp. 13. *Stigmodera hilaris*, Hope. *Æruginosa, elytris miniatis, humeris viridibus maculisque aliis concoloribus per discum positis, corpore infra late virescente.* Long. lin. 3, lat. lin. 1.—From Port Philip.
- Sp. 14. *Stigmodera Saundersii*, Hope. *Atra, elytris miniatis ad basin 4-maculatis, maculâ mediâ rotundatâ nigrâ apicibusque nigris.* Long. lin. 5, lat. lin. 2.—Lately sent by Mr. Fortnum from the Adelaide settlement.
- Sp. 15. *Buprestis albivittis*, Hope. *Ænea, thorace punctulato lateribus externis albis, elytrisque æreis, vittâ albidâ laterali notatis.* Long. lin. $12\frac{1}{2}$, lat. lin. 4.—Inhabits Van Diemen's Land.
- Sp. 16. *Buprestis pyritosa*, Hope. *Igneo-cuprea, thorace flammanti punctato, elytris subviolaceis maculis fasciisque duabus aureis notatis, pedibusque viridibus.* Long. lin. 5, lat. lin. 2.—From Western Australia.
- Sp. 17. *Buprestis verna*, Hope. *Viridis, capite cupreo-æneo, thorace elytrisque aurato-virescentibus et punctatis, corpore subtùs roseo-cupreo et pubescenti, pedibusque concoloribus.* Long. lin. $4\frac{1}{2}$, lat. lin. $1\frac{1}{2}$.—Sent by Mr. Fortnum from Adelaide.
- Sp. 18. *Buprestis Porteri*, Hope. *Cuprea, capite obscurè æneo, scutello aureo, corpore subtùs aurato-æneo et pubescenti.* Long. lin. 3, lat. lin. 1.—From the vicinity of Port Philip.
- Sp. 19. *Buprestis Helenæ*, Hope. *Nigro-ænea, thorace concolore, maculis quatuor irregularibus elytrorum, corpore subtùs æneo, pedibus concoloribus.* Long. lin. $6\frac{1}{2}$, lat. lin. 3.—From Swan River.
- Sp. 20. *Buprestis lanuginosa*, Hope. *Affinis præcedenti: nigro-violacea, thorace cupreo, elytris maculis tribus aurantiacis marginibus apicibusque sanguineis, corpore subtùs æneo lanugine albidâ obsito.* Long. lin. $6\frac{1}{2}$, lat. lin. 3.—Received from Captain Roe of the Swan River settlement.
- Sp. 21. *Chrysobothris Australasiæ*, Hope. *Nigro-ænea, thorace pallidiori colore æneo, elytris nigricantibus, punctis duobus baseos fortiter impressis et alteris in medio cupreo-auratis, corpore subtùs æneo, lateribus sublanuginosis.* Long. lin. 6, lat. lin. $2\frac{1}{2}$.—From Swan River.
- Sp. 22. *Anthaxia Fortnumi*, Hope. *Cyanea, thorace concolori, lateribus aurato-punctatis, elytris ad scutellum aurato-fulgentibus maculâ irregulari aured post humeros locatâ, corpore subtùs violaceo, pedibus concoloribus.* Long. lin. 3, lat. lin. 1.—This is, I believe, the first notice of a true *Anthaxia* being found in New Holland.
- Sp. 23. *Anthaxia Adelaidæ*, Hope. *Nigro-ænea, thorace cupreo-*

- æneo subtilissimè punctato, elytris nigricantibus violaceoque colore tinctis, corpus infra atro-æneum, antennis pedibusque concoloribus.* Long. lin. $1\frac{1}{4}$, lat. lin. $\frac{1}{2}$.—Inhabits Adelaide.
- Sp. 24. *Acmaeodera nodosa*, Hope. *Nigra, thorace nodoso et tuberculato, elytris flavis maculis minutis variis variegatis, corpore infra atro-nitido, pedibusque concoloribus.* Long. lin. 4, lat. lin. $1\frac{1}{2}$.—Received from Captain Roe of Swan River.
- Sp. 25. *Acmaeodera melanosticta*, Hope. *Atra, thorace nigro-nodoso, elytris flavis maculis variis atris variegatis, corpore infra concolori.* Long. lin. $2\frac{1}{2}$, lat. lin. $\frac{1}{2}$.—From Swan River.
- Sp. 26. *Agrilus purpuratus*, Hope. *Purpureus, thorace concolori, lateribus angulis anticis luteis, elytris purpurascensibus, corpore infra albidis maculis notato.* Long. lin. 4, lat. lin. 1.—From Moriatta, captured by Mr. Fortnum.
- Sp. 27. *Agrilus assimilis*, Hope. *Purpureus, capite æneo punctulato flavisque capillis ornato, thorace ad angulos anticis aureo-maculato, elytris purpurascensibus, corpore infra æneo, lateribus annulorum abdominis subpilosis.* Long. lin. 4, lat. lin. 1.—From Western Australia.
- Sp. 28. *Agrilus auro-vittatus*, Hope. *Affinis Agrilo purpurato, Hope, at minor. Purpurascens, capite aurato punctato, thorace lined longitudinali medid aured, binisque aliis ad latera positis, elytris cupreo-purpureis vittâ suturali auratâ in singulo conspicuâ, corpore infra æneo, pedibus concoloribus.* Long. lin. $2\frac{3}{4}$, lat. lin. $\frac{3}{4}$.—Received from Moriatta.
- Sp. 29. *Agrilus pistacinus*, Hope. *Totum corpus supra et infra viride punctatum, antennis saturatiore colore inquinatis, caput ferè rotundatum, thorace angulis posticis rectè acutis, elytra ænea crebrissimè punctulata, corpus infra viride sericie albida obsitum, pedibus concoloribus.* Long. lin. 2, lat. lin. $\frac{1}{2}$.—From the Adelaide settlement.
- Sp. 30. *Cisseis 14-notata*, Hope. *Affinis C. stigmatae, Laporte. Atro-violacea, thorace concolori, lateribus roseo-cupreis, elytris obscuris 14 punctis flavis notatis.* Long. lin. $3\frac{1}{2}$, lat. lin. $1\frac{1}{4}$.—From Swan River.
- Sp. 31. *Cisseis Spilota*, MacLeay MSS. *Viridi-ænea, thorace quatuor punctis albis notato, elytris variis minutis maculis ornatis, corpore infra æneo.* Long. lin. $5\frac{1}{2}$, lat. lin. $1\frac{3}{4}$.—From New Holland.
- Sp. 32. *Ethon signaticolle*, Hope. *Affinis E. bicolori, Laporte, at longior. Violaceum, thorace aureo nitido binis albidis punctis notato, elytris violascentibus punctis variis albis per discum aspersis.* Long. lin. $4\frac{1}{2}$, lat. lin. $1\frac{1}{2}$.—From the vicinity of Port Essington.
- Sp. 33. *Ethon roseo-cupreum*, Hope. *Totum corpus supra cupreum et punctatum, capite foveolato, elytris late cupreis et iridescentibus, corpus infra æneum, lateribus abdominis albedo colore irroratis, pedibus concoloribus.* Long. lin. 3, lat. lin. $1\frac{1}{4}$.—From Moriatta.
- Sp. 34. *Ethon cupricolle*, Hope. *Nigro-æneum, thorace cupreo-aurato binisque minutis foveis albis notatis, lateribus concoloribus, elytris atris et punctis duodecim albidis notatis, corpore infra*

viridi et nitido, segmentis abdominis utrinque albo-punctatis, pedibusque viridibus. Long. lin. $2\frac{1}{2}$, lat. lin. 1.—From Moriatta.

Sp. 35. Ethon æneicolle, Hope. *Ænescens, thorace viridi-æneo foveis dorsalibus albidis binis impresso, lateribus concoloribus, elytris nigricantibus albo-punctatis et subtomentosis, corpore infra viridi, segmentis abdominis utrinque albo-punctatis, pedibusque viridi-æneis.* Long. lin. $2\frac{3}{4}$, lat. lin. 1.—From Adelaide.

Sp. 36. Ethon Gouldii, Hope. *Æneum, thorace cupreo-æneo fortissimè punctato, lateribus externè lined elevatâ æned conspicuis, elytris iridescentibus æneis, colore violaceo sparsim aspersis, maculis duabus obscuris post scutellam positis, corpus infra æneum punctatum, pedibus concoloribus.* Long. lin. 4, lat. lin. $1\frac{1}{4}$.—From Port Essington.

Sp. 37. Stigmodera Stricklandi, Hope. *Flava, thorace olivaceo-æneo marginibus croceis, elytris atro-violaceis, parte dimidiatâ anteriori flavâ, maculâ violacèd in singulo ad latera positâ, fasciâque flavâ ante apicem binisque punctis rubro-miniatis in angulo apicis locatis, corpore infra viridi, ultimis abdominis segmentis croceo colore inquinatis.* Long. lin. 10, lat. lin. $4\frac{1}{2}$.—From Moriatta.

“Descriptions of some new exotic *Reduviidæ*.” By J. O. Westwood, F.L.S.

Ploiaria bispinosa, Westw. *Albida, prothorace in medio valdè constricto, posticè dilatato et bituberculato; scutello spinis duabus brevibus acutis erectis; hemelytris pone medium intus dilatatis irregulariter fusco-guttulatis, venis albis; segmentis abdominis lateribus angulato-productis; pedibus fusco multo annulatis et pilosis.* Long. corp. hemelytris clausis, lin. $5\frac{1}{2}$.—Hab. Nova Hollandia. Adelaide, D. Fortnum. Mus. Hope.

Ploiaria madagascariensis, Westw. *Præcedenti valdè affinis et forsan varietas geographica; pronoto constrictione longiori in medio, hemelytrisque maculis majoribus et magis distinctis, fuscis.* Long. corp. ferè lin. 6.—Hab. Madagascar. Mus. Jardin des Plantes, Paris.

Extracts from a letter from Dr. Templeton, addressed to Mr. Westwood, containing notices of the habits of the *Scolopendræ* and other apterous insects of Ceylon.

Dr. Templeton states that he had been twice bitten by large specimens of *Scolopendra pallipes*, and had seen persons bitten by *S. crassa*; but observes, that if there be poison, it is rather singular in its kind, as there is little or no pain at the time, certainly not more than is due to the mere mechanical violence; and if the bite had been in the thigh, calf of the leg, or other fleshy part, the after-consequences would be trifling; but if in the finger, or where much tendinous structure abounds, about twelve hours after the part inflames, and it is very likely to whitlow; but the application of a poultice relieves it, so that he had never known any pain or signs of inflammation the following day. It is however very probable that persons of cachectic habit might suffer more severely, in fact die of it; but it does not follow on that account that the wound is poisoned. He suspects indeed it is a mere story, like that of the Tarantula.

He has obtained some very curious spiders, and which he thinks must be separated from genera as yet published.

The letter was accompanied by a list privately printed by Dr. Templeton, containing descriptions of the species of *Thysanura*, *Myriapoda*, *Scorpionidæ*, *Cheliferidæ* and *Phrynidæ*, which the author had discovered in Ceylon, with the following notes on the habits of *Phrynus lunatus*, Pallas :—

“Very common in chinks in old walls of dwelling-houses and dark outhouses. The usual movements of this curious animal are slow and prowling, and indifferently in all directions like a crab ; if it be however disturbed it runs with amazing velocity, vastly quicker than the cockroaches, upon the young of which it usually preys : it seizes them by the head and legs with the claws of the pedipalpi with a sudden snap, and thrusts its head into the soft parts beneath the anal plate so as to suck the juices, the maxillary palpi being pressed alternately on the dorsal surface with a clawing movement, in its attempts to force its mandibles more deeply in : it however sometimes devours the coriaceous parts of the insect, as I found by placing one with it in a tumbler ; during the night the femora and all the juicy parts of its prey had disappeared. I have never found cast-off skins. When irritated with the handle of a brush, the snapping blow it makes with the pedipalpi is singularly violent and startling.”

In reference to which Mr. Hope stated, that Signor Costa had informed him that the bite of the *Scolopendra*, in the island of Ischia, was to a certain extent venomous, the pain lasting for seven or eight days, and being considerable ; ammonia was the usual remedy. Captain Parry also stated that the same effects were produced by the bite of the *Scolopendra* in Portugal.

Mr. Westwood mentioned that he had recently observed the excessive fondness of wasps for honey-dew upon whitethorns in the spring ; and that it was thence advisable to watch situations in which *Aphides* abounded at that time, in order to destroy the queen wasps attracted to such spots. He also stated that he had noticed an oak-tree in Staffordshire far more backward in its foliage than the neighbouring trees, but which was entirely covered with galls, the latter being produced by the *Cynipidæ*, which had particularly selected this tree from its ill state of health, as proved by its backward foliage.

August 5th.—G. Newport, Esq., President, in the Chair.

Mr. Evans exhibited a lanthorn adapted with lenses, nearly similar to a magic lanthorn, which he had found of great service in delineating the veins of the wings of Neuropterous insects, the figures being received upon tracing-paper gummed upon a square of glass, and held at any distance from the machine according to the size required.

Mr. F. Bond exhibited a specimen of *Deilephila Galii* taken at Harrow in July ; also specimens of *Polyommatus Arion* taken at Barnewall Wold in Northamptonshire during the latter half of July.

Mr. S. Stevens exhibited a box of *Lepidoptera* recently taken in Black Park near Buckingham, containing the following rare insects : *Limenitis Camilla*, *Psilura monacha*, *Mythimna turca*, *Polia herbida* and *bimaculosa*, *Graphiphora brunnea*, *festiva*, *rhomboidea* (*tristigma*) and *triangulum*, *Hadena saponaria* and *oblonga*, *Rusina ferruginea*,

Thyatira derasa and *Batis*, *Alcis roboraria*, *conversaria* and *sericearia*, *Lithosia helvola* ♂ and *quadra*, *Fumea nitida*, *Cledeobia albistrigalis*, &c.

Mr. Westwood exhibited a specimen of *Serropalpus striatus*, a beetle not hitherto noticed as British, which he had received from Mr. Plant of Leicester, by whom it had been recently obtained in that neighbourhood.

The following memoirs were read:—

“Notice of the occurrence of a species of *Sirex* in a wooden building long erected,” communicated by Sir W. Clinton and the Bishop of Norwich to Mr. Spence.

The wood-work of a conservatory belonging to Sir W. Clinton, which had been erected ten years, having been observed to be undergoing what appeared to be the dry-rot, it was partially taken down, and in the interior of one of the rafters of close-grained Memel deal, several pupæ of an insect, supposed to be a foreign species of *Sirex*, were discovered within burrows filled with wood-dust, and, in the parts where the pupæ were observed, lined with the fragments of wings and other parts of the perfect insect; and as no external orifice was detected, it is supposed that the insect proceeded from eggs laid in the rough timber before it was framed, and that there had been a succession of them. The insect was not however forwarded for inspection, so that doubts must be entertained both as to its species and even family, as the account seems in some respects to agree with the habits of some of the wood-boring species of the Linneæan genus *Spheæ*.

“Notices sur quelques Zoologistes Néapolitains morts.” By Signor Costa of Naples. Communicated with a translation by the Rev. F. W. Hope, F.R.S. &c.

“Observations on the Fossil Insects of Aix in Provence, with descriptions of three species.” By the Rev. F. W. Hope, F.R.S. &c.

In this paper the author gives a list of 113 genera of insects found in the Aix formation, with observations derived from a consideration of their habits whilst living as connected with their deposit; and describes three new species, namely, *Balaninus Barthelemyi*, *Rhynchænus Solieri* and *Corizus Boyeri*.

“Descriptions of two new exotic *Hemiptera* in the cabinet of the British Museum.” By Mr. Westwood.

EUMENOTES, Westw. (gen. nov. Amauro Burm. affine). *Corpus oblongum, capite lato anticè cornubus duobus planis truncatis; antennis satis crassis 4-articulatis articulo 2do reliquis longiori, 4to ovali parvo; prothorace anticè lateribus parallelis membranaque hemelytrorum valdè areolata.*

Eumenotes obscura, Westw. *Obscurè brunnea punctata apice scutelli rufescenti; membrana apicali hemelytrorum nigricanti, pronoti margine postico transverso deflexo; abdominis lateribus subserratis.* Long. corp. lin. 4.—In Mus. Britann.

PHYSODERES, Westw. (gen. nov. Enicocephalo W. affine). *Caput sub-bipartitum; antennis gracilibus 4-articulatis, articulo 2do longiori, 4to præcedenti vix tenuiori; prothorax latissimus lateribus inflato-rotundatis pone medium constrictus, hemelytrorum corio parvo, membrana maxima area magna media.*

Physoderes notata, Westw. *Obscurè brunneo-fulvescens, pronoto in medio partis anticae lineis duabus latis parallelis notisque tribus lateralibus obscuris, abdominis lateribus nigro flavoque variis.*
Long. corp. lin. $4\frac{1}{2}$.—In Mus. Britann.

Extract of a letter addressed by Colonel Hearsay to Mr. Westwood, containing a notice of the habits of *Galeodes* and *Scorpio*, and on the specific identity of *Papilio Pammon* and *Polytes*, which he had observed *in coitu*.

The *Galeodes vorax* of Hutton was observed running about the floors of the Bungalows at Nusseerabad, as large as small mice, several of which he had kept alive in glass bottles. On giving a large *Sphex* to one, the *Galeodes* seized it, and though stung, soon devoured it, without appearing injured by the sting. He also describes a battle which occurred between one of these insects and a good-sized scorpion: the *Galeodes* was stung several times, but was disabled by the scorpion either nipping or biting off a small piece at the very end of one of the two long thread-like feelers, the extremity of which has a process for climbing by excluding air; for by hanging by the end of these leg-feelers they can, but not easily, climb up the side of a glass tumbler. On putting another *Galeodes* to the scorpion the former seized it, and was actually thrown, more than once, violently to the sides of the glass from the strong muscular action of the tail, and the sting fairly entered its body. The *Galeodes* returned to the charge, and at last seized the tail of the scorpion near the sting, the latter endeavouring, but in vain, to seize the limbs of the former: as the *Galeodes* could not however bite through the hard substance of the tail, it gradually went down it with its jaws to its junction with the body, when it buried two of its fangs into the body of the scorpion, holding fast by the other two, and alternately gnawing and holding by these fangs. By this means it cut off the scorpion's tail from the body, and then gradually eat it—tail, sting and all.

In reference to this communication the President stated, that the species of *Galeodes* in question, which had been named *G. vorax*, was the *G. fatalis*, Hbst; and Mr. Doubleday mentioned, that in the genus *Diadema* (*Papilio Bolina*, &c.), the females of some of the species occasionally exhibited the colours of the male.

BOTANICAL SOCIETY OF EDINBURGH.

This Society held its first meeting for the session on the 13th November, 1845. Dr. Douglas Maclagan, President, in the chair.

The President, on taking the chair, begged to offer a few remarks on the present state and prospects of the Society. During the past, as well as former sessions, many valuable papers had been read to them, and much interesting botanical information, especially on some of the more obscure classes of vegetables, had been brought before the public through the medium of their Reports and Transactions. In one respect only the Society had occasionally been deficient; he meant in the attendance of members at its meetings. This was owing in great part to the circumstance that almost all the members were professionally occupied, and therefore unable to give to a purely

scientific society that attendance which they were able to bestow on professional societies and meetings. During last session, they had also felt a great blank in the absence from their meetings of their former distinguished president, Dr. Graham, whose long and painful illness had, for many months previous to his death, precluded his taking any part in their proceedings. Dr. MacLagan felt it to be unnecessary in such a meeting to eulogise the character of Professor Graham. They all not only knew him to be a zealous cultivator and successful teacher of botany, but they had individually found in him a kind, upright and sincere friend. His affable manner, conjoined with his highly honourable deportment, had procured for him the respect and esteem of all who had the pleasure of knowing him.

It was a gratification to find in Dr. Graham's successor the gentleman to whose zeal and activity the Botanical Society of Edinburgh owed its origin. He congratulated Dr. Balfour on his return to his native city, and expressed the hope and expectation that in his new position he would materially support and advance the interests of the Society.

The following communications were read :—

1. "Contributions to the Physiology of Fecundation in Plants." By George Dickie, M.D., Lecturer on Botany in the University and King's College of Aberdeen. (See p. 5 of the present Number.)

2. "Remarks on some forms of *Rubus*." By T. Bell Salter, M.D., F.L.S., Ryde, Isle of Wight. (See 'Annals,' vol. xvi. p.361.)

Mr. James M'Nab exhibited a specimen of silk cotton (*Bombax Ceiba*), and mentioned that this substance was under trial in this city, with the view of its being employed in the manufacture of hats.

Specimens of *Burkhausia setosa*, gathered near North Queensferry, by Andrew Dewar, Esq., Dunfermline, were placed on the table.

MISCELLANEOUS.

Additional note on the Belted Kingfisher, Alcedo Alcyon, Linn., obtained in Ireland.

THE communication on this subject, which was published in the December Number of the 'Annals,' p. 430, was despatched immediately on receipt of the information, more especially that Mr. Yarrell (likewise informed to the same effect) might as early as possible be in possession of it for the second edition of his 'History of British Birds,' then just being concluded. It was consequently deficient in some few points, to which the attention of my correspondents in Dublin has since been directed. It was desirable to know the respective dates on which the birds were met with in Meath and Wicklow, that we might thus guard against the possibility of "one and the same" bird being noticed as two individuals. Mr. Warren replies, the Belted Kingfisher was shot by Frederick A. Smith, Esq., at Annsbrook, county of Meath, on the 26th of October, and that the statement of Mr. Latouche's gamekeeper on the 20th of November was, that the bird seen by him fishing at the river between Lug-

gela and Lough Dan appeared a few days before the latter date. We may therefore conclude that two individuals of this species have been met with. Mr. Ball considers that the full strong plumage which the specimen presents, denotes a truly wild bird, and one which could not have escaped from confinement. According to the descriptions of Wilson and Richardson, it is a female, and not, at all events, in younger plumage than that of the second year.

Belfast, Dec. 3, 1845.

WM. THOMPSON.

SPICULA OF MOLLUSCA.

Fusiform spicula are common in sponges, and in the flesh of several of the true radiated animals, as the fleshy parts of *Lobularia*, and of many other of the *Zoophytaria*, where they form a kind of skeleton to support the more fleshy kinds; the existence of them in the fleshy corals and the sponges has been regarded as one of the reasons why the sponges must be animals. I am not aware that these bodies have been observed in Mollusca; but the genus *Phyllidia*, which is destitute of any true shell, has its mantle strengthened with a regular network formed of ropes of simple, regular, fusiform, transparent spicula about a line or a line and a half in length.

These ropes of spicula form lines which radiate round the circumference of the mantle, and these are crossed at right angles by other ropes of spicula which are parallel to the edge of the mantle, leaving square interspaces which decrease in size, and the ropes decreasing in thickness as they approach the edge. The spicula are also very abundant and larger in the interspaces of the flesh of the foot.

J. E. GRAY.

INDIAN SPECIES OF PAPILIO.

To the Editors of the Annals of Natural History.

GENTLEMEN,—Being the “English entomologist” alluded to by Mr. E. Doubleday as having given information to Dr. Erichson respecting certain Indian species of *Papilio*, which I knew to be erroneous (vol. xvi. p. 305), I must request you, in justice to Dr. Erichson and myself, to state that Dr. Erichson has nowhere, either in his ‘Bericht’ for 1842 or elsewhere, stated that *P. Ganesa* is synonymous with *P. Arcturus*, *P. Polyceutes* with *P. Bootes*, and *P. Xenocles* with *P. Pollux*. His observations refer to the respective juxtaposition of the four first-named species, and to the possibility of the two latter being identical, evidently founded upon a comparison of Mr. Doubleday’s description of *P. Xenocles* with my note on *P. Pollux*, that the latter “variat magnitudine macularum.” It is hard that Dr. Erichson should have the errors of his translators laid on his shoulders, and it is still harder that I should have such an imputation as the above laid to my charge, which you will thus see has no other foundation than the imagination of its author, and which was the more uncalled-for, as I had denied the imputation long ago in Mr. Doubleday’s presence at the British Museum.

Probably it will be further ascertained by a bona fide examination of Dr. Erichson’s ‘Bericht’ itself, that some of the other “very nu-

merous" errors in the Ray Club publication alluded to by Mr. Doubleday (which he threatens hereafter to expose) may be thus traced to their true source.

I remain, Gentlemen,

Your very obedient servant,

Hammersmith, Nov. 30, 1845.

JOHN O. WESTWOOD.

DEATH OF DR. MÖLLER.

Conchology has suffered a severe loss in the early death of Dr. Möller, well-known for his work on the Mollusca of Greenland, a work which at once established him as one of the most promising malacologists of his time. Shortly after he had finished his studies, two years ago, he was appointed governor of East Greenland, and had just returned from that inhospitable climate to his native country when he formed the intention of visiting England, for the purpose of making himself personally acquainted with our conchologists and their collections, and was to have arrived by the end of last month. But I have received the melancholy information of his decease, after a few days' severe illness, at Rome. He had sent a nearly complete collection of the shells he had described to the British Museum shortly after the publication of his work.

J. E. GRAY.

METEOROLOGICAL OBSERVATIONS FOR NOV. 1845.

Chiswick.—November 1. Slight haze: very fine. 2. Slight fog: overcast. 3. Frosty: fine: clear and frosty. 4. Frosty, with dense fog: clear and frosty at night. 5. Frosty and foggy: very fine: overcast. 6. Very fine: rain. 7. Clear and fine: cloudy: rain. 8. Cloudy. 9. Very fine: slight rain. 10. Very fine: heavy clouds. 11. Hazy: rain. 12. Very fine. 13. Hazy: very fine. 14. Foggy throughout. 15. Foggy: fine. 16. Densely clouded: rain. 17. Fine: rain. 18. Cloudy: clear. 19. Boisterous, with rain: showery: very clear at night. 20. Fine. 21. Overcast: heavy rain. 22. Fine: clear and cold. 23. Sharp frost: fine. 24. Very fine: foggy at night. 25. Uniformly overcast: slight rain: foggy. 26. Densely overcast. 28. Cloudy. 29. Heavy rain. 30. Cloudless: overcast at night.—Mean temperature of the month 1°43 above the average.

Boston.—Nov. 1. Fine. 2, 3. Cloudy. 4—7. Fine. 8. Cloudy: rain early A.M. 9. Fine. 10. Foggy. 11. Fine: rain P.M. 12. Cloudy. 13. Fine. 14, 15. Cloudy. 16. Cloudy: rain early A.M. 17. Cloudy: rain early A.M.: rain P.M. 18. Cloudy: rain early A.M. 19. Stormy: rain A.M. 20—23. Fine. 24. Fine: snow and rain early A.M. 25—28. Cloudy. 29. Cloudy: rain P.M. 30. Fine.

Sandwich Manse, Orkney.—Nov. 1. Bright: cloudy. 2. Fine: cloudy. 3. Fine: frost: cloudy. 4. Bright: clear. 5. Clear. 6. Damp: cloudy. 7. Damp: hazy. 8. Drizzle: cloudy. 9. Cloudy: damp. 10. Damp. 11. Cloudy: fog in valleys. 12. Frosty: fog: clear. 13. Fine. 14. Fine: frost: fine. 15. Fine: cloudy. 16. Fine: rain. 17. Fine: showers. 18. Cloudy. 19. Rain: cloudy. 20. Showers. 21. Showers: sleet. 22. Cloudy: showers. 23. Cloudy: snow-showers. 24. Cloudy: snow: rain. 25. Showers: rain. 26. Showers: thunder and showers. 27. Showers: hail: showers. 28. Cloudy: showers. 29. Cloudy: showers: sleet. 30. Sleet-showers: snow on hills.

Applegarth Manse, Dumfries-shire.—Nov. 1. Fair and fine. 2. Fair and chilly. 3. Fair, but dull: frost A.M. 4. Frost, hoar: clear and cold. 5. Frost: dull. 6. Fair and fine: fresh. 7—10. Rain early A.M. 11. Fair and fine. 12—13. Hoar-frost: fine. 14. Raw and cloudy. 15. Rain P.M. 16. Heavy rain P.M. 17. Fine: dry. 18, 19. Heavy showers. 20. Fine A.M.: rain P.M. 21. Showers. 22. Frost. 23. Frost: a few drops of rain. 24. Frost: cloudy P.M. 25. Wet. 26—28. Very heavy rain. 29. Showers. 30. Heavy rain P.M.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 110. FEBRUARY 1846.

X.—Remarks upon the Formation of Starch.

By M. CHARLES MÜLLER*.

THIS subject has already been treated of by J. Münter in his interesting paper "On the Starch of *Gloriosa superba* †." The result of his investigations is, "that a process similar to that of cell-formation may also be supposed to occur in the formation of the starch-granules, the nature of which must constitute the object of future inquiry." At the time the above paper appeared, I had also been engaged on this subject, endeavouring to investigate the formation of the starch-granules in the nucleus of the fruit of *Chara*. I had not then succeeded in ascertaining this, but had discovered the earliest commencement of the formation of the cells in the nucleus, which completely confirmed Schleiden's theory of the cell-formation. Since, however, at a subsequent period, starch only is found in the nucleus in the place of the cells, the simple and natural conclusion was, that the cells themselves must have been converted into starch. The manner in which this was accomplished was not then evident, as the contents of the sac of the spores, which surrounds the nucleus, so soon became turbid, and did not permit of that stage being discovered in which the transition of the cells into starch might be studied ‡. It was remarked in this paper, "that in the mature cells probably new ones are continually formed, until the process of cell-formation terminates by all the cells being converted into starch." I can now, from actual observation, confirm this position, which was previously deduced by Münter from his experiments. In the spring of this year I obtained at Wanzleben near Halle, young specimens of *Chara crinita* having the fruit in an early stage. I took a quantity of it home with me, and in order to examine it accurately placed it in water until I had sufficient time for further

* Translated from the *Botanische Zeitung* for Dec. 12, 1815.

† *Ibid.* No. 12, 1845.

‡ On the history of the development of the *Charæ* (*Bot. Zeit.* 1845, p. 443).

investigation. Some time elapsed before this opportunity occurred. In the interval the young *Chara* had become rapidly decomposed and agglomerated, the fruit alone preserving its form. When some of this was placed under the microscope, not only were the contents of the spiral sacs of the spores decomposed, but the sac itself could now easily be dissolved from the nucleus, so that the latter emptied itself of its cells on a little dissection with a knife. I then perceived what I had so long sought for in vain. All the progressive stages of the later cell-development were exposed to view, so that the formation of the starch-granules could be readily perceived by the action of tincture of iodine. The entire result,—the whole mystery of the formation of starch, may be expressed in very few words: *it is the cytoblasts which are transformed into starch, and this occurs in the mature cells only.*

If there is only one cytoblast in a cell, and this does not contain any further cytoblastema, the cytoblast becomes simply expanded in all directions until it has reached the circumference of the cell-membrane which surrounds it. It then exhibits an extremely thick dark outline, whence we may conclude that its membrane is tolerably thick. At the same time it is not perfectly homogeneous, but of a granular structure. But when the outline of the other hemisphere which lies beneath it is examined at the same time, it may be most distinctly perceived that the cytoblast is hollow. This is particularly well seen when it has been coloured very pale blue by tincture of iodine. At the same time we generally perceive within the cytoblasts some more or less roundish and more or less curved granules. This is the simplest case.

The formation must necessarily become more complex, when in addition to the cytoblast, which is hollowed out and has become converted into starch, several other cytoblasts occur. If this happen, the membrane of the primary cell generally becomes very thick in some places, *i. e.* a granular mass has been deposited upon it, which must be considered as cytoblastema, because its structure is of the same granular kind as that of the other parts of *Chara* (for instance, the cytoblastema between every two cells, from which new cells are formed, consequently in intercalary growth) and is coloured yellow by iodine. In this mass some portions are heaped up, forming one or several more or less globular groups which become expanded and hollow. They are cytoblasts which do not however form any solid membrane on their surface, which by its expansion might enlarge so as to form a homogeneous vesicle, as ordinarily occurs in the process of cell-formation. Thus whilst in the latter case a thin layer of the cytoblast dilates into a homogeneous membrane, in the former the whole mass of the cytoblast is expanded, whence it must neces-

sarily become hollow. It appears however as if the external lamina of the periphery of the cytoblast is always composed of a harder but still not homogeneous structure. I have often observed, that when there was only one cytoblast present in the primary cell, it was encircled by the cytoblastema in which it could be moved like a loose nucleus by rolling the cell to and fro.

This formation and expansion of the cytoblasts occurs in the primary cell in the greatest variety as regards number and size. I have often been able to count seven cytoblasts of the smallest and largest sizes in a single primary cell.

If a cell contains a single cytoblast only, this is usually oval, and as well as its cell-membrane preserves that form during its expansion; but if it contains several, the form is dependent upon their number and arrangement. This form in the nucleus of *Chara* is somewhat triangular and compressed, especially in the larger cytoblasts. In the smaller ones it is generally very angular. The position of the cytoblasts in the parent cell itself varies considerably. They either lie in contact, if there are two, or one lies at right angles to the other (*i. e.* if the form is oval; for when simple globules they must necessarily lie in contact). Hence they are either situated close together or at a distance. If however the primary cytoblast has expanded considerably, so that it almost fills up the cell, it frequently happens that the other cytoblasts widen the membrane of the parent cell still more, according to their own extent. Hence the parent cell acquires numerous projections which always contain their own cytoblasts. Frequently two large cytoblasts exist in one cell and dilate it in two opposite directions. Thus the cell-membrane becomes somewhat contracted in the middle; and thus the forms of the cytoblasts in the parent cell become changed in various ways, that of the mother-cells being also altered. It can readily be comprehended from the hollowness of the cytoblast, that within the cytoblasts which have become converted into starch, a new deposit of the cytoblastema in the form of starch may occur. It has appeared to me, that in *Chara* this deposition constantly occurs in the form of minute granules, but this requires to be confirmed by further observations. I have remarked in my paper on the history of the development of *Chara* that the cytoblasts thus converted into starch subsequently become fissured.

It has also been lately observed by Schaffner in a paper on the growth of cells, that the cytoblasts become hollowed. He noticed it in *Chara* and in *Nitellæ* (*Nitella flexilis*),—as it appears to me in the internodial cells between every two cells,—where, as we know, the starch is deposited in considerable masses for the future formation of new cells. But if he supposes that new cells with

homogeneous membranes are formed by the excavation of the cytoblasts, I believe that he has not observed all the stages and transitions of the cytoblasts into starch; for he does not notice the formation of the starch from the excavated cytoblast. The formation of a homogeneous membrane (membrane-substance) from the external layers of the cytoblast appears to be a very peculiar process, which will hereafter explain how it is that this membrane is not formed round a perfect cytoblast, and the transition of the latter into another state of aggregation (starch).

Still we cannot explain the whole process of the formation of starch throughout the organic kingdom from these investigations, which may be readily made in the manner stated. The above isolated instance is insufficient; I therefore refrain from any further comparison of the separate stages of the starch-formation. However, this example, especially as it may be so readily observed, will constitute a sure starting-point from which we may trace the formation of starch generally.

XI.—*Notice of Spiders captured by Professor Potter in Canada, with descriptions of such Species as appear to be new to science.*
By JOHN BLACKWALL, F.L.S.

[Continued from p. 44.]

Genus *TEGENARIA*, Walck.

19. *Tegenaria civilis*.

Tegenaria civilis, Walck. Hist. Nat. des Insect. Apt. t. 2. p. 7; Koch, Die Arachn. (Fortsetzung des Hahn'schen Werkes), B. 8. p. 37. t. 264. fig. 618, 619.

Agelena civilis, Sundevall, Vet. Acad. Handl. 1831. p. 127.

Araneus subflavus, Lister, De Aran. p. 59. tit. xvii. fig. 17.

Family *THERIDIIDÆ*.

Genus *THERIDION*, Walck.

20. *Theridion quadripunctatum*.

Theridion quadripunctatum, Walck. Hist. Nat. des Insect. Apt. t. 2. p. 290; Sundevall, Vet. Acad. Handl. 1831. p. 118; Hahn, Die Arachn. B. 1. p. 78. tab. 20. fig. 58.

Eucharia bipunctata, Koch, Uebersicht des Arachnidensystems, Erstes Heft, p. 7. tab. 1. fig. 13.

Araneus pullus, Lister, De Aran. p. 49. tit. xi. fig. 11.

21. *Theridion sisymphum*.

Theridion sisymphum, Walck. Hist. Nat. des Insect. Apt. t. 2. p. 298; Latr. Genera Crust. et Insect. t. 1. p. 97; Hahn, Die Arachn. B. 2. p. 47. tab. 58. fig. 132.

Theridion lunatum, Sundevall, Vet. Acad. Handl. 1831. p. 111; Koch, Die Arachn. B. 8. p. 74. tab. 273. fig. 645.

Araneus rufus, Lister, De Aran. p. 53. tit. xiv. fig. 14.

Genus PHOLCUS, Walck.

22. *Pholcus phalangioides*.

Pholcus phalangioides, Walck. Hist. Nat. des Insect. Apt. t. 1. p. 652; Latr. Genera Crust. et Insect. t. 1. p. 99; Hahn, Die Arachn. B. 2. p. 34. tab. 50. fig. 119; Blackw. Linn. Trans. vol. xix. p. 125.

The spider referred to by Mr. Jesse in his 'Scenes and Tales of Country Life,' pp. 202 and 203, as remarkable for the rapidity of its vibratory motions when disturbed, is, I have no doubt, *Pholcus phalangioides*, which frequents ancient buildings in the south of England, and, like *Epëira diadema*, *Theridion quadripunctatum* and some other species, has the habit of violently agitating itself when anything suddenly touches its lines. This vibratory motion, which in the case of *Pholcus phalangioides* appears to acquire its maximum of velocity, is produced by the partial contraction and extension of the joints of the legs in quick succession, as I have ascertained by occasioning specimens of *Epëira diadema* to continue the action till it became so slow, in consequence of the fatigue experienced by the animals, that there was no difficulty in determining the manner in which it is effected. This singular proceeding is evidently intended by the spider to communicate motion to its snare and thus to cause the struggles of any insect entangled in it, by which means it is directed with certainty to its victim.

I may here remark that the large spider alluded to in the same publication, p. 339, as peculiar to Hampton Court, and there named the "Cardinal," most probably is the *Tegenaria domestica* of arachnologists.

Family EPËIRIDÆ.

Genus EPËIRA, Walck.

23. *Epëira affinis*.

Length of the female $\frac{7}{12}$ ths of an inch; length of the cephalo-thorax $\frac{1}{4}\frac{1}{8}$; breadth $\frac{3}{16}$; breadth of the abdomen $\frac{1}{3}$; length of an anterior leg $\frac{9}{10}$; length of a leg of the third pair $\frac{2}{4}\frac{5}{8}$.

Cephalo-thorax compressed before, moderately convex, with a large indentation in the medial line of the posterior region; it is

of a dark brown colour and is provided with hoary hairs, which form a line extending along each lateral margin, and a curved transverse one in front, passing between the two intermediate pairs of eyes. Mandibles powerful, conical, vertical, armed with two rows of teeth on the inner surface: maxillæ short, strong, enlarged and rounded at the extremity: lip semicircular, slightly pointed; sternum heart-shaped, with small eminences on the margins opposite to the articulation of the legs: these parts are of a dark brown colour, the extremities of the maxillæ and lip being yellowish brown. Legs long and robust, provided with hairs and spines; they are of a yellow-brown colour, marked with dark brown annuli; each femur has a broad annulus at its extremity, that of the anterior ones extending over half the joint; first pair of legs the longest, then the second, third pair the shortest. The palpi resemble the legs in colour. Eyes disposed in two transverse rows on the anterior part of the cephalo-thorax; the four intermediate ones, which are seated on a prominence, form a square nearly, the eyes of the anterior pair being rather more distant from each other than those of the posterior pair, and the largest of the eight; the eyes of each lateral pair are placed obliquely on a tubercle, but are not contiguous. Abdomen oviform, thinly clad with hairs, convex above, projecting over the base of the cephalo-thorax; the upper part is yellowish brown, with a large, dark brown, festooned band, which tapers to the spinners, extending along the middle; the anterior part of this band comprises a yellowish brown isosceles triangle including a dark brown triangle of the same form, both having their vertices directed forwards; the posterior part of the band comprises a yellowish brown cross, the longitudinal portion of which tapers towards the spinners and includes a dark brown line, extending along the middle, which is broadest near its anterior extremity; the transverse portion of the cross is somewhat curved, and its extremities usually break the continuity of the large, dark brown festooned band, whose posterior part is marked with some yellowish brown transverse lines; sides yellowish brown, with a broad, longitudinal, dark brown band, dentated at its superior margin, and mottled with yellowish brown; middle of the under part brownish black, with a curved yellowish line on each side, which does not extend to the spinners. The sexual organs are reddish brown, and have a cylindrical membranous process directed backwards, connected with their anterior margin. Plates of the spiracles brown.

The colours of the sexes are very similar, but the male is smaller and slenderer than the female and its legs are longer, an anterior one measuring 1 inch and $\frac{5}{8}$ ths. The palpi are short; the anterior extremity of the cubital joint is provided on the

upper side with two long bristles directed forwards; the radial joint is larger than the cubital, and projects a strong process from its outer side, which is gibbous above near its base, and is amply provided with long hairs; the digital joint is somewhat oval, with a process at its superior extremity curved outwards; it is convex and hairy externally, concave within, comprising the palpal organs, which are highly developed, complicated in structure, with a large, erect, bifid process at their upper part having a projection near the extremity and a gibbosity near the base of the larger limb on the inner side; lower down is a prominent, depressed, yellowish brown process, which is enlarged and rounded at its extremity; contiguous to this, on the inner side, are the somewhat pointed terminations of three prominent processes, the largest of which curves round the extremity of the palpal organs, whose colour is reddish brown with yellowish brown intermixed. The convex sides of the digital joints are directed towards each other.

Epëira affinis, though very closely related to *Epëira apoclisa*, may be distinguished from it by its superior size, by differences in external organization, and by the legs of the male considerably exceeding in length those of the female. Lister, it is true, in comparing the sexes of *Epëira apoclisa*, remarks of the male, that "et pedes et tela longiora;" De Aran. p. 37. Walckenaer also states that "le mâle a les pattes beaucoup plus longues;" Nat. Hist. des Insect. Apt. t. 2. p. 63; but as regards every specimen, whether British or continental, which I have had an opportunity of measuring, the reverse has invariably proved to be the fact.

Among the more obvious structural differences observable in the organs of reproduction in males of these species are the following. The erect, bifid process at the upper part of those organs in *Epëira apoclisa* is proportionably longer and slenderer, is without the projection near the extremity of the larger limb on the inner side, and the gibbosity near its base is much smaller and situated lower; there are, besides, the extremities of two processes only contiguous to the inner side of the prominent, yellowish brown process, the larger of which curves round the lower part of the sexual organs, and terminates in a slender, finely-pointed spine.

Whether the opinion entertained by Koch, that the *Epëira* described by him under the specific name of *foliata** differs from *Epëira apoclisa*, and is identical with the American spider at present regarded by Baron Walckenaer as a mere variety of that species†, be well-founded or not, I do not possess the means of

* Die Arachn. B. 11. p. 119. tab. 387. fig. 920, 921.

† Hist. Nat. des Insect. Apt. t. 2. p. 62.

satisfying myself; but it is evidently distinct from *Epëira affinis*, many varieties of which were included in the Canadian spiders collected by Professor Potter.

24. *Epëira approximata*.

Length of the female $\frac{9}{16}$ ths of an inch; length of the cephalo-thorax $\frac{7}{4}$; breadth $\frac{1}{4}\frac{1}{8}$; breadth of the abdomen $\frac{7}{4}$; length of an anterior leg $\frac{9}{10}$; length of a leg of the third pair $\frac{9}{16}$.

Cephalo-thorax large, compressed before, truncated in front, moderately convex, glossy, with furrows on the sides diverging towards the lateral margins, and a large indentation in the medial line of the posterior region; its colour is dull yellow, the anterior part, which is sparingly covered with hoary hairs, being tinged with red. Eyes disposed in two transverse rows on the anterior part of the cephalo-thorax; the four intermediate ones are seated on a prominence and form a square nearly, the eyes of the anterior pair, which are the largest of the eight, being rather more distant from each other than those of the posterior pair; the eyes of each lateral pair are placed obliquely on a tubercle, but are not contiguous. Mandibles powerful, conical, vertical, and armed with two rows of teeth on the inner surface; their colour is pale red-brown, the fang being dark reddish brown. Maxillæ short, strong, enlarged and rounded at the extremity: lip semicircular and slightly pointed: sternum heart-shaped, with eminences on the margins opposite to the articulation of the legs: these parts are dark red-brown, with the exception of the extremities of the maxillæ and lip, which are yellowish brown. Legs robust, provided with hairs and spines; first pair the longest, then the second, third pair the shortest; they are of a dull yellow colour, with red-brown annuli at the joints, the tarsi being reddish brown. The palpi are dull yellow, except the extremity of the digital joint, which is reddish brown. Abdomen oviform, thinly clad with hoary hairs, convex above, projecting greatly over the base of the cephalo-thorax; the upper part is yellow, with four very conspicuous, sunken, brown spots forming a trapezoid whose narrowest side is before; posterior part and sides faintly tinged with brown; middle of the under part brownish black, with a curved, yellow line on each side, whose extremity does not extend to the spinners. Connected with the superior margin of the sexual organs is a long, striated, prominent membranous process, curved downwards at its base and recurved at its extremity. Spinners and plates of the spiracles dark brown.

In immature individuals of this species, which is nearly allied to *Epëira vulpecula* (see Baron Walckenaer's *Hist. Nat. des Insect.* Apt. t. 2. p. 69), the faint outline of a festooned band may be

traced extending along the middle of the upper part of the abdomen.

25. *Epeira canadensis*.

Length of the female $\frac{1}{2}$ th of an inch ; length of the cephalo-thorax $\frac{1}{12}$; breadth $\frac{1}{10}$; breadth of the abdomen $\frac{1}{8}$; length of an anterior leg $\frac{7}{24}$; length of a leg of the third pair $\frac{1}{7}$.

Cephalo-thorax rather small, compressed before, somewhat pointed in front, very convex, with a large, longitudinal indentation in the middle of the posterior region ; it is of a dull yellowish brown colour, and the anterior part, which has a brown spot on each side of the medial line, is sparingly covered with hoary hairs. Eyes disposed in two transverse rows on the anterior part of the cephalo-thorax ; the four intermediate ones are seated on an obtuse prominence and form a square, those of the posterior pair, which are placed on black spots, being the largest of the eight ; the eyes of each lateral pair are the smallest, and are placed on a minute tubercle, but neither obliquely nor contiguously. Mandibles powerful, conical, vertical, rather long, somewhat divergent at the extremities, and armed with two rows of teeth on the inner surface : maxillæ short, strong, enlarged and rounded at the extremity : lip semicircular and pointed at the apex : these parts are dull yellowish brown. Sternum heart-shaped, brown. Legs moderately long, slender, provided with hairs and spines ; first pair the longest, then the second, third pair the shortest ; they are of a dull yellowish brown colour, marked with obscure brown annuli, the annulus at the extremity of each femur being the largest and most conspicuous. Palpi dull yellowish brown. Abdomen somewhat triangular, with an obtuse prominence above the spinners ; it is thinly clad with hairs, convex above, projecting over the base of the cephalo-thorax ; its general colour is dull yellowish brown, the upper part having a large, dark brown, festooned band extending along the middle and tapering to the spinners ; this band comprises several transverse dull yellowish brown bars, the anterior one, which is much the largest, being crescent-shaped with its convexity directed forwards.

The specimen from which the above description was made had not attained to maturity, as the organs of reproduction were not fully developed.

Genus TETRAGNATHA, Latr.

26. *Tetragnatha armigera*.

Length of the female, not including the mandibles, $\frac{2}{3}$ ths of an inch ; including the mandibles $\frac{1}{2}$; length of the cephalo-thorax $\frac{3}{20}$; breadth $\frac{1}{12}$; breadth of the abdomen $\frac{1}{10}$; length of an anterior leg $1\frac{1}{3}$; length of a leg of the third pair $\frac{2}{5}$.

Mandibles nearly cylindrical, very long and prominent, widely divergent at the extremities, which are armed with a long, slightly curved dark brown fang, having a small, obtuse protuberance at its base on the upper side; on their inner surface are two rows of teeth, the outer one consisting of twelve and the inner one of eight; they have, besides, seven strong tooth-like processes at their extremity surrounding the base of the fang: maxillæ long, straight, enlarged at the extremity, which is prominent and somewhat angular on the outer side: these parts are yellowish brown. Lip semicircular and dark brown, the apex, which is prominent, being yellowish brown. Sternum of an elongated heart-shape and brown colour. Cephalo-thorax somewhat oval, slightly compressed before, broadly rounded in front, with a large circular indentation in the medial line of the posterior region; it is of a brown colour with rays of a deeper shade diverging from the medial indentation to the margins. Eyes disposed on black spots in two transverse nearly parallel rows on the anterior part of the cephalo-thorax; the anterior intermediate pair, with each lateral pair, is seated on a prominence, the anterior eye of the latter being the smallest of the eight. Legs long, slender, provided with hairs and a few fine spines; they are of a pale brown colour; first pair the longest, then the second, third pair the shortest. Palpi very slender and yellowish brown; the cubital joint is the shortest and after that the axillary joint. Abdomen long, somewhat cylindrical, enlarged at its anterior and tapering to its posterior part; along the middle of the upper part extends a large, festooned brown band whose margins are the darkest; in the medial line of this band are numerous, minute, whitish spots, and four small indentations, forming an elongated trapezoid, whose anterior side is the shortest, occur on the part which is enlarged; sides dull yellowish brown, comprising an obscure, irregular, longitudinal brown band; under part dull yellowish brown, with a dark brown band in the middle tapering to the spinners, at the base of which, on each side, is a whitish spot. Spinners and plates of the spiracles reddish brown.

XII.—*On the British Cetacea*. By J. E. GRAY, Esq., F.R.S.

HAVING occasion lately to examine the various species of Cetacea in the British Museum and other collections and the various authorities for the species, I am induced to send you the following list containing some additions to our fauna. It would appear as though modern writers on this part of our fauna had not taken the trouble to examine for themselves the authority on which the species have been determined. Dr. Fleming, in his 'British Ani-

mals,' collected together the best materials for the details of the species, but he made no attempt at revising their arrangement. If I have been under the necessity of reducing some of the larger species, I have been enabled to add three new species, two of which are types of distinct genera.

Fam. I. BALÆNIDÆ.

1. *Balæna Mysticetus*, Linn.
2. *Megaptera longipinna*; *Balæna longipinna*, Rudolphi; *The Whale*; Johnston, Trans. Newcastle N. H. Soc. i. t. 1.
Coast of Northumberland.
3. *Balænoptera Physalus*; *Balæna Physalus*; *B. Musculus* and *B. Boops*, Linn. S. N.; *B. rostrata*, Müller; *Rorqual de la Méditerranée*, Cuvier, Oss. Fos.

The three Linnæan species were established on three plates, one by Martens and the others by Sibbald; Martens' appears to differ from Sibbald's in the imperfection of the figure and description, and Sibbald's from one another in the state of the animal when figured, one having the throat dilated by the accumulation of gas beneath the tongue and the other not.

There is a second species of this genus found on the Dutch coast, which has the upper jaw nearly as wide as the lower. I have no doubt it visits us occasionally; it is the *B. Boops* of Rudolphi and the *Rorqual du Nord* of M. Cuvier, Oss. Foss.

Fam. II. CATODONTIDÆ.

4. *Catodon macrocephalus*, Linn.? O. Fabricius.
5. *Physeter Tursio*, Linn.
Scotland, Sibbald.

Cuvier denies the existence of this species, and Mr. Bell has overlooked the excellent figure of it in Sibbald, 'Phal.' t. 1. f. a, which represents it $\frac{1}{7\frac{1}{2}}$ nd of its natural size. It is well known to whalers as the *black fish*.

Fam. III. DELPHINIDÆ.

6. *Hyperoodon Hunteri*, Hunter, Phil. Trans. lxxvii. t. 19, with the dorsal fin behind the middle of the back.

We have a head of this genus in the Museum, from the Orkneys, four times as large as Hunter's specimen: the elevated crests of the maxillary bones are thickened, so that their inner surfaces nearly touch in front of the blower. I suspect it may be a distinct species.

7. *Hyperoodon Butzkopf*, Lacép., Dale's Harwich, t. 14, with the dorsal fin on the centre of the back.

8. *Delphinorhynchus Sowerbyi*; *Physeter bidens*, Sow. Brit. Misc. t. 1; *D. Sowerbyi*, Desm.; *Delphinus micropterus*, Cuvier, R. A., F. Cuv. Cetac. t. 8. f. 1, t. 7. skull; *D. Dalei*, Lesson.

Mr. James Sowerby at once recognised the skull of this animal in the figures of the skull of *Delphinus micropterus* above cited, so that this species was described and figured by Sowerby many years before its appearance on the coast of France. The French authors have universally overlooked the form of the head and position of the dorsal, and erroneously referred Sowerby's figures to *Hyperoodon*.

9. *Delphinus Delphis*, F. Cuv. Man. Lithog.

We have three specimens from the British coast in the British Museum.

10. *Delphinus Tursio*, Hunter, Phil. Trans. lxxxvii. t. 18; *D. truncatus*, Montague, Wern. Trans. iii. 75. t. 3.

O. Fabricius and Montague described this species as whitish beneath; Schlegel figured it as black above and below.

I have a drawing made by R. Templeton, Esq., from a specimen caught on the south coast of Ireland; it is not in Thompson's list of Irish species.

11. *Lagenorhynchus albirostris*, Gray, Zool. Erebus and Terror, t. ; *D. Tursio*, Brightwell, Ann. and Mag. N. H. 1846, t. 2.

Mr. Brightwell has kindly sent me for examination the head of his specimen; the nose is not longer than the length of the brain-cavity, and rapidly tapers in front with concave sides. The teeth are not half the size of those of *D. Tursio*, and it is at once distinguished from that species by the whiteness extending to the upper part of the beak. This and *Grampus Cuvieri* are most interesting additions to our fauna. We have the skulls of two other species of this genus in the British Museum collection.

12. *Orca gladiator*; *Delphinus Orca*, Linn., Schlegel, Abhand. t. 7 and 8.

Hunter's figure (copied by Bell) has the spot over instead of behind the eye. The figure in the 'Mag. Nat. Hist.' is better in this respect.

13. *Globiocephalus Melas*, Lesson; *D. Melas*, Trail; *D. deductor*, Scoresby; *D. globiceps*, Cuv.

The skull of the specimen described by Dr. Trail was recently sent by that naturalist to the British Museum, and we have also a young specimen.

14. *Grampus Cuvieri*; *Delphinus griseus*, Cuvier.

The Rev. Charles Bury sent me the head of this species, which was taken on the coast of the Isle of Wight in 1845. The animal is black above and whitish beneath, not gray as Cuvier's name would indicate; the figure first sent him from which he described it was of that colour, and he mistook it for the real one.

15. *Phocæna communis*, Lesson; *D. Phocæna*, Linn., F. Cuv. Mam. Lithog. t.

16. *Beluga Catodon*; *Physeter Catodon*, Linn. S. N. from Sibald; *Balæna albicans*, Müller; *D. leucas*, Pallas.

We have a fine large specimen of this species in the British Museum.

17. *Monodon Monoceros*, Linn.

I may add that the characters of the genera and species are given in the monograph of Cetacea in the Zoology of the Erebus and Terror.

The Finner, *Balenoptera Physalus*, appears to elongate the part of the body between the fins as it arrives at maturity; in the small ones (females?), from fourteen to twenty feet long, the pectoral fins are about one-third, and the dorsal two-thirds of the length from the end of the nose; but in the larger specimens, male and female, the middle of the body appears to lengthen twice as fast as the other parts, for in these the pectoral is about one-quarter, and the dorsal three-quarters the entire length from the end of the nose.

XIII.—*Horæ Zoologicaæ*. By Sir WILLIAM JARDINE, Bart., F.R.S.E. & F.L.S.

No. VII. *Notice of some Birds from Western Africa.*

By the attention of a friend in Liverpool we have received a small collection of birds procured by the vessels trading to the Bonny and Old Calabar rivers, and as the species from these regions are comparatively inaccessible to the naturalist, except under great danger and privation, we have thought that a list, with remarks, might not be unacceptable to the ornithological readers of the 'Annals.' One species we have been unable to reconcile with any that has hitherto come under our notice, and have given it as undescribed.

Milvus parasiticus—differs from specimens received from Southern Africa only in being slightly less and in the tint of the plumage being more sombre. Old Calabar river.

- Caprimulgus (Macrodopteria) longipennis.* River Bonny.
- Hirundo rustica.* In moult, but apparently not differing from European specimens. Old Calabar river.
- Merops Cuvierii.* Old Calabar river.
- Halcyon senegalensis,* Linn. River Bonny.
- Halcyon cinereifrons,* Vieill. (*H. torquatus,* Swain., Birds of W. Africa). River Bonny.
- Alcedo cærulea,* Kuhl (*Todier de juida,* Buff.). This very interesting bird has the form and colouring of the true kingfishers, the bill only being more depressed and widened at the base, so much so as to have gained for it the name of "Blue Tody"; but although in this structure and also in its habits it approaches to *Halcyon*, we would place it on the confines of *Alcedo*.
- Rüppell met with this species in the province of Temben in Abyssinia pretty abundantly, frequenting light brushwood, and there feeding chiefly on insects. Its distribution therefore will extend to the very opposite coasts of the continent. Old Calabar river.
- Alcedo cristata.* River Bonny.
- Ceryle rudis.* River Bonny.
- Buceros fasciatus.* Old Calabar river.
- Ardeola thalassina.* Old Calabar river.

TIGRISOMA LEUCOLOPHA, White-crested Tiger-Bittern.

The crown of the head and occiput are adorned with a narrow white crest extending a short way down the nape, concealed anteriorly by the black feathers of the forehead, which are elongated and lie over the white when the crest is not erected. The neck and breast are clothed with the loose standing-back feathers seen in the bitterns and birds of the present form. The ground colour of these is a deep blackish brown, each feather distinctly barred with yellowish brown: those on each side of the crest being of a deeper general tint and more narrowly banded, relieve the pure white feathers. Along the front of the neck and on the breast there are a few broad elongated feathers, entirely blackish brown on the one side, yellowish brown on the other, and having the line of the shaft marked by a conspicuous white stripe; the back, scapulars and wing-covers are of a deep rich brown, barred on the first and second with a rich shade of yellowish brown, on the last broadly and with a paler tint; quills and secondaries nearly black tipped with white; tips of the inner wing-covers broadly margined with white, which forms a light-coloured band

across; tail black, the four outer feathers narrowly barred with yellowish white; belly and vent yellowish brown, clouded with brown, and having the shafts of the feathers marked with a white line; legs and feet appear to have been greenish.

	ft.	in.
Entire length of the skin, rather stretched	2	2
Of bill to extremity of rictus	0	5
Of wing from bend to end of fourth or fifth quills...	0	10
Of tarsus	0	3
Of middle toe	0	2 $\frac{6}{13}$

Ibis chalconotus, Vieill. Old Calabar river.

Thalassidroma Wilsonii appears to present no difference from American specimens. The range of this petrel will thus be very extended. Old Calabar river.

Larus ———. The young state of one of the larger species, probably *L. fuscus* (*flavipes*, Temm.). Old Calabar river.

ANOUS TENUIROSTRIS, Temm.

Sterna tenuirostris, Temm. Pl. Col. 202.

Anous leucocapilla, Gould, Proc. Zool. Soc.

Mr. Gould has lately sent to the Zoological Society of London, descriptions of three or four species of this genus which he considered undescribed. Upon seeing our bird from the Bonny river, he sent us for comparison a species which he had named as above from Raines island in Torres Straits. On comparing these specimens of nearly equal size together, the plumage of the Torres Straits bird is of a slightly grayer tint, and the pure white of the crown shades more gradually upon the cheeks and backwards into gray, assuming upon the head and neck the appearance represented in Temminck's figure of *Sterna tenuirostris* from Senegal and the western coasts of Africa, and to which we refer both birds, notwithstanding the variations that occur.

The differences in the colouring of the sexes and those incident to the seasons being yet not well understood, and the species of *Anous* being in many instances closely allied, we add a description of our present bird. It was received in the month of November, and calculating the passage homewards and other delays, it was probably killed during some of the summer months.

The forehead, crown and occiput, with a narrow circle round the eye, pure white; the lores and cheeks very deep blackish brown, which runs over the eye in a narrow line as far as the posterior angle and separates it from the white of the crown. The whole other parts of the plumage, except the quills and tail, are a deep shade of the clove-brown of Syme, slightly tinted with gray where it meets the white of the occiput, and on the shoulders

with yellowish brown. The quills are deep blackish brown, almost black.

Entire length of the skin (stretched) to the end of the tail...	ft.	in.
Of bill to extremity of rictus	1	1 $\frac{4}{12}$
Of wings from bend to end of first quill	0	2 $\frac{3}{12}$
Of tarsus	0	9
Of middle toe	0	0 $\frac{9}{12}$
Of middle toe	0	1 $\frac{5}{12}$
In the Torres Straits' bird, a ♀, the entire length of the skin is	0	11 $\frac{6}{12}$
Of bill to extremity of rictus	0	2 $\frac{2}{12}$
Of wings from bend to end of first quill	0	8 $\frac{3}{12}$
Of tarsus	0	0 $\frac{9}{12}$
Of middle toe	0	1 $\frac{3}{12}$
The length of <i>Sterna tenuirostris</i> , given by Temminck, } is from	10 in. to 11 in.	(French).

XIV.—Notes on the *Œconomy of the Paussidæ*, extracted from Capt. W. J. E. Boyes' Paper, published in the *Journal of the Asiatic Society of Bengal* (No. 138.—N. S. No. 54).

STARK in his 'Natural History' correctly states, as far as I can vouch from my own experience, that the number of joints in the tarsus of the *Paussus* is five, which circumstance alone should, I imagine, have proved a sufficient reason for the removal of this genus from the Tetramerous to the Pentamerous section of the Coleoptera; but as it will be observed from the following notes, that in addition to its general form, which in outward appearance approximates to many of the *Carabici*, it is also, similarly with several of the latter genus [family], endowed with the faculty of crepitation, attended with the same results observable in many of these, their removal may (I think) well be warranted from the place they now hold to somewhere in the vicinity of *Aptinus* or *Brachinus*.

The thorax resembles the form which obtains in that part of most of the *Carabici*, being generally cordiform, truncated posteriorly with margins produced, though some species have it angulated in front and irregular. In flight the *Paussi* are exceedingly easy and agile, the lower wing when expanded being, in comparison to the size of the insect, of large dimensions; and when they alight the movement is so sudden, and the elytra are closed so instantaneously over the lower wings, that they appear as having dropped down to the spot on which they rest, and where they generally remain several seconds previous to again attempting to move,—facts which I have also remarked as practised by many *Carabici*. Its walk however entirely differs from that of this last-mentioned tribe; for instead of being nimble and occasionally rapid, I have never seen it moving but in a slow and sedate manner, at which time the antennæ are extended to the front of the head, and to these is occasionally given an upward vibratory motion.

What should bring these insects in nearer conjunction with the genus *Carabus* is the curious fact, that on being seized they emit from the anus a very acrid liquid, accompanied by an explosion and attended with a strong scent resembling that produced by *Brachini* and other allied genera when similarly treated, and although in minuter quantities, it is abundantly sufficient to produce a very sensible heat, and the crepitation may be distinctly heard and felt. On *Paussus Fichtelii* being captured it immediately emitted two loud and very distinct crepitations, accompanied with a sensation of heat and attended by a strong acidulous scent. It left a dark-coloured stain on the fingers resembling that produced by caustic, and which had a strong odour something like nitric acid. A circumstance so remarkable induced me to determine its truth, for which purpose I kept it alive till the next morning, and in order to certify myself of the fact, the following experiments were resorted to. Having prepared some test-paper by colouring it with a few petals of a deep red oleander, I gently turned the *Paussus* over it, and immediately placed my finger on the insect, at which time I distinctly heard a crepitation, which was repeated in a few seconds on the pressure being renewed, and each discharge was accompanied by a vapour like steam which was emitted to the distance of half an inch, and attended by a very strong and penetrating odour of nitric acid. On removing the *Paussus* from the paper, I found that a large spot was formed near the place where the abdomen had been, and extending backwards for one-third of an inch. The paper appeared strongly corroded as if with caustic, the colour of the spot being light brown and totally distinct from the purple of the surrounding surface. Having repeated this experiment four times during the day with the same results, and being perfectly satisfied that I could not be mistaken, I proceeded to kill and set the specimen. On being thrown into boiling water the abdomen swelled up and appeared like an inflated bladder, being very much distended, assuming the same appearance as that which is observable in *Brachinus* and other allied genera when they are similarly treated, and which I have had hundreds of opportunities of verifying. This specimen was captured on the 17th of August, and in each experiment on its detonating powers I have used a different finger in giving the small degree of pressure required to induce its crepitating. August 29 : all the marks off my right hand. September 3 : I have now lost all the stains on the fingers of my left hand, by which it appears that those of the left hand have remained eighteen days, or six days longer than those on the right. This is singular enough, and I can only attribute the loss of the marks so much earlier on the right-hand fingers to attrition and more constant use, as the stains left were certainly much deeper in the three first trials than in the latter ones, and when I used the first, second and third fingers of my right hand respectively.

Several species are provided near the exterior margin of the elytra, at the posterior extremity, with a small papillaceous follicle, giving cover to an elongated appendage of the same description, which is attached to the upper exterior margin of the abdomen, and which

by the aid of a pin's point may be lifted up and in a slight degree outspread, but collapsing immediately the impediment is removed. It would be difficult to assign reasons for the different addenda in the form of these insects, and observation alone can afford a clue to their uses; but that they are objects of extreme utility, and perhaps absolutely necessary in their œconomy, is easily to be conceived. Possibly the last-mentioned appendages may be a source of further protection granted these curious insects, which are brought into play as danger may threaten; for in one I captured on the night of the 30th ult., and which flew into the light on the table, I observed that when placed under the microscope, if these papillæ were touched, that they possessed the power of discharging a yellowish milky liquid, resembling pus in consistency, and which speedily overspread the lower part of the elytron, granulating into small egg-shaped grains. On repeating the irritation the same results occurred, and in order to be certain of the fact, I tried each elytron twice with the same effect. In my first trial the emission was so sudden and took me so by surprise, that viewing the insect through the medium of the microscope, I fancied it sufficiently near to be injurious, and incontinently let it fall. I should mention that in all these trials, each emission was accompanied with a faint acidulous odour. Although the appearance of each discharge obtained on the elytron, I am inclined to believe, that, properly speaking, it issued from the foliaceous appendages on the abdomen, and that it spread over the wing-case in consequence of the peculiar shape of the shards at the part which overlaps the extremity of the above-mentioned organ; but my experiments were unfortunately closed ere I could satisfy my doubts, as my servant in removing the microscope to another table contrived to lose my specimen, since which I have been unsuccessful in making a recapture. At one time previous to my loss I was inclined to believe that a minute perforation existed in the exterior angle of each elytron, with margins sufficiently elastic to allow the liquid to pass through, closing immediately after the emission, but I could not bring myself to any certainty on this point.

The following scene will be novel to our English collectors:—

June 22.—We have had very heavy rain for several days past, and insects, both last night and on that of the 21st, were more numerous than I ever remember to have seen before. A lamp I placed outside, for the purpose of attracting them to the light, was after a minute or so extinguished by the immense numbers which flitted about it; and to prevent the wanton destruction of life, I was compelled to cover the lamp with a wire shade at the expense of much light. As for myself I could scarcely remain near the spot, though covered from head to foot with a black blanket; even with this precaution my hair and clothes were so covered by the myriads which swarmed around the light, and caused me so much annoyance by getting under my dress, that I was forced to make a virtue of necessity, and strip myself to a pair of light trowsers and white night-cap, but for which I considered myself amply repaid in the capture of many new and to me rare specimens. Among the most common were several

varieties of *Carabus*, four entirely new to me, *Hegeter*, *Tenebrio*, *Agriolæ*, and swarms of *Copridæ*. Of the rarer sorts I took two new *Cicindela*, two *Colymbetes* and a very beautiful *Haliplus*, which I had never before seen. All these came around the light in numbers, but *Staphylini* and the smaller Orthopterous insects were incredibly numerous. I was almost black with them, and the sensation produced over my back, arms and legs from the multitude of grasshoppers and crickets which were constantly jumping on or off me, and crawling in every direction, was very similar to what is called "needles and pins," or a "foot asleep." Great indeed was the enjoyment of a bathe with some dozens of ghurrahs filled with cold water, which I poured over my head before retiring to rest at 1 A.M.

XV.—*Notice of an American Bittern, Botaurus lentiginosus, Mont. (sp.), obtained in Ireland.* By WILLIAM THOMPSON, Pres. Nat. Hist. and Phil. Soc. Belfast.

I HAVE the pleasure of placing on record the occurrence of an American Bittern in Ireland, the first individual of its species known to have visited this island. The fresh skin of the specimen, being sent to Belfast to be preserved and mounted, came under my inspection on the 14th of November 1845, and having learned that it was sent from Armagh by the distinguished astronomer Dr. T. R. Robinson—whose acutely observant eye had not failed to mark the differences between it and the *Botaurus stellaris*—I wrote to him for all particulars respecting the bird, and received the following information:—"It was shot by my second son Wm. R. Robinson, about noon on the 12th of November last in a bog—part of a flat partially drained tract called Llayde Bottoms—surrounded by hills, and a mile from Armagh. It was put up in sedge, seemed lazy, and flew heavily, not showing the usual wariness of the bittern, but letting him come rather close before it rose. Its stomach was empty, but it was very fat and very good eating, for we roasted it! The sex was unfortunately not noted. The glottis was peculiar, so that I suppose it must have had the powerful voice of the common species." Dr. Robinson, on being informed that it was the American Bittern, most liberally presented the bird to the Belfast Museum. As bearing on the points touched upon in this letter, it may be observed, that Audubon "never saw one of them fly farther than thirty or forty yards at a time; and on such occasions their movements were so sluggish as to give opportunities of easily shooting them; for they generally rise within a few yards of you, and fly off very slowly in a direct course." (Orn. Biog. vol. iv. p. 297.) Wilson states that it "is considered by many to be excellent eating:"—

also that the American Bittern "has nothing of that loud booming sound for which the European Bittern is so remarkable*." Audubon has not himself heard its notes, but gives the observations of two well-known naturalists upon them. Dr. Richardson states that "its loud booming, exactly resembling that of the Common Bittern of Europe, may be heard every summer evening, and frequently during the day †."

Judging from these works, this bird takes the place in North America of the Common Bittern in Europe, but is much more frequent there than the latter *now* is in any part of the British Islands. Audubon informs us that in winter it is "common in the markets of New Orleans, where it is bought by the poorer classes to make gombo soup."

The Prince of Canino, in his 'Comparative List of the Birds of Europe and North America,' makes Montagu's bird, *Ardea lentiginosa*, distinct from the American species (*A. minor*, Wilson), with which however, as described by Dr. Richardson, the one killed in Ireland is perfectly identical in species. It agrees so well with the "description of a male killed on the Saskatchewan plains, 8th July 1827 ‡," that all the details of *colour* and markings equally apply to this example, except in the few following very trivial points:—the feathers on the vent and under tail-coverts being very sparingly dotted with brown towards the shafts instead of being "unspotted"; and the long feathers on the front and sides of the neck and breast having the central stripe of mottled clove-brown bordered with a blackish line imparting to them a beautiful finish, and outside of which is a line of deep yellow shading off gradually to a lighter tint at the margin. In every character of *form* the bird before me agrees with that description, except in having a slight development of web between the outer and inner toe, instead of being "quite free" of such; and in the first quill being the longest instead of the "second and third"—the first exceeds the second, as the second does the third, by not more than one line ($\frac{1}{12}$ th of an inch) in length: it may be added that the third exceeds the fourth by $1\frac{1}{2}$ line, and the fourth the fifth by 6 lines; and that these quills present a very interesting gradation in form from the first, which is pointed, to the fifth, which is quite square at the tip. Like the nine birds examined by Dr. Richardson, it possesses just ten tail-feathers:—Wilson attributes twelve to *A. minor*. Two specimens could not be expected to resemble each other more nearly than that described by Dr. Richardson, and the one killed in Ireland; but the

* Jardine's edit. Wils. Amer. Orn. vol. iii. p. 57.

† Fauna Bor. Amer. p. 374.

‡ Consequently it differs entirely from the other male killed on the 27th June, and which doubtless must have been a bird of a different age.

differences have been stated that the description of the former may suffice for the other, with the exceptions noted.

	in.	lin.
Length (total*) of Irish specimen	26	0
Length of wing	11	9
— bill from first feathers on forehead to point	2	9
— bill to rictus	3	7½
— tarsus	3	8
— naked part of tibia	1	2
— middle toe	2	10
— middle claw measured in a straight line.....	0	7½
— hind toe	1	5
— hind toe claw	1	0½

Although the European and American Bitterns have a general resemblance, they are found, when compared by the ornithologist, to differ in all respects. The latter is much the smaller species, but they both vary remarkably in size. The toes and claws are much smaller in the American bird. The most striking difference in its *colour* is the black stripe on each side of the neck, which in the specimen before me commences 1½ inch below the eye, and extends for 3 inches, until in the shading off of the black the two stripes may be said to meet at the back of the neck: the greatest breadth of this stripe is one inch. All the feathers of the front and sides of the neck and breast having (as already described) a dark central stripe, give to that portion of the plumage a beautifully rich and *regularly streaked* appearance, which is rendered further conspicuous by the entire absence of dusky transverse markings, such as appear there in the Common Bittern. The whole dorsal plumage is different in the American bird, and much more handsome than in the other, consisting of a beautiful mixture of brown of many shades and rich yellows, and when the light falls upon it exhibiting reddish violet reflections, reminding us of the same parts in the Jack-snipe (*Scolopax gallinula*): a species which it likewise resembles in possessing similar richly and beautifully coloured scapular feathers. The tail-feathers† of the American bird are of a uniform dusky brown—those of the European specimen compared with it have more or less of a narrow stripe of black towards the centre; the rest being all freckled or mottled with black on a rich buff ground:—the quills of the American species are likewise of a uniform colour, while those of the European are barred alternately with black and buff, except at the tips, which are wholly black. Other differences might be pointed out, but those mentioned are the most striking. Temminck describes “zigzag” markings on the upper parts of the plumage and on the coverts of the wings‡, but there is not in the American Bittern before me any markings

* Not quite satisfactory, as the bird had been skinned.

† The tail-coverts are mottled.

‡ Man. d’Orn. de l’Eur. vol. iv. p. 382.

to which I would apply that term, as there are on the neck and wing-coverts of the European bird.

Yarrell's figure gives a very good general idea of the American Bittern, but in two impressions (1st and 2nd editions) examined, the back and wings look rather too dark, and I could hypercritically have wished the quills and tail shown of a uniform colour, in which respect they so obviously differ from the same parts in the common species, which are banded. But in figures of so small a size, characters like these can be but partially attended to.

The first *Ardea lentiginosa* which occurred in Europe was (as is well known to ornithologists) described by Montagu under this name; it was killed in Dorsetshire in the autumn of 1804: a second was made known by Dr. E. Moore as shot near Plymouth on the 22nd of Dec. 1829: notice of a third obtained near Christchurch in 1836 was communicated to Mr. Yarrell, who has likewise been told of a bird, believed to be of this species, having been procured in the Isle of Man—but the season or year is not mentioned. About the middle of October 1844, one of these birds—the only one obtained in Scotland—was killed on the property of Sir Wm. Jardine, Bart., in Dumfriesshire, and at a very appropriate time, when Mr. Gould, the well-known ornithologist, was on a visit at Jardine Hall:—where too, I lately had the pleasure of seeing the specimen. These are all the examples known to have occurred in Great Britain. There is no record of this species having been met with on the continent of Europe in Temminck's 'Manuel' &c. (vol. iv. 1840); Keyserling and Blasius' 'Wirbelthiere Europas' (1840), or Schlegel's 'Revue Critique des Oiseaux d'Europe, (1844):—a fact, which, like that of other American species having been obtained in the British Islands, and not farther to the eastward, strengthens the circumstantial evidence in favour of such birds having really crossed the Atlantic. Three out of the four birds of this species, the date of whose occurrence in the British Islands is known to us, were met with about the migratory period when the species leaves the more northern for the southern parts of North America:—the fourth, which was obtained in December, may have arrived at that period, but have remained in the country unobserved until it was killed.

XVI.—*Researches on the Primary Modifications of Organic Matter, and on the Formation of Cells.* By M. COSTE*. (2nd Part.)

[Continued from vol. xvi. p. 385.]

THE most appropriate examples for supplying the necessary means for resolving the difficult problem of the formation of cells

* Translated from the Comptes Rendus, Dec. 22, 1845.

should be found in those parts where the matter undergoes that primary elaboration which prepares the materials of the new individual. Hence the bases for its solution must be sought in the metamorphoses of the *vitellus*, and we there find the facts developed in so characteristic and evident a manner, that they may be verified by any one. But, before showing how it is that the amorphous matter assumes the cellular form, there is another condition of that matter, the history of which I shall rapidly trace, and with which it is not less important to be acquainted. I allude to that progressive subdivision by means of which it is employed for the production of organic spheres, which must be considered hereafter as special elements of the living tissues. We shall proceed then, first, to study the mode of generation of these spheres in the *vitellus* of Mammalia, subsequently tracing it wherever it occurs. When, in Mammalia, the seminal fluid has passed through the uterus and reached the Fallopian tubes so as to envelope the ovum with its moving molecules, in proportion as the molecules penetrate its substance, we see the yolk undergo the primary modifications which are about to induce the organization of the germ. It commences by becoming concentrated into a smaller volume, and forming itself into a granular globe so perfectly spherical and correctly outlined, that all the grains of which this globe is composed, and which are united together by means of a viscid diaphanous fluid, are apparently retained in the general form which their assemblage represents, by a delicate layer of the same fluid which appears at the periphery as the representative of an enveloping membrane. But if, after having sufficiently guarded against optical illusions, we endeavour to develope the reality of the appearances which obscure it, we soon recognise that such a membrane does not exist, and that those observers, as for instance Barry, who have admitted its existence, have not pursued their examination with sufficient care. Their error here evidently arises from their having considered the superficial part of the viscid matter which retains the granulations mingled in its own substance as an enveloping membrane. This matter is in fact merely lodged in the interstices of the granulations which it agglutinates, and which it separates so regularly that it appears at first sight to form a wall at the periphery of the *vitellus*, the outline of which appears more distinctly delineated in proportion as its transparence contrasts with the opacity of the granulations which it bounds. But, I repeat, this is an illusion which an attentive analysis corrects, and on this point I have sufficiently repeated my observations to have a well-founded conviction.

The *vitellus* is not then, as has been supposed, a vesicle or cell filled with granules, but simply a granular homogenous sphere,

the whole of the grains of which are kept agglutinated by a diaphanous interstitial matter, the retraction of which matter gives the whole mass the somewhat geometric regularity which it assumes.

Soon (a few hours are sufficient for the accomplishment of this phenomenon) the vitelline sphere divides into two nearly equal parts, each of which, immediately rendered spherical in form by the centripetal retraction of the viscosity which retains its granulations in union, presents the same aspect and the same composition as the whole from which it emanates.

This primary division is scarcely accomplished before the two secondary granular spheres which are thus formed by a primary division of the *vitellus* become in their turn the seat of a similar division, and the same phenomenon being repeated during a certain time upon each new segment, the *vitellus* is finally resolved into a considerable number of granular spheres of a progressively diminishing volume, but always of the same nature. However Reichert, who has made some special researches upon the division of the *vitellus* of the Batrachia, believes he has observed that each segment is a true cell possessing an enveloping membrane and granular contents. According to him, the phenomenon of the division of the yolk would then have a totally different signification to that which we have given, and would essentially be nothing more than an illusion produced by the liberation of the pre-existing vesicles which were inclosed one within another. The *vitellus*, in his view, would at first represent a mother-cell, the wall of which, when ultimately absorbed, would expose to view two inclosed vesicles which form its contents; these two vesicles having thus become free would be dissolved in their turn, and each of them would allow two other vesicles to escape, which would produce an appearance of a division of the yolk into four segments, and so on, until the completion of this illusory division arrived. But although this hypothesis appears to explain a phenomenon until then but little understood, and to corroborate the theory of the exclusive intervention of the cells for the formation of the tissues, it does not follow that we must accept it without examination, and solely from its being reconcilable with an accredited system. I have therefore examined the question with all that care which its importance demands, and, after the most minute researches, I am perfectly convinced that the segments of the *vitellus* or the granular spheres are not real cells. Consequently Barry and Bergmann were deceived when they admitted the contrary.

When the subdivision of the *vitellus* is completed, a process ensues in each of the granular spheres resulting from this division which converts them into true cells. But before arriving at this degree of organization, as we have seen, the living matter

had assumed regular forms, and in each vitelline sphere had acquired a generating activity which becomes a powerful cause of multiplication.

There is then a distinct organic form, which may be considered as a primary act of individualization, or a primary manifestation of life, between the amorphous state of this matter and its actual application to the formation of the cellular walls. This primary act or this primary manifestation has for its object the formation of granular spheres, which, without being bounded by an enveloping membrane, have already a true existence, are true living individuals, inasmuch as they enjoy the faculty of reproduction, and in multiplying they become the active elements of the organism, and contribute to the formation of the tissues of which the organism is composed.

For my own part, I am unacquainted with anything which is more curious to observe than this progressive duplication of living spheres reproducing in each secondary segment the reduced but invariable image of the primary vitelline sphere. And in proportion as we witness the realization of this remarkable phenomenon, we are as it were involuntarily led to seek, in the interior of the substance which is doubled, some material arrangement which may explain a metamorphosis, the cause of which cannot be clearly found elsewhere.

In fact, a more attentive examination soon shows that in the centre of each vitelline sphere there exists a diaphanous homogeneous globule having a fatty aspect, and which cannot be compared to anything better than a drop of oil. Seeing that this globe appears in so constant a manner, we inquire if the division of the *vitellus* cannot be attributed to its influence. But in order to solve this problem, what passes in this same vitellus prior to its division, and when it consequently appears as a simple sphere, should be examined.

We then see that the fatty or oleaginous globe, hidden in the midst of the granulations of the primitive sphere, there undergoes a contraction which divides it into two segments or distinct globules, and each of these segments seems to become a centre, which tends to envelope itself in a portion of the surrounding granulations, separating them from cells which are entangled by its fellow. We should say, in short, that the vitelline sphere, excited simultaneously by two centres of action, yields to each of these centres half the substance of which it is composed, and thus divides into two segments which are immediately rendered spherical; each segment of the vitelline sphere, being furnished with the oleaginous globule which has excited the separation, then becomes in its turn the seat of a similar process, and the division of its central globule induces that of the secondary sphere which contains

it. This is the manner in which the phenomenon of the multiplication of the vitelline spheres ensues ; but this phenomenon, which we have considered as the result of a double influence simultaneously exerted upon each of the segments of the *vitellus* by the division of the fatty globe which occupies its centre,—this phenomenon, I say, seems to refer to a still deeper cause, and so to speak, to be nothing more than the external and consecutive repetition of a more intimate and previously completed process. In fact, each central fatty globule contains in its interior a much smaller generating globule, and which appears, in regard to the fatty globule, to play the same part as the fatty globe fulfils with regard to the vitelline spheres by which it is enveloped. So that if we review the whole of the facts which the *vitellus* presents during the transformations which we have described, we find that the elements to which these metamorphoses give rise are derived from one another in a continued series, and are all the result of a triple envelopment.

This envelopment commences by the appearance of a primordial globule within the vitelline spheres ; the globule then becomes a centre, around which the fatty globule is condensed ; the latter subsequently resolves itself into two distinct fragments ; and these fragments, enveloping themselves with the vitelline matter, produce the granular spheres, the mode of multiplication of which I have previously described.

The formation of the organic spheres by successive envelopment around a centre, and their multiplication by subdivision, are such general facts as to require the whole attention of physiologists. They are observed in the *vitellus* of Mammalia, Batrachia, the osseous Fishes, Mollusca, insects and worms. The so frequent production of these particular forms of matter proves, in opposition to the opinion of Schleiden and Schwann, that organized bodies are not exclusively composed of cells ; but that other elements may also enter into the composition of their tissues, and that the organic spheres ought to be reckoned among these elements. They do not in fact appear only as a transitory modification of the vitelline matter undergoing the primary influences of fecundation, for they are also found in tissues which are undergoing development, and even in those which form a part of the adult organism. It is these which, by their juxtaposition in the Mammalia, give origin to the earliest and most important formation of the tissues of the germ, because the blastodermic membrane is formed at their expense ; that is to say, that which will subsequently become the basis of the entire organism. It is true that by gradual conversion into cells they soon raise the blastodermic membrane to a higher degree of organization ; but they reproduce it at a period when they are still simple granular spheres, and

they then still enjoy all the properties of these spheres, so that after their incorporation they continue for a certain time to multiply by subdivision, as we shall show in a future memoir.

XVII.—*Notes on Phrynosoma Harlani, Wieg.*

By Dr. PATRICK NEILL.

DEAR SIR,

IN the autumn of 1844 I was presented with a beautiful specimen of the *Phrynosoma Harlani* by a gentleman who had brought it direct from Texas. After keeping it a week or two the creature was sent to my friend Dr. Neill, and the inclosed letters relating to its habits appear to me of sufficient interest to warrant their publication.

I am, dear Sir, yours very truly,

Richard Taylor, Esq.

GEORGE JOHNSTON.

MY DEAR SIR,

Canonmills, Dec. 28, 1844.

The curious Texas Lizard, after six weeks' residence in my hot-house, is still alive, and taking a fly when we can tempt him with a living one.

On procuring Dumeril and Bibron from my friend Mr. Wilson, I found a full and accurate description of the animal, *Phrynosoma Harlani* of Wiegmann, *Agama cornuta* of Harlan, and apparently *Lacerta orbicularis* of Linnæus. The coloured figure in Griffith's 'Règne Animal' seems to have been taken from a museum specimen, for the bright colours are deficient: what is pale brown in Griffith's figure, is in the living subject, when lively and in a temperature of 65° or 70° F., golden yellow. The description of the colours is, to some extent, liable to the same exception.

Fortunately flies are found in our steam-engine room all the winter, and I carry home two or three in a small box every Saturday. *Phrynosoma* is rather cunning or suspicious; for we have been unable to see him catch at a fly, so as to know whether he throws out the tongue as the chameleon used to do. The gardener has watched ten minutes in vain; yet if he leaves a disabled fly with him for five minutes, the fly has disappeared on his return. He can climb the perpendicular smooth wooden wall of a box in which we keep him and can adhere to the wall. He can leap somewhat like a frog, or rather like a toad—clumsily and to a small distance only—not twice the length of his own body. Miss Neill thinks she heard him utter a kind of squeaking croak, but neither the gar-

dener nor I have heard any voice.—[The large long-necked tortoise *fuffs* like a cat very often.]

I remain, dear Sir, yours very truly,
 Dr. Johnston. PATRICK NEILL.

MY DEAR SIR,

Canonmills, Feb. 25, 1845.

The *Phrynosoma*, I regret to say, unexpectedly died about a week ago. I am not aware of having been able to make any observations in addition to those I formerly communicated.

We had a chamber made for it just over the entrance of the flue, and where the temperature was scarcely ever so low as 60° F., and often 70° and upwards: we kept a shallow saucer with water in the chamber, and always some *Hypnum* moss or foreign *Lycopodium* laid over the saucer, so that the lizard could drink and could not overturn the vessel or spill the water. The creature often sat on the top of the moss.

Dear Sir, yours very truly,
 Dr. Johnston. PATRICK NEILL.

XVIII.—On the Relations of the genus *Noggerathia* to Living Plants. By M. ADOLPHE BRONGNIART*.

THE difficulties in determining the relations of fossil plants to those now in existence have long been known. The isolation of the different parts of a plant, and in most cases their imperfect state of preservation, which obliges the naturalist to be satisfied with the examination of characters which are frequently the least important, are the principal obstacles to this study. The more the plants, the remains of which are submitted to our investigation, differ in their organization from those which are the constant studies of the botanist, so much the more difficult is the establishment of their analogies. The further we proceed in the series of ages towards the earliest geological periods, the further are we removed from the actual creation, and the greater do the differences between the living and fossil beings become; this general law is well-established in the animal kingdom, and it is not less true for the vegetable world.

Thus most of the fossil plants of the tertiary strata belong to genera in actual existence, and merely present specific differences; such are the pines, elms, birches, maples, walnut-trees, *Nymphaea*, &c.

Those of the secondary strata may undoubtedly almost always be referred to known families, but appear in most cases to require the formation of new genera.

Lastly, in the older strata, particularly in the coal-formations,

* Translated from the Comptes Rendus for December 29, 1845.

many of the fossil plants cannot be classed in families at present existing, and ought to constitute new groups of equal importance. The *Calamites*, *Lepidodendra*, *Sigillaria*, and *Asterophyllea*, are thus situated; several less well-known genera should probably also be raised to the rank of distinct families. But above the families are the classes and the large divisions of the vegetable kingdom, and it might be asked whether those families which are peculiar to the primitive vegetation of the globe, and which are so different from those which now inhabit it, would enter into the present great divisions of the vegetable kingdom, or whether some of them should be referred to one of an entirely distinct nature, as it were, foreign to the great types of living vegetable organization. This important question cannot probably be solved with certainty in the present state of our knowledge of these fossils. However, all the observations which have hitherto been made appear to show that the earlier creation must be referred to the principal types of the present creation, but without presenting examples of them all. Thus the present vegetable kingdom presents five great divisions: the Cellular Cryptogamia or Amphigens, the Vascular Cryptogamia or Acrogens, the Dicotyledonous Phanerogamia, Gymnospermia and Angiospermia, and the Monocotyledonous Phanerogamia. The first three of these great divisions undoubtedly existed at the period of the coal-formation, whilst the two latter appear to have been completely absent; at least, we have no positive evidence of their existence; whilst, on the other hand, everything tends to render it doubtful. On this point recent researches have merely confirmed what I established more than twenty years ago, *i. e.* the absence of the angiospermous dicotyledonous Phanerogamia, and even that of the monocotyledons, the existence of which then appeared to me very doubtful. But new and hitherto very rare specimens which have been collected and carefully studied in England, Germany and France have caused important changes relative to the plants which I had considered as Acrogens or vascular Cryptogamia. This advance is owing to the discovery of portions of stems of these plants with the internal structure in a state of preservation. They have shown that the *Sigillaria*, *Stigmaria*, and probably most of the *Calamites*, are not plants nearly related to the Ferns, Lycopodia and Equiseta, but to distinct families of the dicotyledonous gymnospermous group, more nearly approaching the *Coniferae* and *Cycadeae*.

Hence, at the period of the coal-formation, vegetation would have consisted entirely, or nearly so, of two of the great divisions of the vegetable kingdom: the acrogenous Cryptogamia, represented by the herbaceous and arborescent Ferns (the latter reduced to the true *Caulopteris*), the *Lepidodendreae*, a family nearly re-

lated to the *Lycopodiaceæ*, and some *Equisetaceæ*; and the gymnospermous dicotyledons, comprising the *Sigillarieæ* (*Sigillaria*, *Stigmaria*, *Lepidostoyos*), the *Calamitaceæ* (*Calamites*), the *Conifereæ* (*Walchia*), and probably the *Asterophylleæ* (*Asterophyllites*, *Annularia* and *Sphenophyllum*). We thus see of what great importance the latter branch of the vegetable kingdom, which is so limited in the present vegetation, appears to have been at this early period. The families which belong to it are moreover still the most obscure, and such as deserve most to receive the attention of botanists. The characters of most of them are merely founded upon the form and structure of the stems, and we are in general unacquainted with the form of their leaves and fructification.

The genus to which I now propose to draw attention is unknown to us except by its leaves; but I believe that I can refer organs of fructification to this genus, establish by this means its relations to recent plants upon a solid basis, and show that it closely approaches a family of the gymnospermous dicotyledons still in existence, the *Cycadeæ*.

M. de Sternberg* has given the name *Noggerathia foliosa* to an impression of a leaf from the coal-formations of Bohemia. At first he did not point out any relation between these plants and those at present existing; subsequently, by comparing them to the leaves of *Caryota*, he placed them near the Palms, and more recently he arranged them among the monocotyledons, without fixing their position. At a period when I was unacquainted with this fossil except from the figure of M. de Sternberg, I admitted the analogy of these leaves with those of *Caryota*. Mr. Lindley, and quite recently M. Corda, still admit this position of *Noggerathia* among the Palms. On the contrary, M. Unger † and M. Goeppert ‡, as I presume, have classed this genus among the Ferns. Which is the most probable of these opinions? Are there not more intimate relations between this fossil plant and other living plants? We shall examine this point. We may first remark, that the genus *Noggerathia* is not confined to the single very rare species at first described by M. de Sternberg, and which has only hitherto been found in the coal-mines of Bohemia. Messrs. Lindley and Hutton long since added *Noggerathia flabellata* from the Newcastle mines to this genus. M. Unger enumerates, in addition, two species described by M. Goeppert, and I have made known two from the Permian sandstone of Russia in Messrs. Murchison and Verneuil's large work. I should add,

* Flore du Monde Primitif, fasc. 2. p. 32. t. 20.

† Synopsis Plantarum Fossilium.

‡ Genres des Plantes Fossiles, livraisons 5 et 6 (quoted by M. Unger). This livraison has not yet arrived at Paris.

that the examination on the spot of several vegetable impressions upon the schists and sandstones from the coal-mines of France, and the transmission of important collections made in these mines by the superintending engineers, have made me acquainted with several new species of this genus. Several beautiful specimens, and the examination of a large number of fragments, have convinced me that most of these species were much larger than those at present known, especially the species first described by M. Sternberg. Generally we merely find isolated leaflets of the large pinnate leaves of these plants; and even more frequently fragments only of these leaflets, which require to be reconstructed at the localities by joining the different portions contained in the slabs.

We thus find that the true *Noggerathia* have pinnate leaves with more or less expanded cuneiform leaflets, which are sometimes fan-shaped, at others almost linear, truncated or rounded like a spatula at the summit, frequently cleft into straight or linear, truncated or rounded lobes. These leaflets generally terminate obliquely at the summit, which indicates, even when they are isolated, that they are leaflets of a pinnate leaf and not simple leaves. Their most important character consists in the arrangement of the nerves. These all arise from the tolerably large base of the leaflet; they are perfectly equal in size, hence the leaflets do not present any median nerve, nor any predominating secondary nerves; arising from the base of the leaflet, they are parallel to each other, or slightly divergent, according to the more or less expanded form of these leaflets; they either remain simple or bifurcate by an insensible duplication, and not by a decided bifurcation as in the Ferns. Hence it results that these nerves are slightly stronger towards the base, more slender towards the centre or the extremities of the leaflets, but all uniform, and thus reach the truncated or rounded extremity of the leaflets. Such are the structural characters of these leaves, which may assist us in appreciating their relations to the leaves of living plants.

It is evident that the relations established between the *Noggerathia* and the Palms are badly founded; for in all the palms which have cuneiform truncated leaflets (*Caryota*, *Harina*, *Martinezia*, &c.), as in those having linear or lanceolate leaflets, there is a more marked median nerve, then some more slender secondary nerves, and finally some very delicate nerves between these; hence the nerves are very unequal, and the median nerve especially is nearly always very distinct.

In the ferns with pinnate leaves, the leaflets of which slightly approach those of *Noggerathia* in form, the nerves also arise from a very distinct median nerve, at least towards the base; more-

over, they are dichotomous with a bifurcation which is distinct, and forms a very obtuse angle. A few ferns only having a simple flabelliform frond, present a structure tolerably analogous to that of the leaflets of *Noggerathia*: such are *Schizea latifolia* and *elegans*, but the general form of the leaf is very different.

These structural characters of the leaves appear to exclude all real analogy of the fossil plants which we are considering with the two families, the Palms and Ferns.

But there is another family very widely diffused among the primary creations of the vegetable kingdom, which presents a much more marked analogy with *Noggerathia* in the structure of its leaves; it is that of the *Cycadeæ*. We know that the *Cycadeæ*, long since placed by botanists sometimes near the Ferns, sometimes the Palms, have been considered by all recent authors, especially since the beautiful publications of L. C. Richard and Du Petit Thouars, as intimately allied to the *Coniferae*, and forming with them the remarkable group of gymnospermous dicotyledons. But if the *Cycadeæ* and *Coniferae* are united by the most important points in their organization, they differ extremely in their general aspect, in which the *Cycadeæ* resemble the Palms. Like them, the *Cycadeæ* have pinnate leaves with linear lanceolate or oblong and almost spatulate leaflets. However, the structure of these leaflets is very different in these two families. In *Cycas* they are traversed by a single median nerve; on the contrary, in *Zamia*, and especially in the American *Zamia*, each leaflet is traversed by slender and numerous nerves, which are of perfectly equal size, arise directly from the base of the leaflet, simple and parallel when the leaflet is linear or oblong, slightly divergent and bifurcate at a very acute angle when the leaflets are obovate or spatulate. In short, the neuration is exactly the same as that of *Noggerathia*. The general form of these leaflets is also very analogous when we compare certain species of *Noggerathia*, such as *N. foliosa* and *spatula*, with some species of American *Zamia*, as *Zamia furfuracea*, *integrifolia* and *pygmæa*. Other species are further removed from the existing *Cycadeæ* by the form of their leaflets; but the characters of the neuration remain the same, and their importance is evidently much greater than that of the form of the leaves. Thus the *Noggerathiæ* appear to me clearly to approach the *Cycadeæ* in the structure of their leaves, and to belong to the division of the gymnospermous dicotyledons. But the *Cycadeæ* and the allied families are frequently arborescent plants, furnished with both male and female flowers, and with seed of a considerable size. May we not find portions of these organs in the strata in which *Noggerathiæ* occur, which would confirm and more accurately determine the affinities of these plants?

One of the best means of removing some of the difficulties in the study of fossil plants, and especially of withdrawing part of the veil which still obscures the affinities of the plants in the coal-measures, appears to me to consist in studying, in the mines themselves, the manner in which the various forms of fossil plants are associated in the rocks which accompany the same layer of coal. In fact, in my opinion, each stratum of coal is the product of a peculiar vegetation, frequently different from that which precedes and that which follows it,—vegetations which have given rise to the superior and inferior layers of coal; each stratum resulting, in this manner, from a distinct vegetation is frequently characterized by the predominance of certain impressions of plants, and the miners in numerous cases distinguish the different strata which they remove by the practical knowledge they possess of the accompanying fossils. Any layer of coal and the rocks which lie upon it should consequently contain the various parts of the living plants at the moment of its formation, and by carefully studying the association of these various fossils, which form so many special floras, containing generally but few species, we may hope to be able to reconstruct these anomalous forms of the ancient world. This is what I have applied myself to in my travels during the last two years, with the view of studying the coal strata of part of France and the fossil plants which they contain; and although similar results cannot generally be obtained except by long-continued researches, which the directors of mines alone could make, still chance has sometimes favoured me, and furnished me with useful materials for the solution of this important question. Thus, in the mines at Bessège, near Alais, I was astonished at finding amongst the portions removed from one gallery and from the same stratum, a large number of the following fossils, which were almost unmixed with others:—1. Numerous fragments of the leaves of *Noggerathia*, with long, almost linear leaflets, which were slightly cuneiform and lobed at the summit; 2. Other fronds of a crested form, and having a very characteristic aspect; 3. A large number of large elliptic or oblong seeds. These remarkable fronds, of which I had met with rather small fragments only, but of which I have since seen almost perfect specimens in other mines, in the species at Bessège, which is the largest I am acquainted with, would be about 50 centimetres long and about 30 broad. They are bipinnatifid, the petiole and rachis large, flattened, expanding as they penetrate the secondary rachides, and from thence into the rounded, recurved and fringed lobes, which constitute the foliaceous appearance. This part has not in the least the aspect of the delicate and well-defined leaves of the ferns, which are so common in these strata; in this it is rather a flattened, dilated petiole, thinner and

lobed at the margins; and there is no small leaflet inserted upon these flattened rachides; hence we cannot suppose that it is the young frond of a fern still convoluted at the extremity. I ought moreover to remark, that these fronds do not constitute a unique and exceptional case, but are extremely abundant in this stratum.

After having compared these impressions with all the foliaceous organs with which I am acquainted, I find none to which they have more analogy than those abortive fronds, which in *Cycas* bear the organs of reproduction. These modified fronds of *Cycas*, which are much shorter than the true leaves, support on their base and on the two sides of the petiole, two, three or four tolerably approximated ovules; towards the extremity they expand into a thick lamina, which is slightly dilated and almost entire in *Cycas circinalis*, very large, and deeply cut into narrow laciniae in *Cycas revoluta*.

There is certainly a great difference both in the shape and details of the form of these organs and those to which I compare them, but their general structure appears to me very analogous; and when we recollect that the leaflets of *Cycas* are spirally convoluted in their young state, like the lobes of this singular frond; when we remember that *Noggerathia*, and particularly the species which accompanies it, has much larger leaflets than those of *Cycas*; finally, when we find these fronds associated with leaflets having so many characters common to the other *Cycadeæ*, we are led to believe that these anomalous fronds are the abortive and fructiferous fronds of *Noggerathia*. This supposition is confirmed by the presence of large quantities of fruits, or rather seeds, which resemble those of *Cycas* most strikingly, in the same strata which contain these two kinds of fronds. These are large oblong or ellipsoidal seeds, flattened by compression, perfectly symmetrical, thicker, and as it were truncated towards the base at the point corresponding to the chalaza, more acute at the summit, and frequently towards this extremity presenting traces of an internal body which appears to indicate the position of the micropyle and the attachment of the embryo.

It is difficult to avoid being struck by the analogy in form and structure of the appreciable parts of these seeds with those of the *Cycadeæ* and certain *Coniferae*, such as the yew and the ginkgo. But they present the most marked relations to the true *Cycadeæ* in form and size.

Hence we find combined in a single layer of one coal-mine, and frequently in the same pieces of sandstone or schist:—1. Leaves, the leaflets of which have the form and nervation of those of certain existing *Cycadeæ*, especially the American *Zamia*; 2. Leaves of a peculiar form, having however a well-marked analogy with the modified leaves which bear the fruit in certain

Cycadeæ, especially *Cycas revoluta*; 3. Seeds, having the most striking resemblance to those of *Cycas*. It is difficult to avoid drawing the conclusion that these three kinds of organs belong to one plant, and that this plant should be placed very near the *Cycadeæ*, probably even in the same family, in which it would form one of the most remarkable genera from the large size and form of its leaves,—a genus which would appear to combine leaves analogous to those of *Zamia* with a mode of fructification similar to that of *Cycas*. I should add, that this association, which appeared to me so striking in the mines at Bessèges, from the abundance of these fossils, appears to exist in several other mines where these fossils are more rare. Thus in those of Treuil at St. Etienne we also find large leaves of a species of *Noggerathia*, probably different from that of Bessèges, associated with fronds having pinnatifid fringed lobes, which are however not recurved as those in the former locality, and having analogous fruits to those above described, although slightly different specifically. In Decazeville we find the same association, although combined with some specific differences and smaller dimensions in all the parts. I possess leaves of a peculiar species of *Noggerathia* obtained by M. Boisse from Carneaux, in the fragments of which I can now recognise lobes of these abortive fronds very analogous to those of St. Etienne; finally, two kinds of seeds having considerable analogy with those which I have attributed to *Noggerathia*, although very different in their proportions. Leaves of *Noggerathia*, although from different species, are also very abundant at Blanzay, in the basin at Autun, at Brassac, Commentry, Saint-Gervais, Neffiez, Saint-Georges-sur-Loire, Saint-Pierre-la-Cour and Anzin.

Most of the straight, linear or slightly cuneiform leaves, having equal and parallel nerves, and called *Poacites*, appear to be leaflets or lobes of the leaflets of *Noggerathia*; however, these leaflets having almost always been found only isolated, and also in very imperfect fragments, we must not generalize too much on their relations with *Noggerathia*; probably several belong to another genus of the same division of the vegetable kingdom, *Flabellaria* of M. de Sternberg, also referred by this savant to the family of Palms, and the affinities of which, both to the *Coniferae* and to the *Cycadeæ*, have been shown by M. Corda; but here the leaves are simple and symmetrical, whilst in *Noggerathia* the foliaceous parts consist of the leaflets of a pinnate leaf, and they are generally oblique at the summit and not symmetrical.

This determination of the position of *Noggerathia* in the vegetable kingdom is not without some interest, for these plants appear very numerous and widely diffused in the coal-formation, and the debris of their leaves appears in some places, by their

accumulation, to have contributed essentially to the formation of the coal.

We may moreover remark, that this genus being excluded from the monocotyledonous division; *Flabellaria borassifolia* of M. de Sternberg, from the coal-mines of Bohemia, being also rejected from the family of the Palms to be arranged with the gymnospermous division; and the genus *Artisia* appearing to be similarly situated; a few fruits only remain in these ancient strata to represent this large division of the vegetable kingdom, and the structure of these is too imperfectly known to allow of our placing them with any probability in this natural division, when we are unacquainted with either their stems or leaves.

Hence everything leads us to conclude from the researches which have hitherto been made, that the terrestrial vegetation of the period of the coal-formation was limited to two of the large divisions of the vegetable kingdom—the acrogenous or vascular Cryptogamia, and the gymnospermous dicotyledonous Phanerogamia.

XIX.—*Characters of some undescribed species of Chalcidites.*

By FRANCIS WALKER, Esq., F.L.S.

1. Chalcis Alphius, mas et fem. *Nigra, antennis nigris, pedibus flavis nigro et piceo cinctis, metafemoribus rufis flavo-variis aut nigris, alis limpidis.* (Corp. long. lin. 2—2½; alar. lin. 3½—4.)

Male.—Body black, convex: head and thorax punctured: head nearly as broad as the thorax; vertex broad; front impressed: antennæ black, filiform, nearly as long as the thorax: prothorax transverse, subquadrate: scutum very large; sutures of the parapsides distinct; axillæ remote from each other; scutellum obconic, having a rim behind: propodeon obconical, declining, rugulose: podoon very short: abdomen smooth, shining, narrower and much shorter than the thorax; metapodeon occupying more than half the dorsum; octoon and following segments short: legs yellow; coxæ black; profemora and mesofemora black, their tips yellow; metafemora red, thick, partly yellow on the outside and armed beneath with nine or ten little black teeth; protibiæ encircled with red; mesotibiæ encircled with a piceous band; metatibiæ curved, piceous at the base and in the middle; tips of the tarsi piceous: wings limpid; squamulæ yellow; nervures fulvous; humerus much less than half the length of the wing; ulna not half the length of the humerus; radius more than half the length of the ulna; cubitus hardly half the length of the radius; stigma very small.

The colour of the legs varies; the protibiæ are sometimes red; the mesotibiæ black, yellow at the base and at the tip; the metafemora altogether black; the nervures of the wings piceous. The antennæ

of the female are clavate, the abdomen is keeled beneath, and the metafemora are black.

From Bombay. In the collection of the Rev. F. W. Hope.

2. *Chalcis Amphilochus*, fem. *Nigra, scutello bispinoso, antennis nigris, pedibus flavis, coxis et metafemoribus nigris, profemoribus, mesofemoribus et metatibiis nigris apice flavis, protibiis et mesotibiis nigro vittatis, alis limpidis.* (Corp. long. lin. 2; alar. lin. 4.)

Body convex, pubescent, black: head and thorax thickly punctured: head transverse, nearly as broad as the thorax: antennæ stout, subclavate, black; first joint long, slender; second small; third and fourth very minute; fifth and following joints to the tenth compact, pubescent, successively decreasing in length; club oval, much longer than the tenth joint: thorax nearly oval: prothorax large, subquadrate, nearly as broad as the mesothorax; its length less than half its breadth; scutum of the mesothorax broad; sutures of the parapsides not very distinct, approaching each other behind; axillæ triangular, hardly nearer to each other than are the sutures of the parapsides; scutellum nearly round, clothed with white hairs on each side and at the tip, along which is a rim prolonged into two very short spines: metathorax transverse, very short: propodeon transverse, abruptly decumbent: podeon very short: abdomen oval, a little shorter than the thorax; metapodeon smooth, shining, occupying nearly one half of the dorsum; octoon and the following segments dull, pubescent; octoon not half the length of the metapodeon; enaton much shorter than the octoon; decaton shorter than the enaton; protelum nearly as long as the decaton; paratelum and telum short: legs yellow; coxæ and hind thighs black; fore and middle thighs and hind tibiæ black, their tips yellow; a black stripe on each fore and middle tibia: wings limp; squamulæ dull fulvous; nervures piceous; humerus much less than half the length of the wing; ulna more than half the length of the humerus; radius a little longer than the ulna; cubitus very short; stigma furcate, very small.

Found at Sierra Leone by the Rev. D. F. Morgan, and presented by him to the British Museum.

3. *Chalcis Visellus*, fem. *Nigra, scutello bispinoso, antennis nigris, pedibus flavis, metafemoribus nigris apice flavis, alis limpidis.* (Corp. long. lin. $2\frac{1}{2}$; alar. lin. $4\frac{1}{2}$.)

Body convex, pubescent, black: head and thorax thickly punctured: head transverse, nearly as broad as the thorax: antennæ stout, nearly filiform, black; first joint long, slender; second small; third and fourth very minute; fifth and following joints to the tenth compact, pubescent, successively decreasing in length; club oval, much longer than the tenth joint: thorax somewhat oval: prothorax large, subquadrate, nearly as broad as the mesothorax; its length less than half its breadth: scutum of the mesothorax broad; sutures of the parapsides not very distinct, approaching each other behind; axillæ triangular, separated from each other by a space almost equal

to the hind border of the scutum, which is included between the sutures of the parapsides; scutellum rhomboidal or nearly round, clothed with white hairs on each side and at the tip, along which is a rim prolonged into two short spines: metathorax transverse, very short: propodeon transverse, abruptly decumbent: podoon very short: abdomen oval, a little shorter than the thorax; metapodeon smooth, shining, occupying nearly one half of the dorsum; octoon and the following segments dull, pubescent; octoon not half the length of the metapodeon; ennaton much shorter than the octoon; decaton shorter than the ennaton; protelum nearly as long as the decaton; paratelum and telum short: legs yellow, in structure like the other species of the genus; coxæ black; hind thighs black along two-thirds of their length from the base; wings limpid; nervures piceous; humerus much less than one half the length of the wing; ulna more than half the length of the humerus; radius a little longer than the ulna; cubitus very short; stigma furcate, very small.

Found at Sierra Leone by the Rev. D. F. Morgan, and presented by him to the British Museum.

4. *Haltichella* *Sepyra*, mas. *Picea*, *antennis pedibusque nigris, metafemoribus, protarsis et mesotarsis rufis, alis limpidis.* (Corp. long. lin. 2; alar. lin. $3\frac{1}{2}$.)

Male.—Body dark piceous, convex: head and thorax punctured: head transverse, nearly as broad as the thorax; vertex broad; front impressed: antennæ black, filiform, shorter than the body: prothorax transverse, subquadrate, longer than the head; its hind border concave: sutures of the parapsides distinct or complete; axillæ remote from each other; scutellum obconical, having a rim on either side and behind, where it is slightly excavated: propodeon obconical, declining, rugulose: podoon very short: abdomen oval, smooth, shining, shorter and rather narrower than the thorax; metapodeon long; octoon and following segments short: legs black; knees and tarsi red; metafemora red, thick, each armed with an obtuse basal tooth and having a black edge along its length beneath; metatibiæ curved; metatarsi black: wings limpid; nervures piceous; humerus much less than half the length of the wing; ulna not one-third of the length of the humerus; radius nearly as long as the ulna; cubitus very short; stigma very small.

From Bombay. In the collection of the Rev. F. W. Hope. Perhaps the difference between *Haltichella* and *Hockeria* is too slight to admit of their being divided. In addition to these two genera, the family *Chalcidæ* comprises the following: *Smiera*, *Epitranus*, *Chalcitella*, *Conura*, *Chalcis*, *Chirocerus*, *Phasgonophora*, *Dirhinus*, *Notaspis* and *Agamerion*.

5. *Callimome* *Amyrius*, fem. *Viridis, abdomine basi cyaneo, antennis nigris, pedibus flavis, femoribus viridibus, alis limpidis.* (Corp. long. lin. $1\frac{1}{4}$; alar. lin. 2.)

Body bright green; base of the abdomen blue: antennæ black, clavate, as long as the thorax; base of the first joint yellow: sheaths

of the oviduct as long as the body: legs yellow; coxæ and thighs green; tips of the latter yellow; tips of the tarsi fuscous: wings limp; nervures piceous; ulna shorter than the humerus; radius very short; cubitus extremely short. The characters which are common to the genus, such as the minute transverse undulations on the thorax, the long scutum, the distinct sutures of the parapsides and the extremely short podoon, are here omitted. The length of the oviduct will distinguish this insect from most of the British species of *Callimome**. In this character it most resembles *C. Bedeguaris*, *varians*, *scutellaris*, *Hedera* and *Arundinis*, but it has more slender antennæ and a smaller body than any of these species.

October; near London.

6. *Lamprotatus Rubrius*, mas. *Viridis, abdomine æneo-viridi, antennis nigris, pedibus fulvis, femoribus viridibus, alis limpidis.* (Corp. long. lin. $1\frac{1}{2}$; alar. lin. $2\frac{1}{2}$.)

Male.—Body convex: head and thorax finely squameous: head a little broader than the thorax: antennæ stout, filiform, not longer than the thorax; first joint long, dilated beneath; second short-cyathiform; third and fourth very minute; fifth and following joints to the tenth long, linear, successively decreasing in length; club linear, conical at the tip, twice the length of the tenth joint: thorax oval, stout, deep, very convex: prothorax moderate, transverse: scutum of the mesothorax broad; sutures of the parapsides very distinct, approaching each other; axillæ large, triangular, not conniving; scutellum truncate-conical, not impressed in front but having a transverse channel near the tip: metathorax large, obconic, decumbent: podoon short, stout, punctured, less than one-sixth of the length of the abdomen: abdomen oval, smooth, shining, slightly convex, shorter and much narrower than the thorax; metapodoon occupying more than one-third of the dorsum, having a broad channel throughout its length; octoon less than one-half of the metapodoon in length; ennaton much shorter than the octoon; decaton a little longer than the ennaton; protelum as long as the ennaton; paratelum shorter than the protelum; telum very short: wings ample; humerus much less than half the length of the wing; ulna not more than half the length of the humerus; radius twice the length of the ulna; cubitus rather shorter than the ulna; stigma large, pyriform, emitting a short branch towards the radius.

Found by Dr. Greville near Edinburgh.

7. *Lamprotatus Helenor*, mas. *Æneo-viridis, antennis nigris, pedibus fulvis, alis limpidis.* (Corp. long. lin. $1\frac{1}{4}$; alar. lin. $2\frac{1}{2}$.)

Female.—Body convex: head and thorax finely squameous: head a little broader than the thorax: antennæ filiform, longer than the thorax; first joint long, slender; second short-cyathiform; third and

* *Callimome* is allied to *Gastrancistrus* through *C. nitidulus*. *C. cyaneus*, Kollar, approaches nearer than any other species that I have seen to *Ormyrus*, which genus connects the *Torymidæ* with the *Eucharidæ*.

fourth very minute; fifth and following joints long, linear, slightly decreasing in length until the tenth; club linear, conical at the tip, much longer than the tenth joint: thorax nearly oval, very convex: prothorax rather large, transverse, narrower in front: scutum of the mesothorax large, transverse, having the scales on its surface disposed in minute transverse undulations; sutures of the parapsides distinct, slightly approaching each other; scutellum truncate-conical, having a very narrow suture at the base: metathorax convex, prominent, decumbent: podoon not more than one-sixth of the length of the abdomen: abdomen nearly conical, smooth, shining, slightly convex, narrower and much shorter than the thorax; metapodoon covering more than half the dorsum, slightly concave at the base; octoon and all the following segments very short: wings ample; humerus less than half the length of the wing; ulna scarcely half the length of the humerus; radius much longer than the ulna; cubitus about one-half of the length of the ulna; stigma very large, forming an irregular cone whose tip points toward the radius.

Found by Dr. Greville near Edinburgh. It is nearly allied to *L. elegans*.

8. *Lamprotatus Babilus*, mas. *Viridis, antennis nigris, pedibus fulvis piceo cinctis, femoribus viridibus, alis fuscis.* (Corp. long. lin. $1\frac{1}{4}$; alar. lin. $2\frac{1}{4}$.)

Female.—Body convex: head and thorax finely squameous: head large, transverse, a little broader than the thorax: antennæ short, compact, subclavate, rather shorter than the thorax; first joint long, linear; second cyathiform; third and fourth very minute; fifth and following joints linear, successively decreasing in length until the tenth, which is as broad as long; club linear, conical at the tip, much more than twice the length of the tenth joint: thorax very convex: prothorax moderate, transverse; fore corners rounded: scutum of the mesothorax large, longer than broad; sutures of the parapsides very distinct, approaching each other; axillæ large, triangular, not conniving; scutellum truncate-conical, very prominent, not impressed in front, but having a transverse channel before the tip: metathorax large, obconic, decumbent: podoon short, stout, not more than one-sixth of the abdomen in length: abdomen short-oval, shining, very finely squameous, deep, very convex, much shorter and a little narrower than the thorax; metapodoon conical, quite smooth, channeled and abruptly decumbent towards the fore border, occupying a little less than one-third of the dorsum; octoon more than half the length of the metapodoon; ennaton shorter than the octoon; decaton as long as the ennaton; protelum short; paratelum and telum very short: wings ample; humerus much less than half the length of the wing; ulna rather less than half the length of the humerus; radius very much longer than the ulna; cubitus stout, much shorter than the ulna; stigma large, pyriform, emitting a short branch towards the radius.

Found by Dr. Greville near Edinburgh. It is allied to *L. fuscipes*.

9. *Lamprotatus Venilia*, mas. *Viridis*, abdomine nigro-cupreo, antennis nigris, pedibus flavis fusco cinctis, femoribus basi viridibus, alis limpidis. (Corp. long. lin. $\frac{3}{4}$; alar. lin. $1\frac{1}{2}$.)

Body convex: head and thorax squameous: head dark green, short, transverse, a little broader than the thorax: antennæ black, stout, slightly increasing in breadth towards their tips, rather longer than the thorax; first joint long, slender; second cyathiform; third and fourth very minute; fifth and following joints to the tenth successively decreasing in length; club fusiform, twice the length of the tenth joint: thorax oval, dark green: prothorax transverse, short, narrower in front: scutum of the mesothorax large; sutures of the parapsides distinct, approaching each other; axillæ large, triangular, not conniving; scutellum truncate-conic, having a channel at the tip but none at the base: metathorax large, obconic, decumbent: podoon squameous, stout, very short, not longer than one-sixth of the abdomen: abdomen nearly linear, smooth, flat, dark purple, shorter and narrower than the thorax; metapodoon conical, concave, mostly æneous green, occupying nearly half the dorsum; the following segments from the octoon to the protelum short, transverse, nearly equal in size; paratelum and telum very short: legs yellow; coxæ green, squameous; thighs fuscous; middle and hind tibiæ having two fuscous stripes across each; protarsi fulvous; mesotarsi fuscous; metatarsi pale yellow, fuscous at their tips: wings limpid; nervures fuscous; humerus less than half the length of the wing; ulna about half the length of the humerus; radius very much longer than the ulna; cubitus rather more than half the length of the ulna; stigma very small, emitting a short branch towards the radius. Length of the body $\frac{3}{4}$ lin.; expansion of the wings $1\frac{1}{4}$ lin.

Found by Dr. Greville in Northumberland. The black and comparatively stout antennæ will distinguish this species from *L. tarsalis*, *annulipes*, *costalis*, *semiauratus*, *philochortoides*, *cyaneus*, *brevis*, *contiguus*, *linearis* and *filicornis*. The very slender pale stigma separates it from all the other species, having dark bands round their middle legs.

10. *Pilonotus Hortensia* (Haliday MSS.). *Viridis*, antennæ luteæ, pedes flavi, femoribus basi fuscis, alæ limpidæ.

Male.—Head and thorax bright green, convex, shining, finely squameous: head a little broader than the thorax: antennæ inserted near the mouth, luteous, slightly clavate, shorter than the thorax; first joint long, slender, slightly curved; second cyathiform; third and fourth very minute; fifth and following short and very small; club fusiform, more than twice the length of the tenth joint: thorax oval: prothorax short, narrower in front: scutum of the mesothorax broad; sutures of the parapsides hardly visible: axillæ rather large, not conniving; scutellum truncate-conical: metathorax large, obconic, declining: podoon very short, so that the abdomen appears sessile: abdomen dark purple, smooth, depressed, nearly linear, narrower and much shorter than the thorax; metapodoon large, green towards the base, covering at least one-third of the dorsum; octoon, ennaton

and decaton moderate, nearly equal in size; protelum short; paratelum and telum very short: legs yellow; coxæ green; hind thighs fuscous towards their base: wings limpid; nervures pale yellow; humerus much shorter than half the length of the wing; ulna half the length of the humerus; radius longer than the ulna; cubitus more than half the length of the ulna; stigma very small.

Female.—Antennæ subclavate, as long as the thorax; first joint long, slightly curved; second long-cyathiform; third and fourth very minute; fifth and following joints to the ninth successively broader; club fusiform, broader than the ninth joint, and more than twice its length: abdomen much compressed, concave along the back towards the base, a little longer than the thorax, like that of the male as far as regards the relative size of the segments.

Found by Dr. Greville in Northumberland.

The thorax of this species is more convex than that of *P. Adamas*.

11. *Eupelmus Amphitus*, fem. *Viridis, micans, antennis nigris, oviductu pedibusque flavis, profemoribus fusco vittatis, alis limpidis.* (Corp. long. lin. $2\frac{1}{4}$; alar. lin. 4.)

Bright golden green: head and thorax minutely squameous, pubescent: front of the head bluish green: eyes and ocelli red: antennæ black, slender, subclavate, as long as the thorax: thorax fusiform: abdomen fusiform, a little longer than the thorax: oviduct yellow, hardly equal to one-sixth of the length of the abdomen: legs yellow; a short fuscous stripe on the outside of each of the profemora; mesotibiæ armed with long spines; mesotarsi dilated: wings limpid; nervures yellow; humerus rather more than one-third of the length of the wing; ulna rather shorter than the humerus; radius about one-third of the length of the ulna; cubitus a little shorter than the radius; stigma small.

From Bombay. In the collection of the Rev. F. W. Hope.

Eupelmus with *Urocryptus*, *Cheiloneurus*, *Metapelma*, *Prionopelma*, *Caloseter* and *Stenocera* forms the family *Eupelmidae*, to which *Lycisca*, *Epistenia*, *Trigonoderus*, *Notanisus* and *Cleonymus* are nearly allied. *Platynocheilus* and *Merostenus* may be included in the same group with the latter genera.

12. *Cerchysius Vulso*, fem. *Viridis, capite cupreo, abdomine antennisque nigris, pedibus flavis viridi cinctis, alis limpidis.* (Corp. long. lin. $\frac{3}{4}$; alar. lin. $1\frac{1}{2}$.)

Body slender: head and thorax convex, squameous: head cupreous, very short, a little broader than the thorax; vertex broad; front abruptly declining, not impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ black, subclavate, very slender, rather shorter than the body; first joint slender, very long; second rather long, increasing in breadth from the base to the tip; the following joints from the third to the eighth successively decreasing in length and slightly increasing in breadth; club long-fusiform, rather broader than the eighth joint and more than thrice its length: thorax elliptical, bright green: prothorax trans-

verse, of moderate size, narrower in front : scutum of the mesothorax broad, slightly convex ; parapsides united to the scutum ; axillæ complete ; scutellum obconic, prominent, very convex, abruptly declining behind the tip : propodeon subquadrate, rather large, declining ; podoon extremely short : abdomen slender, lanceolate, depressed, black, smooth, shining, compressed towards the tip, rather longer and much narrower than the thorax ; metapodeon bright green and like the following segments of moderate size : oviduct exerted in length nearly equal to one-fourth of the abdomen ; its sheaths black : legs slender, yellow, very long ; mesotibiæ and mesotarsi dilated and the former armed with very long spines ; coxæ and metafemora green ; profemora and metatibiæ green, their tips yellow ; mesotibiæ fuscous towards the base ; protarsi fulvous ; tips of the tarsi fuscous : wings limpid ; nervures yellow ; humerus much less than half the length of the wing ; ulna and radius piceous, broad, very short ; cubitus of moderate length, pointing towards the disc of the wing ; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

[To be continued.]

XX.—*Botanical Notices from Spain.* By MORITZ WILLKOMM*.

[Continued from vol. xvi. p. 252.]

No. IX. GIBRALTAR, April 4th, 1845.

I WAS unavoidably detained in Cadiz by illness and incessant rains until the 18th of March. Meanwhile, in consequence of the warm rain, the vegetation was remarkably forward, and promised a richer harvest than hitherto. *Retama monosperma* was quite out of bloom ; on the other hand, under the latter, the sandy soil was covered with *Anagallis latifolia*, L., and near the church of San José the beautiful *Celsia sinuata*, Cav., in company with *Picridium tingitanum*, Desf. The salt marshy lowlands of Chiclana appeared covered with *Cotula coronopifolia*, L., and looked at a distance quite yellow ; near the hedges blossomed *Cynoglossum pictum*, Ait., *Euphorbia serrata*, L., *Muscari comosum*, Mill. ; and on dry grass-plats, *Iris Sisyrinchium*, L., and a form of *Ornithogalum umbellatum*, L., with large flowers, which is common throughout the whole west of Andalusia ; and Boissier, in his 'Elenchus' (No. 181), has described it as a new species under the name of *O. baticum*, but in his 'Journey' he places it as merely a form of *O. umbellatum*. On the following day I set out, in incessant rain, for Couil, a spot formerly celebrated for its sulphur-mines, lying close to the coast, the way to which led over a hilly arid highland, in parts covered with pine forests, and in parts with low copsewood and arable land. In the copse, the *Sarothamnus gaditanus*, B. e. R., was remarkable at a distance from its large golden blossoms ; less frequent was *Calycotome villosa*, Lk., which in the

* Translated from the Botanische Zeitung, Nov. 7, 1845. No. VIII. has not yet appeared in the Bot. Zeit.

environs of the Bay of Gibraltar covers all the hills almost exclusively, and is as great a favourite for its perfumed blossoms as it is feared for its prickly branches. Everywhere the *Cistus albidus*, L., unfolded its large rosy blossoms, and in addition there were found the *Teucrium fruticans*, L., a thorny *Genista*, and other shrubs in flower. In the hedges of pistachio and oak-copses there grew most luxuriantly also *Vinca media*, *Tetragonolobus purpureus*, *Aristolochia bætica*, *Borago officinalis*, *Phaca bætica*, and *Ruta bracteosa*; and the moist cultivated fields were covered with *Scrophularia sambucifolia*, *Reseda luteola*, *Fedia Cornucopiæ*, *Centaurea pullata*, &c. The marshy lowlands and moors abounded with *Asphodelus ramosus*; in the pine-woods lying behind Chiclana grew *Tulipa Celsiana*, DC., and *Scilla vernalis*, Huds., in abundance; less frequent, on sandy spots, *Erodium Botrys*, Bertol. Upon meadows I gathered for the first time the pretty *Ranunculus flabellatus*, Desf., which is very frequent in different forms throughout all the hilly district around Cadiz, and also is found in the mountains up to a height of 2000 feet. On sandy places, amongst low shrubs, I noticed some specimens of *Lupinus luteus*, L., which I have nowheré since found; more plentifully grew here *Ophrys apifera*, Huds., *Orchis longicornu*, Poir., *Polygala nicænsis*, Riss., and a low, spreading *Reseda*. On clayey fields and in hedges at Couil I observed *Aristolochia longa*, L., and on the dry hills and in sandy lowlands around Couil, *Iris Sisyrinchium* flowered in great abundance. The hills between Couil, Cape Trafalgar and Vejer exhibited a vegetation less rich in species. Large tracts were filled with *Leucosium trichophyllum*, Brot., and in the numerous marshes in the neighbourhood of the Cape, *Ranunculus paludosus*, Desf. grew plentifully.

The town of Vejer lies on an abrupt rocky hill of sandstone on the right bank of the Rio Barbate, which issues from the lofty mountains of Alcalá de los Gazales, and joins the ocean eastward of Cape Trafalgar. On the shady moist sandstone rocks of the mountain and the walls of the town, I observed *Targionia Micheli* and *Lunularia vulgaris* in abundance,—the last without fructification. Between Vejer and the sandstone hills of Algeciras, which are connected on the north with those of Alcalá, and bound the western shore of the Bay of Gibraltar, lie several chains of sandstone hills running parallel from north to south, over which the road to Algeciras lies. The first of these chains of hills is covered partly with isolated cork-oaks, partly with low bushes, among which an *Erica*, *Vicia biflora*, Desf., and a pretty *Senecio* were frequent. I also gathered here on sandy spots *Uropetalum serotinum*, Ker., *Anchusa calcarea*, Boiss., *a. glabrescens*, and *Helianthemum guttatum*, P., the last in great plenty. The second more rocky chain of hills, which bears the name of Puerto de Acebuches, is pretty thickly wooded with *Olea europæa*, var. *sylvestris*, and *Quercus suber*, on whose boughs *Polypodium vulgare* is very common. On the sandstone rock I remarked here, rare, *Helianthemum Tuberaria*, P., and in the underwood *Genista linifolia*, L., more frequent. Between these two rows of hills and the mountains of Algeciras lies a marshy tract several miles wide, wholly covered

with *Asphodelus ramosus*, L., which was now in full blossom. When this tract was passed, which is somewhat dangerous to cross at this season of the year on account of the numerous deep morasses in which the path is every instant lost, we entered on the promontory of the Siena de Palma, which is covered with cork-oaks. This is the name given to this central part of the chain of Algeciras, which rises to about 4000 feet,—an abrupt, rocky mountainous district, intersected with numerous deep valleys, woody and rich in water: over this mountain a very dangerous mule-path leads to Algeciras. In the lower part *Genista linifolia*, L., especially occurs in company with another large shrubby species of this genus, plentiful; and on the lakes *Tamarix africana*, Desf., and *Nerium Oleander*, L.

The lower part of the mountain is covered with isolated cork-oaks and wild olive-trees, but at about halfway up begins a dense and beautiful forest, such as I had never before seen in Spain. It principally consists of very old knotty cork-oaks, clothed from top to bottom with *Polypodium vulgare* and the elegant *Davallia canariensis*, Sw., as well as with red and yellow coloured forms of *Usnea barbata*, *Sticta pulmonacea*, and other lichens in the most picturesque manner; also of *Quercus lusitanica*, β . *bætica*, Lam., and *Olea europæa* var. *sylvestris*, on the boughs of which I have also observed, although more rarely, the beautiful *Davallia*. The banks of the crystal brooks are lined with large trees of *Laurus nobilis*, L., which were just in full blossom and diffused a balsamic perfume throughout the wood, and likewise with tall bushes of oleander, pistachio, and *Rhododendron ponticum* with leaves nearly a foot long. There are likewise found in this noble forest trees of *Phillyraea media*, *Ph. angustifolia*, *Arbutus Unedo*, *Viburnum Tinus*, *Cratægus monogyna*, *Pyrus communis*?, and a luxuriant underwood chiefly consisting of myrtles, pistachios, *Erica arborea* and *Rhamnus lycioides*. On the loose soil of this forest, consisting of dead vegetation, which recalls the tropical forests, through the thickly interwoven boughs of which the rays of the sun can scarcely penetrate, blossomed *Allium triquetrum*, L., *Scilla vernalis*, Huds., and *Luzula Forsteri*, DC. The highest part of the mountain is covered with low bushes of *Chamærops humilis* and various species of *Erica*, *Ulex*, *Rhamnus* and *Genista*, beneath which the rare *Polygala microphylla*, L., occurs frequent, and a *Fritillaria* rarely. As soon as this summit was crossed, from whence there is a fine view over the magnificent Bay of Gibraltar and the Pillars of Hercules, we entered again on the underwood above described, which however is on this side less varied. For instance, the laurel-trees are wanting here; on the other hand, I have nowhere seen *Erica arborea* in such profusion, nor in such gigantic specimens, as at this locality. There is moreover found on the eastern declivity, in shady places, the beautiful *Doronicum rotundifolium*, Desf., and further down on sunny blocks of sandstone the rare *Genista tridentata*, L.

Between the eastern foot of the mountain and the shore of the bay, lies a broad, much-intersected, hilly land, consisting partly of sandstone, partly of limestone and alluvium, which surrounds the whole bay, and is watered by the rivers of Palmones and Guadarranque,

both coming from the Sierra de Gazales, which empty themselves in the furthestmost northern part of the bay. This hilly land is, as already observed, exclusively covered with *Calycotome villosa*, Lk., and a *Genista*; frequently are seen also large patches of *Chamærops humilis*, and, more seldom, a *Sarothamnus*. On somewhat moist places and under bushes grows everywhere *Allium triquetrum*, L., and also *Bellis sylvestris*, Cyr., *B. annua*, L., *Ranunculus flabellatus*, Desf., *Rumex bucephalophorus*, L., a small blue-flowered *Linum*, especially in the scattered copses of *Pinus picea*, also *Hedysarum coronarium*, L., *Ophrys apifera*, Huds., more rarely and only on limestone, *Ophrys lutea*, Cav., several *Carices* and grasses, *Salvia Verbenaca*, L., *Anthyllis tetraphylla*, L., *Calendula arvensis*, *Alyssum maritimum*, *Cerastium glomeratum*, *Cerinthe major*, *Corrigiola littoralis*, &c. Large patches were covered with *Pteris aquilina*, especially along the foot of the mountain; whilst in the moist lowlands and marshes grew *Juncus acutus*, *Heleocharis palustris* and *Carices* in abundance, rarely *Alisma ranunculoides*, L. From Algeciras, where I arrived on the evening of March 22nd, I made various excursions into this hilly district, as well as to the neighbouring sierra. In one of these, in which I ascended one of the highest summits of the chain, the Cerro Comodre, I for the first time met with the splendid *Drosophyllum lusitanicum*, Lk., unfortunately not yet in blossom, but in great profusion. It covers the whole northern acclivity of the above-named mountain, which consists of arid boulders of sandstone, where it occurs, in company with a beautiful shrubby *Helianthemum*, at a height of 2000 feet and upwards. *Cistus populifolius*, L., covers exclusively the east and southern acclivity, which was also not yet in blossom, among which here and there grows a pretty species of *Pedicularis*, similar to *P. palustris*.

After a sojourn of eight days at Algeciras, I started, on the 29th of March, for Gibraltar, whose interesting rocks I have explored at all points where it was practicable; for on the eastern acclivity this mountain is only accessible at few points. The Rock of Gibraltar consists of limestone, whose strata are inclined from east to west at an angle of 45° to 50°. On that account it forms, on the western acclivity, a steep rocky slope, on the lowest part of which lies the town, whilst the eastern acclivity descends in steep, almost perpendicular walls of rock. This rock, so arid and barren—for it has nowhere any water, and is also almost destitute of any soil—nevertheless presents a luxuriant vegetation at every season of the year, because the atmosphere is constantly kept moist by the evaporation of the surrounding ocean. The English, taking advantage of this circumstance, have converted a large portion of the rock into a kind of paradise, having brought from the main-land earth, with which they have covered the rock, and have planted various trees, shrubs and plants of the temperate and warm zones, which flourish here without any watering in the most luxuriant manner. The gardens and parks extend from the town, which lies at the north-western foot of the rock, as far as the Punta de Europa, or the most southern point of it, where the lighthouse is placed in the midst of formidable for-

tifications, and, especially the king's garden or the Alameda is one of the most beautiful promenades in the world. Although the Rock of Gibraltar occupies only an insignificant space, and does not rise higher than 1500 feet, yet its vegetation is on both sides very varied. The greatest number of species is found on the western acclivity; the rarest, and the most peculiar to this rock, are on the eastern acclivity. Along the base of the western acclivity now grow luxuriantly *Chrysanthemum coronarium*, L., *Borago officinalis*, L., *Echium plantagineum*, L., *Solanum nigrum*, L., *S. villosum*, L., *Galactites tomentosa*, DC., *Centaurea pullata*, Ait., *Anagallis Monelli* (?), *Aristolochia batica*, DC., *Psoralea bituminosa*, L., *Fumaria capreolata*, L., *Mercurialis annua*, L., *M. ambigua*, L., *Emex spinosus*, Campd., *Euphorbia helioscopia*, L., *Ecbalium Elaterium*, *Urtica membranacea*, Poir., various Trefoils, Medicagos, Silenes, &c., and in shady places the *Acanthus mollis*, L., unfolds its beautiful leaves. On the sunny rocks, from the strand up to the summit, *Asteriscus maritimus*, Mönch., *Calendula incana*, Sm., *Pallenis spinosa*, Cass., *Asphodelus fistulosus*, L., *Lavandula multifida*, L., *Fedia Cornucopiæ*, L., *Clypeola maritima*, *Conyza saxatilis*, L., *Geranium Robertianum*, L., *G. rotundifolium*, L., *Anthyllis tetraphylla*, L., *Hippocrepis multisiliquosa*, L., *Convolvulus althæoides*, L., *Linaria origanifolia*, DC., *Ranunculus flabellatus*, Desf., *Iris Sisyrinchium*, L., *Ruta bracteosa*, DC., *Ornithogalum umbellatum*, L., *Biscutella apula*, L., blossom in abundance; rarely *Convolvulus Siculus*, L., and *Ophrys lutea*, Cav. Of shrubs, there are found frequent on this side *Jasminum fruticans*, L., *Genista linifolia*, L., *Calycotome villosa*, Lk., *Pistacia Lentiscus*, *Daphne Gnidium*, *Spartium junceum*, whilst on the other hand, rare, *Cytisus triflorus*, L'Hérit., already in fruit, *Solanum Sodomorum*, L., and *Osyris quadripartita*, Salzm. I found small shady caverns and clefts in the rock filled with *Targionia Michellii*, *Lunularia vulgaris* and *Rebouillia hemisphærica*, the last two without fruit. In like manner *Ceterach officinarum* and *Asplenium Trichomanes* occur on this acclivity, and also not unfrequent on the eastern one, where *Gymnogramme leptophylla* is found in great profusion. From the signal-house, which stands on the summit of the mountain, a flight of steps cut in the rock in a zig-zag direction leads down to a battery lying near the sea; this is the only way by which the rocks of the eastern acclivity are accessible; these go abruptly and perpendicularly down from 500 to 1000 feet, in some places descending straight into the sea. But it is precisely on these inaccessible walls of rock that many rare plants grow, for instance, the beautiful *Iberis gibraltarica*, L., and the proud *Scilla hemisphærica*, Boiss. (*Sc. peruviana*, L.). The first forms large and luxuriant patches, and grows exclusively in the clefts of these perpendicular rocks, and in great abundance. In order to gather them in any quantity, it would be necessary for a person to be let down by cords from the small shelf covered with dwarf palms, which lies below the signal-house on the edge of the giddy precipice. Besides the great danger of this enterprise, no one can go upon this spot, which lies under the cannon of the batteries of the signal-house, without the express permission of the governor, which it is very dif-

difficult to obtain; because the monkeys live here, which are under the special protection of the English, who have set a great fine upon any one who should take or kill one of these animals. *Scilla hemisphærica* occurs also on boulders, but less beautiful and rarer than on the original walls. On shady boulders and in rocky clefts, as well as along the narrow comb of the summit, *Cerastium gibraltarium*, Boiss., is very frequent. Also, on the rocky walls of the eastern acclivity, grow *Reseda alba*, L., *Antirrhinum majus*, L., and especially on the north-eastern rocks, *Saxifraga globulifera*, Desf., β . *gibraltaria*, Boiss., which is only now beginning to shoot forth its buds. Upon boulders blossom *Veronica cimbrolaria*, Badara, very rare *Senecio minutus*, DC., in fine large specimens, *Erodium moschatum*, L., and under bushes *Ætheorrhiza bulbosa*, Cass., and *Smilax mauritanica*, Desf. The rock-walls of the eastern acclivity descend toward the Punta de Europa straight down into the sea, whilst those of the northern valley descend to only half the height of the mountain, and here join on to a steep slope consisting of boulders and drift-sand, which extends down to the shore. On these slopes grow *Ononis gibraltaria*, Boiss., in great profusion, which unfortunately was not yet in blossom, besides *Silene gibraltaria*, Boiss., in the same state, and several other species of this genus: also in the drift-sand *Erodium laciniata*, Cav., *Uropetalum serotinum*, Ker., a small form of *Picridium tingitanum*, Desf., *Linaria pedunculata*, Spr., and the pretty *L. amethystea*, Lk. Hoffm., var. *albiflora*, Boiss., with white flowers, yellow palate, and violet-spotted lower lip.

On the isthmus of Gibraltar, a naked sandy plain full of numerous salt lakes, which separates the limestone rocks of Gibraltar from the sandstone hills of S. Roque, are found few plants, but some rare species. On the downs grows *Schænus mucronatus*, L., in great abundance, more rare a *Carduus*, and among bushes of *Tamarix gallica* several *Silenes*, *Erodium Botrys*, Bertol., *Astrocarpus sesamoides*, DC., and *Passerina villosa* (?), Wikstr., occur frequently. In addition is found the pretty *Ononis variegata*, Desf., in the drift-sand of the isthmus, in pretty considerable abundance.

BIBLIOGRAPHICAL NOTICES.

Recherches sur l'Anatomie, la Physiologie et l'Embryogénie des Bryozoaires; par M. Van Beneden, Professeur à l'Université Catholique de Louvain. (Extrait du tom. xviii. des Mémoires de l'Académie Royale de Bruxelles.)

IN these "Recherches," Van Beneden continues the admirable series of Mémoires in which he proposes to illustrate the structure of the invertebrate animals found on the coast of Belgium. The first memoir in the present brochure is devoted to the genus LAGUNCULA, as Van Beneden calls the *Lagenella* of Farre, forgetting that Ehrenberg had long ago given the name *Farrella* to this zoophyte. And we would here remark that, while he carelessly sets aside the rules of scientific nomenclature, Van Beneden has a happy tact in confer-

ring upon his genera the most unhappy names. *Laguncula*, it appears, is to be considered the *euphonious* diminutive of *Lagena*!—his *Hydractinia* has little relationship either to *Hydra* or *Actinia*, and is most certainly not the link of connexion between them:—and lo! we have now a *Sompocellaria*,—certainly the ugliest of this ugly family.

The anatomy of the *Laguncula* is well-described and beautifully illustrated, but does not present much novelty to those who are familiar with the labours of Dr. Farre. We shall cull what strikes us as most peculiar to the author.

The inner surface of the stomach is furnished with a semilunar series of cilia, by whose vibrations the food is kept in a continual rotatory motion. There is no appearance of a liver.

The tentacula are the principal organs of respiration: they vary in number—10, 11 or 12, and this variation is not the result of mutilation. The circle they form is less regular than that of other marine Bryozoa, for they are disposed in a symmetrical order, and give indication of the beginning of a binary disposition. *Laguncula* may therefore be considered as a link between its marine congeners and the freshwater *Hippocrepia* of Gervais.

The purpose of a circulation is effected, but without the agency of special organs. A colourless transparent fluid, loaded with irregular globules of comparatively large size, fills the space between the intestinal canal and the skin, and lies in immediate contact with all the organs of the polype. It thus occupies a position like to that of the blood in the superior animals; and although the liquid seems to be water merely, it distributes to each part of the body its nutritive element, and hence also fulfils the same function as the blood does. We cannot perceive any aperture for the admission of the circumfluent water into the peri-intestinal cavity, but Van Beneden is assured of its existence, for he had seen an egg issue forth through the walls of the cell when no pressure was used to force it out. And yet, when these polypes were immersed for a night in water coloured with carmine, the peri-intestinal fluid remained untinged. Lastly, this fluid has the same office in the system as the prostatic secretion (le liquide du sperme), for both spermatozoa and ova swim freely in it. [There is here surely a painful search after analogies, which, after all, appear to us to be of the very loosest kind.]

M. Du Mortier first discovered a nervous system in polypes. Van Beneden has seen it in this genus. A transparent, somewhat yellowish ganglion on the top of the œsophagus, and as it were soldered to its parietes, may be seen in some specimens and in certain favourable aspects; but Van Beneden could not detect any collar or nerves branching from the ganglion, while at the same time he considers their reality to be indisputable. The ganglion is assumed to be nervous from the sameness of its position to the brain of the *Ascidia*.

We pass over the excellent description given of the muscular system, of the skin and cell, to notice some particulars of the reproductive organs. The polypes are hermaphrodites, there being a

male and female organ in all adult individuals. The products of both organs—spermatozoa and eggs—on their becoming detached, are intermingled in the peri-intestinal cavity, where probably the latter are impregnated. The testicle is situated at the extremity of the stomach, in the place where we observe the ovary in other genera: it appears when the polype approaches to maturity, is unequally pitted, and has very much the aspect of the ovary of birds when they are not in season.

The female organ or ovary is formed on the inner surface of the fold of skin that lines the cell, and on one side near the mouth of the sac. It is at first a mere tubercle, similar to an abnormal excrescence, but it grows rapidly, and ova, in different stages of development, are soon visible in it. In the young ova the vesicles of Wagner and of Purkinje are distinctly seen. In those more mature they have disappeared, and we then discover an external vitelline membrane or chorion, and a vitellus underneath. The ovum at maturity tears its envelope and falls into the peri-intestinal cavity. From this it escapes into the sea by a distinct opening which is formed at the base of the tentacula. On its exclusion the surface does not appear to be covered with vibratile cilia; and Van Beneden was unsuccessful in tracing its further evolution.

The increase of the polypidom from the development of buds is next described. Van Beneden first remarks, that although this polype is an animal of considerable complexity in its organization, yet we here observe that it can be formed without the vesicle of Wagner or of Purkinje, whence it is evident that these vesicles are not indispensable to the formation of an animal, and they are to be looked upon only as a means of isolation for the future individual. Next the author inquires if all the textures of these inferior entities proceed from cellules, agreeably to the doctrine of Schwann, and he answers in the affirmative, although it is admitted that there are differences between the cellules in them and in those of the superior animals. After this, Van Beneden proceeds to trace the growth of the bud, and the successive evolution of the organs of the polype, which is done in a very clear and masterly manner.

The characters of the genus and of its species are next given. The *L. repens* is exceedingly abundant and common at Ostend. The *Laguncula elongata*, a new species, is of less frequent occurrence: it is distinguished by having an elongated pedicle which in general exceeds the length of the cell, and the polype has 16 tentacula.

We reserve the second memoir for a separate notice, for we should not like to review in a more cursory manner our author's much-prized labours. There are none on which we set a higher value. In the meantime we have only to remark, that, in some preliminary observations, Van Beneden expresses his opinion that the Linnæan division of the animal kingdom will be found, after all, superior to that of Cuvier or of Blainville, and more in harmony with the development of structure. In the first four classes the vitellus is absorbed by the belly: these are the vertebrated animals that may be more appropriately called the *Hypovitelliens*, or still better the *Hypocoty-*

ledones, for there are several fishes which have no vertebræ. The Insecta of Linnæus, or the articulated animals of authors, are distinguished by the absorption of the vitellus occurring by the back; and as all of them are not articulated, it would be better to name them the *Epivitelliens* or *Epicotyledones*. In the Worms (*Vermes*) of Linnæus, of which Cuvier has made his Mollusca and Radiata, the vitellus returns inwards neither by the back nor by the belly; and we may distinguish them by the names of *Allovitelliens* or *Allocotyledones*. The Mollusca certainly do not differ so much from the Radiata, as the Vertebrata do from the Articulata. Time, as the author says, must test this arrangement, which must be admitted to be very ingenious.

PROCEEDINGS OF LEARNED SOCIETIES.

BOTANICAL SOCIETY OF EDINBURGH.

Dec. 11, 1845.—Dr. A. Inglis in the Chair.

Mr. J. M'Nab read a continuation of his Journal of a Tour through part of the United States and the Canadas.

In the present portion, embracing the journey from Niagara to New London, Mr. M'Nab particularly alluded to the excellent state of the cultivated grounds through the Hamilton and Gore districts, and the suitability of large tracts of the wooded country for emigrants. On some waste land round the head of Burlington Bay, many good specimens of herbaceous plants were observed in flower; of these the *Lespedeza hirta*, *Polygala verticillata*, *Gerardia tenuifolia*, and *G. pedicularia*, were abundant, with *Chrysopsis alba*; the latter plant being noticed for the first time as an inhabitant of Canada. Two grasses with strong herbage, *Andropogon furcatus* and *Limnetus cynosuroides*, abound in the neighbourhood of Hamilton, but neither seemed to be relished by cattle. The moorland ground in the vicinity of Brantford afforded many interesting botanical rarities, among which *Euphorbia corollata* was conspicuous. *Liatris stricta*, *Aletris farinosa*, *Lespedeza frutescens*, *Batschia Gmelini*, *Arenaria stricta*, *Viola palmata*, with many others, were plentiful in flower, and proved most attractive objects on the dry sandy plains; while the moister places yielded *Tofieldia glutinosa*, *Zigadinus chloranthus*, and *Glycine apios* in profusion. The forests of the inland districts were exceedingly rich and varied, many of them containing large and lofty trees of oak, elm, beech, hickory, ash, and white pine. Some of these districts, in process of clearing, presented a very remarkable appearance in consequence of large groups of stately trees standing dead, many with stems from 10 to 14 feet in circumference and varying from 80 to 100 feet in height. The mode resorted to by the settlers for killing the trees is by cutting, during the early part of winter, a notch five or six inches deep round the lower part of their stems. The white pines presented a very singular appearance, caused by a peculiar seeming twisting of the decayed trunks in

a uniform direction from left to right throughout their whole length. During the drying of the stems numerous fissures or rents are formed in a spiral manner from one-eighth to half an inch in width, about 4 inches deep, and generally from 4 to 10 inches distant at the bottom, presenting a ragged edge and narrowing upwards, causing the bark to fall off in large flakes. When dead, they are hewn down, piled in heaps, and set fire to. The quantity of splendid timber annually consumed in this way was described as being very great; but owing to the distance from water communication it is rendered comparatively worthless. Many of the road-sides, through the wooded districts for miles together, were richly adorned with *Lobelia cardinalis* and *siphilitica*, and *Monarda didyma*. *Sambucus canadensis* also presented a striking feature, being very abundant and densely covered with fruit. The only tree not previously seen was the Tamarack or black American larch (*Larix pendula*). In an extensive forest on the banks of the Thames river near New London this tree was generally of straggling growth, and never exceeded three feet in circumference.

Dr. Balfour read an account of a botanical trip to Ben Voirlich at the head of Loch Lomond, and Ben Nevis in August last. He gave description of the general features of the district, and noticed the occurrence of moraines and large angular boulders near the upper part of Loch Lomond, and smooth rounded rocks, with distinct groovings, near the waterfall of Glen Nevis; both being probably indicative of the former existence of glaciers. He also gave an account of the flora, and noticed the occurrence of *Carex irrigua* near Loch Sloy; of *Isoetes lacustris*, *Carex saxatilis*, and *Poa Balfourii*, in large quantities on Ben Voirlich; and of *Lysimachia vulgaris*, *Carex vesicaria*, *Rubus nitidus*, *suberectus*, *sylvaticus*, *Radula* δ . *foliosus*, and *humifusus*, near Inverarnan. After noticing the varieties of *Quercus pedunculata* and *sessiliflora* which occur in Glen Falloch, he proceeded to give a detailed account of the botany of Ben Nevis. Besides the usual alpine plants, he gathered *Saxifraga rivularis*, *Stellaria cerasoides*, *Poa alpina vivipara*, *P. laxa*, and *montana*, *Cornus suecica*, *Cistopteris dentata*, *Carex saxatilis*, and various forms of *Hieracium*.

Specimens of the plants were exhibited to the meeting.

At this meeting the election of office-bearers for the ensuing year took place, when Professor Balfour was chosen President; and Drs. Greville, Seller, A. Inglis, and Douglas Maclagan, Vice-Presidents.

Jan. 8, 1846.—Professor Balfour, President, in the Chair.

The Treasurer read a letter from Mrs. Graham, presenting to the Society some valuable botanical manuscripts by the late Professor Graham.

The following communications were read:—

1. "Notice regarding some species of Plants recently observed as natives of Britain," by Mr. Evans. Among the species referred to in this notice were *Alsine stricta*, *Carduus arvensis*, β . *setosus*, *Glyceria plicata*, *Barkhausia setosa*, &c.; specimens of these, and of *Silene italica*, from two Scotch stations, were exhibited to the meeting.

2. Dr. R. C. Alexander on the Flora of Sicily. Dr. Alexander re-

gards the Sicilian flora as not an aboriginal one, but as derived from Africa on the one side, and from Greece and other Mediterranean countries on the other. The plants peculiar to the island are by no means numerous, and the flora is meagre when compared with that of Dalmatia and other countries on the shores of the Adriatic. In the course of two months' residence in the island, Dr. Alexander found only about 250 species which he had not seen in Dalmatia.

3. Dr. Alexander on the Plants found on the Apennines. He considers the flora of the Apennines from Piedmont downwards to be also a derived one; for excepting the genera which occupy fallow land and broken ground, such as *Medicago*, *Ononis*, *Convolvulus*, and sea-shore plants, he found no genus developed, but a species of one type and a species of another, without connecting links. On ascending the mountains, when he got to a region where a magnificent flora ought to be, he found at most a hardy hill plant that had crept up, but nothing whatever of an alpine nature.

On the Matese, about forty miles north from Naples, vegetation nearly ceased at about 6000 feet; and at the top, which is 7000 feet above the level of the sea, and where there is a snow-field that never entirely melts and therefore cold enough for alpine plants, he met with *Aubrietia Columnæ* (a mere variety of *A. deltoides*), *Ranunculus montanus*, a *Geranium* resembling a Carniolian species, *Arabis alpina*, an *Allium* not in flower, *Scrophularia glandulosa*, and three forms of *Saxifraga aizoon* which are reckoned by some as species. In nearly the same latitude, on the other side of the Adriatic, on the Biokovo, near Macarska in Dalmatia, there is, at the same height, a most interesting alpine flora, and in Ætolia, on Mt. Velugo, one equally so. Dr. Alexander found the Apennines by no means so productive as the Alps of Upper Styria and Upper Carinthia; and he looks upon the range as probably so recent in its formation, as to be only receiving its alpine flora gradually from other districts.

4. Dr. Balfour read a communication which he had received from Mr. Campbell of Islay, relative to Mummy Wheat, specimens of which were exhibited. The wheat sent by Mr. Campbell resembled what is called Bellevue Talavera. Other specimens of the so-called mummy wheat were shown, having all the characteristics of Egyptian wheat (*Triticum compositum*). There appeared to be great doubts as to the fact of the wheat found in mummy-cases having germinated. In all the instances mentioned, there are numerous sources of fallacy which have not been guarded against. The most authentic and best-corroborated instance of the germination of mummy-wheat seems to be that noticed by Mr. Tupper, who got from Mr. Pettigrew grains which had been taken by Sir Gardiner Wilkinson from some alabaster sepulchral vases. Even in this case, however, it is difficult to prove that the grains had not been recently inserted into the vases. The wheat which was then produced was the same variety as that now sent by Mr. Campbell.

5. A communication was read from Mr. Cruickshank, regarding the discovery of *Typha angustifolia* in Lochmaben Loch, and of *Cen-tunculus minimus* near Dumfries.

Specimens were exhibited by Dr. Balfour of *Mentha rotundifolia*, var. *velutina*, in flower, and of *Pyrus pinnatifida* in fruit, from the island of Arran.

Mr. James M'Nab exhibited specimens of *Ardisia crenulata*, from the Horticultural Society's Garden, in which the seeds had germinated within the berries while hanging on the plant.

ZOOLOGICAL SOCIETY.

July 22, 1845.—Harpur Gamble, Esq., M.D., in the Chair.

Mr. Gould exhibited to the Meeting three new species of Birds from Australia:—

STRIX TENEBRICOSUS. *Str. disco faciali fuliginoso-griseo, circum oculos multo saturatiore; corpore superiore fusco-nigro purpureo splendente, singulis autem plumis macula alba ad apicem ornatis; alis caudaque ejusdem coloris sed pallidioribus; corpore inferiore fusco-nigro, stramineo lavato.*

Facial disk sooty grey, becoming much deeper round the eyes; upper surface brownish black, with purplish reflections and with a spot of white near the tip of each feather; wings and tail of the same hue, but paler; the feathers of a uniform tint, without bars; tail-feathers faintly freckled with narrow bars of white; under surface brownish black, washed with buff, and with the white marks much less decided; legs mottled brown and white; irides dark brown; bill horn-colour; feet yellowish.

Total length, 16 inches; bill, $1\frac{3}{4}$; wing, 12; tail, $5\frac{1}{2}$; tarsi, 3.

Hab. The brushes of the river Clarence, in New South Wales.

COLLURICINCLA RUFOGASTER. *Col. omni corpore superiore, alis, caudaque olivaceo-brunneis; gula pallide stramineo-alba fusco-striata; corpore inferiore ferrugineo-rufo.*

All the upper surface, wings and tail olive-brown, with the exception of the inner webs of the primaries, which are dark brown; throat pale buffy white, streaked with brown; all the under surface rusty red; irides black; bill and feet fleshy-brown.

Total length, $7\frac{1}{2}$ inches; bill, $1\frac{1}{8}$; wing, $3\frac{3}{4}$; tail, $3\frac{1}{2}$; tarsi, $1\frac{1}{8}$.

Hab. The brushes of the Clarence River, in New South Wales.

DONACOLA FLAVIPRYMNA. *Don. capite cervino; dorso alisque castaneo-brunneis; corpore inferiore stramineo; tectricibus caudae superioribus cerinis; tectricibus caudae inferioribus nigris.*

Head pale fawn colour; back and wings light chestnut-brown; under surface buff; upper tail-coverts wax-yellow; under tail-coverts black; tail brown.

Total length, $4\frac{1}{2}$ inches; bill, $\frac{1}{2}$; wing, $2\frac{1}{4}$; tail, $1\frac{3}{4}$; tarsi, $\frac{3}{4}$.

Hab. The north coast of Australia.

Prof. Owen communicated his observations on the living *Echidna* exhibited at the Menagerie of the Society in May 1845. The animal when received at the Gardens was active and apparently in sound health. It was placed in a large but shallow box, with a deep layer

of sand on one half of the bottom; the top covered with close cross-bars. The animal manifested more vivacity than might have been expected from a quadruped which, in the proportions of its limbs to the body, as well as in its internal organization, makes the nearest approach, after the *Ornithorhynchus*, to the *Reptilia*. In the act of walking, which was a kind of waddling gait, the body was alternately bent from one side to the other, the belly was lifted entirely off the ground, and the legs, though not so perpendicular as in higher mammals, were less bent outwards than in *Lizards*. The broad and short fore-paws were turned rather inwards; the hind-feet had their claws bent outwards and backwards, resting on the inner border of the sole. The animal was a male, and the tarsal spur, smaller and sharper than in the *Ornithorhynchus*, projected backwards and outwards, almost hidden by the surrounding coarse and close hair. The small eyes gleamed clear and dark; the ball was sensibly retracted when the animal winked, which it did frequently. It commenced an active exploration of its prison soon after it was engaged; the first instinctive action was to seek its ordinary shelter in the earth, and it turned up the sand rapidly by throwing it aside with strong strokes of its powerful fossorial paws, and repeating the act in many places, until it had assured itself that the same hard impenetrable bottom everywhere opposed its progress downwards. The animal then began to explore every fissure and cranny, poking its long and slender nose into each crevice and hole, and through the interspaces of the cross-bars above. To reach these it had to raise itself almost upright, and often overbalanced itself, falling on its back, and recovering its legs by performing a summerset. I watched these attempts of the animal to escape for more than an hour, and it was not until it had got experience of the strength of its prison, that the *Echidna* began to notice the food which had been placed there.

This consisted of a saucer of bread and milk and some meal-worms. The milk was sucked or rather licked in by rapid protrusion and retraction of the long red cylindrical tongue. The tongue came more than once in contact with the larvæ, which were sometimes rolled over by it, but no attempt was made to swallow them.

The moist dark end of the nose felt cold to the touch. The temperature of the animal at the cloaca was 85° Fahr., or nearly ten degrees lower than that of the anus of a rabbit.

The *Echidna* offered little resistance when seized by the hind-leg and lifted off the ground, and made not the slightest demonstration of defending himself by striking with his hind spurs: the only action when irritated was to roll itself into a ball, like a hedgehog—the bristles being then erect. This was the position chosen for sleep; but our *Echidna* showed little of that sluggishness which the French naturalists ascribe to their live specimen on ship-board (*Voyage de la Favorite*, p. 159).

The blood-discs manifested the true mammalian type in their number, size and form: they were flat, circular, averaging $\frac{1}{3200}$ th of an inch diameter; a few large ones were rather less than $\frac{1}{3000}$ th; the smallest was $\frac{1}{8100}$ th.

The circular form of the blood-discs of the Echidna was noticed by Dr. John Davy in some blood of that animal which had been transmitted to him in brine from Van Diemen's Land. More satisfactory observations had been made by Dr. Hobson and Mr. E. Bedford, on the recent blood of both the Ornithorhynchus and Echidna. I have cited these observations in my article 'Monotremata' (Cyclop. of Nat. Hist.); they show that the blood-discs of the Ornithorhynchus are likewise discoid, circular, and about $\frac{1}{3000}$ th of an inch in diameter; and the observations now made on both ovoviviparous genera demonstrate that the Monotremata resemble the other Mammalia in the form, proportional number, and florid colour of the blood-discs, which correspond in size with those of the Armadillo and the Quadrumana, but are larger in proportion to the size and weight of the body than in the larger apes and the human species.

The Echidna having died unexpectedly a short time after its arrival, has afforded a favourable opportunity of investigating certain obscure parts of its anatomy, the results of which Prof. Owen would communicate at some future opportunity.

Prof. Owen next exhibited the skull of a Wombat (*Phascolomys Vombatus*, Auct.) from Van Diemen's Land, and the skull of a Wombat, transmitted by Governor Grey, from Continental (South) Australia, and pointed out the following differences in proof of their specific distinction. They are of equal size, but the skull of the specimen from South Australia is broader in proportion to its length. In the continental species, which he proposed to call *Phascolomys latifrons*, the upper incisors present a transverse semi-oval section, the convex enamelled surface being directed forwards and outwards. This surface is feebly striated longitudinally. The lower incisors are narrower than in *Phasc. Vombatus*, and triedral, the enamelled anterior or under surface is flat, the outer surface longitudinally impressed and almost devoid of enamel. The first lower molar (premolar) is relatively larger, the last relatively smaller, in *Phasc. latifrons*: the symphysis of the jaw is narrower and deeper. The intermaxillary part of the skull is higher in proportion to its width, less convex externally; the nasal bones are relatively broader, forming the whole upper surface of the anterior third of the skull. The inter-orbital part of the skull is relatively much broader, and is produced on each side into a well-marked supra-orbital ridge and post-orbital process, both of which are almost obsolete in *Phasc. Vombatus*. The temporal fossæ are not bounded, as in *Phasc. Vombatus*, by two nearly parallel and remote longitudinal ridges, but are continued by a convex, rather irregular tract, to near the middle of the upper region of the cranium. A very remarkable feature in the skull of the *Phasc. latifrons* is the supra-tympanic cell excavated beneath the base of the zygoma: this cell, in *Phasc. Vombatus*, is transversely oblong, simple, one inch by half an inch in size; in *Phasc. latifrons* it extends inwards one inch and a quarter, and expands to an antero-posterior diameter of one inch and a half, and a vertical diameter of one inch, having an oblong outlet one inch

in length and half an inch in depth, slightly contracted in the middle. This difference in the size of the supra-tympanic cell is obviously not the effect of age, as the skull of the *Phasc. Vombatus* compared is that of an old animal with strong temporal ridges. In *Phasc. latifrons* the articular surface for the condyle of the lower jaw is broader and less convex; the anterior boundary of the zygomatic space is less angular; the palatal surface of the intermaxillaries is deeper; the curve of the lower border of the lower jaw is much deeper; the inner angle of the condyle is less produced; the coronoid process is higher and narrower, and the post-symphysial depression is almost obsolete.

The Secretary saw with much pleasure the decisive proofs which Professor Owen had shown of the existence of two species of Wombat; he had many years before been himself convinced of the fact, having observed that they differed in size and colour, and that one had a sharp prick ear, while the ear of the other was low and elliptical.

August 12.—William Yarrell, Esq., Vice-President, in the Chair.

“Descriptions of new species of *Murex*,” by Lovell Reeve, Esq. :—

MUREX BIPINNATUS. *Mur. testâ elongato-fusiformi, spirâ acuminato-turritâ; anfractibus septem, transversim eximie liratis et elevato-striatis, liris striis interstitiisque subtilissime scabroscrenulatis; anfractibus primis sex tuberculato-nodosis, ultimo trivariicoso, varicibus ultimis duobus pulcherrime fimbriato-pinnatis; nived, rosaceo tinctâ, columellâ pallidè roseâ; apertura parvâ, labri externi limbo minutè denticulato; canali latiusculo, subelongato.*

Hab. — ?

The *Murex bipinnatus* approaches the *Murex clavus* in general form, but the detail of structure and sculpture is distinct throughout. The spire exhibits a mass of prominent nodules, each whorl taking the form of a heptagon, with as many as seven on its circumference. The last two varices are ornamented with a handsome laminated frill structure.

MUREX SINENSIS. *Mur. testâ elongato-ovatâ, subfusiformi, tenui, spiræ suturis subimpressis; anfractibus transversim liratis et striatis, inter varices nodiferis; trifariam varicosâ, varicibus frondosis, frondibus regularibus, curvatis, pulcherrime floridis, incisosserratis; albicante, fusco tinctâ, lineis transversis fuscis; labro infra medium fortiter erecto-dentato.*

Hab. China.

This species appears to have been confounded for some time past with the young of the *Murex ramosus* or *elongatus*. It is uniformly of a thin structure, and the fronds are of a delicate open flowery growth.

MUREX STEERLE. *Mur. testâ abbreviato-fusiformi, crassâ, transversim granoso-lirâtâ, inter varices fortiter tuberculâtâ; trifariam varicosâ, varicibus incrassatis, frondosis, frondibus crispatoramosis, subcompressis, breviusculis, fronde parvâ interveniente;*

fusca liris nigricantibus, frondibus purpureo-roseis, columellâ et apertura fauce albis, labro externo incrassato, intus denticulato; canali breviusculo.

Hab. — ?

This shell might easily be mistaken for an accidental stunted growth of the *Murex palma-rosæ*, were it not for the constancy and marked peculiarity of its characters. The fronds are short and somewhat erect, with a row of small fronds sprouting up at their base; they are also laterally pinched as it were, and do not spread in the same flowery bifurcate manner as in the *Murex palma-rosæ*.

MUREX RUBIGINOSUS. *Mur. testâ fusiformi, interdum subabbreviatâ, transversim granoso-liratâ et striatâ, inter varices fortiter tuberculatâ; trifariam varicosâ, varicibus frondosis, frondibus foliaceis, brevibus, alternis parvis, recumbentibus; rubiginosâ, liris frondibusque nigricante-fuscis; columellâ rubiginoso-luted, apertura fauce albâ.*

Hab. Philippine Islands; Cuming.

This shell, of which I have seen several characteristic specimens, is quite distinct from any hitherto described.

MUREX CRASSIVARICOSA. *Mur. testâ subabbreviato-fusiformi, crassiusculâ, transversim granoso-liratâ et striatâ, trifariam varicosâ, varicibus incrassatis, rotundatis, frondosis, frondibus parvis, foliaceis, alternis minoribus; livido-ferrugineâ, apertura fauce albâ.*

Hab. — ?

A new species, of which I have seen several examples, distinguished amongst other characters by the stunted thickened growth of the varices.

MUREX OCLATUS. *Mur. testâ fusiformi-oblongâ, crassiusculâ, undique leviter scabrosâ, transversim lirâtâ et striatâ, inter varices bituberculatâ; trifariam varicosâ, varicibus lamellis brevibus subcomplicatis tuberculatis; albidd, rufo-fuscescente tinctâ, varicibus maculis quadratis rubentibus alternatim pictis, columellâ rubente-luted, apertura fauce albâ, labro nigerrimo-fusco, supernè præcipuè, maculato, apice rubente; canali breviusculo, compresso, recurvo.*

Hab. — ?

Although this shell has so many characters in common with the *Murex pomum*, it exhibits a constant peculiarity of colour, form and sculpture. In colour it is peculiarly tinged and spotted with red; in form it is more graceful and slender, and in sculpture it is smoother and presents two tubercles between each varix. I have seen numerous examples of this species, and can distinguish them at a glance from the *Murex pomum*.

MUREX ALABASTER. *Mur. testâ trigono-fusiformi, spiræ testæ longitudinem æquante, anfractibus transversim liratis et striatis, liris lævibus, supernè angulatis, nodulis duobus tribusve subconspicuis ad angulum armatis; trifariam varicosâ, varicibus laminato-alatis, tuberculo erecto profundè canaliculato ad angulum munitis; intus extusque eburned; canali breviusculo.*

Hab. Island of Cagayan, province of Misamis, island of Mindanao, Philippines (found on the beach); Cuming.

Mr. Sowerby referred this extraordinary shell with some doubt to the *Murex acanthropterus*; its proportions are however so utterly different that I have no hesitation in describing it as a new species.

MUREX AMBIGUUS. *Mur. testá globosá, subpyriformi, transversim lirata, liris irregularibus erectis, interruptis; octofariam varicosá, varicibus frondosis, frondibus alternis vel paucioribus elato-ramosis, spinosis, basalibus longioribus; albá, frondibus lirisque aterrimis, labri columellari parte superiori nigro tinctá; canali breviusculo.*

Hab. — ?

Three species appear to have been confounded hitherto under the common title of *Murex radix*, which, though closely approximating, may be separated without difficulty with a little careful discrimination. The true *Murex radix* is a round, particularly solid, heavy shell, with a short though sharply acuminate spire with never less than ten varices, in which the fronds are numerous, somewhat laterally compressed, comparatively short and sharp-pointed. The species described by Dr. Philippi under the title of *Murex nigritus* has but eight or nine varices, and the fronds are not branched; those on the upper angle of the whorl being tubercularly squamate, those in the middle flat and very obscure, whilst those at the base are long and horn-shaped. In the species under consideration the shell is of somewhat light structure, and the fronds are large, open and flowery.

MUREX TRIFORMIS. *Mur. testá trigono-ovata, crassiuscula, transversim lirata et corrugata, tuberculis duobus aut pluribus inter varices; trifariam varicosá, varicibus laminato-fimbriatis, supernè excavato-sinuatis; ferrugineo-fusca; apertura ovata, supernè sinuata.*

Hab. New Holland.

This shell, which Mr. Sowerby thought to be a variety of the *Murex acanthropterus*, is of a rude solid structure and dark rusty brown colour.

MUREX PELLUCIDUS. *Mur. testá trigono-fusiformi, tenui, transversim lirata, pulcherrimè squamata, inter varices tuberculata; trivariosa, varicibus obliquis, latissimè et eximè alatis; pellucido-alba; apertura parva, labro intus nodoso.*

Hab. Island of Bantayan, Philippines (found upon a coral bottom at the depth of seven fathoms); Cuming.

Mr. Sowerby has rather incautiously referred this shell to the *Murex trigonularis* of Lamarck, which Mr. Gray considers to be merely a worn specimen of the *Murex acanthropterus*, and M. Kiener one of the *Murex phyllopterus*. The shell under consideration differs essentially from both of these, and the characters which it presents are not at all in accordance with Lamarck's description of *Murex trigonularis*.

MUREX OSSEUS. *Mur. testá oblongo-ovata, subfusiformi, lævius-*

cald, inter varices fortiter tuberculatâ; trivariicosâ, varicibus fimbriato-laminatis, superne falcatis; albâ, castaneo-fusco hic illic tinctâ; aperturâ peculiariter parvâ, ovatâ.

Hab. — ?

Murex pinniger is perhaps the nearest allied species to this, though of very different form.

MUREX GAMBIENSIS. *Mur. testâ fusiformi, inferne attenuatâ, solidiusculâ, transversim obsolete striatâ, tuberculo magno prominulo inter varices; trivariicosâ, varicibus plicato-laminatis, superne falcatis, ad basim alatis; albâ, fusco hic illic punctatâ; aperturâ parvâ, canali longiusculo.*

Also allied to the *Murex pinniger*, but of a more elongated form and different style of colouring.

MUREX MARTINIANUS. *Mur. testâ trigono-clavæformi, transversim liratâ, liris nodulosis, inæqualibus; trifariam varicosâ, varicibus rarispinosis, spinis breviusculis; luteo- vel griseo-carulescente, canali fuscescente; aperturâ ovatâ, labro dente planulatâ, erecto, munito; canali longissimo, recto, superne spinoso.*

Hab. — ?

This shell was supposed to have been the *Murex rarispina* of Lamarck, but it having been satisfactorily shown by both Kiener and Deshayes that Mr. Sowerby's *Murex formosus* is that species, I propose to distinguish it by the above new title.

MUREX FUNICULATUS. *Mur. testâ clavæformi, transversim liratâ, liris ad summitatem funiculatis, costis tribus vel quatuor plicæformibus longitudinalibus inter varices; trivariicosâ, varicibus spinosis, spinis brevibus, acutis, sursum inclinatis; fuscescente-albâ, funiculis transversis castaneis; aperturâ ovatâ, columellâ labroque intus noduliferis; canali elongatâ.*

Hab. — ?

An interesting species, well-characterized by the fine dark chestnut-brown cords with which it is encircled throughout at equal distances.

MUREX NIGRISPINOSUS. *Mur. testâ elongato-clavæformi, transversim liratâ et striatâ, liris inæqualibus, subnodosis, spirâ breviusculâ; trifariam varicosâ, varicibus spinosis, spinis erecto-elongatis; canali elongato, ad extremitatem leviter recurvo, spinoso, spinis longis, subcurvatis purpurascete-albâ, fasciis tribus vel quatuor fusciscentibus subindistinctè cingulatâ, spinis purpureo-nigriscentibus.*

Hab. — ?

This shell approximates to the *Murex tribulus*, but its characters present an agreeable modification throughout, which may be considered of specific importance. The spines are constantly tipped with black.

MUREX BELLUS. *Mur. testâ clavæformi, transversim liratâ, liris tuberculato-nodosis; trivariicosâ, varicibus rotundis, tuberculato-liratis, spinâ brevi acutâ ad basim; albicantè, castaneo-fusco*

supra et infra maculatâ, liris castaneo conspicuè funiculatis, columellâ labroque rufo-aurantio tinctis; canali subelongato.

Hab: — ?

Allied to the *Murex chrysostoma* in respect to its rufous orange mouth, but of a different colour and sculpture throughout.

August 26.—William Horton Lloyd, Esq., in the Chair.

“Remarks on the genus *Achatinella*, Swainson, and descriptions of six new species from Mr. Cuming’s collection.” By Dr. L. Pfeiffer.

Upon examining the long series of forms which occur in the vast family of the *Helicææ*, I have ascertained that there are several groups which Nature herself seems to have characterized as genera, though it would be very difficult to draw out such a generic definition as would exclude all other nearly allied species. One of these natural groups is the genus *Achatinella*, proposed by Swainson in Brandt’s Journal, 1828, which appears to be peculiar to the Sandwich Islands, and has been united to the genus *Bulimus* by most recent authors, as by myself in my ‘Symbolæ.’ However, the greater the number of species we become acquainted with, the more convenient it appears to unite them together as a distinct genus. I may therefore be permitted to give a short account of the species now known.

1. ACHATINELLA LUGUBRIS (*Turbo*), Chemn. Described by Lamarck under the name of *Monodonta seminigra*, and figured by Swainson in the Zool. Illustr. under the name of *A. pica*. Of course the name of Chemnitz must be retained.
2. ACHATINELLA PERVERSA, Swains. Synon. *Helix decora*, Fér., t. 155. f. 5—7; *Bulimus decorus*, Pfr. Symb.
3. ACHATINELLA ACUTA, Swains. *Hel. spirizona*, Fér., t. 155. f. 14, 15.
4. ACHATINELLA BULIMOIDES, Swains. *Hel. lorata*, Fér., t. 155. f. 9—11; *Bul. loratus*, Pfr. Symb.
5. ACHATINELLA LIVIDA, Swains. *Hel. vulpina*, Fér., t. 155. f. 1, 2; *Bul. vulpinus*, Pfr. Symb.
6. ACHATINELLA ROSEA, Swains. A very distinct species, to which none of Férussac’s figures may be referred.
7. ACHATINELLA PULCHERRIMA, Swains. This species might perhaps be considered as a dextrous variety of *A. livida*.
8. ACHATINELLA TURRITELLA (*Hel.*), Fér., t. 155. f. 13; *Bul. turritella*, Pfr. Symb.
9. ACHATINELLA TRISTIS (*Hel.*), Fér. Mus.; *Bul. tristis*, Pfr. Symb.
10. ACHATINELLA VENTULUS (*Hel.*), Fér. Mus.; *Bul. ventulus*, Pfr. Symb.
11. ACHATINELLA RADIATA, Pfr. *Ach. testâ ovatâ, solidulâ, leviter striatâ, nitidâ, viridâ et luteo radiatâ, strigis intercurrentibus nigricantibus; spirâ conicâ, obtusiusculâ; suturâ marginatâ; an-*

fractibus $5\frac{1}{2}$ *vix convexiusculis, ultimo spirâ paulò breviorè; columellâ dente brevi calloso rubello munitâ; aperturâ oblongo-ovali; peristomate intus fusco-rubello-labiato.*

Long. 19, diam. 10 mill.

Ins. Sandwich. (Mus. Cuming.)

12. *ACHATINELLA PICTA*, Pfr. *Ach. testâ sinistrorsâ, ovato-elongatâ, striatulâ, corned, maculis et flammis nigro-fuscis eleganter pictâ; spirâ turrîtâ, gracili, acutiusculâ; suturâ simplice; anfractibus 6 convexis, ultimo $\frac{3}{7}$ longitudinis subæquante; columellâ valdè tortâ, dente planulato, acutè prominente, albo munitâ; aperturâ oblongâ; peristomate simplice, acuto.*

Long. $12\frac{1}{2}$, diam. 7 mill.

Ins. Sandwich. (Mus. Cuming.)

13. *ACHATINELLA BREVIS*, Pfr. *Ach. testâ ovatâ, brevi, solidâ, obliquè striatulâ, nitidâ, fuscâ; spirâ conicâ, acutiusculâ; anfractibus 6 convexiusculis, ultimo $\frac{1}{3}$ longitudinis vix superante, subgloboso; columellâ breviter arcuatâ, acutè dentatâ; aperturâ rotundato-lunari; peristomate simplice, albo.*

Long. 11, diam. $6\frac{1}{2}$ mill.

Ins. Sandwich. (Mus. Cuming.)

14. *ACHATINELLA PYRAMIS*, Pfr. *Ach. testâ ovato-pyramidatâ, lævissimè striatâ, diaphanâ, virenti-corned; spirâ pyramidatâ, apice acuto; suturâ lineari, angustè marginatâ; anfractibus 8 planis, ultimo $\frac{3}{8}$ longitudinis subæquante; columellâ brevissimè arcuatâ, plicâ dentiformi complanatâ, acutâ, munitâ; aperturâ ovali.*

Long. 12, diam. $5\frac{1}{2}$ mill.

Ins. Sandwich. (Mus. Cuming.)

15. *ACHATINELLA CLARA*, Pfr. *Ach. testâ oblongâ, longitudinaliter plicatulo-striatâ, pellucidâ, pallidè corned; spirâ turrîtâ, apice obtuso; suturâ lined rufâ marginatâ; anfractibus 8 planiusculis, ultimo $\frac{1}{3}$ longitudinis vix æquante; columellâ vix arcuatâ, dente parùm prominente munitâ; aperturâ ovali.*

Long. 12, diam. $4\frac{3}{4}$ mill.

Ins. Sandwich. (Mus. Cuming.)

16. *ACHATINELLA CORNEOLA*, Pfr. *Ach. testâ ovato-oblongâ, lævissimè striatulâ, pellucidâ, nitidâ, corned; spirâ turrîto-conicâ, apice obtusiusculo; suturâ subsimplice; anfractibus 8 planiusculis, ultimo $\frac{2}{5}$ longitudinis subæquante; columellâ valdè arcuatâ, dente acutè prominente, albo, complanato instructâ; aperturâ irregulariter ovali; peristomate intus callo tenui, nitido, albo sublabiato.*

Long. 15, diam. 7 mill.

Ins. Sandwich. (Mus. Cuming.)

17. *ACHATINELLA GRAVIDA* (*Hel.*), Fér., t. 155. f. 3, 4.

18. *ACHATINELLA LUTEOLA* (*Hel.*), Fér., t. 155. f. 12. These two species I have not been able to find out of the great number of varieties and species I had the opportunity of examining.

MISCELLANEOUS.

CORIXA STRIATA, CURTIS.

At the meeting of the British Association in Cambridge, Mr. R. Ball brought under the notice of the Zoological Section the fact, that the *Corixa striata* produced loud sounds while immersed in water: the following is a note since obtained by Mr. Ball from the original observer, which it is trusted will induce those who doubted the accuracy of the observation to experiment and satisfy themselves:—

“At Glasnevin, on the 27th of April 1840, found some of *C. striata*; kept them alive in a bed-room basin for six weeks; frequently heard a noise, and on watching attentively saw one of them stretch its hind-legs straight out from its body and remain quite still, resting with its middle legs on a bit of Utricularia at the bottom of the basin; it then moved the fore-legs rapidly in front of its head and gave three brisk little chirps; very often after the chirps it made a noise something like grinding a knife, only very much fainter and softer; while doing so it moved its body rapidly from side to side, still keeping the hind-legs stretched out. It very often made the chirps alone; but not the grinding noise, I think, without the chirps, either before or after (mostly before). The sound may be often heard during the day; the evening seems its favourite time, and frequently during the stillness of night, just before the day begins to break, I have often heard it keeping it up for a long time; still it is very uncertain, as it may often be watched for a long time without hearing it. Noise disturbs it very much, as it at once will stop on the slightest. Often on placing a candle near it, and remaining perfectly still, it has made the sound very merrily: the chirps could be heard distinctly in the next room by leaving the doors open, and the other noise at the far end of the room that it was in; of course, by listening attentively. The longest time that both noises lasted was while twenty was counted very fast, though it may be often repeated. *Corixa* is a very pretty insect in the water; it has the appearance as if its head, thorax, and a stripe on each side (and I believe the under-part of its body) was of the purest silvery-light, which has a very pretty effect when kept in a glass vessel, when held to the light, to see it swimming quickly. It catches very rapidly with its fore-legs those little animalculæ (which abound in water that is kept for some time), by rooting very eagerly at the bottom of the vessel amongst the mud and bits of plants. It lays its eggs on Utricularia in June; they are small and white, fixed singly at a little distance from each other on the leaves, and are hatched in about eighteen days, and swim very nimbly. Two of the *Corixa* had a curious red parasite on the upper part of the body under the wings, and one had a *Gordius* or *Filaria*. From May to the middle of June is the best time for hearing them. We got some *Corixa* the last week in September 1845, two of them lived until the 26th of November; during the first three weeks of their confinement they sometimes made a very faint noise, but not near so frequent or so audible as they make it in early summer.

“Can the striated upper-lip have anything to do with the noise? for certainly, when *Corixa* chirped, it seemed to move rapidly its fore-feet across its forehead; but in the other noise it moved its body from side to side. The head seems to be nearly hollow, and the thorax is so different from other insects, a pin can be easily introduced under it. There are queer little plaits on the under-surface of *Corixa*.

“The grinding sound may be imitated by blowing the breath against the closed teeth, gently shaking the head while doing so.

“When one of the *Corixæ* died, the contents of its body were speedily sucked out by one of its companions.—In August 1844 had some alive, but could not hear any noise from them.”

ON THE HABITS OF DISPOTEA—CUP AND SAUCER LIMPETS.

I have recently received from my nephew, Lieut. William Smith of H.M.S. Carysfort, a collection of specimens of *Dispotea*, which show the great changes that shell undergoes according to the form and the position of the body to which it happens to be attached.

No. 1. The most remarkable specimen is more than an inch and a quarter in diameter, which was attached to the inner surface of one of the valves of a *Venus* shell; it is of a white colour with oblique purple-brown rays; the three rays nearest the internal cup are the broadest; the apex is nearly central, slightly twisted from right to left, and not more than five lines high. The darkest rays are towards the umbo of the shell; its surface is covered with distant short tubular spines.

No. 2. is a flat specimen, very like the former, but rather darker and with similar brown rays: the shell is covered with minute, rather crowded spines, but it has had its margin broken, and the part which has been reproduced round the edge to repair the injury is thinner, less convex, and without any spines.

No. 3. is a specimen which was attached to a *Cardium*; it is dark brown, rather thick, very minutely spinulose, much higher than wide at the base, where it is compressed; on the side opposite to the internal appendage are diverging cross-ridges formed by the adaptation of the margin of the shell as it was enlarged to the ribbed surface of the *Cardium*.

No. 4. is very similar to the preceding, and is attached to the outside of one valve of a *Cardita*; it is equally thick, dark brown, and the surface closely spinulose, but the shell is not so much modified by the ribs of the *Cardita*, which only leave marks on the side near the internal appendage; but then the animal, just within the margin of the shell, has removed the ribs from the surface of the bivalve, leaving a white concave ring the shape of the *Dispotea*. It is to be remarked, that in this shell and the variety next to be described, the animal has affixed itself, so that the edge of its shell is quite close to the lower or ventral edge of the bivalve. The greater part of the side of this *Dispotea*, next to the lower side of the bivalve, is occupied by a smaller *Dispotea*, similar in thickness, colour and surface, considering its size, to the one on which it is attached, but

of a nearly regular, convex, conical form and nearly central tip. The animal of this shell has dissolved a space on the surface of the other *Dispotea* of the size of the edge of the aperture of its shell.

No. 5. is a *Cardita* with a *Dispotea* on each of its valves placed as in specimen No. 4, that is, with one of the edges of the shell close on the lower edge of the bivalve; and there is a single valve of the same species of *Cardita* with another *Dispotea* in a similar situation.

It is to be observed, that under each of these shells, instead of the animal having eaten, or rather dissolved away part of the surface of the bivalve so as to form a smoother surface, each of the animals has deposited on their supporter a circumscribed layer of rather transparent hard calcareous matter of the exact size and form of the mouth of the shell, which fills up the greater part of the space between the ribs and forms an even and smooth base, and in one case it covers over some *Serpulae* and other bodies which were attached to the bivalve. I cannot find any indication of a muscular scar on this deposit. These *Dispotee* have a thick pale brown shell, darker towards the upper part of the cavity; the outer surface is covered with thick, irregular, radiating, flattish-topped ribs, crossed by irregular concentric ridges, having oblong or linear intervening nets, and the surface of one of the specimens is marked with some irregular cross-ridges caused by the inequalities of the shell. In one of the *Dispotee* the internal appendage or back of the shell is near the lower edge of the bivalve, and the other has it near the umbo.

I believe that the whole of these specimens belong to a single species (No. 1 to 4 is *D. tubifera*, Say, and No. 5 is *D. rugosa*, Lesson), but it is curious to observe, that when within the cavity of another shell, it is white, low, and the animal did not dissolve any part of the surface to which it was attached; that when on the outer surface of the shell, it is high, thick, dark brown, and in some cases it absorbs the surface to which it is attached; and at others that it deposits a layer on the surface of the shell to which it is affixed, of the size of the margin of the shell itself. I may observe that generic characters have been formed on less variations in habit and less characters.

In the same collection are two specimens of *Pecten* with two *Crepidula* on each: they have modified the form of the surface of each shell, and the animals have absorbed a very thin layer from the surface of each part of the shell to which they are attached.—J. E. GRAY.

On the Embryology of Actæon. By M. VOGT*.

The embryology of the *Actæon* has been the principal object of my researches; I have seen the coupling of this interesting little mollusk, I have been present at the laying of the eggs, which takes place during some hours after the *coitus*, and I have thus had an opportunity of following, from hour to hour, up to the present day, the changes which the egg undergoes during a month. I have thus been able to ascertain that the separation of the vitellus is complete in this species, and that the division into eight parts offers a very

* Extract of a letter addressed to M. Milne Edwards.

singular peculiarity, inasmuch as the four primitive parts of the vitellus do not each separate into two spheres, as is the case in other known animals, but that, on the contrary, the four new spheres, which are much smaller, are deposited upon the old ones.

The embryo presents, from its first appearance, a kind of thick disc, intersected by a median slit which might be taken as analogous to the primitive line of vertebrated animals, if subsequent observations did not show that it is at the spot which this slit occupies that the mouth is formed. The embryo is composed, some hours after the appearance of this slit, of two lateral wheels furnished with large vibratile cilia, of a beak-like prominence, which afterwards becomes the foot, and of a posterior rounded part in which the intestines are formed.

Of all the internal organs, the ear is first developed; in a subject now under observation the ears are very visible, whilst the eyes are not yet formed.

After the organs of hearing, the shell is formed; I have been able to trace all the phases of its development, as well as of the operculum which clothes the posterior surface of the foot. I now observe that the tail is on the point of detaching itself from the animal; all the loops which retained it have disappeared, and the membrane, which clothed it internally, envelops the viscera tightly, leaving a large space between them and the shell.

The digestive apparatus, which is formed after the shell, is composed of a semicircular mouth, situated between the wheels at the base of the foot, of an elongated œsophagus, which terminates in a large stomachal pouch, and of an intestine curved in the form of a hook, which terminates in an anus situated on the right. The liver is entirely separated from the intestine on its first appearance; it communicates afterwards with the stomachal pouch by a large aperture.

The stomachal pouch, in which I have often seen infusoria, especially *Naviculæ*, appears to be transformed into a buccal mass. I have seen, in the embryos of another species of Nudibranchiæ, and which greatly resemble the embryos of *Actæon*, that a protuberance furnished with projections in the form of spines was developed in the inside of this pouch. Probably this organ was the first vestige of the tongue.

Now, nearly thirty days after the laying of the eggs, my embryos swim freely in water by means of their large lateral wheels. It is remarkable that these agile animals, which for nearly a fortnight are nourished on infusoria, have yet no trace of circulation. *The heart does not yet exist*, and it is impossible that I should have overlooked it. This fact interests me greatly; and as I have seen the heart in embryos of other mollusks which were much more advanced in their development, there could be no possible error on this point.

I hope to be able to continue the researches of which I have given a very incomplete sketch, by bringing some living embryos, or rather larvæ of *Actæon*, to Paris. I intend to follow their development during the winter, in order to ascertain the changes which must still

occur, for the present form of these embryos and their anatomy is quite as much separated from that of the adult *Actæon* as is that of a caterpillar and a butterfly.

I will add another observation which may perhaps interest you. A *Balanus*, which I had detached with several others and preserved alive in a bottle, deposited in my presence a prodigious quantity of little ones, which came out with the stream of water which the animal emitted at the moment of each expiration. The young barnacles had only one frontal eye and three pairs of natatory feet, the two last pairs of which were divided each into two branches. They resembled entirely Crustacea of the genus *Cyclops*.—*Comptes Rendus*, Oct. 6, 1845.

HASSALL'S BRITISH 'FRESHWATER ALGÆ.'

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

GENTLEMEN,—In the accompanying letter I have carefully abstained from any allusions which might be regarded as offensive by your reviewer, and have confined myself as closely as possible to a refutation of certain passages of the review, which, if allowed to pass without notice, would prove injurious to my book, and which are for the most part inaccurate in themselves; I therefore trust that your sense of fairness will allow you to give my communication insertion in the *February Number of the 'Annals'*. I should wish the letter to be published in full; and as no opportunity was afforded to me to notice the review in the *same Number of the 'Annals' in which that review appeared*, none ought to be conceded to the reviewer in the same Number in which my letter appears*.

I remain, Gentlemen, your obedient servant,

January 3, 1846.

ARTHUR HILL HASSALL.

“Reddere cuique sua est æqui bonique hominis.”

Without wishing to charge your reviewer, in his notice of the ‘*History of the British Freshwater Algæ*,’ with undue partiality or prejudice, I believe that I shall be able to show, that, on certain points, he has indulged in animadversion to an extent, which on a careful and candid examination of the work in question is not justified.

It is urged therein against the originality of my work, that not a few of the plates which illustrate it are taken from the works of other writers on the Algæ; and further, that, although copies, no acknowledgement of the fact is made.

In answer to these statements, I beg to observe, that five only out of the 103 plates forming the volume of illustrations are reprints of plates previously published, and that each of these bears the name of its original designer, Thuret, Kützing and Varley.

The figures of many of the *Desmidiæ* are undoubtedly taken from

* We are very willing to comply with the above singular request of Mr. Hassall, and in the mean time leave our readers to form their own judgement.—Ed.

Jenner's and Ralfs's drawings, but no one plate is a copy of any one of their published plates, although many of the figures contained on several are so, and this I conceive to be sufficiently acknowledged in the following quotation:—"Several of the figures of this family, especially certain of the genera *Euastrum* and *Cosmarium*, are taken from those of Jenner and Ralfs illustrating the series of papers on the *Desmidiæ* inserted in the 'Annals.'"

The only instance in which there is any justice in the charge of non-acknowledgement is in reference to the genus *Closterium*, some figures of which genus are copied from Ehrenberg's great work. This omission is however a mere oversight, and scarcely sufficient to support the grave charge of your reviewer. It is to be regretted that those of our botanists who have paid attention to the genus did not send some specimens from which original figures might have been taken. The blame as regards the drawings of this genus might be made to rest with more propriety upon others than upon myself.

It can now be seen to what extent the following remarks of the reviewer are correct:—

"It is unfortunate that the author has not pointed out the cases in which his figures are not the result of his own observations, but copied from published plates. 'The appearance of 'Hass. del.' at the bottom of *all the plates* (the italics are my own) leads us to suppose that *they are all of them original*, but a more careful examination shows that not a few are copies."

In considering the charge of a want of originality in the 'British Freshwater Alga,' it should be recollected, that that work does not profess to be merely a summary of my own personal observations, but that it bears the title of a History, and as such it became the duty of the author to collect and insert all the information which it was possible to obtain in order that the subject might be rendered as complete as it was in his power to make it. The introduction therefore of the five plates in question on points of such extreme importance and difficulty, and on which the author could not reasonably be expected to furnish original drawings, should not be urged against the work as a fault, but should rather be allowed to speak in its favour. Their absence indeed might fairly have challenged reprobation. The charge of non-originality is one, whatever may be the faults of the work, from which I certainly expected to have been exempt, and one moreover which with the least show of justice can be maintained.

On the subject of comparative characters the following observation by your reviewer occurs:—"The size of the filaments would doubtless be a valuable and most convenient mode of distinguishing the plants if it could be described in such a manner as to be always determinable, but comparative size can at no time be depended upon, unless the object with which the comparison is made be previously known." This statement of the reviewer is perfectly fair, and by means of an accurate micrometer, which instrument I did not possess when I penned my descriptions, the relative sizes of the filaments of different species might have been satisfactorily determined.

Wanting this instrument however, I was compelled to have recourse to comparative descriptions, which *your reviewer allows to have their use provided the objects of comparison be known.* Now this admitted use I take to be very important and wholly contradictory of the paragraph following that which has just been quoted and which I here insert:—"To show the *absurdity* of such comparative characters (a use has just been assigned to them), and how *totally useless* a considerable portion of Mr. Hassall's definitions of numerous species becomes, we will take a single series of species of the genus *Zygnema*." Here follows an enumeration of the comparative size of the filaments of several species of *Zygnema*, isolated from the other portions of the description; the only legitimate conclusion from which is, that other characters are required to make up a satisfactory definition, and which characters are in my work very generally supplied. Any naturalist studying the genus *Zygnema* would in a very short period become acquainted with a certain number of species, and this knowledge would enable him to appreciate to its full extent the value and importance of the comparative characters employed by me. I would therefore submit that the definitions of species of the genus *Zygnema* given by me are neither "totally useless" nor characterized by "absurdity."

In another portion of your notice of my work, the reviewer takes an exception to the figure of *Botrydium granulatum* and to the genus *Arthronema*. My answers to these strictures are, that the former species is a doubtful Alga, and that it had better to have been altogether omitted from the work; and that the latter genus is one of the most distinct of those contained in the family to which it belongs.

It now remains to me to notice only two other points in the review; the first is the opinion of the German reviewer on my views respecting the functions performed by the central organs recently discovered in the cells of *Zygnema*, and which he considers to be made up of "phantasies and absurdities." Without pausing to dwell upon the unfairness of quoting a discourteous expression of this sort apart from any reference to a single argument or fact in support of it, I would merely observe, that it comes with an ill grace from one of a people notorious for indulgence in "phantasies and absurdities." Were recrimination desirable, I could name a German naturalist and editor who entertains opinions on the reproduction of the Algae not less absurd and phantastical than any which I have expressed.

In the last place I would wish to notice certain expressions of the reviewer in reference to the labours of Mr. Ralfs. These I will introduce before proceeding to comment on them.

1st. "A more prominent reference might have been made to the very successful labours of Mr. Ralfs upon this family, and also the *Diatomaceæ*, which have appeared in our pages."

2nd. "We do not blame him (Mr. Hassall) for copying these beautiful drawings, but he ought to have taken better copies."

3rd. "We cannot afford time or space to hunt out and record all these errors, nor indeed the very many erroneous references to

synonyms, but merely observe that Mr. Ralfs is frequently made to have used a nomenclature quite different from that which really exists in the 'Annals' and 'Transactions.'

In answer to the first statement I would observe, that Mr. Ralfs' papers, so far as they had appeared up to the date of the publication of my work, are quoted throughout, and that whenever I conceived any description or fact to be appropriate or well-expressed in those papers, I have preferred to adopt the *ipsissima verba* of Mr. Ralfs, acknowledging the source of the quotation by the inverted commas, and appending the name of the writer thereto. It would have been easy for me, had I thought proper so to do, to have abstained from these quotations altogether.

So much for the first statement. Now for the comparison made between my drawings of *Desmidia* and those of Mr. Jenner and Mr. Ralfs. It should be recollected that circumstances compelled me to be my own artist, and that I had not the advantage of a professional engraver; notwithstanding this very great drawback, I will venture to assert that my plates of *Desmidia*, taken as a whole, will be found wanting in no essential particular, and that from the circumstance of the drawings being coloured, they are both more instructive and more pleasing to the sight. The best sketches contained in Mr. Ralfs' plates were drawn by Mr. Jenner, who, in his researches into the *Desmidia*, has been not less successful than Mr. Ralfs. Your reviewer might with propriety have referred to the name of Mr. Jenner in connexion with the *Desmidia*.

To the charge contained in the last statement, viz. that I have frequently attributed to him a nomenclature not belonging to him, I must, except in a single instance, plead entire ignorance. In one example I have indeed, and designedly, altered a termination of a specific name, and this at the request of Mr. Moore, the original discoverer of the species in Britain. Thus *Meloseira arenaria*, Ralfs, I changed to *M. arenosa*, Moore: the former appellation, independently of its not being the name conferred upon it by Mr. Moore, is erroneous, while the latter is not merely that originally assigned, but likewise expresses a character of the species, viz. the gritty sensation which it imparts when rubbed between the fingers. I cannot help suspecting that this charge rests upon a very feeble foundation.

Your reviewer disclaims the intention of hunting out and recording errors. I would remark, that without intending it then, he has exhibited considerable ability in the search which unknowingly he has certainly pursued.

I trust, gentlemen, that I have now proved to your satisfaction, and to that of the readers of this letter, the proposition with which I commenced, viz. that I believed that I should be able to show, that, on certain points, the reviewer has indulged in animadversion to an extent, which on a candid and careful examination of the work in question is not justified.

The following remarks, addressed by Linnæus to Haller, will not inappropriately conclude this letter:—

“If you detect any mistakes of mine, I rely on your superior

knowledge to excuse them; for who has ever avoided error in the wide extended field of nature? Who is furnished with a sufficient stock of observations? I shall be thankful for your friendly corrections. I have done what I could myself."—A. H. HASSALL.

METEOROLOGICAL OBSERVATIONS FOR DEC. 1845.

Chiswick.—December 1. Rain: cloudy: clear. 2. Clear and fine: heavy rain. 3. Overcast: showery: clear. 4. Clear: fine: heavy rain. 5—7. Clear: frosty. 8. Sharp frost: overcast: drizzly. 9. Fine. 10. Clear. 11. Cloudy: clear and windy at night. 12. Overcast: fine: clear. 13. Frosty and foggy: cloudy. 14. Foggy: hazy: drizzly. 15. Rain: fine. 16. Fine. 17. Overcast: slight drizzle. 18. Foggy: rain. 19. Densely and uniformly overcast: rain. 20. Clear: dark clouds, with rainbow. 21. Boisterous and densely clouded: clear and frosty at night. 22. Densely overcast: sleet: showery: very boisterous at night. 23. Cloudy and boisterous at night. 24. Cloudless, with bright sun. 25. Hazy: thick fog at night. 26. Cloudy. 27. Clear: fine: overcast. 28. Boisterous, with rain: clear. 29. Frosty: overcast. 30. Overcast: clear. 31. Very fine: heavy rain and boisterous at night.—Mean temperature of the month $0^{\circ}\cdot4$ above the average.

Boston.—Dec. 1. Cloudy: rain early A.M. 2. Fine: rain P.M. 3. Fine. 4. Fine: rain P.M. 5—7. Fine. 8. Fine: rain P.M. 9. Cloudy: stormy P.M. 10. Fine. 11. Stormy: stormy night. 12. Cloudy: rain early A.M. 13, 14. Fine. 15. Stormy. 16. Cloudy. 17. Cloudy: rain P.M. 18. Rain: rain early A.M.: rain all day. 19. Cloudy. 20. Cloudy: rain early A.M. 21. Windy: rain early A.M. 22. Windy and showery. 23. Stormy. 24. Fine. 25. Rain: rain early A.M. 26. Cloudy: rain P.M. 27. Fine. 28. Rain: rain early A.M. 29. Fine: rain P.M. 30. Windy: stormy P.M. 31. Fine.

Sandwick Manse, Orkney.—Dec. 1. Showers: sleet-showers. 2. Showers: sleet: clear: aurora borealis very brilliant. 3. Fine: clear: aurora borealis very brilliant. 4. Showers: hail: cloudy. 5, 6. Rain: cloudy. 7. Clear frost: clear. 8. Bright: cloudy. 9. Showers. 10. Cloudy: rain. 11. Showers. 12. Cloudy. 13. Cloudy: showers. 14. Rain. 15. Sleet-showers: rain. 16. Sleet-showers: showers. 17. Frost: cloudy: clear frost. 18. Frost: cloudy: snow-showers. 19. Showers: clear frost. 20. Frost: cloudy: sleet-showers. 21. Frost: bright: cloudy: thaw. 22. Showers. 23. Showers: clear. 24. Cloudy: showers. 25. Showers: cloudy. 26. Showers. 27. Snow-showers: sleet-showers. 28. Snow: frost. 29. Rain. 30. Showers: clear frost. 31. Cloudy: rain.

Applegarth Manse, Dumfries-shire.—Dec. 1, 2. Showers. 3. Showers of snow. 4. Frost: rain P.M. 5. Very heavy rain. 6. Showers. 7. Fair and fine: slight frost. 8. Frost: rain P.M. 9. Fine A.M.: rain P.M. 10. Fair, but damp. 11. Fair and clear: frost. 12. Frost. 13. Frost, hard. 14. Very wet P.M.: frost A.M. 15, 16. Heavy showers. 17. Fine A.M.: shower P.M. 18. Fine A.M.: frost P.M. 19. Frost A.M.: rain P.M. 20. Frost A.M. 21. Frost: clear. 22. Heavy showers. 23. Slight frost. 24. Frost A.M.: shower P.M. 25. Fine. 26. Heavy rain all day. 27. Heavy showers. 28. Fair and fine. 29. Heavy rain: frost. 30. Heavy rain. 31. Frost A.M.: rain P.M.

Mean temperature of the month *	39°·5
Mean temperature of Dec. 1844	33·8
Mean temperature of Dec. for 23 years	38·3
Mean rain in Dec. for 18 years	3 inches.

* It would be worth while for the meteorological correspondents to note the particulars here stated in their reports.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

No. 111. MARCH 1846.

XXI.—*On the Osteology and Dentition of some North American Mastodons.* By JOHN C. WARREN, M.D.

To the Editors of the Annals of Natural History.

GENTLEMEN,

I BEG to communicate to you the following letter which I have received from Dr. Warren of Boston, an excellent anatomist and eminent physician. It contains so many important observations on the osteology and dentition of some of the most complete examples of the North American Mastodon, as leads me to believe you may give it a place in your next number of the 'Annals.'

I am, Gentlemen, your very obedient servant,

London, Feb. 16th, 1846.

RICHARD OWEN.

MY DEAR SIR,

Boston, Jan. 31, 1846.

The interest you have taken in the anatomy of the *Mastodon giganteus*, and the clearness with which you have elucidated many points of their anatomy, lead me to address you at this time.

In the autumn of 1845 the skeleton of a Mastodon, accompanied with two perfect heads, two additional lower jaws, and various other bones, which had been exhumed in the State of New Jersey, was brought to this place. On examination I found it to be the most perfect specimen, which, so far as I knew at that time, had been discovered; I therefore proceeded to examine it with some care, and in the early part of November last made a detailed report of its anatomy to the American Academy of Arts and Sciences, accompanying this report with several drawings. Two of these drawings were of the whole skeleton; the third was of one of the other heads. By the liberality of a number of gentlemen of Boston all these specimens have become the property of Harvard University at Cambridge, three miles from Boston.

In the month of August last we had rumours that the ske-
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leton of another *Mastodon giganteus* had been discovered in the town of Newburgh, State of New York, about six miles from the bank of the Hudson river (in the same town, but not on the same spot, from which the skeleton set up by Mr. Peale was obtained in the beginning of this century), and that it was in every respect more perfect, and perhaps larger than any one yet found. It is worthy of remark, that of five existing specimens of Mastodon, three have been exhumed in the contiguous States of New York and New Jersey; two of them from the same town. Only two or three Mastodon bones have been discovered in any part of New England. The Baltimore skeleton was excavated in the State of Ohio, and the Missourium of the British Museum from the State of Missouri.

After the specimen from Newburgh had been articulated, it was exhibited in the city of New York during the past autumn, and was subsequently brought to the vicinity of Boston by the proprietor, Mr. Brewster. Having satisfied myself of the perfection and the great value of the bones, with a view to the promotion of science and from a conviction of the great injury which would be done to the skeleton by public exhibition in various places, I made offers for its purchase, which were accepted. This invaluable specimen is now my property, and as a duty to scientific men who are interested in the subject, I shall feel myself called on to describe it particularly at a future time in connexion with the New Jersey skeleton.

As the bones were articulated in a manner different from what seemed to me exact, I have had them separated with a view to a new arrangement, founded on the strictest anatomical observation. The skeleton appears to be about twelve feet high, and some idea of the size of its parts may be formed from the fact, that the head is three feet long without the tusks, which were ten feet in length. These dimensions have, however, diminished since the bones were first exposed to the air; the pelvis, for example, which measured six feet two inches at first in its transverse diameter, now measures six feet. The comparative length of the tusks and of the diameters of the pelvic apertures are characters from which I have inferred the New Jersey specimen to have been a female, and my own very probably a male.

The whole head with its teeth is perfect, as is the whole vertebral column, consisting of seven cervical vertebræ, twenty dorsal, three lumbar, and the os sacrum. A solid sternum exists, the posterior part of it only being deficient. The ribs, twenty in number, are perfect. The bones of the pelvis are co-ossified,—a fact which would lead to the suspicion of the animal having been aged; but on the other hand, the epiphyses, although co-ossified with their bones, yet generally exhibit traces of separation. The

bones of the extremities are perfect, with the exception of some of the terminal bones of the feet, and two or three of the intermediate phalanges. Some of these missing bones were removed with the mud and have been recovered; others will probably be found in the spring, after the sun has unbound the surface of the earth.

All the bones are solid, and ring on being struck with a hard substance. Their colour is lighter than that of any of the Mastodon specimens I have had an opportunity of seeing. On the whole, the state of preservation of these bones, considering the miry position in which they had lain for centuries unknown, must be a subject of admiration. They were found together in a very small lacustrine deposit four rods wide by fifteen rods long, where no other bones ever have been or are likely to be discovered, since the deposit has been dug to a considerable depth and removed.

The manner of their discovery was this. In consequence of the uncommon dryness of the season, the proprietor of the farm had determined to remove the deposit for the purpose of manure. After taking away two feet of peat and two feet of red moss, the labourers entered a bed of shell-marl, and at the depth of a foot in this marl the head of the Mastodon was discovered. The thickness of the marl was about three feet, and under it was a bed of vegetable mud, which was penetrated by an iron rod to the depth of twenty feet. The bones, with very slight exceptions, were all lying in their natural relations to each other, the skeleton being in an upright posture, so that there could be no mistake as to the unity of the skeleton, nor as to the relative position of its parts.

I have said nothing of the tusks nor of the teeth.

The tusks are two in the upper jaw and one in the lower. Those of the upper jaw were when discovered about ten feet long (about two feet of which are now decomposed, four feet very much impaired and broken, and the remaining four feet, being the anterior extremity of the tusk, are in an almost perfect state).

The tusk in the lower jaw is single. It is this tusk, which our excellent anatomists, Godman and Hays, considered as the distinctive character of the species *Tetracaulodon*. The perfect resemblance between the bones of my Mastodon and those of the one from New Jersey, most satisfactorily prove that they were both of the same species. The latter specimen is of a younger animal, as shown by the distinctness of the epiphyses, yet it has no tusk in the lower jaw. Whence it follows, that this submaxillary tusk may exist in the early life of both sexes, and disappear in the female at the adult age, but does not belong to a distinct species. The opinion, therefore, which you have

expressed on this point is undoubtedly demonstrated to be exact. This existing submaxillary tusk is eleven inches long, and is situated on the left side of the symphysis of the lower maxillary bone: on the right side is seen the remnant of a socket, which has been filled up, with the exception of about an inch of its anterior part.

The teeth are four in the upper and four in the lower jaw; the points are somewhat worn, but in other respects these teeth are perfect. The anterior have six eminences; the posterior eight, with quite a prominent heel. The front tooth measures four inches by three; the posterior seven inches by three and three-quarters. In this respect they accord with those in the other *Mastodon giganteus*, of which we have spoken above. But in the smaller heads accompanying the latter the number and forms of the teeth were different. The descriptions, as minuted in October last, were as follows:—

“In the youngest of the heads there are three teeth on each side in the upper and lower jaw, of which one, the posterior molar, is not fully developed. In this tooth we have only the crown lying imbedded in its socket, but so loosely that the finger being passed into the cavity of the alveolus is made to penetrate the cavity of the crown. The two anterior teeth are perfect, and contain each six eminences in three rows. At the anterior part of the jaws, in front of the teeth on each side, is an alveolus filled up. The upper and lower jaw nearly correspond. This is the smallest head and evidently that of a young animal; one tusk being only eight inches long on the outside of its socket, the other being broken.

“In the second head, or that of middle size, and this is the most perfect of the three, there are, as in the preceding head, three teeth on each side of each jaw. In addition, the anterior tooth on the left side of the lower jaw, although very much worn, had not dropped out, but was readily removed by the fingers. The surface of its crown was worn quite flat, and one of the fangs wholly absorbed. The anterior tooth on the right side of the lower jaw and both from the upper had dropped out, and their alveoli were nearly filled up; thus making thirteen teeth in the whole.

“In the third or largest-sized head there are only two teeth on each side of each jaw fully developed, and no appearance of a germ, making the whole number but eight. These teeth are much larger than those of the preceding heads, and the posterior tooth has, in addition to eight eminences arranged in two longitudinal rows, a terminal eminence or heel.

“Besides these heads and their appendant lower jaws, there are in this collection two separate lower jaws, both of them be-

longing to young animals. The most perfect of the two is fourteen inches long from the symphysis to the angle, and contains three teeth on each side. The anterior is a small tooth, the crown of which is about an inch square, having two hills, each of them imperfectly divided into two points. These points are worn, and this tooth bears a resemblance to those in the head of a Hippopotamus in my collection. The second tooth is about double the size of the first; it has three hills, the two anterior divided into two points, the posterior is but slightly notched in the middle. The third tooth is double the size of the last, and has like it three hills, each divided into two points. This tooth is, however, buried in the jaw-bone, and was probably during life covered by the gum.

“The most interesting feature in the anatomy of this lower jaw is the existence of two holes at the symphysis, not found in the three other specimens, evidently the sockets of two small tusks. These sockets are an inch and a half deep, and are each of them of sufficient diameter to admit the little finger. The tusks which filled these holes do not exist, but we may suppose them to have been about three inches long, grounding this opinion on the diameter and depth of the holes. In other respects this lower jaw does not differ in its anatomical characters from the remainder above mentioned.”

I have extracted the above minutes from my account of the New Jersey Mastodon, because they serve to support and illustrate the observations you have made on this important topic. They of themselves seem to give a pretty satisfactory view of the dental series in this animal.

To the statements relating to the osseous fabric of the Mastodon I will add a few words on the subject of its supposed food. In connexion with the bones found in the State of Virginia, there was said to have been seen in the situation of the stomach and intestinal canal a quantity of bruised twigs, leaves and other vegetable substances, which probably had composed the food of this animal. Similar substances were discovered in a similar relation to the New Jersey Mastodon so often alluded to, and in our Mastodon about six bushels of such matters were seen in the situation of the stomach and intestines. As the position of the animal had not been disturbed when it was discovered, there is satisfactory reason to believe, that there could be no mistake as to the opinion that these were really articles of food. This opinion receives additional support from the fact stated by the discoverer of the skeleton, that the whole course of the lower intestines could be traced by the food. Accompanying this communication I send you a small portion of these substances, and also

of the great tusks, with some of the marl in which they were imbedded.

You will consider this as a mere sketch, intended to give a general idea of the condition of the two most perfect specimens of *Mastodon giganteus*. At a future period I shall endeavour to give a more detailed account of them, accompanied by the best representations I am able to procure. As my object is the promotion of science, and as the one in my possession is unquestionably the most perfect, if not the largest known specimen of *Mastodon giganteus*, I shall be quite ready to answer any inquiries which you or other scientific gentlemen may propose. I shall also be glad to exhibit the skeleton to any such gentlemen who happening to be in this country may have a desire to examine it. The other skeleton will also, I apprehend, be placed in a situation where it can be examined by those interested in comparative anatomy and palæontology.

I remain, my dear Sir, with great respect, your friend, &c.,

JOHN C. WARREN.

Professor Owen, Royal College of Surgeons, London.

XXII.—*Notice of a Bottle-nosed Whale, Hyperoodon Butzkopf, Lacep., obtained in Belfast Bay in October 1845.* By WILLIAM THOMPSON, President Nat. Hist. and Philosophical Society of Belfast.

[With a Plate.]

IN a paper published in the 'Annals' for February 1840 (vol. iv. p. 375) I noticed seven Hyperoodons—the first of which had previously been most fully described by Dr. Jacob of Dublin—as having been obtained on a limited portion of the coast of Ireland, comprised in less than the northern half of the eastern line of coast, or merely from the bay of Belfast to that of Dublin inclusive. An eighth—about 24 feet in length—examined by Dr. G. J. Allman, was obtained at the island of Ireland's Eye, on the Dublin coast, on the 30th of October 1842. I have now to record the occurrence of a ninth individual procured within the same range of coast. Its capture was thus noticed in one of the Belfast newspapers—the Banner of Ulster—on Friday Oct. 31, 1845 :—

“*A Whale in Belfast Lough.*—On the morning of Wednesday last [29th Oct. 1845] the services of the Coast Guard stationed at Cultra Point were called into active requisition by the appearance of—not a smuggler—but something ‘very like a whale,’ ploughing the waters a few hundred yards from the pier. * * *

Fig. 1.



Fig. 2.



Hyperoodon Bützkopf, Lacép.



Without loss of time a boat was manned by four or five of the Coast Guard armed with harpoon, cutlass, carbine and hatchet, resolved to make the stranger pay dearly for his visit. * * * After a good deal of manœuvring the men succeeded in bringing their boat alongside the enemy, and then commenced their assault upon him without mercy * * * and after a little show of opposition he attempted to make off, but his endeavours were fruitless. After receiving two or three shots, and a good many strokes with the harpoon, a grappling-iron was thrown over him and the boat was rowed shorewards amid the huzzas of the spectators, with the poor whale vanquished and weltering in his blood, which dyed the waters, and soon the retreating tide left him high and dry upon the beach. * * * It exhibited great tenacity of life, having survived six hours after being brought to land, though cut and hacked in an extreme degree. * * * On Wednesday and yesterday crowds of persons flocked from this town and other places to see it where it lies on the shore at Cultra.”

I was absent from home at the time, but my friend Mr. James Bryce, F.G.S., ever active and energetic, hastened to the beach where the animal was lying, took the measurements of it in detail, and subsequently repeated them under more favourable circumstances in the yard in the town of Belfast, to which the animal was brought for exhibition, and where it attracted a large number of visitors for several days. Mr. Bryce had at this time careful drawings made of the *Hyperoodon* by his relative Mr. R. Young, which, together with his own notes, have been kindly placed in my hands. I happened to return home just in time to see the animal before it was cut up on the 8th of November. It is a male. Mr. Bryce's description is as follows:—

	ft.	in.
“ Length, measured in a straight line from snout to tail.....	20	4
———, measured along the dorsal curve	23	4
Height, greatest	4	6
Girth, greatest.....	11	6
Breadth of forehead	3	0
Length of rostrum or snout	0	11
——— of mouth to rictus	1	7
Depth of each jaw at point	0	4
Eye from point of snout	3	1
Blow-hole from point of snout (following dorsal profile)	3	9
———, in length (slightly crescentic points directed towards } the head: it and the eyes in the same vertical plane)..... }	0	6
Pectoral fins from base of snout	5	0
——— fins, space between them	1	7
——— fins in length, from base at upper side to point	2	2
——— fins in breadth	0	7
Dorsal fin distant from caudal fin, estimated from a straight line } drawn from snout to tail	8	0
Dorsal fin, length at base	1	7
——— fin in height (points backward)	1	0

	ft.	in.
Caudal fin, greatest length	1	11
——— fin, greatest breadth	5	6
——— fin, greatest thickness	0	3
Aperture anterior to vent in length	1	0
——— of vent in length	0	6

“The marking at each side from behind the lip, extending under the chin in the direction of the belly, is fourteen inches in length; in breadth it is two inches anteriorly and nine inches posteriorly*. *Colour* when quite recent of a blackish lead hue, and the skin, which was exquisitely thin, beautifully polished like patent-leather, and more especially so on the tail and caudal fin: it was merely of a lighter shade beneath and not white. No teeth visible.”

Although no teeth could be seen when the animal was entire, the removal of the fleshy portion of the lower jaw exposed four of them towards its extremity. They are loose in their sockets, and so deeply sunk in the groove as not to be apparent above the bone when the jaw is viewed in profile. Though loose, the two front teeth may be stated as $7\frac{1}{2}$ lines from the extremity of the jaw, and the hinder pair as 9 lines distant from them. The accompanying sketch (Pl. IV. fig. 1) which I made of them, represents the teeth and jaw of natural size. So much has already been written on the teeth of this species, that I shall content myself with merely calling attention to the very small size of the anterior pair in the present individual—a male upwards of twenty-three feet in length—compared with those represented in Owen’s ‘*Odontography*,’ pl. 88. fig. 1, although the *Hyperoodon* to which the latter belonged is said to have been immature, p. 347. The stomach of the Irish specimen was quite empty. It was believed that this animal, which was in the highest condition, would have been about five tons in weight; it produced above ninety gallons of oil: the entire skeleton has been preserved for the Belfast Museum.

Baussard’s figure of the *Hyperoodon* (as repeated in F. Cuvier’s ‘*Hist. Nat. Cetacés*,’ pl. 17. fig. 1) would with some corrections represent this specimen; but it has seemed to me desirable to have an outline of it engraved from the drawing already alluded to, *zoologically* corrected by myself (Pl. IV. fig. 2). The difference between Baussard’s and the Irish specimen will be seen to consist in the latter being less elongate; in its dorsal fin being smaller, and placed considerably farther back; in its eye being round instead of oval like the human eye, and in its being defi-

* These are evidently the same as the “two diverging furrows” described as “under the throat” in the *Physeter bidens* of Sowerby; they were said in the Irish specimen under consideration to have resembled the healed-up deep wounds in the stem of a large tree.

cient in the ornament of eyebrows; also, in the spiracle being placed in the same vertical plane with the eye.

In my paper before alluded to (p. 379), a simultaneous movement or migration of Hyperoodons to the Irish Sea is recorded to have taken place in the autumn of 1839, not more than two however appearing in company. In connection with this fact, I have on the present occasion only to notice the autumnal appearance of the species in another year, and the occurrence of three individuals on the same day, though in localities widely separated, the one being taken in Belfast Bay and the others in the Firth of Forth. Just as I reached Edinburgh on the 31st of October, and was conversing with Dr. P. Neill—who had likewise borne his part in describing British whales—the body of an *Hyperoodon* to our astonishment appeared in view, and as we learned, was about to be taken to the Zoological Garden, and exposed to the atmosphere during winter. The blubber and soft parts had previously been removed, the latter having been anatomically examined by Mr. John Goodsir, and “preparations” of them made for the University Museum, where the skeleton itself will eventually be placed. This is said to be the first known occurrence of the species on the eastern coast of Scotland. From the gentleman just named, and Mr. Melville, his most able assistant in the Museum of Comparative Anatomy, &c. in Edinburgh University, I have learned that this whale, killed in the Firth of Forth on the 29th of October, “measured $28\frac{1}{2}$ feet in a line from the tip of the snout to the middle of the caudal fin, not following the curvature, but as if a plumb-line were dropped from one point to the other. It was a female, and was accompanied by a young female (nine feet long, measured in the same way) which was still sucking: the mammae of the mother were distended with milk which appeared very rich in butter, and tasted pleasantly.” Mr. Melville adds, that he “forgot to ascertain the point at which the triangular process of skin under the throat commenced posteriorly, but anteriorly it reached to the middle of the lower jaw: the large teeth were not visible, being hid under the gum in both.” We have another instance of a mother and her young being taken, in those described by Baussard as stranded at Honfleur. I am not aware of the occurrence of any of these whales upon our coasts in the autumn or winter just passed, excepting the three noticed in this communication.

XXIII.—*Notes on the Natural Habitat of the Common Potato ; and on its Introduction into Europe.* By GEORGE ORD, Esq., Philadelphia. Communicated by Sir W. Jardine, Bart.

To Richard Taylor, Esq.

DEAR SIR,

I HAVE the pleasure to send you a paper on the "Natural Habitat of the Potato," from an esteemed and intelligent correspondent in Philadelphia, Mr. Ord; and while that communication will be interesting to all classes of your readers, whether they are botanists or agriculturists, or mere seekers after general information, it has been accompanied by a private letter, which I consider of even more importance, as pointing out the state of the disease in that root in a cultivated part of the New World,—the opinions and feelings that are held regarding it there, as well as of our endeavours to account for it and to arrest its progress. I do not think that I shall be committing any breach of confidence to my correspondent in prefacing his paper by some extracts from the letter in question; at all events, I trust he will only attribute my doing so to a wish to communicate as much information as possible upon a subject far more important to us than it can ever be to our brethren across the Atlantic.

Believe me, Sir, very sincerely, yours

W. J.

MY DEAR SIR,

Philadelphia, 28th Dec. 1845.

Your letter of the 21st of November was received by me on the 20th instant, together with the printed slips on the subject of the potato disease, which it appears has occasioned great alarm in various parts of Europe.

The summer of this year has certainly been most unpropitious to the cultivation of the potato, not only in your country but also in this; for our later crop has proved to be of inferior quality and the produce has been scant; and in many places the disease in question has affected the tubers in the manner described in the British publications on the subject. With us a wet and cold season is greatly injurious to this vegetable. Frequent showers when the plant is immature are beneficial, but when the tubers approach to maturity, temperate and dry weather is necessary to bring them to perfection. Had the last summer with you not been extraordinary for the quantity of rain which fell, and the low temperature of the atmosphere, you would have had no reason to complain of the scantiness of your crops or of the destruction occasioned by the rot. In Pennsylvania we have two crops of potatoes, those planted at the opening of the spring, in-

tended for summer use, and those planted about the latter end of May. Our first produce this year was most excellent; but the latter crop, as I have stated above, is of very inferior quality, occasioned it is said by superabundant wetness when the tubers had received their full growth.—In the list of your printed queries it is asked, “Do plants die out?” “Is the potato dying out?” I would answer that I know of no instance of plants dying out, nor do I believe that the potato is dying out; and should your next summer be exempted from superabundant rains and be favoured with more genial heat than the last, all your investigations, chemical, botanical and entomological, would be found to be superfluous.

You may even spare yourselves the trouble of sending to America for seed, your own being infinitely better than any which we could furnish you with. It takes many years for potatoes to become acclimated. Should you plant exotic tubers, it is probable that you would have no reason to be satisfied with the result. In Pennsylvania the most esteemed kind is known under the name of Mercer; some of these were planted at my instance by Charles Waterton, Esq., at Walton Hall, Yorkshire, a few years ago, but the produce was not considered equal to that of the English varieties. I once made the experiment of planting for three successive years, the Irish variety called Rose Potato; every care was taken to promote success, a suitable soil and exposure were selected, and the ordinary tillage was attended to with exactness. The first year the produce was inferior to the seed as respected quality, the next year an evident deterioration had taken place both as to quality and quantity, and the third year the product was of so little value that it was cast to the hogs; during all the three seasons mentioned my Mercer potato exhibited no change.

The present year here is remarkable for another accident in the vegetable kingdom. The European walnut (*Juglans regia*) presented a great display of fruit in the month of June, but a coleopterous insect had deposited its eggs in the green nuts in such quantities, that at the usual period of maturity the kernels were found to be entirely destroyed. I have in my garden two trees which bore bushels of fruit, none of which escaped the ravages of the larvæ of the insects.

I am inclined to believe that your agriculturists by their recent publications have created an unnecessary panic on the occasion of the potato rot: we make no stir here when any of our crops fail; people discourse of the event it is true, but we appoint no committee of scientific men to investigate the cause of the failure; the greater the evil, the more earnestly do we set about to palliate it.

I learn from the public prints that the diseased roots have

been ascertained to be deleterious, and it has been boldly asserted that both men and beasts have been poisoned by eating of the vegetable when it was in a morbid state. Do not, I beseech you, give countenance to such opinions as these: they may be productive of great evil. Where is that individual who has not frequently observed at his domestic board an unsound potato? What is that blackish morbid matter which is often seen in the centre of the tuber?—the evidence of the very rot in question. When we detect it in our dish we merely abstain from eating what is by no means palatable, and finish our meal without the least suspicion that there has been “poison in the pot.”

Believe me to be, my dear Sir, most sincerely yours,
 To Sir W. Jardine, Bart. G. ORD.

The discovery of America made known to the world three vegetable productions, which have acquired a character from their intrinsic qualities that is worthy of note—the common potato, the maize, and the tobacco. The first two have contributed greatly to the means of human sustenance, and consequently to the augmentation of population, especially in those countries where the ordinary bread-corn is of difficult or expensive cultivation. The last is a luxury which seems destined to know no limit but that of the human race.

The period of the introduction into Europe of the potato, the *Solanum tuberosum*, has been the subject of frequent discussion; and writers are not yet agreed on this point. From various sources we learn that this plant was cultivated in the southern parts of Europe not long after the discovery of America; hence there is reason to presume that it formed part of the vegetable collections which were transported into Spain by the adventurers under Christopher Columbus. This illustrious navigator made four voyages to America in the following years:—

First voyage	in	1492–1493.
Second	„	1493–1494, 1495, 1496.
Third	„	1498.
Fourth	„	1502, 1503, 1504.

As there has existed a difference of opinion with regard to the natural habitat of the common potato, it may be well to state that it was never found in any of the West India islands, either wild or cultivated, by the early navigators; the root named by the aborigines of Hispaniola *ages* being undoubtedly the sweet potato, the *Convolvulus batatas* of botanists.

From Peter Martyr's account of the first voyage of Columbus we extract the following passage. Speaking of the natives of

Hispaniola, he says: "Theyr meate is a certeyne roote which they call *ages*, much lyke a navew roote in *fourme* and greatnesse, but of sweete taste, much lyke a green *chesnutte*. They use *ages* more often rosted or sodden, then to make breade thereof."—*Eden's Translation of the Decades of P. Martyr*, book i. p. 3.

In the personal narrative of the first voyage of Columbus we are informed that the principal subsistence of the natives of Hispaniola or Haiti was bread made of the sweet potato, called *ajes*, *niames* or *names*. Columbus saw some of the roots of the thickness of a man's leg. On the homeward voyage of the successful navigator, he carried with him a quantity of these roots as a substitute for bread. This is strong presumptive evidence of the first introduction of the sweet potato into Europe.

Several varieties of the sweet potato were cultivated by the natives of Hispaniola and Cuba and elsewhere, all of which are mentioned in the ninth book of Martyr's third Decade. It is proper to note, however, that the first adventurers nowhere speak of finding this root in a wild state, but always cultivated in the gardens of the Indians.

That the common potato is indicated among the vegetable productions of the coast of Honduras, we would infer from the tenor of the passage: "There regyons beare also gossampyne trees here and there commonly in the wooddes. Lykewise mirobalanes of sundry kyndes, as those which the physitians caule emblicos and chebulos. Maizium also, jucca, *ages* and *battatas*, lyke unto those whiche we have sayde before to bee founde in other regions in these coastes."—*Martyr's third Decade*, book iv. p. 105.

And again, of the productions of Terra Firma: "Theyr common meate is *ages*, jucca, maxium, *battata*. * * * There are lykewise dyvers kyndes of the rootes of *ages* and *battata*. But they use these rather as fruites and dysshes of service, then to make breade thereof, as we use rapes, radysshes, musheroms, navies, perseneppes, and such lyke. In this case, they mooste especially esteeme the best kynde of *battata*, which in pleasant taste and tenderness farre exceedeth owre musheromes."—*Third Decade*, b. v. pp. 114, 115.

From the want of precision in the passages just quoted, we are led to infer that the two very distinct plants, the *Solanum tuberosum* and the *Convolvulus batatas*, are confounded in the vernacular names *ages* and *battatas*. Certain it is that the root termed *ages*, in the first Decade, is the *Convolvulus*, as the comparison of it, as respects form and size, with the newew, a species of cabbage, the *Brassica napus* of Linnæus, and its resemblance, in regard to taste, to raw chestnuts, must make manifest. No such description will apply to the common potato.

The sweet potato is clearly indicated in the enumeration of the productions of Darien: "They dygge also owte of the ground certeyne rootes growynge of themselves, whiche they caull *betates*, much lyke unto the *navie* rootes of Mylayne, or the greates puffes or musheroms of the earth. Howe soo ever they bee dressed, eyther fryed or sodde, they gyve place to noo such kynde of meate in pleasant tenderness. The skyn is sumwhat towgher then eyther of navies or mussheroms, and of earthy colour, but the inner meate thereof is verye whyte. These are nooryshed in gardens, as we sayde of jucca in the first Deccade. They are also eaten rawe, and have the taste of rawe chestnuttes, but are sumwhat sweeter."—*Second Decade*, b. ix. p. 81.

As the sweet potato is little known in Great Britain, except among botanists, it may not be superfluous to remark, that its flavour more resembles that of the chestnut than any other esculent. When Humboldt published his essay on the Geographical Distribution of Plants (*De Distributione Geographica Plantarum*, Paris, 1817, in 8vo) he was of opinion that the native country of the common potato had not been ascertained; as, after frequent inquiries, he could meet with no one who had observed it in a wild state in the localities wherein preceding botanists had indicated it. It is known, says this celebrated traveller, at Quito in the Cordelliers, only in the domestic state as in Europe. Humboldt was, doubtless, aware that the tuberculous root mentioned, under the name of *papas*, by Pierre Creca, in his 'Chronicle of Peru,' published at Seville in the year 1583, was the potato; but as it had been given as a product of cultivation, he was not disposed to admit it as indigenous to the country. The author of the article *Morella* in the 'Dictionary of the Natural Sciences,' published at Paris in 1824, thus speaks of the potato: "Europe is indebted to South America for this precious plant, which was cultivated into this hemisphere. This inestimable plant, says M. de Humboldt, this plant on which the population of the most sterile countries of Europe depend, in a great measure, for their subsistence, presents the same phænomenon as the banana, the maize and the wheat: the localities wherein it is indigenous are unknown. The diligent researches of this learned naturalist, in the country where the potato was supposed to be a native, did not enable him to ascertain that any one had found it in a wild state. But M. de Humboldt was misled on this subject. Dombey, who, before him, had travelled into Peru, had seen the potato growing without cultivation in the Cordelliers; and Joseph Pavon subsequently met with it in a wild state near Lima. The potato is also indigenous in the forests of Santa Fè de Bagota."

In the 'Dictionnaire Universel de Matière Médicale,' Paris, 1834, it is asserted that the potato had been found growing

spontaneously in Mexico; and this derives probability from the fact, that the early travellers enumerate it among the useful natural productions of Terra Firma.

However, the South American origin of this precious vegetable is established beyond a doubt. The late Dr. Baldwin of the U. S. navy, a learned botanist, in a letter to Dr. Darlington, dated on board of the U. S. ship Congress at sea, July 7, 1818, thus writes: "I do not recollect that I informed you, in any of my preceding letters, of my finding the *Solanum tuberosum* indigenous about Montevideo and Maldonado. This is the fact, although it is unknown to the inhabitants, who inform you that they cannot cultivate the common noble plant."—*Reliquiæ Baldwinianæ*, p. 273.

The evidences of Dr. Baldwin's discovery were exhibited to the botanists of Philadelphia on his return from the voyage above alluded to: these were tubers of the plant. They were examined by a committee of the American Philosophical Society, composed of Joseph Correa de Serra, Zaccheus Collins and Dr. William P. C. Barton. The tubers were planted by Mr. Collins, and their vegetation proved the species. Tubers were likewise given by Dr. Baldwin to an excellent practical botanist, Col. Robert Carr, the proprietor of the Bartram Botanic Garden near Philadelphia; and Col. Carr was equally successful in the cultivation of them. It is to be regretted that the respectable gentlemen who composed the committee of the American Philosophical Society did not give publicity to their investigations. If they had done so, they would have prevented a doubt which arose in the minds of the European botanists as to the accuracy of Dr. Baldwin's decision; a doubt resulting from the belief that the usual satisfactory evidence of *specimens* had not been supplied by him. Col. Carr has informed me, that the tubers above mentioned corresponded as to their size and aspect with those figured in the work which I shall now speak of.

In the first volume of the 'Transactions of the Horticultural Society of London,' a Society famed for its beneficial labours and splendid publications, there is a communication entitled "An attempt to ascertain the time when the Potato (*Solanum tuberosum*) was first introduced into the United Kingdom," written by Sir Joseph Banks, and read to the Society the 7th of May 1805. The conclusion of the learned author was, that "the potato now in use was brought to England (from Virginia) by the colonists sent out by Sir Walter Raleigh in the year 1586." This opinion, which appears to be prevalent, shall be the subject of comment by and by. In the fifth volume of the same 'Transactions' there is a paper under the following title: "On the native country of the Wild Potato, with an account of its culture in the Gar-

den of the Horticultural Society, &c., by Joseph Sabine, Esq., F.R.S. &c., Secretary; read November 19, 1822." From this excellent paper we make the following extracts: "The possession of the plants of the *native wild potato* has been long a desideratum; and from the great importance and extensive use of the cultivated root, the subject of course became an object of attention to the Horticultural Society. In my communications with the Society's correspondents on the other side of the Atlantic, this was pointed out as one of the most interesting objects to which their attention could be directed; and it is with no small satisfaction that I am able to state that our inquiries have been successful. Great doubts have existed as to what parts of the New World the natural habitat of the *Solanum tuberosum*, or potato, should be assigned; and the question is even now a matter of discussion among botanists of the greatest eminence.

"The vegetable in its cultivated state was first known in this country as the potato of Virginia; I conceive however there can be little doubt that the plants which Sir Walter Raleigh found in that colony and transferred to Ireland, had been previously introduced there from some of the Spanish territories in the more southern parts of that quarter of the globe; for had the potato been a native of any district now forming part of the United States, it would before this time have been found and recognised by the botanical collectors who have traversed and examined those countries.

"Early in the spring of the present year, Mr. Caldcleugh, who had been some time resident at Rio Janeiro, in the situation of Secretary to the British Minister at that Court, where he had been indefatigable in his exertions to forward the objects of the Horticultural Society, returned to England, having previously taken a journey across the country, and visited the principal places on the western coasts of South America. Among many articles of curiosity which he brought with him were two tubers of the *wild potato*.

"The two tubers were exhibited to the Society, and a drawing made of them before they were planted. * * * They were planted separately in small pots, and speedily vegetated; they grew rapidly, and were subsequently turned out into a border at about two feet distance from each other, where they became very strong and luxuriant. The blossoms at first were but sparingly produced, but as the plants were earthed up they increased in vigour, and these bore flowers abundantly."

The result of the experiment was most satisfactory; the produce was remarkable: "Above 600 tubers were gathered from the two plants."

A beautiful coloured engraving of the plant in blossom ac-

companies the account ; and in another plate there are figures of the original tubers and those produced by the cultivation above mentioned.

The intelligent author concludes his paper with the following remarks :—

“ On the subject of the potato there is also a point of curiosity and much interest open to those who have leisure and opportunity of conducting the investigation. Several accounts of its introduction into Europe, and especially into Great Britain and Ireland, are before the public, differing from each other, and none exactly correct. The entire truth is probably to be extracted from the whole, and ought to be supported by references to the original authorities for the different facts. To these, in order to render the early history of the potato complete, an account of its original discovery and the observations made on it by the first and early visitors to the shores of South America should be obtained ; and this remark would probably lead to a detection of the circumstances attending its first introduction into Virginia, which is at present involved in obscurity.”

Thus the fact is clearly established, that the common potato is indigenous to South America ; and botanical science should seem to require proofs equally conclusive that it is also a native production of North America.

English writers appear to agree on one point, to wit, that the potato was first introduced into Great Britain in the year 1586. The credit of the introduction has been given by some to Raleigh, and by others to Drake. It is hardly necessary to state, that Sir Walter Raleigh, to whom the discovery of Virginia has been attributed, was never in any part of the extensive country now known as the United States of America. But under the auspices of Raleigh and at his own expense, two vessels, commanded by Philip Amadas and Arthur Barlow, were fitted out in the year 1584 ; and they discovered in the month of July the coast of North Carolina, which was taken possession of in the name of Queen Elizabeth, who had granted a patent to Raleigh for “such lands as he should discover not in the possession of any Christian prince or people.”

In the latter part of 1584 the two vessels returned to England, and next year, at the instance of Raleigh, a fleet of seven vessels, under the command of Sir Richard Greenville, were fitted out by a company recently established ; and the first colony was planted at Roanoke under Ralf Lane as governor and Philip Amadas as admiral.

Greenville returned to England the same year, in the expectation that the colonists would be enabled to maintain their posi-

tion in the island of Roanoke. But this expectation was not realized in consequence of the hostility of the natives and the improvidence of the colonists themselves, who were reduced to the verge of ruin, which was averted only by the arrival of Sir Francis Drake, who, returning from a marauding expedition against the Spanish settlements in the West Indies and on the continent, offered to convey the disheartened colonists to England, which offer they embraced; and they arrived at Portsmouth on the 28th of July 1586.

Here then we read the epoch of the first introduction of the potato into England. Was it Drake who brought it from the Spanish settlements recently ravaged by him? or ought we to attribute the introduction of it to the colonists of Sir Richard Greenville? With respect to the former, it is now known that he had invaded those countries where the potato was both wild and cultivated; and therefore it is no stretch of probability to presume that it formed part of the natural curiosities which he conveyed to England. Touching the colonists of Roanoke, let us inquire into their knowledge of those plants which constituted the food of the natives of the region explored by them. Thomas Heriot, the surveyor of the colony, wrote an account of it on his return to England. This is given in Hakluyt's collection, published in 1589. "*Openauk*," says the writer, "are a kinde of roots of rounde forme, som of the bignesse of walnuts, some far greater, which are found in *moist* and *marish* grounds, growing many together one by another in *ropes*, or as though they were fastened with a string. Being boiled or sodden, they are very good meat." In the edition of Hakluyt published in 1600, to the foregoing is added: "Monardes calleth these roots *beads* or *Pater nosters* of Santa Helena."

This root, described, it should seem, with sufficient accuracy to preclude doubt, has nevertheless been taken for the potato; but a little attention to the subject will not fail to convince the intelligent botanist that it belongs to a different plant from the *Solanum* in question. The potato is never found in *moist* and *marish* grounds; nor do the tubers grow many together, *one by another in ropes*, as though they were fastened with a string, or in the form of a *string of beads*. Heriot's description of *Openauk* can therefore only be applicable to the roots of a plant which abounds from Canada to Florida in low watery grounds: this is the *Glycine apios* of Linnæus, the *Apios tuberosa* of Pursh, and the *Apios americana* of Cornutus, who in his 'History of the Plants of Canada' gives a good figure of it, illustrating the peculiar form and connexion of the tuberous roots.—*Jac. Cornuti Canadensium Plant. Historia*, Paris, 1635, 4to.

In Dr. Barton's 'Compendium Floræ Philadelphicæ' this plant is named "wild potato-vine." It is common in the swamps of New Jersey, but more abundant perhaps in East Florida, where the writer of this article, in exploring that desolate country before its cession to the United States, found its tuberculous roots to be a most excellent succedaneum for the potato.

The root mentioned in Smith's 'History of Virginia' under the name of *Tockawhoughé*, which some have supposed to be the potato, is the plant called in Jefferson's 'Notes on Virginia' *Tuckahoe*, the *Lycoperdon tuber*. It has no resemblance to the potato.

Thus there is no evidence whatever, that either the colonists of Roanoke or those of James Town had ever seen the potato among the natives of those countries; and we are warranted in asserting that there has not been a single instance of this plant being observed in a wild state in any part of the United States by any of the numerous botanists who have assiduously explored our country. Should it be found in those extensive tracts which yet invite research, happy will the discoverer be to whom this honour shall belong of adding to our flora a production, that, on the score of utility, is worthy to be ranked among those vegetables which greatly contribute to the wealth of nations by augmenting the sustenance of man.

XXIV.—*Description of Caprolagus, a new genus of Leporine Mammalia.* By E. BLYTH, Esq., Curator of the Asiatic Society's Museum*.

IN the 'Bengal Sporting Magazine' for August 1843, p. 131, Mr. Pearson has described an animal by the name *Lepus hispidus*, which I have long been very desirous of examining, and have sought to procure by every opportunity that has offered; and the Society has at length been favoured with a fine specimen of it by our esteemed correspondent and contributor, Major Jenkins, Political Agent in Assam.

As I fully expected, this animal has proved to be not satisfactorily admissible into *Lepus*, as the limits of generic divisions are now currently accepted, but must be regarded as a third generic type of the *Leporina*, Waterhouse; or rather it is a very strongly marked modification of the *Lepus* subtype, and not so distinct a form (equivalent to *Lepus*) as is that of *Lagomys*. In all its more essential characters it is akin to *Lepus*, but exhibiting very considerable modification in the various details of its structure. The head is large, the eyes small, the whiskers slight and inconspi-

* From the Journal of the Asiatic Society of Bengal, No. 76.

cuous; the ears are comparatively very short; tail the same; limbs small, and much less unequal than in *Lepus*; and the claws are particularly strong, straight, and very sharp-pointed, being obviously of important use in the creature's œconomy: lastly, the fur is very remarkable for an animal of the Leporine group, on account of its harshness, which is well expressed by the specific appellation *hispidus*.

The skull is much more solid and strong than in any *Lepus*, with every modification that should contribute to increased strength, but upon the same subtypical model of conformation; dentition also similar, but the grinders broader and more powerful, and the incisors and rodential tusks proportionally much larger: the palatal foramina are reduced so that the bony palate is as long as broad; the ant-orbital foramina are nearly closed by obliquely transverse bony spiculæ, corresponding to the open bony network observable in *Lepus*; the nasal bones are broad, with an evenly arched transverse section, and are less elongated backward than in the true Hares,—the maxillaries and intermaxillaries corresponding in their greater width and solidity; zygoma also fully twice as strong as in *Lepus*; the super-orbital processes continued forward uninterruptedly, the anterior emargination seen in the Hares being quite filled up with bone, while the posterior is also much less deep.

What little is known of its essential anatomy is, as might be expected, identical, or nearly so, with that of typical *Lepus*. Mr. Pearson notices that "the mammæ are from six to ten; cæcum very large, apparently almost like a second stomach; womb double."

The length of the Society's specimen as mounted, is, in a straight line from nose to tail-tip, fifteen inches and a half; ears posteriorly two inches; tail with hair scarcely one and a half; tarsus to end of claws three and three-quarters; entire length of skull the same: fur of two kinds, that next the body short, delicately soft and downy, and of an ashy hue; the longer and outer fur harsh and *hispid*, and consisting partly of hairs annulated with black and yellowish brown, and partly of longer black hairs, all the black having rather a bright gloss: lower parts paler or dingy whitish: toes somewhat yellowish white: fur of the tail rufescent above and below, except near its base underneath, and not of the same harsh texture as the body fur.

Mr. Pearson, in his original description of this species, remarks as follows: "From the notes of Mr. C. D. Russell, who sent the stuffed skin from which the description has been drawn up, I learn that the animal was killed on the right bank of the river Teestah, close under the saul forest, and about six miles north of Jelpee Goree. In this place they are said to be very scarce, not

above four having been seen by Mr. Russell's party during ten days, though game of all other kinds was met with in great plenty; and the following year the same party killed only one. But towards the hills, as Mr. Russell was told by the natives of that part of the country, they may be met with in greater abundance. Of the habits of this animal little is known. Mr. Russell states that 'its flesh is white, and eats very much the same as that of the rabbit;' and from the circumstance of his never having succeeded in putting one up a second time, he is almost certain that it burrows. It is called by the natives of the country, where it was met with, by the same name that they give to the hare."

Mr. R. W. G. Frith, upon examining the Society's specimen, believes it to be the same animal so often described to him by sportsmen, who have on several occasions been shooting in the extensive sâl jungle in the district of Mymensing, called the Muddapore jungle, on the western or right bank of the Burramooter river; but he never chanced to meet with it himself, though he long ago called my attention to the existence of such an animal in that part.

It is included in Messrs. McClelland and Horsfield's list of the Mammalia of Assam, Proc. Zool. Soc. 1839, p. 152, but with the statement that the ears are "very short, not projecting beyond the fur," which is either a mistake, or another species is alluded to; though I believe the former to be the truth: Mr. McClelland remarking, "I am indebted to Lieut. Vetch of Assam for the skin of this animal, but unfortunately the skull is wanting. According to Mr. Pearson, however, it is the same as the skull of the common hare. It inhabits Assam, especially the northern parts of the valley along the Bootan Mountains." The differences of the skull from that of any *Lepus* have been already adverted to.

I propose that it should bear the generic name *Caprolagus*, and be accordingly styled *C. hispidus* (Pearson), nobis.

XXV.—*A Synopsis of the British Rubi.*

By CHARLES C. BABINGTON, M.A., F.L.S., F.G.S. &c.*

It is only of late years that the fruticose species of *Rubus* have received the attention which they deserve: botanists were long contented to call them all *R. fruticosus* or *R. cæsius*, and the introduction by Smith of another name (*R. corylifolius*) must have appeared to be a very great innovation. Each of these is a collective species, by which I mean, one in which many forms, doubt-

* Read before the Botanical Society of Edinburgh, Feb. 12, 1846.

less constituting truly distinct species, are included. Hence the great diversity in the mode of applying these names.

All students of this very difficult genus are extremely indebted to Weihe and Nees v. Esenbeck for the publication of their splendid work the '*Rubi Germanici*,' without which it would have been scarcely possible to attain that knowledge of Brambles which we now possess; and all will agree, that for extending our acquaintance with British *Rubi* no name justly stands so high as that of Borrer, to whom we owe the elaborate account of these plants contained in Hooker's '*British Flora*' (ed. 2 and 3), and the descriptions of many species in the eminently beautiful but far too little known '*Supplement to English Botany*.' Dr. Lindley, in his '*Synopsis of the British Flora*' (ed. 1), gave the specific characters of twenty-three species, mostly translated avowedly from the work of Weihe and Nees, but including several supposed to be undescribed. He states that he had attained his knowledge of them from plants growing in the garden of the Horticultural Society, and that he was "satisfied that their distinctions are permanent and important." In his '*Flora of Shropshire*' Mr. Leighton has collected together the opinions of the above-mentioned botanists, and also of Nees v. Esenbeck, by sending a perfect set of specimens to each of them, accompanied by corresponding numbers. He has also described the plants with great accuracy, and thus placed students as nearly as possible in the same situation as himself. Without attempting to enumerate all those who are now studying *Rubi*, I cannot pass unnoticed the very valuable papers by Dr. T. Bell Salter in the '*Phytologist*' and '*Annals of Natural History*,' by which he has shown himself to be peculiarly qualified to become the illustrator of this genus. I had hoped that he would have undertaken such a review of it as that upon which I have now ventured; this his professional duties prevent. I must take the present opportunity of acknowledging myself to be very greatly indebted to him, both for the gift of specimens and also for the communication of much valuable information.

To Mr. E. Lees, a gentleman who has long paid attention to these plants, I am indebted for a very extensive series of specimens. Many other botanists have liberally assisted me in a similar manner; I would more especially mention the Rev. A. Bloxam and Mr. H. O. Stephens.

In the following pages I have endeavoured to apply those characters to the discrimination of the British species which have been found to be the most permanent by the best British and continental authorities, and would more especially refer the student to the following works in addition to those already noticed: the '*Flora Silesiæ*' of Wimmer and Grabowski (Breslaw, 1827);

'Novitiarum Floræ Sueciæ mantissa altera et tertia' of Fries (Upsala, 1839—1842); 'Monographia Ruborum Sueciæ' of Arrhenius (Upsala, 1840); and 'Monographie des Rubus de Nancy' of Godron (Nancy, 1843). It has also been my endeavour to ascertain what forms are to be considered as species and what only as varieties. Had views concerning species been adopted similar to those elucidated in the invaluable 'Rubi Germanici,' this synopsis would have contained sixty-three species at the least, and with every wish to reduce them as far as nature will allow, they still amount to about half that number. Several of these are now described for the first time; of them full descriptions are given; of the others the technical characters alone are introduced, accompanied by such notes and observations as appeared to be requisite.

In so large an assemblage of species it becomes necessary to attempt a separation into groups, but in this, as in all rich and natural genera, it is found to be nearly impossible to do so. Many species are easily referable to sections, such as those which I have adopted; but their artificial character is shown by other species which would belong to one section when young, and to another in their maturer state, or which possess characters so nearly intermediate, as to make it very difficult to decide in which section they should be placed. Still the divisions adopted in this essay have been found to be more constant and convenient than those derived from other peculiarities which are employed by some authors.

It is not pretended that all the forms are correctly referred to their true places, but simply that the information within my reach and the best judgement which I can form have been used in this attempt at their arrangement. Additional study will doubtless show that many alterations are requisite; will perhaps prove that some of those now considered as varieties are really specifically distinct, and demonstrate that several of my species may be combined with others. In those cases in which plants are described as new, every endeavour has been made to ascertain that they are not already published in the works of continental botanists; but the want of authentic specimens has added greatly to the difficulty of determining many of those species which are not represented in the 'Rubi Germanici,' and made it far from improbable that some of my names, and also those of Dr. Salter, will ultimately be superseded. It would appear that botanists generally are very little inclined to distribute authentic specimens of *Rubi*; indeed, when we consider the variable character of many species, and the trouble attending the preservation of sufficiently characteristic specimens of all, we can hardly wonder at their rarity. In my own case, from residing in a district far from rich

in brambles, most of my specimens have been collected during botanical tours, when it was scarcely possible to find space for the preservation of more than a very few specimens from each locality.

It is unnecessary to prolong these preliminary observations with remarks upon the value of characters, as the following descriptions will show upon what points it has appeared most desirable to place confidence; but it may be as well to state, that the form and armature of the matured barren shoot, the form of its leaves, the general form and structure of the panicle and its armature, and in some cases its foliage, and the direction of the calyx of the fruit, seem most deserving of attention. The shape of the petals, the colour of the styles, the form of the torus and of the primordial fruit, are points which will probably well repay a careful study; unfortunately my attention was not drawn to them until the opportunities for their examination had passed away. They are strongly recommended to the notice of botanists.

As it has been thought better not to encumber this paper with synonyms, only those references are given which appeared requisite for the more certain determination of the plants.

In conclusion, I must crave the indulgence of those who may honour this synopsis with their attention, and assure them that whatever errors they may find in it are not the result of carelessness, but caused by the paucity of our knowledge of plants which have been too generally neglected. It is hoped that by publishing the knowledge that they may obtain, all botanists will assist in perfecting our acquaintance with a genus, which more than most others requires a division of labour.

RUBUS, *Linn.*

Ordo naturalis ROSACEÆ.

Tribus DRYADEÆ.

Character genericus. Cal. quinquepartitus. Petala quinque. Stamina indefinita. Styli subterminalis. Carpella indefinita, drupacea, supra torum protuberantem non carnosum collocata. Semen pendulum, prope basin styli affixum.

A. FRUTESCENTES.

* Caules erecti; folia pinnata.

1. *R. Idæus* (Linn. !); caule suberecto tereti pruinoso, aculeis setaceis rectis, foliis quinato-pinnatis ternatisve, floribus axillaribus terminalibusque corymbosis pendulis, fructibus lanuginosis.

R. Idæus, *Linn. Sp. Pl.* 706; *Eng. Bot.* 2442; *Rubi Germ.* t. 47.

Stems 4—8 feet high, downy, armed with setaceous straight declining purple, or on the white-fruited plant pale, prickles,

which vary greatly in number. Leaves pinnate, of two pairs and an odd leaflet, snowy-white beneath; terminal leaflet ovate or cordate with a long stalk, lateral ones ovate, nearly or quite sessile; on the flowering-shoots ternate. Fruit red or amber-coloured.

β . *trifoliatus* (Bell Salt. !); caule polito alto, aculeis paucis minimis rectis, foliis ternatis, foliolo terminali pedicellato, panicula laxa, fructibus sanguineis. *Ann. Nat. Hist.* xvi. 365.

γ . *Leesii*; caule tomentososo alto, aculeis paucis brevissimis purpureis, foliis ternatis, foliolis omnibus rotundato-ovatis subsessilibus lateralibus terminali incumbentibus, panicula fructuque ignotis.

R. *Idæus c. fragariæ-similis*, *Lees!* in *Lond. Cat. of Br. Plants* (name only).

In woods and hilly places. γ . In a wood near Ilford Bridges, three miles from Linton, Devonshire, *Mr. E. Lees*. June.

Obs. 1. Our *var. β* . is at least as large as the normal plant. Not so the trifoliate *var. microphyllus* (Wallr. Sched. Crit. 226), which is much smaller, has leaves of only half the size, and is branched from the base.

Obs. 2. Our *var. γ* . is a very curious plant, of which the barren stems alone were found. Its three leaflets being all nearly or quite sessile and very round, give it greatly the appearance of a distinct species. It is well deserving of the attention of botanists visiting the north of Devon.

** Caules plerique suberecti; folia digitata vel subpinnata; panicula laxa.

2. *R. suberectus* (Anders. !); caule suberecto anguloso, aculeis paucis minimis rectis subulatis, foliis quinatis septenatisve, foliolis flexilibus: terminali cordato-ovato acuminato infimis subsessilibus, ramorum floriferorum basi attenuatis, panicula subsimplici, sepalis a fructu (atro-sanguineo) reflexis.

R. suberectus, *Anders. in Trans. Linn. Soc.* xi. 218. t. 16; *Eng. Bot.* 2572; *Sm. Eng. Fl.* ii. 406; *Arrhen. Rub. Suec.* 19.

Stems 3—4 feet high, nodding at the end, glabrous. Prickles enlarged suddenly at the base. Leaves green on both sides, paler beneath, pilose; on the flowering shoots ternate, all much narrowed to their base, terminal one scarcely emarginate below. Panicle usually unarmed, or with small hooked prickles. Torus conical.

β . *trifoliatus* (Bell Salt. !); caule polito, aculeis paucis, foliis ternatis, panicula elongata laxa simplici, "fructibus sanguineis." *Ann. Nat. Hist.* xvi. 365.

Boggy woods and heaths. July and August.

Obs. 1. The typical form of this plant cannot be confounded

with any of our other species. It has quite the habit of *R. Idæus*; its leaves are usually septenate by the separation of two leaflets from the base of the middle leaflet, they are thin, flexible and slightly pilose or quite glabrous; the petioles and rachis bear a few short hooked prickles. The inflorescence is small, of a few solitary axillary flowers, and a small open terminal raceme. The floral leaves have all their leaflets narrowed to the base, not cordate.

Obs. 2. *R. fissus* (Lindl.) seems scarcely to differ from this species, except by having more numerous and scattered prickles, the calyx of the fruit erecto-patent, and the fruit "bright red." In Lindley's description of his *R. fastigiatus* (Syn. ed. 1. p. 91), which he declares to be *R. fissus* (Syn. ed. 2. p. 92), he describes the calyx as reflexed. It would thus seem either that he lays but little stress upon that character, or that, if it is of value, his *R. fissus* is not that of Leighton (Fl. Shrop. 225). The presence of "bright red" fruit in Bell Salter's *R. suberectus* β . *trifoliatus* shows that that cannot be depended upon as a certain distinction between *R. suberectus* and *R. fissus*.

Obs. 3. A garden specimen of *R. suberectus* in Smith's herbarium, which was given to him by Mr. Edw. Forster, is accompanied by the observation, "The plant was given to me by Geo. Anderson, and is therefore authentic. *E. F.*" It is exactly our plant.

3. *R. plicatus* (W. et N.); caule suberecto anguloso, aculeis æqualibus parum deflexis in caulis angulis congestis, foliis quinatis plicatis, foliolo terminali cordato-ovato acuminato infimis subsessilibus, ramorum floriferorum lateralibus rhombico-ovatis basi dilatatis, panicula subsimplici racemosa, sepalis a fructu (atro) reflexis. *R. plicatus*, *Rub. Germ.* 15. t. 1; *Eng. Bot. Suppl.* 2714. *R. fruticosus*, *Arrh. Rub. Succ.* 23.

Stems 3—4 feet high, glabrous. Prickles slender, dilated at the base. Leaves rarely 7-nate, green on both sides, paler beneath, pilose, unequally and acutely serrate; on the flowering shoot generally ternate, basal leaflets dilated below especially on one side where they are often lobed, terminal one narrowed to its rather emarginate base. Petioles with hooked prickles. Peduncles simple, elongated, patent; terminal flower nearly sessile. Bracts lanceolate.

β . *carinatus* (Bell Salt. !); aculeis falcatis, foliolis omnibus elliptico-lanceolatis basi apiceque acutis carinatis subtus venis prominentibus, panicula simplici, pedunculis longissimis, "fructibus atrorubentibus." *Ann. Nat. Hist.* xvi. 365.

Stony but rather damp places in the north. Somewhat boggy

places in Sussex, Mr. Borrer. β . Burnt House, Isle of Wight, Dr. Bell Salter. July and August.

Obs. 1. Near the extremity of the barren shoots the prickles are more hooked, but as that part is usually dead and lost at the flowering season the prickles are then all nearly straight.

Obs. 2. The β . *carinatus* does not agree well with this species and may prove distinct. All its leaves, especially those of the flowering shoot, differ remarkably from those of the true *R. plicatus*, to which I refer many plants which would be named *R. suberectus* by numerous English botanists; the leaves of the flowering shoots combining with general habit to point out their true location.

Obs. 3. The *R. nitidus* from "Snelsmore Common near Newbury," gathered by Mr. Bicheno and preserved in Smith's herb., appears almost certainly to be *R. plicatus*; as are also the *R. suberectus* from Frant and from Ashdown Forest. *R. nessensis*, a cultivated specimen from Mr. J. Mackay, and one named *R. suberectus* by Smith from "Scotland, Mr. G. Don," are *R. plicatus*.

A German specimen named *R. plicatus* by Mr. Sonder of Hamburg is the same as our plant, to which also specimens named *R. suberectus* and *R. fastigiatus* by Dr. Weihe belong.

4. *R. fastigiatus* (W. et N. ?); *caule decurvo vel procumbente* anguloso glabro, aculeis paucis rectis declinatis æqualibus in caulis angulis congestis, *foliis* quinato-digitatis *planis*, foliolo terminali cordato acuminato infimis subsessilibus intermediis incumbentibus, ramorum floriferorum lateralibus basi dilatatis, paniculæ subsimplicis foliosæ apice corymboso, sepalis a fructu reflexis.

R. fastigiatus, Rub. Germ. 16. t. 2.?

Stems very long, but (I believe) not rooting. Prickles dilated at the base, distant. Leaves green on both sides, pilose above, paler and downy beneath, flexible, large, unequally dentate-serate. Petioles and midrib with strong hooked prickles. Panicle with few small straight declining prickles: floral leaves few simple cordate-ovate. Peduncles simple, elongate, ascending, downy with spreading hairs; lower ones distant axillary, upper corymbose; terminal peduncle much shorter than the others. Leaves of the flowering shoots ternate.

In dense woods at Jardine Hall in Dumfries-shire. August and September.

Obs. This plant so closely agrees with the figure and description of *R. fastigiatus* as given in the 'Rubi Germ.,' that it is considered better to retain that name for it. It differs chiefly by having its lower leaflets nearly sessile and overlapping the intermediate pair, and the almost exactly dentate margin of its leaves.

5. *R. nitidus* (W. et N.); *caule* suberecto anguloso lævi nitido, aculeis conicis rectis declinatis basi dilatatis, *foliis* quinato-digitatis *planis* supra nitidis subtus viridibus pubescentibusque, foliolo terminali ovato rotundatove *infimis pedicellatis intermediis dissitis*, *paniculæ compositæ foliosæ* ramis patentibus divaricatisve: rachi polita superne pilosa.

R. nitidus, *Rub. Germ.* 19. t. 4.

Stem not arching, but producing a pendulous shoot in the autumn, glabrous or with a few scattered hairs. Terminal leaflet usually ovate; all sharply and irregularly serrate. Petioles with short, generally numerous, hooked prickles. Panicle very prickly, its branches usually spreading nearly at right angles to the rachis.

Hedges and thickets. July and August.

Obs. 1. "This plant is remarkable for the bright varnished appearance" of its stem, as well observed by Dr. T. B. Salter (*Phyt.* ii. 102). These stems are very frequently only suberect, but in some cases a slender pendulous shoot is produced which reaches the ground and roots. The flowering-shoots are nearly glabrous throughout the greater part of their length, but become gradually more and more covered with patent hairs as the extremity of the panicle is approached, between which the shining cuticle is seen.

Obs. 2. The panicle is here considerably different from that of all the preceding species. It is much more compound, irregular, and often rather close, nor do any of our specimens quite accord with the figure in '*Rub. Germ.*' of this part. A specimen from Dr. Weihe has a less prickly panicle than the English plant.

*** *Caules* arcuati vel procumbentes, radicanter, *nunquam asperi, setis nullis* (sæpe in caulibus junioribus, in maturis rarius, inveniuntur setæ sparsæ). *Aculei* in caulis angulis sæpissime congesti, subæquales.

6. *R. Salteri* (n. sp.); *caule* procumbente anguloso sulcato parce piloso, aculeis æqualibus parvis rectis declinatis, *foliis* quinatis, *foliolis* ovalibus apiculatis pilosis subtus tomentosis, *infimis breviter pedicellatis intermediis dissitis*, *paniculæ angustæ inferne foliosæ* pubescentis ramis brevibus divaricatis simplicibus corymbosisve, *sepalis* fructui oblongo adpressis.

Stem long, decumbent, angular, striated, furrowed, green, with scattered short patent hairs; prickles few, moderately long from a thick base, straight, declining, nearly equal, confined to the angles of the stem, slightly pilose. Leaves quinate-pedate; stipules linear-lanceolate; petioles and midribs with a few small strong declining or deflexed prickles; leaflets strongly and doubly dentate-serrate in their upper half, the serratures simple and decreasing downwards; terminal leaflet oval, shortly pointed, sub-

cordate and slightly narrowed below; lateral obovate, pointed, narrowed below; basal oblong, not overlapping the lateral leaflets. Flowering-shoot long, pubescent with lax hairs; prickles few, moderate, deflexed; leaves ternate, green beneath; petioles and midribs with few small deflexed prickles; terminal leaflet obovate-oblong, rather abrupt, jagged at the end. Stipules linear-lanceolate. Panicle narrow, compound, pubescent with lax hairs, not setose; prickles few, short, slightly deflexed; two or three lower branches axillary from ternate or 3-lobed or simply ovate leaves, often elongated and patent; the other branches short and patent, simple or 2—3-flowered; terminal flower sessile; lower bracts foliaceous, upper ones trifid. Sepals woolly, ovate, closely embracing the oblong black fruit. Petals lanceolate, narrowed below.

Apse Castle Wood, Isle of Wight, *Dr. Bell Salter*. July and August.

Obs. 1. This is a very straggling plant, prostrate unless supported by the neighbouring bushes or much shaded by trees. It is remarkably distinct in appearance from all its allies.

Obs. 2. A plant found by the river-side above Cramond Bridge near Edinburgh probably belongs to the same species, but it has its terminal leaflets cordate-acute, a short panicle with fewer hairs and smaller and more numerous prickles, subquinque intermediate leaves, and stipules slightly more broadly ovate; its fruit and the direction of the calyx are unknown; its petals are shortly ovate and clawed. A plant submitted to Dr. Bell Salter from Bradbury Wood, Cheshire, by Mr. Sidebotham, he considers to be identical with the plant of Cramond, but as with it, the direction of the calyx *when in fruit* is not ascertained. In Mr. Sidebotham's plant the panicle is somewhat larger and more branched, by which it more nearly approaches the Isle of Wight or typical plant, while the prickles of that part are somewhat larger. A suberect form, similar to that noticed below (*Obs. 3.*), was sent with it from the same place. Another plant, kindly sent to me by the Rev. A. Bloxam, by whom it was gathered near Twycross, Leicestershire, in company with Mr. E. Lees, and named by the latter gentleman "*R. amplificatus* (Lees)," is also a probable variety of *R. Salteri*. It differs from the typical specimens by having linear stipules; the petioles and midribs with more numerous and stronger prickles; the flowering-shoot with much stronger and more numerous hooked prickles, and leaves ashy beneath; panicle with rather numerous and very strong hooked prickles, its branches nearly all axillary short few-flowered corymbose from ternate leaves, the uppermost leaf simple lanceolate; end of the panicle leafless, corymbose, terminal flower shortly stalked; the fruit smaller with a patent (?) calyx. This plant

does not agree with specimens of *R. amplificatus* received from Mr. Lees himself, which are very nearly allied to *R. macrophyllus*.

Obs. 3. A form of this plant occurs in Apsle Castle Wood, in a dense shade, similar to that mentioned by Dr. Bell Salter as his β . *frustratus* of *R. Wahlbergii* (Ann. Nat. Hist. xvi. 371); it is suberect with flaccid leaves and abortive flowers. This is a state of arrested development. He is of opinion that this state of the plants should be considered as a recognised variety, for the reason that it is a permanent form, he having noticed it unchanged in the same situation for many years. Its identity with the fully-developed form described above is proved, not merely by transition states, but by a plant of the erect and abortive form having acquired the normal condition since it has been removed into a garden. A similar state is found in *R. discolor* in more exposed places. I observed this latter plant in that state on ditch-banks near Cambridge in the autumn of 1845.

7. *R. tenuis* (Bell Salt. !); caule procumbente tereti glabro, *aculeis deflexis* æqualibus validis, *foliis ternatis* rarius quinatis subglabris *subtus viridibus pubescentibusque*, foliolo terminali obovato-acuminato, panicula decomposita, *sepalis lanceolato-acuminatis* fructui parvo (nigro) drupeolis paucis magnis composito *adpressis*.

R. tenuis, Bell Salt. in Ann. Nat. Hist. xv. 305.

R. affinis δ , Rub. Germ. t. 3 b.

β . *ferox* (Bell Salt. !); aculeis crebris uncinatis.

Whole plant much resembling *R. cæsius*, from which it differs by its stout equal and not straight prickles and total want of hairs and setæ on the barren stems, and the stronger prickles on its panicle. From *R. corylifolius* it may be known by the strongly hooked prickles on its petioles, almost constantly ternate leaves, and longer and adpressed sepals.

South of England. July and August.

8. *R. corylifolius* (Sm. !); caule decurvo vel procumbente teretiusculo glabro, *aculeis conicis rectis tenuibus*, *foliis quinatis* planis marginem versus undulatis subcoriaceis *subtus mollibus canisque*, foliolo terminali rotundato-ovato cordatove, *infimis subsessilibus intermediis incumbentibus*, panicula subcorymbosa, *sepalis ovatis* a fructu reflexis.

R. corylifolius, Sm. Fl. Br. 542; Eng. Bot. 827; Arrh. Rub. Suec. 16; Bab. Man. 95.

R. affinis, Bab. Man. 93.

Stems long, usually glabrous. Prickles moderate, those of the petioles nearly straight. Lower branches of the panicle often elongated and spreading. "Torus roundish-clavate." Fruit sometimes rather hairy.

Hedges and thickets, common. July and August.

Obs. 1. I am now quite convinced that the common English plant is not *R. affinis* (W. and N.), and also that it is the *R. corylifolius* (Sm.), and have therefore removed the former name from our list and employed Smith's nomenclature. The *R. affinis* (W. and N.) appears to have its basal leaflets very decidedly stalked, the prickles of its barren shoot much stronger than in *R. corylifolius* and deflexed, and that shoot much more angular. In *R. corylifolius* the shoots might often be called round, never truly angular.

Obs. 2. Dr. Bell Salter noticed a plant at Selborne (Phyt. ii. 100) which he considers the typical plant of the *R. affinis* of the 'Rub. Germ.'; of this I possess only an imperfect specimen which does not seem to differ from the common form of this species, and certainly is not the *R. affinis* (W. and N.).

Obs. 3. Plants are occasionally found resembling, and probably referable to, *R. corylifolius*, which differ by having more angular stems and much stronger and deflexed prickles. I was once disposed to consider these as *R. affinis* (W. and N.), but their close similarity to *R. corylifolius* and the decidedly stalked basal leaflets of the plant figured in the 'Rub. Germ.' have caused a change in my views. It should however be observed that a specimen from Dr. Weihe himself (Reich. Fl. Germ. exsic. 781) has the lower pair of leaflets sessile, and that in some of our plants these leaflets are very manifestly stalked. In other cases the prickles on the rather angular stems are not deflexed but declining.

Obs. 4. The panicles of plants referable to this species often differ very remarkably, not in their real structure but in appearance. In some they are narrow, short and close; in other cases the lower branches are very much elongated and spreading; but all the intermediate forms may be found. The colour of the barren stem is usually purplish-green, but sometimes it is of a rather dark purple tint.

Obs. 5. Smith, in his first description of *R. corylifolius* (Fl. Br. ii. 542), says that the calyx is inflexed, and Woodward (With. Bot. Arr. ed. 3. ii. 470) says, "bent inwards and clasping the fruit." In his later works (Eng. Bot. 827; Eng. Fl. ii. 408) Smith corrects this, stating that it is reflexed. This will probably explain the difficulty which foreign botanists have found in determining Smith's plant; and the 'Fl. Brit.' being the work most frequently in their hands will account for their so generally referring *R. corylifolius* (Sm.) to *R. nemorosus* (Hayne), *R. du-metorum* (Weihe).

[To be continued.]

XXVI.—Notes on some rare species of Animals found on the Coasts of Ireland. By JOHN SCOULER, M.D.

Thia polita.

THIS rare and interesting crustacean was figured and described by Dr. Leach in the 'Zoological Miscellany,' vol. ii. pl. 103, and since the time of that eminent naturalist I am not aware that it has been found on our shores by any British naturalist. In his account of the *Thia polita*, Dr. Leach does not give us any information as to the locality where it was found, which was however probably somewhere on the English coast, especially as Milne Edwards mentions that it is to be found on the opposite shores of France.

For the discovery of this species, which may be considered as an acquisition to the British as well as the Irish fauna, we are indebted to that acute and indefatigable observer Mr. William M'Calla, who has enriched the natural history of Ireland by the discovery of many species both of Algæ and Invertebrate animals. Among other rare Crustacea which we owe to him, I may mention the *Pisa tetraodon*, of which the Dublin Museum contains a fine series, and also the true *Portunus marmoreus*.

The *Thia polita* as well as the other species mentioned was found at Roundstone in Connemara, in a sandy bay at extreme low water, and as Mr. M'Calla remarks, it is similar in its habits to the *Corystes Cassivelaunus*.

Halichondria hispida.

Spongia hispida, Montagu, Wernerian Memoirs, vol. ii. pl. 5. fig. 1, 2.

I am not aware that any one has found this sponge since it was discovered by Montagu. About a year ago some very fine specimens were dredged from deep water at Roundstone by Mr. M'Calla, who took the precaution to preserve them in spirits, so that the character of the species can be satisfactorily ascertained. Both the figure and description of Montagu are very good, and leave little to be added: when moist it is very soft and gelatinous, and shrivels up a good deal in drying. The spiculæ are very long, and many of them projecting from the surface of the branches gives them the appearance expressed by the brevial name.

Tethya carnososa.

Halichondria carnososa, Johnston, Brit. Sponges, p. 146. pl. 13. fig. 7, 8.

This sponge has been excellently described by Dr. Johnston from specimens collected in Connemara by its discoverer Mr.

M'Calla. He observes that in habit and compactness of texture this sponge is a *Tethya*, and like the species of that genus it is covered by a distinct skin, but the disposition of the spiculæ is different, and there is no central nucleus. An additional supply of specimens preserved in spirits has enabled me to verify Dr. Johnston's conjecture, and to prove that this sponge should be removed to the genus *Tethya*.

When a longitudinal section of this sponge is made, it is seen to consist of three very distinct substances, an epidermis, a parenchyme, and a fibrous axis. The epidermis is very thin, of an olive colour, and not perforated by oscula; the greater part of the sponge consists of a pretty firm orange-coloured substance, permeated by tortuous canals; the axis is white, of a fibrous texture, and easily distinguished from the parenchyme by its colour and structure. From the presence of this fibrous axis, we think this sponge should be removed from the genus *Halichondria* to that of *Tethya*.

This species was originally found at Roundstone by Mr. M'Calla, and it appears to be a common species, for the same indefatigable observer has lately obtained specimens from Belfast Lough, where, as at Roundstone, it is associated with the *Halichondria ægagropila*.

XXVII.—*Characters of some undescribed species of Chalcidites.*

By FRANCIS WALKER, Esq., F.L.S.

[Continued from p. 115.]

13. *Encyrtus Cervius*, mas. *Cyaneo-viridis, abdomine nigro, antennis pedibusque piceis, alis limpidis.* (Corp. long. lin. $\frac{1}{2}$; alar. lin. 1.)

Body rather narrow, slightly pubescent: head and thorax bluish green, convex, squameous: head transverse, short, rather broader than the thorax; vertex broad; front abruptly declining, slightly impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ piceous, subclavate, slender, inserted near the mouth, rather longer than the thorax; first joint long, slender; second long-cyathiform; the following joints from the third to the eighth successively though slightly increasing in breadth; club fusiform, more than twice the length of the eighth joint: thorax oval: prothorax transverse, short, narrow in front: scutum of the mesothorax broad; parapsides united to the scutum; axillæ complete; scutellum obconic: propodeon subquadrate, declining, of moderate size: podoon extremely short: abdomen elliptical, depressed, black, smooth, shining, much shorter and narrower than the thorax; metapodeon, octoon and ennaton of moderate size; the following segments very short: legs piceous; mesotibiæ and mesotarsi dilated, and

the former armed with long spines; coxæ green; knees fulvous; protibiæ and protarsi fuscous: wings limpid; nervures fuscous; humerus yellow, much less than half the length of the wing; ulna broad, very short; radius longer than the ulna; cubitus of moderate length, pointing towards the disc of the wing; stigma extremely small.

Found by Dr. Greville near Edinburgh.

14. *Encyrtus Meges*, fem. *Nigro-cupreus*, *scutello abdominisque basi cupreis*, *antennis nigris*, *pedibus nigris*, *genubus tarsisque fulvis*, *alis limpidis*. (Corp. long. lin. $\frac{2}{3}$; alar. lin. $1\frac{1}{4}$.)

Body stout, dark cupreous: head and thorax convex, finely squameous: head transverse, as broad as the thorax; vertex rather narrow, front not impressed: eyes large, not prominent: ocelli near together, disposed in a triangle on the vertex: antennæ black, clavate, inserted near the mouth, as long as the thorax; first joint long, fusiform, slender toward the base; second long-cyathiform; third very minute; fourth, fifth and sixth small; seventh, eighth and ninth broader; club 3-jointed, fusiform, much broader and rather longer than the three preceding joints: thorax rounded in front, square behind: prothorax transverse, short, convex in front, straight behind: scutum of the mesothorax broad; parapsides united to the scutum; axillæ large, triangular, complete; scutellum bright cupreous, large, obconic, reaching to the base of the abdomen: metathorax, propodeon and podoon very short and broad: abdomen obconic, depressed, smooth, shining, much shorter than the thorax; metapodeon short, bright cupreous, varied with green; octoon and following segments transverse, short: legs stout, black; knees and tarsi fulvous; tips of tarsi piceous; middle tibiæ dilated, fulvous at the tips and armed with long spines; middle tarsi dilated: wings limpid; nervures fulvous; humerus rather less than half the length of the wing; ulna extremely short; radius very short; cubitus longer than the radius; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

15. *Encyrtus Præcia*, mas. *Cupreus*, *scuto viridi*, *abdomine nigro cupreo*, *antennis nigris*, *pedibus fulvis nigro cinctis*, *alis limpidis*. (Corp. long. lin. $\frac{1}{2}$; alar. lin. 1.)

Body slender: head and thorax convex, cupreous, finely squameous: head transverse, a little broader than the thorax; vertex broad; front slightly impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ black, slender, filiform, inserted near the mouth, much longer than the thorax; first joint long, slender; second long-cyathiform; third very minute; fourth and following joints to the ninth small, of nearly equal size; club fusiform, as long as the three preceding joints: thorax oval: prothorax transverse, very short: scutum of the mesothorax broad, bluish green; parapsides united to the scutum; axillæ complete; scutellum obconic: metathorax, propodeon and podoon very short: abdomen oval, depressed, smooth, shining, cupreous

black, shorter and narrower than the thorax; metapodeon of moderate size; octoon and following segments short: legs pale fulvous, slender; middle tibiæ and middle tarsi dilated, and the tips of the former armed with long spines; thighs and middle tibiæ striped with black; hind thighs and hind tibiæ black, tips of the latter fulvous; hind knees pale yellow: wings limpid, narrow; nervures yellow; humerus much less than half the length of the wing; ulna and radius extremely short; cubitus longer than the radius; stigma very small.

Var. β . Scutum green, æneous towards the fore border.
England. From the collection of the Rev. G. T. Rudd.

16. Encyrtus Peticus, mas. *Cyaneo-viridis, scutello cupreo, abdomine nigro, antennis nigris, pedibus flavis viridi cinctis, alis limpidis.* (Corp. long. lin. $\frac{1}{2}$; alar. lin. 1.)

Body nearly linear, somewhat narrow: head and thorax convex, bluish green, finely squameous: head transverse, a little broader than the thorax; vertex broad; front abruptly declining, not impressed: eyes red, of moderate size, not prominent: ocelli forming a triangle on the vertex: antennæ slender, subclavate, black, shorter than the body; first joint long, linear; second long-cyathiform; third and following joints small, successively increasing in breadth until the ninth; club fusiform, broader than the ninth joint and thrice its length: thorax oblong-subquadrate: prothorax transverse, very short: scutum of the mesothorax broad; parapsides united to the scutum; paraptera large, yellow; axillæ triangular, meeting on the dorsum; scutellum obconic, dull cupreous, of moderate size, abruptly declining at the tip: propodeon transverse, short, declining: po-deon extremely short: abdomen obconic, depressed, smooth, shining, bluish black, much shorter and rather narrower than the thorax; metapodeon bluish green, of moderate size; octoon and following segments short: legs yellow, long, slender; coxæ green; mesopedes dilated as usual; propedes fulvous; thighs and tibiæ of mesopedes and of metapedes each encircled with a broad green band: tips of the tarsi piceous: wings limpid, rather narrow; nervures fulvous; humerus much less than half the length of the wing; ulna and radius extremely short; cubitus of moderate length, pointing towards the disc of the wing; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

17. Encyrtus Metharma, fem. *Cupreus, scuto æneo-viridi, capite thoracisque lateribus rufis, antennis nigris flavo fasciatis, pedibus flavis piceo vittatis, alis limpidis.* (Corp. long. lin. $\frac{1}{2}$; alar. lin. 1.)

Body stout: head and thorax convex, finely squameous: head pale red, nearly semicircular, convex in front, slightly impressed behind, as broad as the thorax; vertex narrow: eyes large, not prominent: ocelli disposed in a small triangle, the middle one much in advance of the other two: antennæ clavate, black, inserted near the mouth, longer than the thorax; first joint piceous, long, stout, fusiform; second long-cyathiform; third very minute?; fourth and following

joints unto the ninth small, successively increasing in breadth; eighth and ninth joints yellow; club 3-jointed, fusiform, as long as the three preceding joints: thorax rounded in front, square behind, æneous green, pale red on each side: prothorax transverse, short, convex in front, straight behind: scutum of the mesothorax broad; parapsides united to the scutum; axillæ large, triangular, complete or meeting together between the scutum and the scutellum; scutellum cupreous, large, obconic: metathorax, propodeon and podoon very short and broad: abdomen obconic, depressed, cupreous, smooth, shining, much shorter than the thorax; metapodeon, octoon, ennaton and decaton of moderate size; protelum, paratelum and telum short: legs yellow; middle tibiæ and tarsi dilated and the former armed with long spines; a broad interrupted piceous band across each thigh and tibia: wings limpid; nervures fulvous; humerus rather less than half the length of the wing; ulna extremely short; radius very short; cubitus longer than the radius; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

18. *Encyrtus Genutius*, fem. *Viridis, scutello cupreo, abdomine purpureo, antennis fulvis apice piceis, pedibus fulvis fusco cinctis, alis limpidis.* (Corp. long. lin. $\frac{2}{3}$; alar. lin. $1\frac{1}{4}$.)

Body stout: head and thorax convex, dull green, pilose, finely squameous: head transverse, a little broader than the thorax; vertex broad; front abruptly declining: eyes of moderate size, not prominent: ocelli forming a triangle on the vertex: antennæ clavate, fulvous, piceous toward the tips, inserted near the mouth; first joint long, stout; second long-cyathiform; third and following joints short, successively increasing in breadth until the ninth; club elliptical, piceous, broader than the ninth joint and more than thrice its length: thorax oblong-quadrate: prothorax transverse, very short: scutum of the mesothorax broad, nearly flat on the disc; parapsides united to the scutum; axillæ complete or meeting together on the dorsum; scutellum cupreous, obconic: propodeon transverse, short, declining: podoon extremely short: abdomen obconic, purple, depressed, smooth, shining, rather shorter and narrower than the thorax; metapodeon of moderate size; octoon and following segments short: oviduct subexserted: legs fulvous; mesotibiæ and mesotarsi dilated and the former armed with long spines; coxæ green; thighs and tibiæ and tips of the tarsi fuscous: wings limpid; nervures fulvous; humerus much less than half the length of the wing; ulna fuscous, very short; radius extremely short; cubitus of moderate length, pointing towards the disc of the wing; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

19. *Encyrtus Mamertus*, mas. *Niger, antennis nigris, pedibus fulvis, alis limpidis.* (Corp. long. lin. $\frac{1}{2}$; alar. lin. 1.)

Body black, stout, slightly pubescent: head and thorax convex, finely squameous: head transverse, very short, nearly as broad as the thorax; vertex broad; front impressed, abruptly declining: eyes of moderate size, not prominent: ocelli near together in a triangle

on the vertex: antennæ black, filiform, pilose, nearly as long as the body; first joint long, fusiform; second long-cyathiform; third very short; fourth and following joints long, linear; club more than twice the length of the ninth joint: thorax oblong-subquadrate: prothorax transverse, very short: scutum of the mesothorax broad; parapsides united to the scutum; axillæ triangular, complete; scutellum obconic; epimera large: propodeon transverse, short, declining: pondeon extremely short: abdomen obconic, depressed, smooth, shining, rather shorter and narrower than the thorax; metapodeon of moderate size; octoon and two or three following segments short; the rest very small: legs fulvous, pilose; mesotibiæ and mesotarsi dilated and the former armed with long spines: wings limpid; nervures fulvous; humerus much less than half the length of the wing; ulna very short, broad, fuscous; radius extremely short; cubitus of moderate length, pointing towards the disc of the wing; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

20. *Encyrtus Hyettus*. *Nigro-cyaneus, capite viridi, antennis nigris, pedibus piceis, alis fuscis.* (Corp. long. lin. $\frac{3}{4}$; alar. lin. $1\frac{1}{4}$.)

Body short, thick, broad, convex: head transverse, bright green, roughly punctured, a little broader than the thorax; vertex narrow; front abruptly declining, slightly impressed: eyes pubescent, very large: ocelli disposed in a triangle on the vertex: antennæ capitate, pubescent, black, shorter than the thorax; first joint long, slender, produced beneath; the other joints forming a compact fusiform mass: thorax short, dark blue, finely squameous: prothorax not visible: scutum short, broad; parapsides forming one segment with the scutum; scutellum obconic, surrounded by a rim: propodeon short, broad: abdomen broad, shorter than the thorax, to which it is closely joined without any apparent pondeon: legs stout, piceous; tarsi paler: wings fuscous; nervures piceous; humerus much less than half the length of the wing; ulna about one-third of the length of the humerus; radius short; cubitus long, not much shorter than the ulna; stigma very small.

Taken in St. Vincent's Island by the late Rev. Lansdown Guilding. In the collection of the Rev. F. W. Hope. This species may be considered as the type of a new genus, for which I propose the name *Ænasius*. The ulna is longer than is that nervure in most other *Encyrtidæ*. In the form of the antennæ it approaches *Cerapterocerus*, and in some characters it resembles *Eunotus*.

21. *Elasmus Anticles*, fem. *Viridis, antennis pedibusque piceis, alis limpidis.* (Corp. long. lin. 1; alar. lin. $1\frac{1}{2}$.)

Fem. Body green: head very short: antennæ piceous, shorter than the thorax: thorax convex, coarsely punctured: pondeon not apparent: abdomen lanceolate, twice the length of the thorax, depressed above, keeled beneath, decreasing in breadth from the base to the tip: oviduct subexserted: legs piceous, long, slender: wings limpid;

nervures fuscous; ulna nearly twice the length of the humerus; radius short; cubitus not more than half the length of the radius; stigma very small.

Found at Bombay. In the collection of the Rev. F. W. Hope, who possesses a *Tinea* that is infested by two species of *Ichneumonidæ*; the *Elasmus* and *Entedon Imbreus*, n. s., are also parasites of the *Tinea*, or else lay their eggs in the larvæ of the *Ichneumonidæ* above mentioned. *Elasmus* seems to connect the *Encyrtidæ* with *Eulophus*; the ulna is remarkably long.

22. *Eulophus Anaxippus*, fem. *Cyaneo-viridis, antennis nigris, pedibus viridibus, genibus fulvis, tarsis fuscis basi flavis, protarsis piceis, alis limpidis.* (Corp. long. lin. 1; alar. lin. $1\frac{2}{3}$.)

Body slender, pubescent, bright bluish green: head and thorax convex, finely squameous: head transverse, very short, as broad as the thorax; vertex broad; front much impressed, abruptly declining: eyes of moderate size, not prominent: ocelli disposed in a small triangle on the vertex: antennæ subclavate, black, pubescent, as long as the thorax; first joint long, slender, green; second long-cyathiform; third and following joints nearly linear, successively decreasing in length and increasing in breadth; club fusiform, nearly twice the length of the fifth joint: thorax oval: prothorax transverse, very short: scutum of the mesothorax broad; sutures of the parapsides indistinct; axillæ large, triangular, remote from each other; scutellum subrhomboidal: propodeon transverse, short, declining: podeon very short: abdomen elliptical, depressed, smooth, shining, longer than the thorax; metapodeon and following segments of moderate size: legs slender, bluish green; knees fulvous; tarsi fuscous, first joint pale yellow; protarsi piceous: wings limpid, ample; nervures fuscous; humerus much less than half the length of the wing; ulna shorter than the humerus; radius nearly as long as the ulna; cubitus long, but less than half the length of the radius; stigma very small, emitting a short branch.

August, near Dover.

23. *Entedon Fufius*, fem. *Viridis, abdominis disco nigro-cupreo, antennis nigris, pedibus viridibus, genibus tibiisque apice albis, tarsis fuscis basi albis, protarsis piceis, alis subfuscis.* (Corp. long. lin. $\frac{3}{4}$; alar. lin. $1\frac{1}{4}$.)

Body green: head and thorax convex, finely squameous: head transverse, a little broader than the thorax; vertex broad; front abruptly declining, not impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ clavate, black, pubescent, as long as the thorax; first joint long, slender, green; second long-cyathiform; the following joints from the third to the fifth successively shorter and broader; club conical, longer than the preceding joint: thorax oval: prothorax transverse, very short: scutum of the mesothorax broad; sutures of the parapsides indistinct; axillæ triangular, of moderate size, remote from each other; scutellum rhomboidal: propodeon transverse, shining, rugulose, declining:

podeon short: abdomen elliptical, depressed above, keeled beneath, rather longer but not broader than the thorax; disc dark cupreous; metapodeon and following segments of moderate size: legs slender, green; coxæ and thighs squameous; knees and tips of the tibiæ white; tarsi fuscous, white towards the base; protarsi piceous; wings slightly fuscous; nervures fuscous; humerus less than one-third of the length of the wing; ulna much longer than the humerus; radius and cubitus very short, the former a little longer than the latter; stigma of moderate size.

August, near Dover.

24. *Entedon Cœdicus*, mas. *Viridi-cupreus, antennis piceis, pedibus albidis, alis limpidis.* (Corp. long. lin. $\frac{2}{3}$: alar. lin. $1\frac{1}{3}$.)

Bright, broad, rather short, cupreous, varied with green: head and thorax convex: head transverse, as broad as the thorax, very finely squameous, almost smooth; vertex broad; front abruptly declining, not impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ setaceous, slender, piceous, inserted near the mouth; first joint long, slender, fulvous; second long-cyathiform; third and following joints nearly linear; club fusiform, acuminate, longer than the preceding joint: thorax oval, finely squameous: prothorax very short: scutum of the mesothorax broad; sutures of the parapsides distinct, approaching each other towards the scutellum; axillæ triangular, of moderate size, remote from each other; scutellum rhomboidal, rather large: propodeon large, obconic, declining, rugulose: podeon distinct, equal in length to one-fourth of the abdomen: abdomen depressed, smooth, shining, rather broader than long, as broad as the thorax but less than half its length; metapodeon of moderate size; octoon and following segments to the protelum each shorter than the metapodeon; paratelum and telum very short: legs white; tips of the tarsi fuscous: wings limpid; forewings broad; nervures yellow; humerus less than one-third of the length of the wing; ulna much longer than the humerus; radius less than one-fourth of the length of the ulna; cubitus much shorter than the radius; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

25. *Entedon Nautius*, mas. *Cyaneo-viridis, abdominis disco æneo, antennis nigris, pedibus stramineis, alis limpidis.* (Corp. long. lin. 1; alar. lin. $1\frac{1}{2}$.)

Body nearly linear, bright bluish green: head and thorax convex, finely squameous: head transverse, short, as broad as the thorax; vertex broad; front impressed, abruptly declining: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ setaceous, black, pubescent, much shorter than the thorax; first joint long, slender, fulvous; second long-cyathiform; third large; fourth and following joints nearly linear; club fusiform, acuminate: thorax oval: prothorax transverse, very short: scutum of the mesothorax broad; sutures of the parapsides distinct, slightly approaching each other towards the scutellum; axillæ triangular, small, sepa-

rated from each other by nearly the whole breadth of the dorsum; scutellum rhomboidal: propodeon transverse, subquadrate, rugulose, shining, decumbent, of moderate size: podoon very short: abdomen nearly linear, depressed, shining, very finely squameous, narrower than the thorax and hardly more than half its length; disc æneous; metapodeon bright blue towards the base; octoon, ennaton and deatton of moderate size, each rather shorter than the metapodeon; protelum, paratelum and telum short: legs very pale yellow; tips of the tarsi fuscous: wings limpid; fore-wings broad; nervures fulvous; humerus less than one-third of the length of the wing; ulna much longer than the humerus; radius about one-fourth of the length of the ulna; cubitus very short, not more than one-half of the length of the radius; stigma very small.

England. From the collection of the Rev. G. T. Rudd.

26. Entedon Glabrio, mas. *Nigro-viridis, abdomine cupreo, antennis nigris, pedibus flavis, femoribus viridibus, alis limpidis.* (Corp. long. lin. $\frac{2}{3}$; alar. lin. 1.)

Body narrow, nearly linear: head and thorax convex, dark green, finely squameous: head transverse, short, a little broader than the thorax; vertex broad; front much impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ filiform, stout, pubescent, black, as long as the thorax; first joint long, stout, fusiform; second small; third, fourth and fifth nearly equal in size; club fusiform, acuminate, longer than the preceding joint: thorax oval: prothorax very short: scutum of the mesothorax broad; sutures of the parapsides distinct, approaching each other towards the scutellum; axillæ triangular, of moderate size, remote from each other; scutellum rhomboidal: propodeon obconic, declining, rugulose: podoon very short: abdomen conical, depressed, smooth, shining, cupreous, æneous green towards the base, narrower and much shorter than the thorax; metapodeon of moderate length; octoon and following segments each shorter than the metapodeon: legs fulvous; coxæ and thighs green; tips of the tarsi fuscous: wings limpid; nervures fuscous; humerus less than one-third of the length of the wing; ulna much longer than the humerus; radius rather more than one-fourth of the length of the ulna; cubitus not more than half the length of the radius; stigma small.

England. From the collection of the Rev. G. T. Rudd.

27. Entedon (Pediobius) Imbreus, fem. *Niger, cyaneo et viridi varius, antennis nigris, pedibus cyaneo-viridibus, tarsis albis, alis limpidis.* (Corp. long. lin. $\frac{2}{3}$; alar. lin. 1.)

Body convex, black, shining here and there with blue or green: head and thorax finely squameous: head transverse, as broad as the thorax; front convex, not impressed: eyes of moderate size, not prominent: ocelli disposed in a triangle on the vertex: antennæ clavate, black, shorter than the thorax: thorax oval: prothorax transverse, short, narrower in front: scutum transverse; sutures of the parapsides indistinct; scutellum obconic: propodeon short, declining: po-

deon short: abdomen elliptical, smooth, shining, a little narrower but not longer than the thorax; metapodeon longer; octoon and following segments short: legs bluish green; tarsi white, their tips piceous: wings limpid; nervures fulvous; humerus not more than one-third of the length of the wing; ulna as long as the humerus; radius short; cubitus very short; stigma very small.

Found at Bombay. In the collection of the Rev. F. W. Hope.

It belongs to the section of *Entedon* which I have named *Pedio-bius*, comprising *E. Alaspharus*, *Eubius*, *Amyntas*, *Epigonus* and other species. See Monogr. Chalciditum, i. 109.

28. Scelio Acte, fem. *Niger, antennis nigris basi fulvis, pedibus fulvis, femoribus fusco fasciatis, alis limpidis.* (Corp. long. lin. 2.)

Body black, long: head and thorax convex, rugulose: head transverse, as broad as the thorax; vertex broad; front not impressed: eyes of moderate size, not prominent: antennæ black, subclavate, as long as the thorax, inserted near the mouth; first joint long, stout, fulvous; second joint fulvous, long-cyathiform; third long-cyathiform; fourth and following joints forming a fusiform club: thorax oval: prothorax very short: scutum of the mesothorax large; scutellum small: propodeon transverse, declining: podedon short: abdomen flat, fusiform, striated, rather narrower and much longer than the thorax: legs fulvous; coxæ black; a broad piceous band across each of the femora; joints of the tarsi from the first to the fourth successively decreasing in length; fifth joint as long as the fourth: wings limpid.

Found at Bombay. In the collection of the Rev. F. W. Hope.

XXVIII.—On the Development of *Starch and Chlorophylle Granules*. By CARL NÄGELI*.

IN the actual *punctum vegetationis* there is nothing but a homogeneous mucilage (protoplasma of Mohl). This becomes finely granular in the lower part; it is here that the deposition of the fibres occurs. If we examine the fluid of the cell from this part (the fibre zone) of a young leaf or stem, we find in it very small granules, the diameter of which does not exceed $\cdot 003$ of a line, and in these consequently nothing is to be made out. In the vicinity are cellules or utracles of from $\cdot 001$ to $\cdot 0025$ of a line; they are filled with a thin yellowish mucilage, which, in the smaller appears homogeneous, in the larger finely granular. Somewhat lower down (the starch zone) the formation of amyllum takes place; the young leaf there becomes of a shining white colour. The cell-

* From the memoir on *Caulerpa prolifera*, by Carl Nägeli. Zeitschrift für Wissenschaftliche Botanik, von M. J. Schleiden and Carl Nägeli, Erster Band, Erstes Heft, 1845, p. 149 *et seq.* Communicated by Arthur Henfrey, F.L.S. &c.

contents exhibit abundance of similar larger and smaller utricles. We find utricles also, which contain with the granular mucilage one or more small starch granules in process of development; further, some which inclose from one to three and, more rarely, four to six perfect starch granules. Near to these occur some free starch granules separate or adhering together, the number of which increases as we examine the contents of the starch zone further down, while the number of utricles diminishes.

The amyllum globules do not originate immediately in the cell-contents in *Caulerpa*, but in separate, small mucilage-cells. In the investigation of this subject we must bring the cell-fluid under the microscope, without adding water, as the contents of the utricles are altered by it. The previously equally distributed mucilage is precipitated from the membrane in the form of a continuous layer or of particularly large granules. The utricles undergo a similar alteration from the application of iodine. The mucilage becomes coloured by it yellow or yellowish brown; the membrane however, being from its situation free from the superincumbent contents, appears as an uncoloured line. The starch granules inside the utricle are perceptible on account of their blue colour. When these starch granules are perfectly formed the utricles are re-absorbed. Once, probably in consequence of pressure and the action of water, I saw an utricle burst and the starch granules escape from it. It is certain however that this is not the normal process, but the granules of amyllum become free as the utricles are gradually dissolved. The former now appear as single granules, if in the utricles they lay separately or several loosely aggregated. They remain adhering together in clusters of three or more, if they were crowded together.

The formation of chlorophylle takes place in the leaves, and indeed always, *after* the formation of amyllum. They seem to be produced in a similar manner to the latter. In each part of the leaf, which gradually becomes green, we find in the cell-contents, in addition to the starch granules (which originate earlier), utricles in which merely a greenish matter is to be perceived, others containing three or more green granules, lastly free chlorophylle granules separate or adhering in clusters of four to eight. Lower down in the leaf occur only free chlorophylle granules in company with the starch granules. As the parent-cells of the chlorophylle are only half the size of the starch, the investigation is very difficult, and conclusions are only possible from analogy, as particular conditions agree with those of starch-formation. I believe myself entitled however from this to assume that the chlorophylle granules in *Caulerpa* originate, several together, in separate mucilage-cells, which are afterwards absorbed.

Since nothing has been hitherto observed of the development of starch and chlorophylle, it is sufficient here merely to state the fact as authentic in the cells of *one* plant. I intend at a future period to publish some other facts on the development of these two elementary structures and their mutual relation, and wish that other microscopical inquirers would direct their attention to this point, for it is indeed only occasionally that one meets with useful facts.

The origination of caoutchouc appears first to take place where the amyllum and chlorophylle formation is completed. It is there that I first find the little granules in the cell-contents with certainty, and from there first it visibly coagulates in water.

XXIX.—*Botanical Notices from Spain.*

By MORITZ WILLKOMM*.

[Continued from p. 120.]

No. X. MALAGA, May 30th, 1845.

AFTER spending several days in the little town of San Roque, situated two leagues distant from Gibraltar, I proceeded along the coast towards Malaga, where I arrived on the 19th of April. The vegetation of the hilly country of San Roque is, in its principal features, perfectly similar to that of Algeciras. All the hills are thickly covered with *Calycotome villosa*, Lk., here and there alternating with large patches of *Lavandula Stæchas*, L. The high plains on the north and west of the town, which separate this hilly district from the valley of the Rio Guadarranque, are mostly covered with *Quercus humilis*, Lam., which is here very common, but appears seldom to flower; at least I have hardly obtained ten specimens in flower. On these high plains *Cistineæ* occur in abundance, especially *Cistus crispus*, L., *C. albidus*, L., *Helianthemum salicifolium*, P., *H. guttatum*, P., and others; further, *Ornithopus compressus*, L., *Ranunculus flabellatus*, Desf., *Uropetalum serotinum*, K., several *Orchideæ*, *Erodia*, &c. The most important botanical localities in the environs of S. Roque are—the oak-woods stretching out in a north and west direction and watered by the Guadarranque, the sandstone hills rising on the other side of that river, a branch of the Sierra de Gazales and Monte Almoráima, a sandstone mountain lying between the bay and the sea. In the rocky clefts of this mountain occur the pretty *Anthericum bicolor*, Desf., not unfrequent, besides numerous *Cistineæ*: as *C. albidus*, *crispus*, *populifolius*—upon the roots of which I observed here *Cytinus hypocistis*,—*Helianth. halimifolium*, and especially *H. Tuberaria*, P.; besides *Anemone palmata*, L., *Ranunculus flabellatus*, *Passerina villosa*, *Tulipa Celsiana*, and on moist localities on the broad coomb

* Translated from the Botanische Zeitung, Nov. 14, 1845.

extending from the Almoráima towards the north, the *Ranunculus hederaceus*, L., which is rare in Spain. In a fine copse lying east of the town I gathered *Serapius Lingua*, L., in great abundance; much rarer occurs among it the splendid *Serapius cordigera*, L., some specimens of which I also observed on the sandstone hills lying on the other side of the Guadarranque. I also met with *Drosophyllum lusitanicum*, Lk., a second time in company with the same *Helianthemum* with which I had before observed it in the mountains of Algeciras. The oak-woods of S. Roque were chiefly composed of *Qu. Suber*; only along the river stretches a broad strip of *Qu. lusitanica* β . *bætica*, mixed with *Fraxinus excelsior*. On the banks of the river grow *Nerium Oleander*, *Tamarix africana*, *Euphorbia palustris*, &c. in abundance, and the numerous ponds along the banks are filled with *Nasturtium officinale*, *Iris Pseudacorus* and a *Callitriche*. Further occur in these woods *Ruscus aculeatus*, L., *Anemone palmata*, L., *Ranunculus trilobus*, Desf., *Ficaria ranunculoides*, &c. I have in vain sought for *Salvia bætica*, Boiss., which is said to occur in these woods; probably it does not flower till summer. On clayey fallow land in the environs of S. Roque the *Convolvulus tricolor*, L., and *C. undulatus*, Cav., were already in blossom; among the young corn the flowers of *Gladiolus segetum*, Gawl., and *Papaver Rheas*, L., were pre-eminently splendid, and the thick hedges of *Pistacia Lentiscus* and *Coriaria myrtifolia*, both now in flower, were thickly interlaced with flowering *Smilax mauritanica* and *Bryonia dioica*. In the hilly land between S. Roque and the peninsula of Gibraltar, where occur *Anthyllis Vulneraria*, L., var. *rubriflora*, *Lupinus angustifolius*, L., several *Hedysara*, *Trixago apula*, Col., *Anchusa italica*, L., *Euphorbia retusa*, Cav., *Cerithe major*, L., &c. in abundance, more rarely *Picridium vulgare*, Desf., there are numerous ponds and bogs in which I met with an *Œnanthe*, together with *Alisma ranunculoides*, L., *Carices* and *Heleocharis palustris*.

As I have already several times remarked, the entire hilly and mountainous district in the province of Cadiz, with the exception of the high limestone mountain of Guazalema extending along its north-eastern limits, consists of sandstone. This formation suddenly ceases after passing the Rio Guadiaro, a large river which springs in the neighbourhood of the town of Ronda, forms the boundary between the provinces of Cadiz and Malaga, and empties itself into the sea at the eastern base of the Almoráima. On its left bank rise lofty limestone mountains, which belong to the wide-spreading Serrania de Ronda. This extensively branched and complicated mountainous district lies between the two rivers Guadiaro and Guadalhorce, which last separates it from the limestone mountains of Antequera and the hilly land of Malaga. The principal chain of the Serrania de Ronda is formed of the high mountains of Yunquera, composed of the older limestone and marble, whose highest summit, called Las Plazoletas, rises to a height of 8000 feet above the level of the Mediterranean. From this principal chain extends a series of craggy, abrupt limestone mountains northwards from 5000 to 6000 feet high, called

Sierra de la Nieve*, which is joined in a western direction by several parallel chains of less height, at whose western foot lies the town of Ronda. Toward the west the Sierra de Yunquera gradually descends to form a spacious high table-land, in which are several small villages, and the western limit of which is bounded by a mountain-chain stretching from the mountains of Ronda along the left bank of the Guadiaro as far as the sea—the Sierra de Gaucin. In a south-eastern direction a mountain-chain proceeds from the high mountains of Yunquera, constituting the Sierra de Tolox and Montes de Pereyla, and terminates on the dolomite mountains of the Sierra de Mijas, nearly 6000 feet high, which extends to the sea and the mouth of the Guadalhorce. Between these dolomite mountains and the mouth of the Guadiaro runs a chain of mountains along the coast of considerable height, forming the southern boundary of the central high plains and the whole Serrania, and whose different parts take, from the valleys of several coast rivers, the names of Sierra de Estepona, Sierra de Marbella and Sierra de Bermeja†. Along this mountain-chain the coast forms a strip of from one to four miles in width, which, as far as the country of the town of Marbella, is comparatively level and covered for the most part with shrubs of various *Cistineæ*, pistachios and dwarf palms; from Marbella onwards, on the contrary, where the mountain recedes further from the coast, this plain passes over into a gradually ascending hilly land.

A number of leguminous plants of the genera *Trifolium*, *Medicago*, *Lotus*, *Lathyrus*, *Astragalus*, *Vicia*, *Hippocrepis*, *Ornithopus*, &c., in company with various *Plantagines*, *Cistineæ*, *Silene* and grasses, were now in flower along the coast in great profusion. In marshy spots on the Guadiaro I found *Ranunculus trilobus*, Desf., plentiful, and on dry grass-plots along the river, *Lithospermum apulum*, Vahl. Along the coast occurred *Erythræa maritima*, P., *Stachys hirta*, L., and on isolated spots the small and tender *Lotus parviflorus*, Desf. Under the bushes, from Estepona onwards, *Genista hirsuta*, Vahl., grows plentifully, and on the hills of Marbella *G. umbellata*, L. In the drift-sand of the coast occur *Medicago marina* and *littoralis*, a small Umbellate, *Plantago Coronopus*, L., various grasses, and between Marbella and Fuengirola a beautiful *Senecio*. On the firmer sand-hills blossomed the beautiful *Statice sinuata*, L., in plenty. In the sunny clefts of limestone rocks around Estepona I found *Lotus edulis*, L., with *Asteriscus maritimus*, Mönch., and *Valeriana Calcitrapa*, L., which is also very common on the thatched roofs in Estepona.

* Boissier in his Voyage confounds the Sierra de Yunquera with the S. de la Nieve, and comprises both chains under the name of Sierra de la Nieve. The inhabitants of the Serrania however distinguish exclusively the lower mountain chain lying to the north of Yunquera by this name.

† The Sierra de Estepona bears also, among the people, the name of Sierra Bermeja, and Boissier, in his Voyage, understands constantly the Sierra de Estepona under the last name. But as he sometimes indicates this chain also by its true name Sierra de Estepona, I think the Sierra Bermeja of Boissier so rich in plants is that indicated by this name on all maps, lying west of the Sierra de Mijas, and saw subsequently, to my great disappointment, that I had been deceived.

The corn-fields were surrounded with *Chrysanthemum coronarium* and *segetum*, L., *Anacyclus clavatus*, P., *A. radiatus*, Lois., and other *Anthemideæ*. Under the bushes, between Estepona and Marbella, as well as in the hilly land lying further eastward, occurs, though rather rarely, the beautiful *Lupinus hirsutus*, L., with *Medicago orbicularis*, L. Lastly appear in the above-mentioned hilly land, *Malva hispanica*, L., *Bupthalmum aquaticum*, L., *Linum strictum*, L., *Lin. narbonneuse*, L., *Lathyrus purpureus*, Desf., *Tolpis barbata*, Gärtn., a number of *Cistineæ*, and on moist spots, not rarely, the pretty *Imperata*, as well as, under shady bushes by rivulets, *Arum italicum*, L. In the country distant a mile from the south-western foot of the Sierra de Mijas, close to the village of Fuengirola, lying on the shore, the mountain recedes fully ten miles from the coast, so as to form an abrupt angle with the Sierra de Mijas stretching from north-east to south-west. The rugged Sierra Bermeja forms the western bend of this angle, whose highest points may rise about 5000 feet, and which I visited on the 18th of April from Fuengirola. The whole space between the coast, the Sierra Bermeja and Sierra de Mijas, includes a variously intersected hilly land, watered by the Rio Gomenaro, which separates these two mountain-chains, and is almost wholly covered by a dense Monte-bajo often taller than a man, consisting principally of *Helianthemum glutinosum*? P. On the hills close to the foot of the Sierra Bermeja occurs, very rare, *Cistus ladaniferus*, which was just beginning to unfold its large white blossoms, and appeared to be not frequent in the country along the coast, whilst, for instance, it almost wholly covers the Sierra Morena. I also found here and there *Adenocarpus Telonensis*, Gay., in flower. On the rugged walls of rock facing the north and east of the Sierra Bermeja, covered nearly to its top with shrubs, the splendid *Helianthemum atriplicifolium*, W., began to blossom; I likewise gathered *Senecio Doronicum*, L., var. *lanatus*, Koch. The *Echium flavum*, Desf., occurred but very rarely, and in the clefts of rock *Ranunculus gramineus*, L., var. *luzulaefolius*, Boiss.; somewhat more frequent on the rocks of the summit, *Valeriana tuberosa*, DC., and the pretty *Saxifraga gemmulosa*, Boiss. Lastly, I found at several hundred feet below the highest summit on the south side a splendid *Stipa*, and in shady clefts of the rock at the foot of the mountain the delicate *Arenaria retusa*, Boiss. The northern declivity of the chain is for the most part wooded with cork-oaks.

On the following day my way led me through the lowest and most southern part of the Sierra de Mijas, as this mountain-chain between Fuengirola and Torremolinos stretches to the sea, and in part descends abruptly in rocks into the sea. In corn-fields around Fuengirola I for the first time observed *Vicia vestita*, Boiss., which occurs very plentifully in the environs of Malaga. On the rocky high table-land between Torremolinos and Chuniãna blossomed *Cladanthus proliferus*, DC., in company with *Anacyclus clavatus*, P., *Galactites tomentosa*, Mnch., and *Phlomis purpurea*, L., in great abundance. The last is one of the commonest plants of the warm region in Andalusia.

Before speaking of the environs of Malaga, I will endeavour briefly to describe the rich and interesting vegetation of the lofty mountains of Yunquera, which I had an opportunity of investigating during a sojourn of several days at the end of April. The little town of Yunquera lies in an almost circular expanse, surrounded by one of the branches of the Serrania, close to the foot of the steep mountain of the same name. From the mountains of Ronda a branch runs in a north-eastern direction as far as the Guadalhorce, which bounds the wide valley of Yunquera north and east, and forms between this place and the river two parallel chains of 5000 to 6000 feet high, bearing the names of Sierra Blanquilla and Sierra Prieta. Both these chains consist of limestone, and are remarkable for their sterility and nakedness. In one of the valleys running in a southern direction lies the village of Alozáina, through which the road leads from Malaga to Yunquera, and is separated from the Guadalhorce by an undulating hilly land. In these hills I observed large tracts wholly overgrown by *Convolvulus tricolor*, L., *C. undulatus*, Cav., and *Lavatera trimestris*, L.; on dry stones, plots of grass, and under shrubs in sunny spots blossomed *Cleonia lusitanica*, L., *Salvia viridis*, L., *Teucrium pseudo-chamæpitys*, L., *Asperula hirsuta*, Desf., *Micromeria græca*, Bth., *β. latifolia*, Boiss.; in corn-fields *Ornithogalum narbonneuse*, L., and a *Phalaris*; and by the road-side *Galactites tomentosa*, *Ormenis mixta*, DC., *Micropus supinus*, L., *Plantago Serraria*, L., *P. albicans*, L., &c. Upon walls and rocks at Alozáina the pretty blue-flowered *Umbilicus hispidus*, DC., is very common, as also on the rocks in the valleys of the Sierra Prieta, which the road crosses. In shady places we meet with isolated specimens of *Sarothamnus affinis*, Boiss. (*Cytisus affinis*, Brot.). Near Yunquera is a rocky eminence, upon which stands an old watch-tower, one of the few habitats of the rare *Digitalis laciniata*, Lindl., which unfortunately was not yet in flower. Here, and throughout all the rocky district of Yunquera, the pretty large-blossomed *Erodium guttatum*, W., is found plentifully. In the same undeveloped state as *Digitalis laciniata* I met with two of Boissier's choice plants, namely *Linaria Clementei* and *Salvia Candelabrum*, which occur at the foot and in the lowest part of the Sierra, and whose stems were just beginning to shoot.

The first excursion which I made from Yunquera led me into the lowest parts of the mountain, toward the *nacimiento* of the Rio Grande. By this is understood the issuing forth of an entire river directly from a cavern in the rock,—the only rivulet of any importance in the whole mountain-chain of Yunquera, which is unusually destitute of water. Through a rocky side-valley, watered by the stream on which the little town stands, we enter on the romantic Barranco del Nacimiento, hemmed in on all sides by picturesque rocks, in the depths of which the water of the Rio Grande, constantly interrupted in its course by immense blocks of marble, apparently loses itself in milk-white foam. At the mouth of the rivulet of Yunquera is a spinning-manufactory belonging to the apothecary of the town, and this spot is the only locality for the rare *Scrophularia*

crithmifolia, Boiss., growing at the foot of the shady rock, which is kept perpetually moist by the spray from the foaming river, and of which plant I have only found a single specimen. On the same rock grows *Campanula Erinus*, L., in abundance, common on all rocks in the lower part of the mountain, as well as in the environs of Malaga; and at the foot occurred, frequent, *Scrophularia auriculata*, L., and various umbelliferous plants not yet in blossom.

From hence I started for the Nacimiento, accompanied by the apothecary and the physician of the town, both friends of M. Prologo, and from whom I experienced the most hospitable reception. The path winds along the left side of the valley, one while over declivities of boulders, at another on the edge of giddy precipices. Here, upon sunny masses of rock, grows the charming *Linaria satyroides*, Boiss., frequent, together with *Polygala saxatilis*, Desf. (*P. juniperina*, Cav.), *Echium albicans*, Lag., and the beautiful *Reseda undata*, L., a magnificent plant of two to three feet high, with close compact heads of large white flowers with purple anthers, which were unfortunately afterwards lost by accident, as well as some branches of the splendid *Lavatera arborea*, a large shrub of which I remarked in full blossom on a perpendicular, inaccessible wall of rock. In sunny clefts of the rock blossomed the shrubby *Anthyllis podocephala*, Boiss., a beautiful species with golden flowers, also *Micromeria græca*, Bth., *Lavandula multifida*, L., and other rock-plants. Higher up a perpendicular and lofty wall of rock, over which a little rivulet precipitates itself, stretches obliquely across the valley, and closes it abruptly; to the left of this rivulet, and on the right side of the valley, lies the Nacimiento of the Rio Grande. This is a spacious dark rocky cavern, the bottom of which is formed of a large basin of crystal water, from which the stream issues. The entrance of the cavern is overshadowed by old wild fig-trees, in whose shade grow *Orleya grandiflora*, Hoffm., *Scrophularia auriculata*, L., *Geranium Robertianum*, &c.

The next day I made an excursion to the Convento de las Nieves, a lonely convent situated at the foot of the Sierra de la Nieve, which rises in grotesque forms, some leagues to the north of Yunquera. It lies on the acclivity of a tolerably broad valley, filled with thick copse-wood, which passes over higher up into a deep rocky barranco. In the neighbourhood of the convent I found, upon dry grass plots, *Linaria tristis*, Mill., and the pretty *Trixago latifolia*, Rchb. The wood consists mostly of *Quercus Suber*, *Qu. Ilex*, *Qu. lusitanica* and *faginea* (*Qu. faginea*, Lamk., *Qu. valentina*, Cav.), which were just in full blossom; and below, *Qu. pseudo-coccifera*, Desf., *Qu. coccifera*, L., and *Qu. Mesto*, Boiss., a pretty shrubby oak with round thorny denticulated leaves, which was unfortunately not in flower. In this wood I gathered a *Coronilla* (♂), *Cephalanthera ensifolia*, Rich., *Orchis longicrucis*, Lk., *Scilla campanulata*, Ait. (*Hyacinthus cernuus*, Brot.), *Helleborus foetidus*, L., common throughout the whole Serrania, which was here already out of flower, whilst in the alpine regions of the Sierra de Yunquera it had scarcely begun to flower. From hence I ascended to the Pico Jarro, one of the highest rocky summits

of the Sierra de la Nieve, which has a number of interesting plants. From a third of the way up was seen the pretty *Senecio minutus*, DC. (*Cineraria*, Cav.), in great abundance; higher up in the rock-clefts *Narcissus Jonquilla*, L., and the beautiful *Ranunculus blepharicarpus*, Boiss., as well as a very minute *Saxifraga* and *S. granulata* L. aff.; and on dry grass-plots on the summit *Arabis auriculata*, Lam., *A. verna*, R. Br., *Draba verna*, L., *Lepidium petræum*, L., *Sisymbrium rigidulum*, Lag., *Erysimum canescens*, Rth., various grasses, &c. From hence I returned to Yunquera, crossing many ridges and valleys of the mountain-chain, on whose steep rocky walls grows the pretty *Galium pulvinatum*, Boiss., in thick beds, which however was not yet in flower; I gathered also on the way a very narrow-leaved form of *Pinus halepensis*, Mill., in fruit and flower, which is frequent throughout the whole Serrania.

The two following days I devoted to a visit to the high mountain-chain of Yunquera. Accompanied by an experienced guide, I left Yunquera on the morning of the 27th of April, and soon entered the Barranco Bacamon, a narrow rocky valley, through which the mule-path ascends to the upper parts of the mountains, and where, amongst other rare plants, *Linaria tristis* occurs, but is very rare. The whole Sierra, as well as probably a great part of the entire Serrania, was formerly thickly covered with forests of *Abies Pinsapo*, Boiss. But these have been so destroyed that trees of this pine are now almost exclusively met with only in the higher mountain and alpine regions. At a height of about 3000 feet the acclivities of the valleys are seen covered with low pinsapo bushes. I remarked everywhere in plenty, *Scilla campanulata*, Ait., *Echium albicans*, Lag., various *Helianthema*, &c. After ascending for some hours we came to a wide, cauldron-shaped valley, open toward the east, called El Caucón, whose borders reached up to the alpine region. In the clefts of the rocks *Saxifraga biternata*, Boiss., occurs in luxuriant beds, a species diffused over the whole of the upper portion of the mountain, also *S. granulata* L. aff., and upon moist boulders *Veronica præcox*, All., *Cardamine hirsuta*, L., *Arabis verna*, *A. auriculata*, *Viola tricolor*, var. *arvensis*, and *V. Demetria*, Prol., first found here by Prolongo, a pretty little species with yellow flowers, which is met with in abundance throughout the whole of the alpine region of this chain. The south border of the Caucón terminates at its east end in an immense piled-up mass of rock, called Tajo de la Cáina, which is somewhat dangerous to explore: This rock is the only habitat at present known of *Centaurea Clementei*, Boiss.; it was just beginning to unfold its leaves, which are on both sides thickly covered with dazzling white wool. Between this rock, the Caucón and a second more eastern valley called Cañada la Perra, is a broad rocky ridge, on which, among other plants, occur in plenty *Taraxacum obovatum*, DC., *T. levigatum*, DC., *Gagea polymorpha*, Boiss., *Narcissus Jonquilla*, L., and the pretty and very viscous *Saxifraga Arundana*, Boiss. In the upper parts of the Cañada la Perra commence the trees of *Abies Pinsapo*, which were densely hung with red male cones, and also *Quercus alpestris*, Boiss., which however were now entirely leaf-

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less, quite in a wintery dress. Under these trees blossomed *Helleborus fatidus*, L., and *Daphne Laureola*, L., in great numbers.

From this valley we came to the highest ridges of the chain, which are broad, partly quite naked, and in parts covered with *Ptilotrichum spinosum*, Boiss., *Arenaria tetraquetra*, L., *Anthyllis Erinacea*, L., *Genista aspalathoides*, DC., *Juniperus phænicea*, L., and other alpine shrubs, all as yet without blossoms. In clefts of the Peñon de los Enamorados, an isolated rock, I found for the first time the pretty gold-flowered *Draba hispanica*, Boiss., which occurs plentifully on all the summits of this chain, and does not descend lower than 6000 feet. The upper ridges of the chain were still in part covered with snow. At a depressed spot, which derives the name of Hoya del Tejo from a large tree of *Taxus baccata*, L., I met with some few specimens of *Bulbocodium vernum*, L., in flower, near the edge of the melting snow in places thoroughly saturated with the snow water. Towards five o'clock in the afternoon we came to a basin of water, lying among limestone rocks and surrounded by very old pinsapos and alpine oaks, called El Pilar de Tolox, where we resolved to spend the night. Whilst my companions were engaged in preparing for our bivouac, I ascended alone the highest summit of the mountain Las Plazoletas, at whose northern foot lies the Pilar de Tolox at a height of about 7000 feet. There were few flowers, except *Viola Demetria*, *Lithospermum incrassatum*, Guss., and *Draba hispanica* on this giant mountain, the only locality of the *Pyrethrum Arundanum*, Boiss., which blossoms in August, and was discovered here by Prolongo. After a night passed merrily by the light of a large watch-fire, we started the following morning through a valley filled with beautiful pinsapo-woods, towards the Loma de la Alcazaba, a lofty mountain-ridge, which forms the eastern boundary of the above-mentioned central high table-lands, and on which grow *Taraxacum obovatum*, *T. lævigatum*, *Lithospermum incrassatum*, *Narcissus Jonquilla*, *Gagea polymorpha*, *Draba hispanica*, *Veronica præcox*, *Lamium amplexicaule* var. *inapertum*, Boiss., *Androsace maxima*, L., *Viola arvensis*, *V. Demetria*, and a small yellow *Alyssum* in profusion; and, less frequent, *Thlaspi Prolongi*, Boiss., *Viola parvula*, Guss., and a small very white woolly alpine form of *Cynoglossum cheirifolium*, L.; and thence over the Cerro de los Pilones, overgrown with *Salvia officinalis*, towards the Puerto de las tres Cruces, where I found *Bulbocodium vernum* for the second time, on the edge of the melting snow. From this pass we descended to the Hoya de la Caridad, a hollow surrounded by limestone rocks, in the clefts of which *Thlaspi Prolongi* occurred in tolerable plenty; and from hence through a valley filled with luxuriant pinsapos, towards an immense mass of rocks, called Tajo de Pedro Muñoz, in the vicinity of which I found on the boggy meadow land *Narcissus pseudo-narcissus*, L., in great plenty. From this point we returned to Yunquera, traversing a lofty mountain-pass, through a narrow rocky valley, which bears the name of Las Angusturas de los Corales, where *Viola Demetria* and *Draba verna* occur plentifully, and *Lepidium heterophyllum*, Bth., rarely.

The environs of Malaga present at this season of the year a very

rich vegetation, the chief part of which however belongs to the general Mediterranean flora. A number of leguminous plants, *Cichoraceæ*, *Anthemideæ*, *Plantagineæ*, *Malvaceæ*, *Caryophylleæ* and grasses abound along the road-side and edges of the fields. Among the corn there were in flower *Papaver Rhæas*, *P. dubium*, *Ornithogalum narbonense*, *Vicia vestita*, Boiss., and many other species of *Vicia* and *Lathyrus*, various *Allia*, *Fumaria*, *Convolvulus arvensis*, *Carduncellus cæruleus*, L., several *Centaureæ* and *Silene*, *Galium tricorne*, With., *Torilis neglecta*, Schult., *T. nodosa*, Gärtn., *Rhagadiolus stellatus*, Tournef., *Biscutella auriculata*, L., *Caucalis leptophylla*, L., *Medicago turbinata*, W., *M. Sphærocarpa*, Bertol., *M. tribuloides*, Lam., and grasses of the genera *Phalaris*, *Lolium*, *Festuca*, *Agrostis*, &c.—In hedges and on walls, *Spartium junceum*, *Acanthus mollis*, L., *Elæagnus angustifolius*, L., *Sinapis virgata*, Cav., *Phagnalon Lagascæ*, DC., *Umbilicus erectus*, DC., *Asperula hirsuta*, Desf., *Bryonia dioica*, L., *Urtica membranacea*, Poir., various *Cardui*, *Silybum Marianum*, *Notobasis syriaca*, Cass., *Onopordon illyricum*, L., *Carrichtera Vellæ*, DC., and others. In sandy places on the shore and dried sandy beds of streams, there were in flower various species of *Andryala*, *Medicago littoralis*, Rohde, *Alsine marina*, Mch., *Stipa tortilis*, Desf., *Malcolmia tricuspidata*, R. Br., *Astragalus pentaglottis*, L., *Erodia*, *Silene*, grasses and the like; on the numerous vine-hills, *Fumaria parviflora*, L., *Ononis spinosa*, L., *Valantia hispida*, L., *Orobanche minor*, L., *Crucianella angustifolia*, L., *Rumex scutatus*, L., *R. Acetosella*, L., *R. bucephalophorus*, L.; upon fallow land, *Verbena supina*, Clus., *Anethum segetum*, L.; upon heaps of rubbish, *Echium violaceum*, L., *E. plantagineum*, L., *E. pustulatum*, Sibth.; in ditches and wet places, *Lythrum flexuosum*, Lag., *Briza virens*, L., &c. It would carry me too far to describe the vegetation of Malaga in all its varieties according to the nature of the ground; I will therefore content myself with mentioning here three localities, namely, the sandy and waste plain known by the name of the Dehesilla, which lies between the city and the Guadalhorce,—the hilly land encompassing the Vega of Malaga in the north and east, and stretching far to the coast eastwards,—and the Cerro San Anton, a lofty limestone mountain projecting above this hilly land, and about 1500 feet high.

Large portions of the Dehesilla, which I have many times visited, sometimes alone, sometimes in company with my friend Prolongo, are covered with *Ononis Natrix*, L., *O. ramosissima*, Desf., and *Euphorbia Paralias*, L. On marshy places and around ponds grow *Juncus acutus* and other species of this genus, as well as *Carices*, *Scirpus maritimus*, L., and among them *Chlora lanceolata*, Koch, and *Samolus Valerandi*; in the drift-sand, *Lotus aurantiacus*, Boiss., in great plenty, also *Erodium hirtum*, W., *Festuca phleoides*, Desf., and other grasses, *Anchusa calcarea*, Boiss., β . *aspera*, *Centaurea sphærocephala*? L., and *Thesium humile*, Vahl., rare. In the much-intersected hilly land, consisting chiefly of limestone debris and breccia, the greater portion of which is covered with vines, occur *Trifolium stellatum*, L., *T. striatum*, L., *T. angustifolium*, L., &c., *Medicagines*, *Filago gallica*, L., *F. germanica*, L., *Phagnalon saxatile*, DC., *Micropus*

erectus, L., *Evax pygmæus*, L., *Ervum Ervilia*, L., *Asperula hirsuta*, Desf., *Cachrys pterochlæna*? DC., a small form of *Scabiosa stellata*, L., *Velezia rigida*, L., *Atractylis cancellata*, L., *Silenes*, leguminous plants, grasses, &c. On the vine-hills, near the convent of Los Angeles, lying half a mile to the north of Malaga, occurs the beautiful *Cleome violacea*, L., but not frequent; and on the neighbouring hills grow, in addition to the above-mentioned plants, *Cynara horrida*, DC., *Podospermum calcitrapæfolium*, DC., *Scorzonera hispanica*, L., *Chlora lanceolata*, Koch, *Linum strictum*, L., *L. tenue*, L., *Paronychia argentea* and *nivea*, *Gnaphalium luteo-album*, L., *Andropogon hirtus*, L., *Ononis picta*, Desf., and others; in fields in the neighbourhood of the same convent, *Scorzonera macrocephala*, DC., and *Phalaris nodosa*, L.; and in clefts in the limestone rocks of the Cerro Coronado, lying east of the convent, as well as on the rocks around the hermitages (Las Hermitas) lying to the west, *Campanula mollis*, L., *C. Erinus*, L., *Elæoselinum Lagasæ*, Boiss., which was just beginning to unfold its umbels, *Alyssum campestre*, L., *Umbilicus hispidus*, DC., *Nigella damascene*, L., var. *minor*, and various grasses. On the northern acclivity of the lofty, steep and sterile hills, among which the Rio Guadalmedina, flowing through Malaga, winds, occur in plenty *Coronilla juncea*, L., *Lysimachia linum-stellatum*, L., *Convolvulus mænanthus*? Lk., a small *Stachys*, *Linum fruticosum*, L., and other mountain plants, and among them *Orchis papilionacea*, L., which had already ceased flowering at the beginning of this month; on the southern acclivity I gathered here the pretty *Leobordea lupinifolia*, Boiss.

The Cerro S. Anton, which I visited twice, is a steep limestone mountain, divided into two cones; it lies one league east of Malaga and a mile from the coast. On the way thither are found in the hedges gigantic tree-like shrubs of *Ricinus communis*, L., also *Kentrophyllum arborescens*, Hk., and here and there *Physalis somnifera*, L. Close to Malaga, on barren rocky acclivities below the castle of Gibralfaro, grows *Echinops Rufio*, L., and near the English churchyard the rare *Statice ægyptiaca*, L. On the south-west acclivity of the S. Anton grow various species of *Ononis*, and on their roots here and there the splendid black-red *Orobanche fætida*, Desf. On the western summit occur very rare *Ervum Lenticula*, Schreb., and *Minuartia montana*, Löffl. The eastern summit is somewhat higher, but has the same vegetation as the western, which descends toward the west in escarped rocks, in the clefts of which grow *Elæoselinum Lagasæ*, Boiss., *Rhamnus pumilus*, L., *Lavatera maritima*, Gon., and *Silene velutina*, Pour. At the foot of these rocks, under low bushes of *Chamærops humilis*, is found the rare *Fumaria macrosepala*, Boiss., the only locality hitherto known for this remarkable species.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL INSTITUTION.

Feb. 6, 1846.—Prof. Owen “On the Geographical Distribution of Extinct Mammalia.”

The Professor announced his purpose to develop the law or principle on which mammals are, and have been, distributed over the surface of this planet. [A mammal was described as being characterized by a hairy skin, quick respiration, and, therefore, a temperature usually higher than that of the surrounding atmosphere, and by bringing forth living young.] He stated that recent researches had led him to defined views on the following subjects:—1. *Comparative development as between mammals of the Old and New World.* 2. *Peculiarities of mammalian distribution in Australia and the neighbouring islands.* 3. *Probable final causes of several instances of this development.* 4. *Inquiry whether the extinct species of mammals were localized like the present races.*

Thus,—1. *On the comparative mammalian development in the New and Old World of geographers.* The Professor stated, that in the Old World mammals reached their highest type. Among other illustrations of this truth, he contrasted the lion and royal tiger of Asia and Africa with the puma and jaguar of America; the large and useful camel with the feeble vicugna. The most remarkable of the herbivorous and pachydermatous animals, as the giraffe and the antelope in the former class, and the elephant, rhinoceros, hippopotamus, babroussa, horse, djiggitas, zebra in the latter, are peculiar to the Old World. With respect to the rodent animals, water-rats, hares, rabbits, tailless hares, are only found in the Old World. The beaver is, indeed, represented by an American species, but this is distinct from the beaver of the Danube. The monkeys of the Old World are equally distinguishable from those of the New. In the latter we find the prehensile tail, the wide and approximated nostrils, and the absence of an opposable thumb on the hand.

Prof. Owen proceeded, 2ndly, to *notice the peculiarities of mammalian distribution in Australia and the neighbouring islands.*—In this tract of the globe all the animals are distinguished by two remarkable peculiarities, one positive and the other negative: (a) all are organized to carry about their young, from a very early period of embryonic life, in a portable pouch; and (b) none have attained a high degree of development. The largest marsupial carnivora are the *Thylacinus* and *Dasyurus*, which are respectively of the size of the dog and the wild cat.

3. *Probable final causes of several instances of this development* were then adverted to. Thus, the marsupial inhabits a country liable to long-continued drought, and where the indigenous animals are consequently compelled to make long journeys in search of water; were it not for the arrangement enabling the marsupial to carry its young with ease from one place to another, the races would probably become soon extinct. The prehensile tail of the American marsupial, as well as of the porcupine, kinkajous, ant-eaters, and monkeys of the New World, have reference to their arboreal life in the huge

forests in which these creatures live. Then, to prevent mischievous effects from the decomposition of vegetable matter in countries where it is so luxuriant, decaying plants furnish food to *Termites* and other insects, which, in their turn, support a peculiar genus of quadrupeds, the *Myrmecophaga* (or ant-eaters). In closing this part of his subject, the Professor noticed the armour-like, osseous skin of the armadillos, which live at the foot of trees, and are, therefore, extremely liable to blows from falling boughs, &c.

In other parts of the world, where vegetation is abundant, the quadrupeds related with it are generically distinct from those of South America. This adaptation of species to locality having impressed itself strongly on his mind in regard to the present globe, the Professor stated, that he early applied himself to inquire whether—
 4. *The extinct species of mammals were localized like the present races.*—For this purpose he formed a full and correct catalogue of the fossil remains of mammals in our island. He then gave a rapid sketch of the successive races of the extinct mammals, as they have been traced by the fossils in the ascending series of strata in England and Scotland. The first examples of this class are found in the limestone slate of Stonesfield, at the base of the middle oolite. These fossils were remains of small insectivorous, and probably marsupial, quadrupeds, associated with remains of beetles, vegetable fossils, shells, and fishes allied to the *Cestracion*. These recall many of the characteristic features of actual organic life in Australia. During the long period which followed the formation of the Stonesfield slate, and which has permitted the subsequent, successive, and gradual accumulation of enormous masses of sedimentary rocks, viz. great oolite, cornbrash, forest marble, Oxford clay, calcareous grit, coral rags, Kimmeridge clay, Portland stone, Wealden, gault, greensand, chalk, no trace of a mammalian fossil has been found. In England we first obtain evidence of that class of animals in the debris of some continent, poured out by vast rivers upon the surface of the chalk, forming masses 1000 feet in depth—the Plastic and London clays. Here are remains of great *Tapiroids*, as *Lophiodon* and *Coryphodon*, and smaller pachyderms, like peccaries—*Hyracotherium*. Here, with boa constrictors, are turtles, sharks, fossil palms, and other forms of tropical vegetation. At the same period there were alternating freshwater and marine deposits in continental Europe, filling up a vast excavation of chalk, called the Paris basin, and forming the foundations on which that city is built, analogous to the clays on which London stands. Here Cuvier first discovered and described the *Anoplotherium*, *Palæotherium* and *Charopotamus*.

The Professor then briefly noticed the existence of similar calcareous freshwater and marine deposits in the Isle of Wight, and adverted to the discoveries of Mr. Allen and Mr. Pratt. It was, however, remarked, that little is gained by comparison of eocene and existing mammals, excepting so far as these indicate a great change in the distribution of earth and sea, and an accompanying alteration of climate. With the last layer of eocene deposits, we lose in England every trace of the peculiar mammals of that period. A vast series of geological operations took place, from which the miocene

strata resulted, before this country was again in a condition to sustain other mammalian races. Of these intermediate operations, and of the contemporary mammals, we have only the evidence of continental geology. We have in this country traces of one species of mastodon, found in the miocene crag-deposits of Norfolk. In process of time, when this island had become the seat of freshwater lakes, in which molluscous shells were deposited, and during the changes which converted lakes into river-courses, there were in these deposits and in contemporaneous local drifts, remains of mammalian fauna: the mastodon had disappeared; but, of the *Ungulata* were traces of mammoth, rhinoceros, hippopotamus, urus, bison, bos, *Megaceros*, *Strongyloceros*, *Hippelephas*, reindeer, roe, horse, ass, wild boar;—of the *Carnivora*: lion or tiger, *Machairodus*, leopard and cat—hyæna, bears, wolves and foxes, badger, otter, polecat, weasel;—of the *Insectivora*: bats, moles and shrews, *Palæospalax* (large shrew mole, now extinct);—of *Rodentia*: beavers, hares, rats and mice, *Trogotherium*, extinct);—of *Cetacea*: cachelot, narwhal, grampus, whales.

The Professor then demonstrated, by the following proofs, that these remains had not been brought hither by any sudden and transient convulsion, but were relics of animals which had lived and died in this island in successive generations. 1. Vast numbers are found in tranquil freshwater strata. 2. The condition of the bones is not as if they had been triturated by the violence of waves, but their processes are perfect, and their outlines sharp and well-defined. 3. The great proportion of antlers proved to have been naturally shed, and these of different stages of growth, to the fossil bones of the deer, proves, beyond question, that generations of this animal must have passed their existence here. 4. The *Coprolites*, and other phænomena of Kirkdale Cavern, described by Dr. Buckland. Anticipating the question—how so many races of quadrupeds, now extinct, could have found their way hither—Prof. Owen gave a brief outline of the geological and zoological evidence, that England once formed a part of the continent from whence they came. The British Channel is, geologically speaking, of recent formation. At the time when England became an island, it is probable that the *mammoth*, rhinoceros, hippopotamus, &c. became extinct. This, though at a geologically recent period, was long before any historical records existed.

Prof. Owen adverted then to Dumarest's arguments in confirmation of this opinion, derived from the specific identity of the wolf and the bear of France, with the same animals historically known to have once infested our island; and he maintained that the races of some of our most familiar animals were coeval with the *mammoth*: two species of bats, mole, badger, otter, fox, wild cat, mouse, hare, horse, red deer, roe; and, on the continent, the reindeer, beaver, wolf, *Lagomys*; the aurochs of Russia, identical with an animal of the same kind in England. In the New World the same correspondence is singularly illustrated by the coincidence of the peculiarly zygomatic process and the dentition of the megatherium with that of the still living sloth. The *Armadillo* of South America is also similar to the high fossil *Glyptodon*. North America had its peculiar species of

mastodon; but, being connected with South America at its apex, and with Asia, by frozen seas, at its base, in accordance with this geographical condition, it was found that the mammoth of the Old World had migrated from the north, and the megatherium from the south, and that both had met in middle temperate regions of that continent. The fossil mammals of the newer tertiary period of Australia belong to the marsupial genera of *Kangaroo*, *Phalanger*, *Dasyurus*, wombat, &c., peculiar to the same country at the present day, but represented by species as big as the rhinoceros. A more remarkable example of the concordance of the existing and last extinct races of warm-blooded animals was afforded by the small peculiar and wingless bird (*Apteryx*) of New Zealand, and the extinct gigantic birds (*Dinornis*) from the superficial deposits of the same island. No remains of fossil quadrupeds have yet been found in New Zealand; and this country possessed no marsupial or other species of aboriginal quadruped when discovered by Captain Cook. From these and similar facts, the Professor drew the conclusion, that *the same peculiar forms of mammal quadrupeds and terrestrial birds were restricted to the same natural provinces at the later tertiary period as at the present day.* And as a corollary, *that the same general disposition of the larger bodies of land and sea then prevailed as at this time.* On the other hand, in carrying back the comparison of recent and extinct quadrupeds to the earlier tertiary period, indications were obtained of extensive changes in the relative position of land and sea, and, consequently, of climate; and that the deeper we penetrate the earth, or, in other words, the further we travel in *time* for the recovery of extinct mammals, the further we must travel in *space* to find their existing analogue. The *Tapir* of Sumatra or South America is the nearest living analogue of the eocene *Lophiodon*;—and the marsupial insectivores of Australia have, of all known animals, the nearest resemblance to the fossil *Phascolotherium* of our English oolites.—*Athenæum.*

ZOOLOGICAL SOCIETY.

Oct. 14, 1845.—William Yarrell, Esq., Vice-President, in the Chair.

“On the size of the Red Corpuscles of the Blood in the Vertebrata, with copious Tables of Measurements.” By George Gulliver, Esq., F.R.S.

The following Tables contain a synopsis of my former observations, corrected when necessary and extended by many more since made and now first published. They include altogether no less than 485 species, here systematically arranged, so as to exhibit a summary, and yet more complete view than any yet extant, of the size of the blood-corpuscles in the different subdivisions of vertebrate animals. In this respect I hope the Tables may be useful, as well as for reference in connection with physiological questions now often arising. I have introduced no measurement not made by myself. The observations on the form and size of the corpuscles, unless otherwise expressed, refer to the majority of them as existing in any portion of the blood of the adult animal spoken of; for there may be a few differing greatly from the average. In the blood-corpuscles of

the Oviparous Vertebrata, for example, there are often many gradations of form, from the well-marked and prevailing ellipse, to the longer or shorter oval or even circular figure; and in any mammal some of the corpuscles are a third larger and some a third smaller than the mean size.

MAMMALIA.

Various sizes of the corpuscles.—The corpuscles of the Elephant are the largest yet known; then follow those of the Sloth and of the Whale. The Napu Musk Deer has the most minute corpuscles; those of the Stanley Musk Deer are nearly as small; those of the Ibex of Candia are larger; and the next increase of size is in those of the Goat. Before my observations, the corpuscles of the last-named animal were the smallest known.

Size of the corpuscles in relation to that of the animal.—The smallest British mammal, the Harvest Mouse, has corpuscles quite as large as those of the Horse; in the Common Mouse they are larger than in the Horse or Ox. But although there is no relation between the size of the corpuscle and that of the animal in different orders, in the same order the larger species have generally larger corpuscles than the smallest species. Thus, in the large Ruminants the corpuscles are distinctly larger than in the smallest Ruminants, and the same fact is observable of the Rodents. In these examples the gradation in the size of the corpuscles may not exactly follow that of the animals, but none of the very small species have corpuscles so large as those of the largest species.

Size of the corpuscles in the same animal at different periods of life.—In very young embryos the corpuscles are much larger than in the adult, and in such embryos each corpuscle has a nucleus, which disappears at a later period of intra-uterine life, when the corpuscles are yet larger than those of the mother. At a still later period they become so unequal in size that it is difficult to say whether they be larger or smaller in the fœtus than in the adult. In a kid twelve days old, bred between an ibex and a goat, I found the corpuscles larger and more variously sized than those of either of its parents.

The thickness of the corpuscles is variable; but it is commonly somewhat more than a fourth of the diameter.

Size of the corpuscles in different Orders.—The Monkeys have corpuscles pretty uniform in size, generally just perceptibly smaller than those of Man; in some of the Monkeys of the new world the corpuscles are slightly smaller than in the Monkeys of the old world, and in the Lemurs somewhat smaller still. In the corpuscles of the different subdivisions of the *Feræ* there is such a well-marked diversity of size, that the fact* might be used as a help to classification. The families, set down in the order of the size of their blood-discs, stand as follows: Seals, Dogs, Bears, Weasels, Cats, Viverras. It is commonly most easy to distinguish a viverra, by the comparatively small size of its blood-corpuscles, from a seal, dog or bear. Among genera of doubtful affinities, if regard were paid to the blood-

* It has recently been enlisted into the service of natural history by Mr. Jesse, in his interesting Anecdotes of Dogs.

corpuscles, the *Hyæna** would be arranged with the *Canidæ*, *Basaris* with the *Ursidæ*, and *Cercoleptes* with the *Viverridæ*. It is curious that the Fox has slightly smaller corpuscles than the Dog. In the Ruminants the smallest corpuscles are found; yet some of the largest species have corpuscles larger than those of many Carnivora, and of the Horse. The *Camelidæ* are the only mammals with oval blood-discs, like those of the lower Vertebrata in shape, but uniformly smaller; and in structure the corpuscle of the Camels is exactly the same as the corpuscle of other Mammalia, being destitute of a nucleus corresponding to that which is so obvious in the corpuscle of lower animals. Among the Rodents, the corpuscles of the *Capybara* are as large or slightly larger than those of Man; the *Harvest Mouse* has smaller corpuscles than any other Rodent, and in the order generally their size is about the same as in the Lemurs. Of the Edentata, the *Two-toed Sloth* has the largest corpuscles, after those of the *Elephant*, of any mammal; those of the *Armadillo* are about the same in size as those of the *Monkeys*. The corpuscles of the *Marsupia* agree generally in form and size with the corpuscles of the corresponding placental mammals. In the *Monotremata*, according to the observations of Dr. Davy, Dr. Hobson, and Dr. E. Bedford, the corpuscles are of the same form and about the same size as in Man. An examination which I made of the corpuscles of the *Echidna* was to the same effect, but I had not an opportunity of applying a micrometer to them.

OVIPAROUS VERTEBRATA.

In birds and reptiles, with a few exceptions, the corpuscles are oval, the long diameter being commonly rather less than twice the short diameter. These proportions used to be considered as universal, but they are not so; for the long diameter of the corpuscles of birds and reptiles may either be nearly thrice or scarcely one and a half of the short diameter; and it is remarkable that these differences of form are occasionally presented in the corpuscles of nearly allied genera. In osseous fishes, as Professor Wagner has noticed, the corpuscles are generally not much longer than broad; I commonly found a few among them of a circular shape, and he observed the majority of them of this figure in the blood of the *Cyclostomes*. In some species of other orders the corpuscles are about twice the length of their breadth; in the *Pike* they are somewhat angular and pointed at the ends; and on the whole the corpuscles of fishes are extremely variable in shape. The diameter of the circular corpuscles of mammals is very frequently about the same as the short diameter of birds' corpuscles. They are largest in the *Amphibia* generally; and largest of all in the *Amphibia* with permanent gills, as discovered some years ago by Professor Wagner. My measurements of the corpuscles of the *Siren* agree with his view.

Nucleus.—This exists permanently in the blood-corpuscle of the lower Vertebrata, but only for a short time in that of mammals, not

* It is remarkable that the extent of the streaked muscular fibre of the gullet of the *Hyæna* is the same as in the *Viverridæ*, which differ in this respect from the *Canidæ*, and still more from the *Ursidæ*. It would be interesting to examine the œsophageal muscular sheath of the *Kinkajou*.

excepting even the *Camelidæ*. It is only during the earlier period of intra-uterine life that the corpuscle of mammals has a nucleus corresponding to the permanent one in the corpuscle of lower animals. In birds, the nucleus, when exposed by a weak acid, is commonly longer in proportion to its breadth than the envelope; but there are some exceptions, and the nucleus becomes globular or nearly so when in contact with water. In the blood-corpuscle of mammals the central spot, so often mistaken for a nucleus, is not visible in the best focus and light; then if the object-glass be so slightly removed from the corpuscles as not to destroy their clear contour, a dark spot appears in their centre; if the glass be next so far moved towards the corpuscles as to place them slightly within the focus, the dark spot will become bright; and when altogether invisible in a bright light, the spot may be instantly brought into view simply by diminishing the light.

Note.—The following measurements are all in vulgar fractions of an English inch; but for the sake of convenience, the numerator is omitted throughout, as it is invariably 1, and the denominators only are printed. The measurements of the blood-discs are given as they lie flat, unless when a T indicates a measurement of their thickness. By L.D. the long diameter and by S.D. the short diameter is denoted. The measurements refer exclusively to average sizes. The nuclei were measured after exposing them by the action of dilute acetic acid on the envelopes.

MAMMALIA.

Homo	3200	Ateles ater	3602
	T... 12400	— Belzebuth	3589
SIMIÆ CATARRHINI.		Cebus Apella	3467
Simia Troglodytes	3412	— capucinus	3454
Pithecus Satyrus	3383	Callithrix sciureus	3713
Hylobates Hoolock	3368	Jacchus vulgaris	3624
— leucogenys	3425	Midas Rosalia	3510
— Rafflesii	3539	LEMURIDÆ.	
Semnopithecus Maurus	3515	Lemur albifrons	3976
Cercopithecus Mona	3468	— Catta	3892
— sabæus	3342	— Anjuanensis	4003
— fuliginosus	3530	— nigrifrons	4440
— ruber	3395	Loris tardigradus	3691
— pileatus	3578	— gracilis	3461
— pygerythrus	3401	CHEIROPTERA.	
— Petaurista	3478	Vespertilio murinus	4175
— griseo-iridis	3429	— noctula	4404
— Æthiops	3454	— Pipistrellus	4324
Macacus radiatus	3563	Plecotus auritus	4465
— Rhesus	3429	INSECTIVORA.	
— niger	3583	Talpa Europæa	4747
— cynomolgus	3429	Erinaceus Europæus	4085
— Silenus	3430	Sorex tetragonurus	4571
— nemestrinus	3493	PLANTIGRADA.	
— sylvanus	3338	Meles vulgaris	3940
— melanotus	3389	Arctonyx collaris	3609
Cynocephalus Anubis	3461		
— leucophæus	3555		
SIMIÆ PLATYRRHINI.			
Ateles subpentadactylus	3620		

MAMMALIA—(continued).

Ursus maritimus	3870		
— Arcctos	3723		
— Americanus	3693		
— Americanus, var.	3782		
— ferox	3530		
— labiatus	3728		
Helarctos Malayanus	3562		
Mellivora Capensis	3824		
Procyon lotor	3950		
Nasua fusca	3789		
— rufa	3878		
Basaris astuta	4033		
Cercoleptes caudivolvulus	4573		
CARNIVORA.			
Paradoxurus leucomystax	4236		
— Bondar	5693		
— binotatus	4660		
— Pallasii	5485		
Canis familiaris	3542		
— Dingo	3395		
— Vulpes	4117		
— fulvus	3920		
— argentatus	3888		
— cinereo-argenteus	3761		
— lagopus	3888		
— aureus	3860		
— mesomelas	T... 14000		
— Lupus	3645		
— Lupus	3625		
Lycan tricolor	3801		
Hyæna vulgaris	3735		
— crocuta	3820		
Herpestes griseus	4662		
— Javanicus?	4790		
— Smithii	4466		
Viverra Civetta	4274		
— tigrina	5365		
Felis Leo	4322		
— concolor	4465		
— unicolor	4481		
— Tigris	4206		
— Leopardus	4319		
— jubata	4220		
— pardalis	4616		
— domestica	4404		
— Bengalensis	4419		
— Caracal	4684		
— cervaria	4220		
— Serval	4129		
Galictis vittata	4175		
Mustela Zorilla	4270		
— Furo	4134		
— vulgaris	4205		
— Putorius	4167		
Lutra vulgaris	3502		
Phoca vitulina	3281		
CETACEA.			
Delphinus Phocæna	3829		
Balæna Boops	3099		
PACHYDERMATA.			
Sus Scrofa	4230		
— Babyroussa	4316		
Dicotyles torquatus	4490		
Tapirus Indicus	4000		
Elephas Indicus	2745		
Rhinoceros Indicus	3765		
Equus Caballus	4706		
— T... ..	13422		
— Asinus	4000		
— Burchellii	4360		
— Hemionus	4421		
RUMINANTIA.			
Camelus Dromedarius... ..	L.D. 3254		
	S.D. 5921		
	T... 15337		
— Bactrianus	L.D. 3123		
	S.D. 5876		
	T... 15210		
Auchenia Vicugna	L.D. 3555		
	S.D. 6444		
— Paco	L.D. 3361		
	S.D. 6294		
— Glama	ibid.		
Moschus Javanicus	12325		
— Stanleyanus	10825		
Cervus Wapiti	4138		
— Hippelaphus	3777		
— Axis	5088		
— Dama	4515		
— Alces	3938		
— Barbarus	4800		
— Elaphus	4324		
— macrourus?	5074		
— Mexicanus	5175		
— Marhal	4978		
— porcinus	5391		
— Reevesii	6330		
— Capreolus	5184		
— Virginianus	5036		
Camelopardalis Giraffa	4571		
Antilope Cervicapra	5108		
— Dorcas	4922		
— T... ..	16000		
— Gnu	4800		
— Sing-Sing	5150		
— Philantomba	5116		
— picta	4875		
— Bubalis	5600		
Capra Caucasica	7045		
— Hircus	6366		

MAMMALIA—(continued).

Capra Hircus, var.	6430	Syntheris prehensilis	3444
Ovis Musmon	5045	Capromys Fournieri	3483
— Aries	5300	Myopotamus Coypus	3355
— Tragelaphus	6355	..... T...	10667
Bos Taurus	4267	Castor Fiber	3325
— Taurus, var.	4571	Cavia Cobaya	3538
— Bison	4062	Dasyprocta aurata	3857
— Bubalus	4586	— Acouchi	3777
..... T...	14000	Cœlogenys subniger	3481
— Caffre	4703	Hydrochærus Capybara	3190
— frontalis	4299	Lepus cuniculus	3607
— Sylhetanus	4222	Lepus timidus	3560
RODENTIA.		EDENTATA.	
Pteromys nitidus	3777	Bradypus didactylus	2865
— volucella	3892	Dasypus sex-cinctus	3457
Sciurus vulgaris	4000	— villosus	3315
— niger?	3841	MARSUPIATA.	
— maximus	3633	Didelphis Virginiana	3557
— cinereus	4000	..... T...	12000
— capistratus ..	3930	Dasyurus viverrinus	4056
— Palmarum	3847	— Maugei	4034
— Listeri	3948	— ursinus	3534
Arctomys? pruinosis	3484	..... T...	10910
— Empetra	3503	Perameles Lagotis	3902
Dipus Ægyptius	4172	Hypsiprymnus setosus	4000
Mus giganteus	3892	Macropus Bennettii	3535
— decumanus	3911	— ocydromus	3442
— Rattus	3754	— Derbyanus?	3405
— musculus	3814	..... T...	10910
— sylvaticus	3839	Halmaturus Billardieri	3623
— messorius	4268	Phalangista vulpina	3617
— Alexandrinus	3900	— nana	3856
Arvicola amphibia	3790	— fuliginosa	3688
— riparia	4199	Petaurista sciureus	3661
Ondatra Zibethica	3550	Phascolomys Wombat	3456
Hystrix cristata	3369		
Erithizon dorsatum	3380		

AVES.

RAPACES.	L.D.		S.D.	
Gypaëtus barbatus	1913	3425	Buteo vulgaris	1852 3691
Cathartes Iota	1880	3691	— Lagopus	1852 3691
Sarcorhamphus Gryphus	1761	3892	Aquila chrysaëtos	1812 3832
— Papa	1825	3600	— Bonelli	1866 3598
Vultur auricularis	1835	3461	— fucosa	1852 3485
..... Nuclei ...	4000	10666	— choka	1830 3691
— fulvus	1829	3399	Helotarsus typicus	1891 3461
..... T. 9600			Haliaëtus albicilla	1829 3390
— Kolbii	1794	3337	— leucocephalus	1909 3390
— leuconotus	1806	3425	— Aguia	1806 3585
— Angolensis	1684	3166	Falco Peregrinus	1916 3862
Polyborus vulgaris	1829	3572	— Tinnunculus	1891 3490

AVES—(continued).

	L.D.	S. D.		L.D.	S. D.
Falco subbuteo	1827	3507	Turdus canorus	2305	3892
Milvus vulgaris	1931	3677	Merula vulgaris	2097	4256
Gypogeraus serpen- } tarius	1722	3301	Orpheus polyglottis	2223	3732
Surnia Nyctea	1555	4042	— rufus	2231	3646
Nuclei ...	3200	10666	Muscicapa grisola	2179	4173
Otus brachyotus	1763	4076	Lanius excubitor	1989	5325
Bubo maximus	1720	3566	Vanga destructor	2019	3892
Bubo Virginianus	1837	4000			
Syrnium Aluco	1930	3801	GRANIVORÆ.		
Strix flammea	1882	3740	Dolichonyx oryzivorus .	2400	4167
Nuclei ...	4000	10666	Ploceus textor	2213	4575
			Cardinalis Dominicana...	2140	3643
OMNIVORÆ.			— cucullata	<i>ibid.</i>	<i>ibid.</i>
Cracticus hypoleucus ...	2116	4000	Amadina fasciata	2001	4364
Barita Tibicen	2118	3892	— punctularia	2133	4133
Garrulus pileatus	2041	4167	Pyrgita domestica	2140	3500
— glandarius	2064	3878	Nuclei ...	4364	9200
Nuclei ...	4000	10666	— simplex	2273	4000
— cristatus	2041	3512	Fringilla Cœlebs	2253	4133
Nucifraga Caryocatactes	1875	4172	— Chloris	2232	3600
Corvus corax	1961	4000	— amandava	2243	4800
— frugilegus	1894	3196	— cyanea	2144	3741
Nuclei ...	4572	9140	Linaria minor	2416	4848
— monedula	2243	4167	Parus cæruleus	2313	4128
Nuclei ...	4000	10665	— caudatus	2136	4570
— Pica	1953	3365	Nuclei ...	4800	10666
T. 11600			— major	2133	3892
Nuclei ...	4245	11138	Alauda arvensis	2125	4128
Gracula religiosa	2075	4167	Nuclei ...	4000	12000
Fregilus graculus	2106	4505	Emberiza citrinella	2286	4000
Pastor roseus	2106	4630	Nuclei ...	4000	12000
— cristatellus	2133	4050	— cristata	2310	4167
— tristis	1993	4167	Plectrophanes nivalis ...	2133	4740
Sturnus vulgaris	2115	3892	Loxia coccothraustes ...	2042	3790
Nuclei ...	3764	11333	T. 9141		
— predatorius	2133	4175	Nuclei ...	4570	10666
Coracias garrula	2000	3478	— curvirostra	2365	4000
Molothrus sericeus	2133	4567	— enucleator	2247	4083
Buceros Rhinoceros? ...	1690	3230	— Javensis	2286	3677
			— Astrild	2273	4740
			— cærulea	2290	3740
INSECTIVORES.			— Malacca	2359	4167
Troglodytes Europæus...	2359	4133	Vidua paradisæa	1998	3740
Regulus cristatus	2284	4133	Nuclei ...	3555	10666
Motacilla alba	2182	3600			
Nuclei ...	4000	10666	ZYGODACTYLL.		
Sylvia Phragmites	2003	3550	Corythaix Buffonii	1902	3764
Philomela lusciniæ	1895	4400	Cuculus canorus	2028	3600
Nuclei ...	4000	12000	Ptyctolophus Eos	1981	3728
Curruca atricapilla	2359	4133	— sulphureus	2203	3399
Erythaca rubecula	2305	4133	— rosaceus	1842	3547
Accentor modularis	2342	4000	Nuclei ...	4000	12000
Turdus viscivorus	2247	4000	— galeritus	1880	3600
— musicus	2203	4133	— Philippinorum ...	1974	4041
— migratorius	2348	4133	Macrocerus Aracanga...	1902	4041

AVES—(continued).

	L.D.	S.D.		L.D.	S.D.
Macrocerus Illigeri ...	1924	4335	CHELIONES.		
— Ararauna	1961	4128	Hirundo rustica	2133	4000
— Macao	1902	4762	— urbica... ..	2170	4000
— severus	2165	3801	Cypselus Apus	1982	3850
Platycercus Pennantii ...	2106	3931	Nuclei ...	4000	10666
— Pacificus	2118	4174			
— eximius	2193	3892	COLUMBÆ.		
— flaviventris	2118	3892	Columba Palumbus	1973	3643
— Vasa	2045	3892	— risoria	2133	3523
— scapulatus	2000	4042	— Turtur	2005	3369
— niger	2133	3892	— tigrina	2088	3615
Nymphicus Novæ-Hol-landiæ }	2160	4174	— rufina	2314	3429
Psittacara leptorhyncha .	2067	3931	— chalconoptera	2208	4062
— murina	2133	4031	— Nicobarica	2133	3692
— Patachonica	2115	3977	— Guinea	2165	3839
— viridissima	2029	4190	— Corensis	2193	3643
— solstitialis	2133	4000	— aurita	2422	3519
— virescens	2097	4175	— montana	2239	3692
Trichoglossus capistratus	2203	3892	Nuclei ...	5333	12000
Palæornis Alexandri ...	2115	3892	— Zenaida	2203	3571
— torquatus	2174	3892	— migratoria	1909	4626
— Bengalensis	2278	4000	— coronata	1954	3491
Lorius domicellus	2093	4133	— leucocephala	2132	3646
— Ceramensis	2115	4000	— mysticea	2100	3512
— Amboinensis	2045	4133			
— coccineus	2165	4000	GALLINÆ.		
— Sinensis	2115	3692	Penelope leucolophos ...	1902	3607
Tanygnathus macro- }	2106	3829	Nuclei ...	3555	9166
Psittacus erythacus	1898	4000	— cristata	<i>ibid.</i>	<i>ibid.</i>
— albifrons	1931	3692	Crax globicera	1985	3425
— Augustus	2085	3600	— rubra	1993	3664
— Americanus	2115	3600	— Yarellii	2000	3456
— Regulus	2037	3764	Ourax Mitu	2005	3490
— Dufresnii	2278	3374	Pavo cristatus	1835	3589
— Amazonicus	1800	3832	— muticus	<i>ibid.</i>	<i>ibid.</i>
— leucocephalus	2050	3727	— Javanicus	1884	3491
— badiceps	2165	3617	Phasianus pictus	2213	3615
— menstruus	2115	3708	— nycthemerus	1887	3470
— melanocephalus ...	2005	3892	Nuclei ...	4000	8000
— mitratus	2029	3892	— superbus	2128	3587
Psittacula cana	2101	4174	— lineatus	1855	3348
— pullaria	2097	4174	Nuclei ...	4570	9166
Picus minor	2170	3892	— Colchicus	2168	3646
			Nuclei ...	5647	7111
ANISODACTYLI.			Gallus domesticus	2102	3466
Sitta Europæa	2213	4188	Nuclei ...	6000	9140
Nuclei ...	4572	11000	Meleagris gallapavo ..	2045	3598
Certhia familiaris	2305	4000	Numida Rendallii	2054	4415
			Francolinus vulgaris ...	2106	4041
ALCYONES.			Perdix longirostris	2054	3801
Dacelo gigantea	2110	3555	Bonhami	1933	3282
Alcedo Ispida	2124	3693	Nuclei ...	4570	10666
			Coturnix Argoondah ...	2347	3470
			Ortyx Virginianus	2213	4000
			neoxyenus	2305	3836

AVES—(continued).

	L.D.	S.D.		L.D.	S.D.
Tetrao urogallus	2248	3836	Ciconia Argala	1728	3555
Tetrix	2376	3728	— Marabou	1859	3460
Caucasica	1923	3456	Ibis ruber	1948	3153
Nuclei ...	4570	9166	Numenius Phæopus ...	1846	4465
Tinamus rufescens	1752	3338	Limosa melanura	1973	3764
ALECTORIDES.			Scolopax Gallinago	2170	3622
Dicholophus cristatus ...	1884	3364	Rallus Philippinensis ...	2997	3389
CURSORES.			Gallinula chloropus	2055	3839
Struthio Camelus.....	1649	3000	PINNATIPEDES.		
T. 9166			Podiceps minor	2001	3200
Nuclei ...	3200	9166	PALMIPEDES.		
Dromaius Novæ-Hol-landiæ	1690	3031	Plectropterus Gambiensis	1866	3728
Rhea Americana	1898	3273	Chenalopex Ægyptiaca .	1866	3839
GRALLATORES.			Cereopsis Novæ-Hol-landiæ	1722	3692
Ædicnemus crepitans ...	2157	4000	Bernicla Sandvicensis ...	1866	3839
Vanellus cristatus	1964	3310	— Magellanica	<i>ibid.</i>	<i>ibid.</i>
Hæmatopus Ostralegus .	1895	4000	Cygnus atratus	1806	3692
Nuclei ...	3200	9000	Dendrocygna viduata ...	1789	3555
Psophia crepitans	1883	3488	— autumnalis	1916	3764
Anthropoides Virgo	1884	3740	— arborea	1931	3724
T. 11230			Dendronessa sponsa ...	2001	4079
— Stanleyanus	1909	3529	Tadorna vulpanser	1925	3839
Balearica pavonina	1859	3777	Mareca Penelope	1873	4385
T. 9597			Querquedula crecca.....	2062	4592
Nuclei ...	4000	9750	— acuta	1993	3839
— Regulatorum	1858	3478	— circia	2088	3839
Ardea cinerea	1913	3491	Anas galericulata	1937	3424
— Nycticorax	1780	3555	Larus ridibundus	2097	4000
— minuta	1993	3827	— canus	1973	3839
Platalea leucorodia	1859	3600	Nuclei ...	3555	10666
Ciconia alba	1755	3439	Pelecanus Onocrotalus...	1777	3369
— nigra	1806	3403	Nuclei ...	3200	9600
			Phalacrocorax Carbo ...	2005	3765

REPTILIA.

	L.D.	S.D.		L.D.	S.D.
Chelonia Mydas	1231	1882	Lacerta viridis	1555	2743
Nuclei ...	4000	6000	Anguis fragilis	1178	2666
Testudo Græca	1252	2216	Natrix torquata	1371	2157
— radiata	1241	2197	T. 8341		
Alligator — ?	1324	2122	Nuclei ...	3835	6817
Crocodylus acutus	1231	2286	Coluber Berus	1274	1800
T. 8000			Nuclei ...	3227	4986
— Lucius?	1124	2215	Python Tigris	1440	2400
Champsia fissipes	1259	2315	Nuclei ...	3555	7468
Iguana Cyclura	1230	2285			
Nuclei ...	5333	6400			

AMPHIBIA.

	L.D.	S.D.		L.D.	S.D.
Rana temporaria	1108	1821	Triton Bibronii	848	1311
T. 7112			Nuclei ...	1901	3000
Nuclei ...	3114	6297	— cristatus	<i>ibid.</i>	<i>ibid.</i>
Bufo vulgaris	1043	2000	Lissotriton punctatus ...	814	1246
T. 5625			Nuclei ...	1778	2667
Nuclei ...	2802	5261	Siren lacertina ..	435	800
			Nuclei ...	1142	2007

PISCES.

	L.D.	S.D.		L.D.	S.D.
Perca fluviatilis	2099	2824	Cyprinus auratus	1777	2824
T. 8000			T. 10666		
Nuclei ...	7482	8830	Nuclei ...	4570	8000
— Cernua	2461	3000	— Erythrophthalmus.	2000	3200
Nuclei ...	6000	8000	— Phoxinus	2000	2900
Cottus Gobio	2000	2900	Esox Lucius	2000	3555
T. 8000			Nuclei ...	5333	8000
Cyprinus Carpio	2142	3429	Anguilla vulgaris	1745	2842
T. 8000			T. 8000		
Nuclei ...	6400	8000	Nuclei ...	7500	10000
— Tinca	2286	2722	Gymnotus electricus ...	1745	2599
T. 8830					
Nuclei ...	8500	9600			

MISCELLANEOUS.

MILDNESS OF THE SEASON.

Two instances of the mildness of the season have occurred. A pair of the *Vanessa Io* were brought to me, caught flying at Bardsey, near Leeds, on the 24th January. A *robin's* nest, with *young ones*, was found near Swillington, about six miles from Leeds, on the 2nd February.

HENRY DENNY.

DE HIRUNDINUM AD NOS REDITU.

Salve, quæ ad nos incolumis te vertis, hirundo,

 Quandoquidem veris nuncia grata redis ;

Et nos ceu socios post frigora sæva revisis,

 Et tecum nobis tempora læta refers.

Te redeunte redit facies lætissima mundo.

 Sævus abit Boreas ; mitior aura redit.

Solvunturque nives, et grato murmure rivi

 Labuntur ripis, prataque amœna rigant.

Herba solum vestit, pinguntur floribus arva,

 Omnis abit squallor, pulchra juventa redit.

Te redeunte, virent nuper quæcunque rigebant,

 Arboribus redeunt te redeunte comæ.

Salve, igitur, felix cunctis mortalibus ales,

 Nuncia veris avis, nuncia lætitiæ.

Lucas Nicolaus del Muto.

AGRIMONIA ODORATA, AITON.

In the course of an examination of my native species of *Rosaceæ*, I have had the fortune to detect a good specimen, in fruit, of the *Agrimonia odorata* of the Hortus Kewensis, given to me by the Rev. W. W. Newbould, who gathered it at Beaumont in the island of Jersey on the 15th of August 1842. I believe this to be the only continental plant, not known as a native of Britain, which has been added to the flora of the Channel Islands since the publication of the 'Primitiæ Floræ Sarnicæ.' It is distinguished from *A. Eupatoria*, which it greatly resembles, by its "greater size,—three to four feet high;" leaves more deeply and more sharply cut, hairy and furnished with scattered glands beneath, not cano-tomentose; tube of the calyx of the fruit larger but shorter, bell-shaped or nearly hemispherical, not turbinate, uniformly hairy and glandular, only furrowed in its upper half, and even there the furrows are shallow; spines longer, and the lower ones strongly reflexed; petals "saturate aureis," red in the dried specimen. It will probably be detected in some of our southern counties if diligently looked for.—C. C. B.

HASSALL'S "BRITISH FRESHWATER ALGÆ."

The Editors think it right to make a few observations upon Mr. Hassall's letter printed in the last number of these 'Annals,' and to which these remarks would have been appended, had they not thought that they might as well allow their readers one month's opportunity of contrasting the letter and the review, believing that the latter is by far the best answer to most points brought forward in the former. They wish it to be distinctly understood that they are not again reviewing the work, and do not intend to be drawn into a paper war, which would be totally out of place here.

Mr. Hassall complains that the review contains animadversions which a careful and candid examination of the work will not justify; they have now to state that a re-examination has only convinced them that the reviewer has been very lenient, and that Mr. Hassall should have been well-satisfied when he reflects how plentifully he has appropriated to himself the labours of others.

Suppose that Mr. Hassall had been engaged for the last two or three years in bringing out periodically original and elaborate figures with descriptions, as Mr. Ralfs has done, and that some compiler, watching close at his heels, had instantly and without ceremony copied a very large number of his figures, and given them to the world as his own, would Mr. Hassall have been content to acquiesce without complaint or remonstrance? To say nothing of the illegality of such a proceeding (which however is clear enough), there is too much reason to complain of its injustice and disingenuousness.

It is to little purpose that Mr. Hassall states that "no one plate is a copy of any one of Mr. Ralfs's," when the figures of which they are composed are palpably so, although by transpositions and inversions the identity of the plates is disguised.

Our readers may judge for themselves by comparing the plates of *Desmidiæ* in both works: they will see that there is not a single

figure in Mr. Hassall's Plates lxxxv. or lxxxvi. that is not taken from the Annals.

Mr. Hassall alleges that he has made a *sufficient* acknowledgement in having stated in his work that "several of the figures of this family, especially *certain* of the genera *Euastrum* and *Cosmarium*, are taken from those of Jenner and Ralfs." Now, with regard to *Cosmarium*, all the figures, thirty-four in number, are copied from the 'Annals,' while in *Goniocystis*, including *Arthrodesmus*, there are fifty-one figures, all copies, without a single original.

Neither space nor inclination allows the detail of further instances, but an examination of the work has confirmed the editors in the conviction that Mr. Hassall has by no means made a full and fair avowal of the extent of his obligations to others.

The opinion expressed in the review upon comparative specific characters is confidently left to the judgement of naturalists.

Mr. Hassall's statement that "it would have been easy for him, had he thought proper to do so, to have abstained from quoting Mr. Ralfs altogether," when he had helped himself so freely to his figures, needs no comment.

It may be right to state that Mr. Jenner's labours were not coupled with those of Mr. Ralfs in the review, owing to his not having *published* upon these tribes. Mr. Jenner's researches are well-known to and most highly appreciated by the reviewer. Mr. Jenner would be the last to take credit to himself for the labours of another, as may be seen in his 'Flora of Tunbridge,' pp. 178, 188, 192, 200.

HASSALL'S "BRITISH FRESHWATER ALGÆ."

To the Editors of the Annals of Natural History.

GENTLEMEN,—In Mr. Hassall's letter in your February number, in answer to your reviewer of his 'British Freshwater Algæ,' my name is used, in the allusions to Mr. Ralfs's papers on the *Desmidiæ*, in such a manner as I am afraid might mislead the public; I am induced, therefore, to beg the insertion of a few lines in your next number.

Those papers were written solely by Mr. Ralfs, and I must disclaim any praise at his expense; since my having assisted him in his observations, or given the outlines of some of the figures, could not make me the author.

No one has been more ready, nor more careful to give another credit for what was due to him than Mr. Ralfs has been; but what little I have done has been for my own amusement, and from love of natural history. It has afforded me the greatest pleasure, as well as instruction, to have a person so faithful in investigation, so acute and accurate in observation, and so perspicuous, simple and concise in definition to correspond with, and I am pleased with the opportunity now afforded me to state that at first, most of my knowledge of this interesting, curious and very beautiful tribe of plants was obtained through his kindness, and also that it is my intention to render Mr. Ralfs every assistance in my power in bringing out his

'Monograph of the British *Desmidiæ*,' either in microscopical observation, by faithful outlines, or in the determination of any difficult point.

Mr. Hassall also is a gentleman whom I respect, and for most of my knowledge of the British *Conjugatæ* I am indebted to his kindness. I am, Gentlemen, your obedient servant,

EDWARD JENNER.

On the Disease of the Plantain. By GEORGE R. BONYUN, M.D.
Communicated by W. H. Campbell, Esq., LL.D., Secretary of the Royal Agricultural and Commercial Society of British Guiana.

The varieties of the edible plantain, which are known and cultivated throughout the West Indies, Africa and the East, are all of them reducible to two species, viz. the plantain and the banana (*Musa paradisiaca* and *Musa sapientum*). The difference between these two plants is even so slight as to be scarcely specific; it is therefore most probable that there was originally but one stock, from which they have by cultivation and change of locality been derived. It is therefore necessary to determine with exactness, if possible, whether the plantain or banana (whichever be the parent stock) exists anywhere at present, or has been known to have existed as a perfect plant, that is, bearing fertile seeds, or whether it has always been in the imperfect state, that is, incapable of being procreated by seed, the only state in which it exists in this colony.

In the oldest botanical descriptions of the plantain, bakova, pisang, banana, bihai, or by whatever name it is known, it is invariably described as an anomalous plant not perfecting its seeds; nor is there any traveller who has described a plant which could be considered to be the plantain in its uncultivated state.

In Gerard's 'Herbal,' printed in 1636, p. 1464, there is an excellent drawing of a bunch of plantains, and it is described as seedless. Plumier, in his 'Nova Plantarum Americanarum Genera,' printed in 1703, gives a like description of the plantain. Linnæus, in his 'Species Plantarum,' anno 1763, describes four species, *Musa paradisiaca*, *sapientum*, *Bihai* and *Troglodytarum*, which latter, on the authority of Rumphius, he says, bears many seeds (*hæc gerit semina multa*). He supposes the two former to be hybrids produced by impregnating the Bihai with some congeners unknown to him. Since Linnæus's time the "Bihai" has been found to belong to a different genus than *Musa*; it is now called *Heliconia humilis*, is a native of South America, and produces fertile seeds. Whether Linnæus be right in his conjecture that the Bihai is the stock-plant of the plantain, it is almost impossible to ascertain; but the absence of any description of a wild seed-bearing plantain renders it highly probable that the cultivated species are hybrids produced long ago. The banana, from time immemorial, has been the food of the philosophers and sages of the East; and almost all travellers throughout the tropics have described these plants exactly as they are known to us, either as a sweet fruit eaten raw, or a farinaceous vegetable roasted or boiled.

It is remarkable that the plantain and banana should be indigenous, or at all events have been cultivated for ages both in the old and new world. Numerous South American travellers describe some one of these plants as being indigenous articles of food among the natives, thus showing (if the plantain and its variety be hybrids) a communication between the tropics of America, Asia and Africa long before the time of Columbus. The older writers on this colony consider the plantain to be a native. Thus Hartsinck in his 'History of Guiana,' vol. i. p. 71, describes under the head of "description of wild trees" the fruit of the plantain or wild banana tree as being eaten by the Indians roasted or ripe, &c., while the banana is under the description of cultivated trees. Belin, 'Description Géographique de la Guyane,' p. 49, in like manner describes the plantaine, or plantin, as being a food used by the Indians, &c. It is remarkable that Sir Robert Schomburgk likewise found a large species of edible plantain far in the interior. It appears to me to be quite clear therefore that the plantain is either a hybrid, or its power of procreation by seed has been destroyed long ago by cultivation, and that it is not known to exist anywhere in a perfect state; in either of which cases, any attempt to improve *our present stock* by the introduction of suckers from elsewhere must be totally futile. I need scarcely remark, that should the suppositions with regard to the hybridity of the plantain be incorrect, and that in certain localities to us at present unknown the plant matures its seed, the seedlings would require long cultivation by repeated transplantation of suckers to deprive the fruit of its seed, or in other words, to render it edible.

If the proposed introduction of plantain suckers from Matanzas, Porto Rico, or other countries, be with the view of entirely substituting them for our present stock, and thus getting rid of the disease, a very serious matter for consideration is presented to us, viz. Is the disease hereditary or owing to imperfection in the plant itself, or is it caused by unfit soil or imperfect tillage? If it be hereditary, then the only means left is totally to eradicate the present stock and to introduce a new one. If, on the other hand, the disease be one of locality, then the introduction of new plants would be merely exposing them to the same cause of destruction. The cause of the disease has been considered by some to be a species of beetle, which destroys the root or finds its way into the body of the tree. This however is a conjecture totally unsupported by any facts, the minutest investigation not disclosing the existence of any such animals in the diseased plantain tree, or at least in that relation to the tree which would in any way justify the supposition that they were the cause of the disease. Another supposition has been that the disease is similar to the smut in wheat, but is equally as unfounded as the beetle theory, no fungi being discovered in the diseased parts, even by the aid of a very powerful achromatic microscope.

Dr. Aanzorg's theory is, that there is a deficiency of certain chemical substances in the soil, and his experiments appear to render his supposition very probable. On the other hand, several planters declare that the youngest suckers from a diseased stock grow up for

the most part diseased, wherever planted. These conflicting opinions must be cleared up by experiment. In the meantime, I believe that I can point out the "seat of the disease," which is at all events the first step towards the discovery of its cure. If a plantain tree be stripped of its leaves from the root upwards, it will be found to consist of a number of joints—the bunch of plantains being a continuation of the upper joint, and the spire being the upper leaf rolled up—exactly similar to a cane and its arrow—the bunch being the organic apex of the plantain tree, in the same manner as the cane arrow is the organic apex of the cane plant.

Of the various vessels and tissues which are necessary to vegetable life, the plantain tribe abounds in what are called spiral vessels or tracheæ; and if a healthy plantain tree be examined from the root upwards as far as the fruit, these vessels will be found in continuous lines; and even in the farina of the plantain they are detected in an extreme state of tenuity. On further examination, these spirals (as has been known to botanists for some time) are found to be composed of numerous fasciculi, and are contained in tubes from whence they can be drawn forth, having a translucent appearance, and being perfectly free from any adherent matter. From the large number of these vessels in the plantain tribe, it is evident that their functions must be important, and that any impediment to their healthy action must be attended with an imperfect development in some part of the plant. Now if a plantain tree bearing a bunch of plantains in a more or less diseased state be examined carefully, a certain number of these tubes containing spirals from the roots up, through the culm or body of the tree into the bunch, will be found to be filled with a ferruginous-looking fluid of a more or less dark colour, and if the spiral vessels be drawn forth from their tubes, this matter will be seen to collect upon them in minute drops; the spirals will also be of the same colour as the substance contained in the tubes. A bunch of plantains in the extreme state of disease, containing no farina, but merely the dissepiments of the cells, will have a large number of the spiral tubes, particularly in the circumference of the culm, filled with a dark ochreous-coloured fluid, while the number of diseased tubes will be fewer, and the colour of the fluid contained more of a yellowish colour, in less diseased plants.

In the stock of a small poor bunch of plantains, but still containing farina and edible, only a trace here and there of the abnormal matter was found. This peculiar state is not confined to the full-grown plant, but the youngest suckers show the disease in a greater or less degree. All the other tissues and vessels of diseased trees I have found after the most careful investigation to be quite sound. The decay of the leaves, and subsequent rottenness and destruction of the plant, is owing to its diminishing vitality, and has nothing to do with the specific disease. Any mechanical injury sufficiently violent to diminish the vigour of the plant, would be followed by similar decay and rottenness. I am therefore fully convinced, that, whatever may be the cause of the disease, the seat of it is in the tubes containing the spiral vessels, which are invaded by an abnormal

fluid, which is inimical to the formation of the pulp in the fruit, or impedes the spirals in the due performance of their functions. The chemical composition of this fluid, and whether it be absorbed directly from the soil, or eliminated within the plant in consequence of functional disease of its organs, will form the subject of future investigation; and I would venture to augur, the colony having now the assistance of a gentleman of high scientific acquirements, that not only the cause, but the cure of this very destructive disease will be shortly discovered.

METEOROLOGICAL OBSERVATIONS FOR JAN. 1846.

Chiswick.—January 1. Fine. 2, 3. Frosty: fine: overcast. 4. Rain. 5. Sharp frost: cloudy: clear and frosty. 6. Drizzly. 7. Overcast and mild throughout the day and night. 8. Cloudy and fine. 9. Uniformly overcast. 10. Overcast: drizzly rain. 11. Hazy and drizzly. 12. Cold haze. 13. Hazy: very fine. 14. Foggy: overcast and fine. 15. Fine. 16. Thick fog: rain at night. 17. Hazy: drizzly: cloudy and mild. 18. Foggy: rain at night. 19. Constant rain: boisterous, with rain at night. 20. Clear and fine. 21. Rain: densely clouded and mild: boisterous, with rain at night. 22. Boisterous, with rain: densely clouded. 23. Heavy showers. 24. Hazy and mild. 25. Rain. 26. Showery: heavy rain at night. 27. Clear: cloudy: rain at night. 28. Rain: cloudy: very high tide in the Thames: clear. 29. Rain. 30. Overcast. 31. Cloudy: windy at night.

Mean temperature of the month	43°·54
Mean temperature of January 1845	38·69
Average mean temperature of Jan. for the last twenty years	36·46
Average amount of rain for the last twenty years	1·60 inch.

Boston.—Jan. 1. Stormy: rain last night. 2. Fine. 3. Cloudy. 4. Rain. 5. Fine. 6. Rain. 7. Cloudy. 8. Fine. 9—13. Cloudy. 14, 15. Fine. 16. Foggy. 17. Cloudy: rain A.M. and P.M. 18. Foggy. 19. Rain: rain early A.M.: rain P.M. 20. Windy: rain early A.M. 21. Cloudy: rain P.M. 22. Cloudy and stormy: rain early A.M. 23. Fine. 24. Cloudy: rain early A.M. 25. Fine: rain early A.M. 26. Cloudy: rain early A.M. 27. Fine. 28, 29. Rain. 30, 31. Cloudy.—N.B. Not so warm a January since January 1834: the average of that month was 44°·3.

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

Applegarth Manse, Dumfries-shire.—Jan. 1. Snow-showers. 2. Frost: clear and fine. 3. Wet all day. 4. Fine A.M.: shower P.M. 5. Frost A.M.: rain P.M. 6, 7. Showery. 8. Fair. 9, 10. Slight drizzle. 11. Slight drizzle: fog. 12. Fair and mild. 13. Fair A.M.: rain P.M. 14. Fair: one slight shower. 15. Wet A.M.: cleared: fine. 16. Frost, slight: fine. 17. Fair A.M.: slight shower P.M. 18. Fair, but cloudy. 19. Rain nearly all day. 20. Rain all day: flood. 21. Fair, but cloudy. 22. Drizzling rain. 23. Rain and fog. 24. Thick fog. 25. Heavy rain: flood. 26. Drizzling rain. 27. Rain A.M.: fair: rain P.M. 28—31. Rain.

Mean temperature of the month	43°·0
Mean temperature of January 1845	36·1
Mean temperature of Jan. for twenty-three years .	34·5
Mean rain in January for eighteen years	2·57 inches.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 112. APRIL 1846.

XXX.—*Observations on the Tribe Sphæriaceæ, and descriptions of certain new Genera.* By Prof. GIUSEPPE DE NOTARIS. Florence*, 1844. 4to.

By means of the immortal works of Bulliard, Persoon, Fries, Kunze, Nees, Greville and others, mycology has made of late years surprising progress, although it still continues in some of its parts very inferior to the other branches of cryptogamic botany. This arises, if I mistake not, from an opinion unfortunately adopted by certain writers of authority, who have not hesitated to assert, that microscopic observations instead of conducing to happy results are prejudicial to the study of mycology, and are the perpetual fountain of error and confusion. This opinion I not only hold to be false, but even incompatible with the present exigences of the human mind, which cannot content itself with the superficial exterior of things, but delights in searching into their most secret recesses.

And what, in truth, was the study of Cryptogamia before the compound microscope, thanks to the pains taken by the enlightened Amici, was brought to its present degree of perfection? The microscope has unveiled to us, not to speak of the surprising discoveries in bryology, lichenology and algology, the various ways in which fungi are reproduced, which, whether from the singularity of their forms, their hidden mode of growth, or the excessive minuteness of their parts, were the subject of very insufficient observations. How mycology has advanced since the late improvement in microscopic observations, the works of Vittadini, Corda, Montagne and Berkeley bear incontestable evidence.

No one is ignorant that Persoon and Fries made the study accessible by defining the limits of the families, properly describing the species, and laying the foundation of the natural system;

* Translated from the Italian. Communicated by the Rev. M. J. Berkeley. This memoir, which was first published as a separate pamphlet in 4to, has since appeared in 'Giornale Bot. Italiano,' edited by Parlatore.

but from having too often preferred characters more ready of access to those of internal structure, and trivial differences to the organs of fructification, they led students astray from the analytic method formerly adopted by the immortal Micheli, who, assisted by the power of their own minds, would otherwise have guided them by a surer and more noble path. The works of Micheli were often consulted, but his observations were either carelessly passed over or considered incomprehensible, and we have seen several of our contemporaries advance facts as new which had already been published in the 'Nova Plantarum Genera.'

Of all the divisions of the mycological kingdom, that of the *Pyrenomycetes* or *Hypoxylya* especially appears to me most strikingly to prove what I have above asserted. Analyse the works of Persoon, Fries, Duby, Wallroth and Chevalier, and you will find the form and colours of the perithecia, the way in which they open, the mode in which they burst from the matrix, the stroma, the colour, the consistence of the nucleus, accurately described; but of the parts of which the nucleus itself is composed, of the parts in which the essential and classical characters really reside, of the fructification, of the internal structure of the conceptacula, there is no intimation whatever, or they give them joined to the others as of secondary importance and out of mere compliment.

Thus it is that in this family myriads of errors and contradictions are met with at every step. We find, for example, some species of *Sphæria* placed among the *Cytispora*, because the nucleus bursts from the perithecium in the form of a tendril; to *Lophium* we find pulverulent sporidia assigned, because they are thread-shaped and equal in length to the asci. Among the *Sphæria* we find species which have the nucleus composed of sporidia only—species which belong to *Sphæronema*, and in short true *Peziza*, because in colour, form, and mode of growth they present the semblance of a perithecium.

Among the general characters of Fries' sections of the immense genus *Sphæria*, based principally and sometimes with useless details on the existence or want of a stroma, or on the mode in which the perithecia are disposed, we certainly find the asci and sporidia mentioned, but the sporidia in the same sections differ immensely in the several species in form, structure or size. We find allied species dispersed in different sections or even identical species, solely from their having attacked vegetables of different families or parts of different duration.

I do not hesitate to assert this, having had the advantage of procuring an authentic copy of the entire collection of the *Scleromycetes Suecici* of Fries, possessing also the greater part of the types published in the 'Fasciculi' of the enlightened Prof. Kunze, those illustrated by Montagne in his 'Notice sur les Plantes

Cryptogames récemment découvertes en France,' and in the third edition of the 'Flore des environs de Paris' of Merat, and the collections of Demazières and others, with the help of which I have been able to make a multitude of comparisons and clear away no slight number of errors;—errors which, without further preface, appear to me incontestably to demonstrate—

1st. That the progress in cryptogamic botany is chiefly owing to microscopical observations.

2ndly. That the classification of the *Pyrenomycetes* especially can never be natural nor philosophical, until we know the most minute particulars of the fructification of the species.

Besides which, if in the classification of many other tribes of fungi, and in defining the genera and species of the *Perisporiacei*, *Myxogastres*, *Mucorini*, *Coniomycetes*, &c., part of the characters are furnished by the peridia and sporidia, why should such characters be altogether rejected in the *Pyrenomycetes*, in which these organs are more complicated, and consequently rank higher in the series of organized structure?

The suspicion that differences in the fructifying parts of the genus *Sphæria* might be found, had arisen in my mind from the first moment in which I prepared myself to examine analytically a few minute fungi, which I afterwards described and figured in my decades of *Micromycetes*. During last winter, however, having previously excluded those species in which I had not succeeded in finding a *nucleus ascigerus*, I prepared with the utmost diligence of which I was capable, the analysis, descriptions and figures of 200 other *Sphæria*; and I assert that in identical species, from whatever different region they came, and these often growing on plants of different families, I have always found the structure, size, colour and shape of the sporidia identical; while, on the contrary, species properly distinct have never presented to me sporidia of the same shape. How many times have I admired in ecstasy the inexhaustible fullness of the great Creator of all things, who has given to an organ essentially the same in its nature and office such an infinite variety of form, so that each species carries with it an invariable impress or token to distinguish it from its allies!

Still very far from the end I had proposed to myself, from want of time, and not being able to embrace a larger field, I confine myself at present to a notice respecting the tribe of indigenous *Pyrenomycetes Sphæriaceæ*, because on recurring to the examination of the most essential parts of the fruit, they exhibit on a small scale the basis on which I intend to proceed in their re-arrangement; re-arrangement I say, because Greville, Corda, Montagne, and Fries himself in the 'Plantæ Homonemæ' felt the urgent necessity of lending a hand in the dismemberment of

the genus *Sphæria*, proposing the genera *Diplodia*, *Ostropa*, *Cucurbitaria*, *Cryptosphæria*, *Valsa* and *Hypocrea*, which conveniently limited according to the characters of fructification common to the greater number of the respective species, and selected from the heterogeneous materials which they everywhere contain, ought without doubt in some measure to be adopted, although for the most part founded on the appearance of the stroma, perithecia and nucleus, characters comparatively of small value.

I comprehend among the *Pyrenomycetes Sphæriaceæ*, those species only in which we meet with truly ascigerous conceptacula or perithecia, whether spheroidal, lentiform, conical, oval; whether obtuse or acute, or finally produced into a kind of cylindrical neck, angular or compressed, isolated or gregarious, or collected together in a stroma of varied form; opening by means of a vertical pore, sometimes scarcely visible or gaping in consequence of the thinness of the exterior coat, which yields readily to the shock of the sporidia bursting forth from the asci when arrived at maturity, or of the asci themselves separated from the walls of the perithecia, or in short by means of an irregular fissure.

The limits indeed within which the celebrated Corda has circumscribed the tribe or family of the *Sphæriaceæ*, in his immense iconographical work on the family of Fungi (*Icones Fungorum*, vol. v. p. 31), might be adopted for the present, had he not as I believe comprised in it genera which do not properly belong to it, and for the most part defined too loosely.

In the *Sphæriaceæ* we have to consider the stroma, the perithecium, its texture, the mode in which it opens, the nucleus, the asci, the paraphyses and the sporidia.

The stroma, on which the fundamental divisions of Fries are based, furnishes characters of some importance in the greater part of compound *Sphæriæ*, which, besides serving as a receptacle for the perithecia, presents a determined form characteristic of each species. The stroma cannot properly be compared to the thallus of Lichens, because it is an integral part of the fructifying apparatus. From the mycelium, the true equivalent of the thallus, one can scarcely draw materials for the diagnosis of the genera, because it is always extremely difficult to follow up its development. Deeply invested in the substance of the matrix or confluent with it, and often evanescent in fructifying individuals, it cannot afford precise characters except by the help of observations, often perhaps impracticable, and attentively following up the development before the evolution of the perithecia. In the simple, free, superficial or innate species, and in the *Cespititiæ*, the nature of the stroma appears less clear, because in some species

it is preceded by the appearance of the perithecia. In many of the *Obvallatæ*, *Pertusæ*, *Denudatæ*, *Caulicolæ*, and analogous tribes of Fries, the matrix at first appears unaffected; neither do we see it penetrated by the stromatic substance, if it has not already completed the development of the perithecia; for which reason I should feel inclined to regard this indeterminate form of stroma either as the result of a peculiar disorganization induced in the substance of the matrix from the corroding action of the conceptacula as the rudiments of abortive perithecia, or in short as a sort of secretion from the conceptacula themselves which filters through the pores of the matrix, or is diffused on their surface and by degrees vanishes.

This latter mode in which the stromatic substance originates is a fact repeated in a multitude of species, and which has to a certain extent some analogy with the changes effected in the more superficial strata of the bark in woody dicotyledonous plants, in which the external cells of the cortical parenchyma have not become inert and modified in their qualities and appearance by the continual action of atmospheric agents, though certainly by the progressive deposit of the superfluous nutritive particles.

However this may be, I refer to the *Simplices* all those species of the first division of Fries in which the stroma has no determined and constant figure nor free evolution, in consequence of which I unite, according to their real affinities, many forms which till now have been ascribed to separate sections; for example, *Sphæria leioplaca* and *S. miliaria* of the *Concrescentes* to *S. entypa* and *S. inquilina* of the *Obtectæ*. And why may we not believe, from the great similarity of the simple species to certain *Verrucariæ*, that we shall be able to clear up the same aberrations in the *Sphæriæ* which so often recur among the lichens with a centrifugal thallus, in which we find apothecia developed independently of the thallus? I must however add, that I have never met with isolated independent perithecia of the same form as those in any of the stromatic or compound species. Besides, the differences of the sporidia in the species of the types just indicated are adjusted; differences, which when clearly expressed may be assumed as the fundamental hinge of the primary divisions analogous to those adopted by Fries.

In the works of the above-mentioned authors, the particulars relative to the configuration of the stroma are minutely described; it therefore appears to me superfluous to say more about it. Many, on the contrary, would like to discourse about the nature, use, and signification of the tomentose subiculum with which the perithecia are girt in the *Byssisedæ* and various other sections. This structure does not necessarily indicate affinity; but I dare

not now, for want of direct observations, announce the opinion I have formed.

The perithecia in compound *Sphæriæ* are found more or less deeply inserted into the stroma; in the simple species they may be free or innate, isolated, fasciculate, gregarious or otherwise. Their structure deserves the highest attention: the perithecium in some species consists of a membranaceous, elastic, transparent, reticulated sac, constituted of a single stratum of very much compressed cellulæ; in others it is made of minute, round or angular cells of varied dimensions, containing a peculiar substance for the most part of a fuliginous colour. The consistence, thickness, fragility or tenacity depend on the greater or smaller number of the cellular elements, which arranged in one or more strata concur to form the walls, their size and reciprocal cohesion. Sometimes they consist of an apparently anhistous membrane similar to the stratum, which by means of maceration may be separated from the epidermis of the leaves of phænogamous plants.

If the simple *Sphæriæ* presented constantly a perithecium of a cellular structure, or to speak more correctly, of a stratum of concentric cells, we should think their external coat corresponded to the stroma or receptacle which unites the perithecia in the compound species; but in these as well as the others both forms occur. I should rather say that the apparently anhistous perithecium was analogous to the peridiola of the *Mucedines*, the other to the peridia of some *Gastromycetes*.

The *Sphæriaceæ*, I remark by the way, by the symmetry of their parts and their ascigerous fructification, have a great analogy to the *Discomycetes*, were it not that the excipulum generally speaking has a filamentous instead of a cellular structure.

The neck of the perithecium, which is highly developed both in certain vertical and innate stromatic *Sphæriæ*, and in simple species deeply buried in the matrix, does not furnish characters of primary importance. The transitions from *Coopertæ* to *Cerastomæ* are notorious, and from the latter to *Platystomæ*, &c.

The asci and paraphyses, or the asci alone, constitute the nucleus, the constant property of which in growing individuals is to present the character of a gelatine of a whitish, cinereous or slightly fuliginous tint. The differences depend essentially on the particular state of the asci, and the manner in which the sporidia of these and the perithecia are set at liberty. When humidity is wanting, the primary element in the life of *Pyrenomycetes*, the nucleus nearly vanishes, being reduced to a sort of down or to a thin crust which lines the base or cavity of the perithecia.

Nothing can be added respecting the anatomy of the asci, sporidia and paraphyses which has not already been registered in the

later works of Montagne, Berkeley and Corda. I shall observe however that the asci present two essential modifications which correspond with the characters of the nucleus.

When the perithecium has an anhistous appearance and the nucleus is amylaceous, the asci from the moment in which they become visible under the microscope are found detached from the walls of the perithecium and steeped, so to speak, in a sort of mucous matter, in which we may frequently observe little bubbles. I never succeeded in determining what relation these had to the walls of the perithecium, but I am almost inclined to think that the formation of the asci is repeated by a process similar to that by which pollen is developed in the cavity of the anthers. All species of analogous structure seem constituted of a single membrane, which, when the inclosed sporaceous mass has scarcely divided itself into sporidia, is re-absorbed or dissolved in the water with which the perithecia are penetrated, and entirely disappears. The sporidia however adhering together preserve for some time their normal position, and are seen dispersed in the surrounding mucous matter in groups or rows of eight which retain the figure of the asci, and often show traces of a thread, which, proceeding from the inferior sporidium, is lost in the mucous matter in which the sporidia are suspended.

The sporidia in the species belonging to the series in question are very small, cylindrical in shape, mostly curved, continuous or obscurely septate, transparent and of a yellowish colour, like oil or pearls. Each of the sporidia frequently incloses a sporidiolum of a roundish form, and which is endowed with a rapid motion when liberated, as may be observed if one is isolated in a drop of water on the object-glass. The paraphyses are scarcely to be traced at all, or are entirely wanting.

Besides the case described, the asci, whether they spring from the base of the perithecium or from the surface of its internal walls, often remain adhering by their base, which is generally attenuated like a peduncle, and preserve for an indefinite time and even to the maturity of the sporidia their position, by which the study of them is rendered much less difficult. It is easy to see in them the internal membrane which lines the walls.

In the species of this series the various forms of the sporidia are innumerable; spherical, elliptic, reniform, semilunar, semi-circular, lanceolate, fusiform, cylindrical, filiform, straight, curved, contorted, sigmoid, didymous, simple, articulate, cellulose, polished, faceted, torulose, provided with membranaceous appendages, diaphanous, trapezoidal, &c. The episporium is most evident in them, and sometimes equal in thickness to the endosporium.

When the development of the sporidia is completed, the asci

commonly open above. In some species they are provided with a thick border or a particular appendage, to which the perithecium* is attached, in which case the evacuation of the sporidia may be effected from the inferior side. If the asci and sporidia do not all come to maturity at the same time, it is easy to observe all the phases of their development;—an argument with which I shall occupy myself in detail when I come to discuss the merit of the fundamental divisions of the whole tribe.

In only two Sphærias, *S. profusa*, Fr., and *S. macrospora*, nob., I have yet found the asci tetrasporous. In the greater number they are octosporous and uniseriate: in very few cases are they polysporous.

The nucleus when constituted of asci only bursts through the perithecium in the form of a turbid stream which flows on the matrix, or if of a denser consistence, assumes the form of a little cirrhus; a property which, though rare, is even repeated in the species which possess asci of longer duration.

Finally, I expect to be able to draw part of the distinctions of the genera from the paraphyses, whenever they offer the character of separate organs distinguished from the asci by their filamentous form and the articulations with which they are interrupted at intervals. Under other forms and when inarticulate, they may be regarded as asci in a rudimental state, and indeed there are many species in which they are totally wanting in the most fully developed individuals. Examples of this kind are met with in all the species analogous to *Sphæria herbarum*, described in my third decade of the *Micromycetes*, which with its analogues constitutes a most distinct genus.

I have thus indicated the elements which may be made use of in the needful reform of the *Sphæriaceæ*; though I am but a gleaner in this vast field, I yet think myself able now, at least partially, to propose some very distinct genera, making use—

I. Of the characters which may be derived from the figure of the stroma, if determinate, and of the texture of the perithecium.

II. Of the properties of the nucleus, the asci and paraphyses.

III. And especially of the structure of the sporidia, of their number in each ascus, and of the manner in which they are dispersed.

It may afterwards be possible to limit the genera without having recourse to the stroma and perithecia, that is to say, when the analysis of the parts of the fructification in most if not all of the known species is completed; and if any reply to me that it is injurious to science to multiply genera, although founded on im-

* Observed I believe for the first time by Montagne in *Thamromyces rostratus*, Pl. Cellul. Exot. 2 cent. Ann. d. Sc. Nat. vol. xiii.; and by Corda in *Sph. Hugelii*, Icon. Fung. Fasc. 4.

portant characters, and there are always too many who fly from minute and conscientious analysis, I would advise them to return to the golden age in which no generic difference was recognised between *Lycoperdon*, *Lycogala* and *Sphæria*.

In the meantime, to confirm by some examples the reasonableness of the innovations which I am meditating, I subjoin the descriptions of some genera belonging to the *Aplosp hæriæ*.

I. VENTURIA.

Perithecia crustacea, fragilia, globoso-depressa, poro rotundo amplo pertusa, circa ostiolum setulis rigidis longiusculis hispida, fundo ascigera. *Asci* fixi erecti oblongi ellipticive, in basim breviter abrupteque tenuati, fere pedicellati octospori. *Paraphyses* nullæ. *Sporidia* constricto-didyma bilocularia, articulis subæqualibus, episporio pertenui endosporio vix translucido papyraceo fuscescente.

I dedicate this genus, of which I know two species, to the enlightened Sig. Antonio Venturini of Brescia, an excellent mycologist.

1. *Venturia Rosæ*: sporidiorum fusco-castaneorum loculis inæqualibus obtusis, inferiore minore.

It grows on the dead boughs of the *Rosa alpina* at Mt. Cenis.

It appears to have a great analogy with the *Sphæria strigosa* of Albertini and Schweinitz (Conspect. Fung. p. 33. n. 3. tab. 5. fig. 7. a, b, c); nevertheless it differs from it in not being entirely invested with bristles, in the depresso-globose perithecia, instead of globose or ovate, and still more by their rather ample and not papillated ostiolum.

2. *Venturia Dianthi*: sporidiorum atro-fuscorum loculis subæqualibus ovato-subacutis.

On the dried stalks of the *Dianthus carthusianorum*, or within their cavity.

The two species agree together admirably in the manner of their development, bursting through the epidermis, which at first covers them, in the form of the ostiolum, which is surrounded by rigid bristles, in the structure of the perithecium and the nucleus, in the absence of paraphyses, in the asci, which are strongly attenuated at the base, in the bilocular brown sporidia, veiled by an episporium, which is almost confluent with the papyraceous endosporium, and are easily distinguished by the shape of the sporidia without having recourse to the dimensions of the perithecia and the matrix, from which, if we were to take the distinctive characters, the one, *V. Rosæ*, would belong to the *Villosæ*; the other, *V. Dianthi*, to the *Caulicolæ*.

II. MASSARIA.

Perithecia coriacea cortici immersa, globoso-depressa, vertice attenuata, ostioloque erumpente papillæformi prædita, in sicco collabentia. *Asci* clavati, fixi grandes octospori. *Paraphyses* filiformes flaccidæ intertextæ. *Sporidia* subbiserialia, majuscula ovata, episporio hyalino crasso, endosporio papyraceo castaneo-fusco triloculari, loculis inæqualibus, superiore majore subhemisphærico, medio subgloboso, extimo minore hemisphærico ascis vertice dehiscentibus copiose profluentia, atro inquinantia.

I dedicate this genus to the memory of the late Dr. Massara, author of the 'Flora Valtellinese.'

Massaria inquinans. *Sphæria inquinans*, Tode Fung. Mecklenb. ii. p. 17. n. 13. tab. 10. fig. 85, rather bad and incomplete; Schmidt and Kunze, Exsicc. n. 180! according to a specimen from the enlightened Kunze; Fries, Syst. ii. p. 486; Sclerom. Succ. ed. 2. n. 304. *Spilobolus inquinans*, Link, Handb. iii. p. 380.

It grows on the dead branches of the sycamore.

The perithecia of this species are a millimetre in diameter, and grow under the soft bark of the young boughs of the sycamore, sometimes solitary, sometimes in pairs or in clusters of many individuals. On their upper surface they are clothed with a fuliginous down, a peculiarity not included in the generic characters, because it is sufficiently distinguished by the episporium of considerable thickness and the form of the endosporium.

The celebrated Link, in the 'Handbuch zur Erkennung,' 1. c., has proposed a new genus among the *Sphæriaceæ*, under the name of *Spilobolus*, characterizing it merely by the way in which the sporidia are evacuated from the perithecia. He refers to it *Sp. inquinans*, *S. Xylostei* and *S. Tiliæ*, three species which have no affinity together. Suffice it to say, *Sp. Tiliæ* belongs to the compound *Sphæria*, and the part which Link and many other authors have described as a perithecium is nothing more than a stroma of a determinate figure.

III. ROSELLINIA.

Perithecia globosa in strata bina facile secedentia, crustacea, fragilia, stromate effuso filamentoso plus minusve contexto fuscescente insidentia, ostiolo papillari minuto prædita. *Asci* fixi, octospori, lineares paraphysesque filiformes flaccidæ ex tota superficie interiori perithecii nascentes. *Sporidia* reniformia, episporio tenui, endosporio fusco-badio, vix diaphano subpapyraceo, septo medio obscuro bilocularia.

Dedicated to Dr. Ferdinando Pio Roselline of Pisa, a great cultivator "dell' amabile scienza."

Rosellinia aquila. *Sp. aquila*, Fries, Syst. ii. p. 442.

On the dried stems of the larger umbelliferous plants in the plains of Southern Sardinia.

I cannot assert the identity of my specimens with the species of Fries, not having been able to compare their fructification; my plant differs from the *Byssisedæ*, under which name other really distinct species are perhaps confounded. *Sp. aquila* has been found hitherto on rotten branches only, and has therefore been referred to *Byssisedæ*: my specimens might be ranked with *Caulicoleæ*.

IV. BERTIA.

Perithecia erumpentia oblonga ovoideave, stromate effuso atro crustæ-formi insidentia, cellulis mediocribus subrotundis contexta, fere suberosa, tenacia, rugoso-verrucosa; in sicco rugoso-tuberculata, rigida, ostiolo inconspicuo vel saltem minutissimo prædita. *Asci* creberrimi octospori, fixi, cito evanidi. *Paraphyses* tenuissimæ. *Sporidia* hyalina, cylindracea, utrinque obtusa, curvula, endosporio ab episporio haud distincto, septo medio bilocularia.

I have named this genus after Dr. Giuseppe Berti of Porto Maurizio, to whom I owe numerous collections of cryptogams from Eastern Liguria.

Bertia moriformis. *Sph. moriformis*, Tode Fung. Mecklenb. ii. p. 22. n. 19. tab. 11. fig. 90. *a, b, c*, tolerably correct but incomplete; Fries, Syst. ii. p. 458; Sclerom. Suec. ed. 2. n. 125.

Found for the first time in Italy by my illustrious friend Baron Vincenzo Cesati. A species common in other parts of Europe, but very variable in its mode of growth and in size; nevertheless the nucleus, the asci and the sporidia always preserve the same characters in solitary individuals as well as in those which are clustered together; a fact, be it observed, which supports the maxim I have tried to establish, and which I hope in the sequel to be able triumphantly to demonstrate.

In the distinction of the genera and species we ought to set the highest value on those characters which are drawn from the form and structure of their sporidia.

XXXI.—Notes on the genus of Insects *Sitona*, with descriptions of two new Species. By JOHN WALTON, Esq., F.L.S.

Fam. CURCULIONIDÆ.

GENUS *SITONA*, Germ., Steph.; *SITONES*, Schönh.

§ A. *Eyes subdepressed.*

1. *Sitona hispidula*, Fab., Germ., Steph., Schönh.

— *pallipes*, Steph.

Curc. hispidulus, Marsh., Gyll., Kirb. MSS.

The subimmersed eyes, and the erect rigid hairs scattered on

the body, distinguish this common insect at a glance from every other species.

2. *Sitona suturalis*, Steph.

Curc. rufipes, Marsh., non Linn.

This insect very much resembles the preceding in general habit, but may at once be recognised by having the thorax and elytra entirely without hairs, and from every other species by its subdepressed eyes.

Unknown to Schönherr and Germar until I sent specimens to them.

Local and not often met with; I once found it plentifully in a damp meadow in Yorkshire. Taken abundantly by Mr. S. Stevens and myself amongst grass in a moist field on the west side of Turner's Wood, Hampstead, in June; it also occurs in Hackney Marshes.

§ B. *Eyes moderately prominent.*

3. *S. Regensteinensis*, Herbst, Germ., Schönh., Steph. Manual.

— *Spartii, femoralis et pleuritica*, Steph. Illustr.

Curc. Spartii, Kirb. MSS.

Dr. Germar concurs with Mr. Stephens in referring this insect to *Curc. Regensteinensis* of Herbst*, and M. Schönherr to *Curc. Spartii* of Kirby†, with which it is distinctly synonymous; *Curc. Ulicis*, referred to Kirby (MSS.), is not to be found in his manuscript. I possess specimens from M. Chevrolat of Paris, named *S. Regensteinensis*.

Excessively variable in size (length $1\frac{1}{2}$ —3 lines), but distinguished from all the other species by having the thorax considerably dilated and rounded at the sides, and remarkably narrowed behind, with the elytra setose.

Found abundantly on the broom and furze in the spring and autumn.

4. *S. sulcifrons*, Thunb., Germ., Schönh., Steph. Man.

Curc. tibialis, Gyll., Steph. Illustr.

— *chloropus*, Marsh.?

— *subaurata*, Kirb. MSS., Steph.

— *pleuriticus*, Kirb. MSS.

My British specimens were referred by Schönherr and Germar to the first name, and an insect sent by Gyllenhal in the foreign collection of Kirby is identical. Mr. Stephens has in his possession two examples of *Curc. chloropus* from the collection of Marsham, one of which is the true *Curc. tibialis* of Herbst, and the other is *Sitona sulcifrons* of Thunb.; the latter is accurately

* Ent. Zeit. Stettin, no. 5. p. 99, 1842.

† Schönh. Syn. Ins. vii. p. 455.

described by Stephens under the name of *Sit. tibialis* of Herbst, after Gyllenhal, and he has quoted *Curc. chloropus* in his 'Syst. Catal.' as synonymous; but I think Marsham's description of the sculpture on the thorax agrees better with the former, I have therefore placed a note of interrogation. *Curc. subauratus* and *C. pleuriticus* of Kirby MSS. and collection are identical, and are most decidedly specimens of *Sit. sulcifrons*.

It may be known from all the species of this section by its smaller size and by its proportionably shorter form.

Found abundantly in many localities amongst grass and in hedges in the spring and autumn.

5. *Sitona lineata*, Linn., Mus. Linn., Germ., Steph., Schönh.

Curc. lineatus, Fab., Marsh., Gyll., Kirb. MSS.

— *ruficlavis*, Marsh.

— *griseus*, Marsh., non Fab.

— *griseus* (var. β .), Kirb. MSS.

Recent specimens of this insect may generally be known by having the alternate interstices of the elytra covered with paler scales than the others, and are more or less distinctly lineated; but they are sometimes concolorous and not lineated; individuals of this and many other species (especially those which are clothed with silvery-gray scales) are from age very subject to abrasion, and these occur not unfrequently with the upper surface very thinly or unequally clothed with scales; sometimes the shoulders and scutellum are maculated, or with an abbreviated streak; at other times immaculate and more or less denuded; nevertheless they may be distinguished, without difficulty, by a comparative examination of the form and sculpture, which may be more easily seen than expressed: the females are more robust.

Curc. ruficlavis and *Curc. griseus* of Marsham are varieties, sparingly clothed with silvery-gray scales, with the elytra concolorous or partially denuded.

The most abundant species of the genus, everywhere common, and sometimes found in great numbers amongst peas and beans.

6. *S. puncticollis*, Kirb. MSS., Steph. 1831.

— *octopunctatus*, Germ. in Litt.

— *insulsus*, Schönh. 1834.

Curc. flavescens (var.), Kirb. MSS.

I sent specimens of this insect to Schönherr and Germar as "*Sit. puncticollis* of Kirby, *nigriclavis*, *longiclavis* et *flavescens*, Marsh.;" the former referred them to *Sitones insulsus**; and the latter observed, that "*Sit. puncticollis* of Kirby, *insulsus* of Schönh., is the true *Sit. octopunctatus*, Germ.;" which opinion is further corroborated by a foreign specimen sent by him for my inspec-

* Schönh. Syn. Ins. ii. p. 103. no. 9 (1834).

tion. I find by a recent examination of the typical examples from the Marshamian cabinet, that the three synonyms, *nigriclavis*, *longiclavis* and *flavescens* of Marsham, belong to the next species, and not to the present; and I regret to have led Schönherr and Germar in this instance into an error, which they have published on my authority; it is therefore necessary to state, that according to the manuscript and collection of Kirby, *Curc. flavescens* is unquestionably (as he suspected) a pale immature variety of his *puncticollis*, and referred by him to Marsham's 'Ent. Brit.' no. 212. without doubt; this was my authority. Germar supposed that his *Sit. octopunctatus* was identical with *Curc. caninus* of Gyll. and *flavescens* of Marsh., and therefore he published the former name without characters*. *Sitones insulsus* is described by Gyllenhal as specifically distinct †; and it appears not to have been found hitherto in Sweden, whilst the following is plentiful in that country.

This is a larger and more robust insect than *S. flavescens*, and differs by having the head broader, the front sometimes with an obsolete puncture in the middle, or a faintly impressed line, more or less abbreviated, never extending to the vertex; the vertex commonly has two pale spots and is more convex; the thorax with three distinct pale lines, the lateral ones the broadest, and sometimes flexuous, between which are two whitish spots placed transversely, rarely with two near the base, and two on each side anteriorly; the elytra distinctly longer in proportion to the breadth, obscurely lineated, the sutural and the second interstice on each elytron very frequently with interrupted fuscous or black streaks; the legs longer and more robust, especially the femora.

Generally distributed, but more plentifully in the south of England; it occurs in Yorkshire, but I have never seen a specimen reputed to have been found in Scotland.

7. *Sitona flavescens*, Marsh. 1802; Steph. Illustr.

— *octopunctatus*, Schönh. 1834.

Curc. nigriclavis, Marsh.

— *caninus*, Gyll., Steph.

— *longiclavis*, Marsh. MSS., Steph., Kirb. MSS.

— *griseus*, Kirb. MSS.

— *lineatus*, Fab., Mus. Banks.

British specimens of this insect were forwarded to Schönherr and Germar with the name *Sit. canina* of Stephens; the former referred them to "*Sitones octopunctatus* †," and the latter published the following observations: "*Sitones octopunctatus*, Schönh., may probably be only a variety of *Sitones insulsus*, Schönh., *puncticollis* of Kirby and of Stephens, from which it is only distin-

* Ins. Spec. p. 416. no. 3. † Schönh. Syn. Ins. ii. p. 103. no. 9 (1834).

‡ Schönh. Syn. Ins. ii. p. 104. no. 10. et vi. p. 269. no. 31.

guished by its smaller size and less distinct colouring, of which however there are many transitions*." Mr. Stephens has in his cabinet examples of *Curc. flavescens* and *C. nigriclavis* from the Marshamian collection; these I have recently examined and compared with the descriptions, which leave no doubt on my mind as to their authenticity and identity; the former is a pale immature variety, and the latter is black, with the tibiæ and tarsi rufous. According to Germar, *Curc. caninus* of Fab. is a variety of *Curc. lineatus* of Linn.†; and it appears from the Banksian cabinet that Fabricius has mixed this species with *C. lineatus*; consequently the Fabrician name *Curc. caninus*, used by Gyllenhal and Stephens as the oldest, must necessarily be changed, not for *octopunctatus* of Germ. (a new name, and denoting a different insect), but for the next oldest, either for *flavescens* or *nigriclavis* of Marsh. I have preferred *flavescens* because it is the first-described, and I think equally appropriate and more current, being synonymized by Gyll., Germ. and Schönh. without a note of interrogation.

This insect unquestionably approaches extremely close to *Sit. puncticollis*, and I formerly had a doubt whether it was sufficiently distinct‡, but after a lapse of eight years I am now satisfied it is a good species, and may be recognised with facility by that peculiarity of form technically called habit; it is not only of a smaller size than the preceding, but is distinctly shorter in proportion to the breadth and of a different form; it also differs by having the head narrower; the front with a very deep channel extending to the vertex, and nearly to the apex of the rostrum; the eyes are smaller and less prominent; the thorax has the lines and spots indistinct; the elytra are distinctly shorter; and the alternate interstices in recent specimens are more or less distinctly variegated. I possess specimens with the body and legs entirely flavescens or rufous, and others black with the tibiæ and tarsi ferruginous, the effect of immaturity and of age. Mr. Waterhouse always considered this insect specifically distinct, and has received many specimens from Scotland, but not accompanied by one of *Sit. puncticollis*.

Found abundantly throughout Great Britain in fields of grass and clover from May to October.

8. *Sitona humeralis* (Kirb. MSS.), Steph. 1831.

— *Pisi*, Steph.

— *promptus*, Schönh. 1834.

I possess foreign specimens of this insect from Germar and Chevrolat, named *Sitones promptus* of Schönh.

* Ent. Zeit. Stettin, no. 5. p. 99, 1842.

† Ins. Spec. p. 416. no. 4.

‡ Ent. Mag. v. p. 254, 1838.

Common in woods, on the oak, birch and hazel, particularly in the chalky districts of Kent and Surrey, from June to September.

9. *Sitona Meliloti*, Walton.

Elongate, black; clothed more or less densely with coppery and fuscous, or cinereous and silvery-gray scales. Head narrow, very little broader than the rostrum, closely punctulated; the front flat, with a deeply impressed longitudinal line, commencing on the vertex and extending nearly to the apex of the rostrum: eyes rather smaller and a little less prominent than the other species of this section except the last: rostrum rather shorter than the head. Antennæ testaceous, sometimes the funiculus pitchy, with the clava fuscous. Thorax as broad as long; moderately dilated and rounded at the sides; the base rather broader than the apex; convex above, very closely and minutely punctured; more or less densely clothed at the sides with scales; the disc sparingly so, obsoletely trilineated or partially abraded. Elytra elongate; the shoulders subrectangular and rounded; the sides nearly straight; the apex obtusely rounded, rather deeply punctate-striate, more or less thickly clothed with scales; distinctly maculated on the shoulders and scutellum; the interstices indistinctly variegated with fuscous and cinereous scales: specimens sometimes occur very thinly clothed with silvery-gray scales, concolorous or partially denuded. Body densely clothed with scales beneath. Legs black, with the base and apex of the femora, the tibiæ and tarsi testaceous. Length 2—2½ lines.

Found in company with *Sit. lineata* and on the same plant, and has been mistaken for that insect; but *Sit. lineata* has the head much broader, the eyes more prominent, and the sculpture different. It is the most nearly allied to *S. humeralis*, the head, eyes and thorax being very similar, but *S. humeralis* differs in having the front of the head, and the rostrum above, deeply excavated; the thorax with large scattered punctures, and the interstices minutely punctured; the elytra shorter, being long-ovate.

This is, according to Schönherr, a new and undescribed species; and according to Germar, "closely allied to *Sit. geniculatus* of Schönh., but having only a defective specimen of the true *Sit. geniculatus* I cannot decide; the thorax seems a little less rounded."

I found this species in Yorkshire on the melilot trefoil (*Trifolium officinale*) in June; subsequently it has been taken from the same plant in Charlton sand-pits by Mr. S. Stevens and by myself, in June and July.

§ C. *Eyes very prominent.*10. *Sitona tibialis*, Herbst, Germ., Schönh.*Curc. chloropus*, Marsh.*S. lineellus*, Gyll., Schönh.— *ambiguus* (var.), Schönh.*Curc. albescens*, *affinis* et *lineatulus*, Kirb. MSS.

Oblong, black; clothed more or less thickly or unequally with shining silvery, coppery, or green scales, and with very short, suberect, inconspicuous setæ. Head broad, rugulose-punctate; the front with a broad and very deep furrow extending nearly to the apex of the rostrum: eyes large and very prominent: rostrum rather shorter than the head, and a little narrower, similarly punctured. Antennæ entirely testaceous, or frequently with the joints of the funiculus piceous, and the clava fuscous. Thorax subquadrate, moderately dilated and rounded at the sides, convex above, transversely impressed near the apex, which is distinctly elevated, deeply rugose-punctate; commonly more thickly covered on the lateral margins and down the middle with scales, distinctly or obsoletely trilineated. Elytra long-ovate, very convex above, profoundly punctate-sulcate, the interstices narrow and convex, indistinctly rugulose; the suture, the fourth interstice (rarely the second), and the margin on each elytron more or less thickly clothed with pale scales; either distinctly or indistinctly lined, or often concolorous and scattered, and frequently more or less denuded. Body densely covered with silvery-white scales beneath. Legs, with the femora generally black, sometimes the base and apex testaceous; the tibiæ and tarsi also testaceous, the latter frequently piceous; the legs rarely entirely black. Length $1\frac{1}{3}$ — $2\frac{1}{3}$ lines.

British specimens of this insect were examined by Schönherr and Germar, and referred to *Curc. tibialis* of Herbst; tested by Schüppel. The following are small narrow varieties, viz. *Curc. albescens* of Kirby and *Sit. ambiguus* of Schönh. (of which I have foreign specimens), very thinly clothed with silvery-gray scales of one colour; *Curc. affinis* and *Curc. lineatulus* of Kirby, rather densely clothed with silvery-gray scales; the latter variety with the alternate interstices of the elytra regularly lined, and the legs black.

Marshall appears to have confounded this insect with *Curc. sulcifrons* under the name of *C. chloropus* (see notes under *S. sulcifrons*), and as from the insufficiency of his characters it appears doubtful to which it should be referred, and as it seems to have escaped the notice of Stephens, I necessarily describe it.

Of *Curc. lineellus* I have carefully examined two foreign specimens from Gyllenhal, four from the collection of Billberg, and

five from Schön herr ; these are in my opinion examples or varieties of *Curc. tibialis*. Dr. Germar informs me that "*Curc. lineellus* of Gyll. appears to be recently excluded, and that he believes it to be merely a small variety of *Sit. crinitus*."

Hundreds, with innumerable varieties, may be found almost everywhere on the furze (*Ulex europæus*) in the spring and autumn.

11. *Sitona crinita*, Oliv., Steph., Schön h.

— *lineella* et *albescens* (var.), Steph.

Curc. macularius, Marsh., Kirb. MSS.

This insect greatly resembles the preceding in general habit, is equally variable in magnitude, but less so in the colour of the scales ; the elytra are proportionably longer, of a different form, and it is distinctly a less convex insect ; most generally thickly clothed with dark or pale cinereous scales ; the small varieties approximate very closely to the last, and are extremely liable to be confounded with it ; but the longer and very conspicuous setæ with which it is invariably clothed will always distinguish it, independent of other characters.

I have examined a long series with many varieties captured by Mr. R. N. Greville in Scotland ; I have found it plentifully in Yorkshire, and in profusion amongst tares on a chalky soil at Mickleham and Birch Wood in June.

12. *S. Waterhousei* (Schön h. in litt.), Walton.

Elongate, sublinear, black, sparingly clothed with cinereous and silvery-gray scales. Head very broad, coarsely punctured ; the front with a deep fovea and with a broad and very deep furrow, extending from the fovea to the middle of the rostrum ; the vertex elevated and convex : rostrum about as long as the head, and not much narrower : eyes very large, semiglobose, and extremely prominent. Antennæ entirely testaceous. Thorax oblong, subcylindrical, slightly dilated at the sides, flat above ; very coarsely and deeply punctured, somewhat rugose ; clothed at the sides more or less closely with scales ; the disc sometimes glabrous. Elytra elongate, the shoulders nearly rectangular, the angular points rounded, and the callous elevated, the sides straight, the apex obtusely rounded ; profoundly punctate-sulcate, the interstices very narrow, convex and rugulose, the second and fourth from the suture distinctly elevated, and clothed more or less with cinereous and silvery-white scales. Legs totally testaceous. Length $2\frac{1}{2}$ lines.

This is a new and distinct species according to Schön herr and Germar.

I have seen only three specimens, one of which I obtained from a dealer at York, who said it was found in the neighbourhood of

that city or near Cambridge. I have another from the collection of the late Mr. Millard, and the third is in the cabinet of Mr. Waterhouse; it appears to be extremely rare or very local.

13. *Sitona cambrica* (Kirb. MSS.), Steph. 1831.

— *cribricollis*, Schönh. 1834.

— *rugulosus* (Dillw.), Kirb. MSS.

This insect is very distinct from every other species of this genus.

I have occasionally found a few specimens in Yorkshire inhabiting moist meadows in June, but never in the south of England. Barnes Common, Hampstead, and Plumstead, in marshy places, June and July, but scarce, Mr. S. Stevens.

14. *S. grisea*, Fab., Mus. Banks., Schönh.

— *gressorius*, Fab., Germ., Schönh.

Curc. fuscus, Marsh.

— *trisulcus*, Kirb. MSS.

This remarkably distinct insect appears to be the true *Curc. griseus* of Fab., according to the two specimens pinned to that name in the Banksian cabinet, and referred to by Schönherr. *Curc. griseus* of Marsh. is very distinctly a variety of *Curc. lineatus* of Linn.

XXXII.—*A Synopsis of the British Rubi.*

By CHARLES C. BABINGTON, M.A., F.L.S., F.G.S. &c.*

[Continued from p. 175.]

9. *R. cordifolius* (W. et N.); caule arcuato anguloso glabriusculo, aculeis validis rectiusculis horizontalibus declinatisve, foliis quinatis coriaceis subtus tomentosus, foliolo terminali ovato vel subrotundo vel cordato-cuspidato, *infimis petiolatis intermediis dissitis, panicula composita hirta.*

R. cordifolius, *Rub. Germ.* 21. t. 5.

R. rhamnifolius, *Rub. Germ.* 22. t. 6; *Eng. Bot. Suppl.* t. 2604; *Bab. Man.* 93.

Stems many feet long, naked or slightly hairy. Leaflets variable in size, soft and green or whitish beneath; in some rare instances nearly or quite glabrous on both sides. Terminal leaflet cordate roundish cuspidate in *R. cordifolius*, ovate or roundish-ovate acute in *R. rhamnifolius* of the 'Rubi Germanici.' Panicle rather long; the lower branches often elongated and spreading, axillary; rachis downy. Petals roundish.

Common. July and August.

Obs. 1. I have willingly followed Mr. Borrer and many other

* Read before the Botanical Society of Edinburgh, Feb. 12, 1846.

recent observers in combining two plants of the 'Rubi Germ.,' but adopted the above name (which stands first in the 'Rubi Germ.')

in order to avoid the confusion attending the use of that of *R. rhamnifolius*. It is also the more appropriate.

Obs. 2. Plants are occasionally found which would, at sight, be referred to this species, but which from their nearly sessile lower leaflets overlapping the intermediate pair can hardly be joined with it. In some other respects they seem to occupy a place between this and the preceding species, to which they are the more nearly allied in technical character. One of these dubious specimens, from Islay, N. B., has the terminal leaflet of one of its leaves partially subdivided at the base, thus showing an approach to the suberect group: the same leaflet is also quite abrupt at the end, closely resembling that of *R. discolor*, var. *abruptus*. Another, from near Midford Castle near Bath, is marked "agrees with a specimen of *R. rhamnifolius* from Nees in Mr. Borrer's herbarium exactly." Another from Crow Moele, Salop, is ticketed by Mr. Leighton "*R. rhamnifolius*, approaching *R. cordifolius*, Nees," on that author's authority. On table 6 of the 'Rubi Germ.' two plants are figured as *R. rhamnifolius* α . and β , the former with distinct lower leaflets, the latter with overlapping ones. No reference is made to these varieties in the text of that work, nor is anything said about this character. Mr. J. Adamson has given to me a specimen gathered near Gouroch, Ayrshire, in which the leaves are thin and flexible with a convex upper surface. It is rather more hoary in appearance than is usual in this species, but seems to be referable to *R. cordifolius*.

10. *R. discolor* (W. et N.); *caule* arcuato anguloso sæpissime sulcato strigoso-sericeo, aculeis rectiusculis decurvatis horizontalibusve, *foliis* quinatis coriaceis tenuibus *marginem versus decurvatis* subtus *albo-tomentosis*, foliolo terminali obovato vel oblongo acuminato, *panicula elongata angusta* subaphylla tomentosa.

R. discolor, *Rub. Germ.* 46. t. 20.

R. fruticosus, *Eng. Bot.* 715; *Rub. Germ.* 24. t. 7.

Stem long, usually deeply furrowed. Prickles large, strong, numerous. Leaflets variable in shape, usually, in English plants, obovate and acute, sometimes (*R. abruptus*, Lindl.) cuneate-oblong, abruptly truncate and cuspidate. Panicle with patent branches, occasionally with long axillary ones below. Petals roundish-obovate.

β . *thyrsoides* (Bell Salt. !); *caule* subglabro, aculeis rectis, foliolis planis subtus molliusculis, *paniculæ* plerumque breviusculis tomentosæ ramis patentibus. *Phytol.* ii. 104.

γ . *macroacanthus* (Bell Salt. !); *caule* sericeo pilis paucis patentibus ornato, aculeis validis pilosis, foliolis planis subtus molliusculis,

paniculæ tomentosæ ramis ascendentibus. *Ann. Nat. Hist.* xvi. 366.

R. macroacanthos, *Rub. Germ.* 44. t. 18.

δ. *argenteus* (Bell Salt. !); caule patente-piloso, aculeis rectis, foliolis planis subtus molliusculis, paniculæ tomentosæ ramis ascendentibus. *Ann. Nat. Hist.* xvi. 367.

“*R. argenteus*, *Rub. Germ.* t. 19.”

Common. July and August.

Obs. 1. I have placed both the plants of the ‘Rubi Germ.’ under the type of this species, but neither of those plates exactly represents either of our plants. The narrow leaves of the *R. fruticosus* of that work agree well with the more common English plant, but then they are combined with a deeply furrowed glabrous barren shoot. In our plant this form of leaf is most usually found upon silky angular but scarcely furrowed shoots. Also the much rounder leaves of the *R. discolor* (Rubi Germ.) is an attendant upon a furrowed barren shoot and a thyrsoid panicle in this country.

Obs. 2. The panicle in *var. a.* and *β.* has a different appearance from that of *var. γ.* and *δ.* owing to its lower branches, although short, spreading at nearly a right angle from the rachis; in the later varieties they are usually rather longer, but ascend from a very acute angle with the rachis.

Obs. 3. Dr. Bell Salter has given to me a form of this plant under the manuscript name of *var. levis*, differing from the typical state in having its flowering shoot nearly without prickles. It seems hardly deserving of a distinctive name; it is probably the *var. inermis* of Godron. The *R. abruptus* (Lindl.) can only be considered as a state of the species, not a true variety. Such forms are found in many if not all the species.

Obs. 4. A *frustratus* form of this species occasionally may be observed. It is almost exactly suberect, showing no tendency to prolong its growing shoots so as to reach the ground, or indeed to do more than very slightly curve at the summit. In all other respects it resembles the typical plant.

11. *R. leucostachys* (Sm. !); caule arcuato anguloso piloso-villoso, aculeis æqualibus rectiusculis horizontalibus, foliis quinatis coriaceis planis subtus mollibus fulvo-albove-hirtis micantibus, foliolo terminali ovato rotundatove abrupte apiculato, panicula elongata angusta foliosa villosa vel tomentosa.

R. leucostachys, *Eng. Bot. Suppl.* 2631.

R. pubescens, *Rub. Germ.* 42. t. 16.

Stem long, not furrowed, often nearly round; *pubescence* loose, weak. Prickles numerous, hairy. Leaflets, particularly those of the flowering shoot, often wavy at the margins. Flowering shoot

and panicle with numerous long straight prickles (in which respect it differs from the figure quoted above from the 'Rubi Germ.')

and a few setæ; branches short, patent or divaricated.

β. vestitus (Bell Salt. !); caule æstivo suberecto, foliolis subrotundis acutis mucronato-dentatis subtus pallide viridibus albidisve. *Phytol.* ii. 105.

R. vestitus, *Rub. Germ.* 81. t. 33.

R. diversifolius, *Lindl. Syn. ed.* 1. 83.

R. villicaulis, *Leight. ! Fl. Shrop.* 231.

R. villicaulis α, *Bab. Man.* 95.

γ. argenteus (Bell Salt. !); caulis pubescentia densa argenteaque, foliolo terminali subrotundo-obovato acuminato duplicato-dentato subtus albo sericeo micanteque, caulis paniculæque aculeis maximis, paniculæ ramis inferioribus elongatis et erecto-patentibus. *Ann. Nat. Hist.* xvi. 366.

R. villicaulis β, *Bab. Man.* 95.

Hedges and thickets. *β.* in shady places. *γ.* Channel Islands. Sussex and Isle of Wight, *Dr. Bell Salter.* July and August.

Obs. I fully concur with my friend Dr. Bell Salter in combining these three plants, although it would be difficult to believe that they are only varieties if the extreme forms alone were before us. The remarkably round leaflets and somewhat suberect habit of *R. vestitus*, and the branching corymbose and often very straggling panicle of *R. argenteus* would undoubtedly afford good distinguishing marks, did we not see numerous intermediate forms connecting both of them with the typical *R. leucostachys*.

12. *R. sylvaticus* (W. et N.); caule arcuato anguloso subteretive piloso, aculeis paulo inæqualibus tenuibus rectis, foliis quinatis subtus mollibus micantibus pullideque viridibus, foliolo terminali cordato-ovato apiculato, paniculæ compositæ foliosæ ramis brevibus.

R. sylvaticus, *Rub. Germ.* 41. t. 15.

R. villicaulis γ, *Bab. Man.* 95.

Stem not furrowed, often nearly round; pubescence of shining patent nearly parallel hairs. Prickles moderate, rather numerous, declining, hairy at their base, not quite confined to the angles. Leaflets serrate, usually tinged with purple on the veins beneath. Flowering shoot and panicle with short slender prickles and setæ usually sunk in the dense pubescence; floral leaves usually 3-fid or simple.

β. villicaulis; foliolo terminali ovali rotundatove cuspidato, paniculæ ramis longioribus: aculeis validioribus, caulis aculeis subæqualibus sparsis.

R. villicaulis, *Rub. Germ.* 43. t. 17.

Rather rare. Bath; Killarney; Loch Eil and Linlithgow.

β . Isle of Wight and Dorset, *Dr. Bell Salter*. July and August.

Obs. The differences between the *R. sylvaticus* and *R. villicaulis* of the 'Rubi Germ.' do not seem to be more than those of varieties. The under side of the leaves of the latter is usually rather paler, but in all respects the characters between them are only those of degree. I take *R. sylvaticus* as the specific name from its standing first in that work, and also because *villicaulis* has been often misapplied in this country to *R. leucostachys* β .

13. *R. Borreri* (Bell Salt. !); caule procumbente tereti hirto, *aculeis* crebris inæqualibus longis tenuibus *deflexis*, *foliis* quinatis *subtus* *hirtis* *concoloribus*, *foliolo terminali* late obovato-lanceolato *cuspidato*, *paniculæ corymbosæ* ramis inferioribus longis decompositis flore terminali subsessili, sepalis fructum hemisphæricum laxè amplectentibus.

R. Borreri, *Bell Salter in Ann. Nat. Hist.* xv. 306.

Stems mostly quite prostrate, very prickly; pubescence of patent hairs. Prickles not confined to the angles of the stem. Leaflets of the same colour on both sides. Flowering shoot and panicle with few short slender prickles, hairy and slightly setose. Sepals linear-lanceolate.

" β . *Wilsoni* (Bell Salt. MSS.); pilis in aciculos paucos abeuntibus, aculeis ad basin latis."

Apse Heath and Pagham Common, Isle of Wight, *Dr. Bell Salter*. β . Near Buglawton, Cheshire, *Mr. S. E. Wilson*. June.

14. *R. Sprengelii* (Weihe); caule procumbente tereti sparsim piloso, aculeis uncinatis, *foliis ternatis*, foliolis obovatis acuminatis concoloribus subtus venosis, *paniculæ ramosæ tomentosæ* ramis divaricatis paucifloris, sepalis ovatis acuminatis dense tomentosis patentibus.

R. Sprengelii, *Rub. Germ.* 32. 10.

A low trailing plant with greenish purple stems, which are very slender and either simple or branched. Prickles purple, yellow-tipped, small and slender, and so extremely uncinuate that the point is parallel with the stem. Hairs rigid, shining and patent, but not sufficiently numerous to produce the appearance of pubescence. Leaves rarely otherwise than ternate. Petioles armed as the stem, furrowed above. Leaflets obovate acuminate, irregularly but finely and acutely serrated, bright shining green above, with a few spreading hairs and the principal venations grooved, green and hairy beneath with very prominent veins, and the midrib armed with a few slender uncinuate prickles. Terminal leaflet with its petiole geniculated, lateral leaflets broader externally and somewhat lobed. Stipules with small glands. *Panicle*—or rather flowering stem, as it grows erect from the last

year's shoot apparently from the ground—in the lower part leafy and clothed nearly as the barren shoot, but the prickles somewhat smaller, and the hairs more numerous and longer. Leaves like those of the barren shoot but rather more hairy: upper or floral portion branched. Branches rather distant, slender and few- (about three-) flowered and spreading; one or two lower ones axillary from ternate leaves, which towards the summit pass into leafy bracts. Peduncles and calyx very hairy, with shining patent hairs interspersed with shaggy pubescence. Petals ovate, obtuse, rugose, of a very beautiful rose-pink. Stamens erect.

Bredbury Wood, Cheshire, plentifully, *Mr. Joseph Sidebotham*. Near Congleton, Cheshire, *Mr. S. E. Wilson*.

Obs. 1. Our English plant has both the prickles and petals slightly more elongated than represented in the 'Rubi Germanici.' In other respects both the figure and description in that work represent ours most faithfully.

Obs. 2. This is one of the most beautiful as well as most distinct of our *Rubi*, and is a highly interesting addition to our flora. *R. Sprengelii*, with its concealed branched and creeping barren shoot, and its erect delicate flowering stem growing apparently from the ground, approaches most nearly in appearance to the herbaceous forms, but in appearance only, as it is, though small, weak and trailing, one of the true fruticose species, its panicles in reality emanating from a biennial shoot. In the general form of the leaf and leaflets it very much resembles *R. glandulosus* (particularly the *var. rosaceus*), as also in having the terminal leaflet articulated; in the grooving of the veins above and their prominence beneath it resembles *R. Radula*, while the midrib approaches the carinated aspect of that part in the *var. carinatus* of *R. plicatus*.

The delicately slender wire-like branches and peduncles, and the beautifully bright tint of its flowers, formed of reticulated or rugose-plicate petals, render this plant remarkably beautiful.

Obs. 3. The two kinds of hairiness on the peduncles of this plant are very striking: it is like the patent, parallel villosity of *R. sylvaticus*, combined with the shaggy hairiness, spreading in all directions, of *R. leucostachys*. The shining rigid patent hairs may be seen protruding through the tomentum.

N.B. I am indebted for the above character, description and observations to Dr. Bell Salter, as I have seen no native specimens of *R. Sprengelii*.

15. *R. Leightonianus* (n. sp.); caule arcuato subanguloso hirto, aculeis paulo inæqualibus rectis paulo declinatis, *foliis* quinatis ternatisve *duplicato-apiculato-dentatis* supra pilosis *subtvs pallide viridibus hirtisque*, *foliolo terminali rotundato acuto*, paniculæ in-

ferne foliosæ densissime hirsutæ setosæ ramis brevibus paucifloris divaricatis.

R. villicaulis δ . tenuis, *Bab. Man.* 95.

R. dentatus, *Bab. in literis ad amicos*.

Stem long, arched, slightly angular, hairy; prickles rather numerous and unequal, not confined to the angles of the stem, straight, yellow tinged with purple, subulate from a dilated hairy base; setæ and aciculi wanting; hairs numerous, scattered, slender, spreading, white. Leaves quinate-pedate or ternate by the junction of the lateral pairs, thin; terminal leaflet nearly round, acute, slightly emarginate at the base, doubly and coarsely dentate-crenate-apiculate, except towards the base, which is distantly serrate; intermediate leaflets obovate-acute; lowermost when distinct shortly stalked, oval, acute; all thin, dark green and pilose above, light green with much more conspicuous hairs, especially on the ribs, beneath; petioles and pedicels very hairy and with scattered straight slender strongly declining yellow prickles with a purple base; stipules linear-lanceolate hairy. Flowering shoot and panicle very hairy; prickles slender, straight, declining, yellow tinged with purple at the base. Leaves ternate; leaflets large, oval, acute, finely and nearly regularly dentate-apiculate. Panicle and its branches with numerous setæ which are shorter than the hairs and hidden by them; about three lower branches from the axils of the leaves, the rest, about eight, subtended by trifid slender very hairy bracts, all spreading nearly at right angles to the rachis and bearing a corymb of three or four flowers, the uppermost are 1-flowered; the lower ones about two inches long, the others shortening upwards. Sepals acuminate, densely woolly on both sides, with long hairs and a few short setæ interspersed.

Gathered at Haughmont, Salop, in September 1837, in company with my friend the Rev. W. A. Leighton, author of the justly valued 'Flora of Shropshire.' I have named the plant in his honour, being obliged to place the *R. Leightoni* (Lees) as a variety of *R. rudis*, and wishing to retain his name attached to a species in a genus to the elucidation of which he has so successfully devoted his talents. I also found it at Alborne, Sussex, in 1845.

Obs. The peculiar tothing of the leaves is a characteristic point of great value, very few species being so distinguished. *R. Babingtonii* in the glandulose group is a similar and almost solitary case.

16. *R. carpinifolius* (W. et N.); caule ascendente subanguloso hirto, aculeis validis deflexis declinatisve, foliis quinatis coriaceis acute serratis subtus viridis, foliolo terminali ovato angusto acuminato,

infirmis intermediis dissitis, *paniculæ angustæ valde hirsutæ ramis ascendentibus.*

R. carpinifolius, *Rub. Germ.* 36. t. 13; *Eng. Bot. Suppl.* 2664.

Stem suberect, ultimately arching, clothed with fascicles of straight spreading hairs, angular when young. Prickles numerous, of moderate size, equal, hairy, tipped with yellow. Leaflets slightly hairy above, more so and paler beneath. Panicle prickly, compact, often slightly setose, usually with short ascending few-flowered branches, or with a simple close panicle. Flowers and fruit contemporaneous.

Hedges, rare. July to September.

Obs. 1. It has been well observed by Dr. Bell Salter, that the mode of growth of the barren shoot of this species is very similar to that observed in *R. nitidus*. In the present case the autumnal secondary growth more generally takes place, but during the summer months it is truly suberect. The young shoots are usually angular, but the matured wood seldom shows much trace of the angles.

Obs. 2. A variety with rose-coloured flowers, flaccid leaves and more angular stem is noticed in the 'Rubi Germ.' and mentioned as "an extremely beautiful" plant by Dr. Salter, who also observes that this form has a few scattered glands in the panicle.

17. *R. macrophyllus* (W. et N.); caule arcuato anguloso hirto, *aculeis paucis parvis rectis æqualibus, foliis quinatis mucronato-serratis subtus pallide viridibus pubescentibusque, foliolo terminali elliptico-ovato, infimis petiolatis intermediis dissitis, paniculæ compositæ elongato-corymbosæ ramis ascendentibus.*

R. macrophyllus, *Rub. Germ.* 35. t. 12; *Eng. Bot. Suppl.* 2625.

Stem long, purplish, more or less hairy or nearly glabrous. Prickles short, thick at the base, distant. Leaflets irregularly but doubly serrate, acute, or with a long point, downy or distantly pilose beneath. Prickles on the panicle small.

β. Schlechtendalii (Bab.); foliolo terminali obovato-cuneato cuspidato irregulariter duplicato-serrato, aculeis majoribus. *Bab. Man.* 95.

R. Schlechtendalii, *Rub. Germ.* 34. t. 11.

γ. amplificatus; foliolo terminali ut in var. *β.* sed sæpe subtus pallido, *paniculæ longissimæ angustæ inferne foliosæ ramis erecto-ascendentibus: pubescentia flavescente.*

R. amplificatus, *Lees MSS.* !

Hedges and thickets, rare. July and August.

Obs. 1. These plants are usually quite without setæ on the barren shoot, but even on English specimens I believe that a very few may occasionally be detected. On Irish (Killarney) specimens of the typical variety short setæ are moderately abundant, and a

very few extremely short aciculi may also be found: some of these specimens have almost glabrous barren shoots. We thus see an approach to the species included in the next section.

Obs. 2. Mr. Lees has favoured me with fine specimens of his *R. amplificatus*. It presents a different appearance from *R. macrophyllus*, but I fear that it must be considered as a variety of that species. Its chief difference is found in the panicle, which is very much longer, and has rather long axillary branches below, which form a very acute angle with the rachis when the plant is in flower, but afterwards appear to become much more spreading. The prickles on the panicle are usually much stronger, and the dense pubescence is beautifully tinged with yellow. One of the specimens has an enormous panicle, each lower branch of which has the same structure as that which is usual to the whole inflorescence.

*** *Caules arcuati vel procumbentes, radicanes, angulosi, hirti, setosi.*

† *Caules punctis elevatis rigidis, ubi setæ et aciculi sederunt, asperi efficiuntur. Aculei subæquales, in caulis angulis sæpissime congesti.*

18. *R. Babingtonii* (Bell Salt. !); *caule arcuato tereti sulcato vel anguloso lateribus planis striatis aspero, aculeis brevibus declinatis, setis aciculisque multis brevibus, foliis ternatis quinatisve mucronato-crenato-dentatis pilosis opacis subtus parce pubescentibus pallide viridibus foliolis obovato-orbiculatis abrupte cuspidatis, paniculæ compositæ longæ tomentosæ aculeatæ setosæ ramis omnibus e foliolorum axillis, sepalis ovato-lanceolatis aciculatis setosis tomentosis a fructu laxè reflexis.*

a. verus; *caule tereti sulcato, aculeis validis, paniculæ ramis racemosis.*

R. Babingtonii, *Bell Salt. in Ann. Nat. Hist. xv. 307.*

A very large stout plant of peculiar appearance. Stem greenish purple, rounded and sulcate, with very short thick-based prickles and numerous aciculi and setæ of the same form. Leaves dark green with a few scattered hairs above, paler green with rather more numerous short hairs beneath, ternate or occasionally quinate by the subdivision of the lateral leaflets, in which case the lower leaflets are stalked. Petioles armed like the stem. Stipules linear, membranaceous, hairy and sparingly glandulose. Panicle more than three feet long, with large branches forming secondary panicles. Rachis, branches, peduncles and petioles with numerous long slender straight declining yellow prickles with broad purple bases, numerous hairs and small aciculi and unequal setæ. Floral leaves very large; lower ones ternate; upper ones simple, ovate-acuminate, lobed. Sepals yellowish,

with a prominent midrib which is lengthened into an acuminate point. Fruit small and composed of small drupes.

β. Bloxamii; caule anguloso lateribus planis striatis, aculeis parvis, aciculis setisque brevissimis, paniculæ ramis brevibus paucifloris corymbosis.

Week Hill, Selborne, Hampshire, *Dr. Bell Salter*. *β.* Very abundant in a lane by Hartshill Wood, Warwickshire, but on the opposite side from the wood, *Rev. A. Bloxam*. July.

Obs. 1. In some respects this plant approaches *R. thyrsoflorus* (Weihe), but in that the greater part of the panicle is extra-foliaceous, in this it is leafy to the end. From *R. Kæhleri*, to which it has some points of resemblance, it is separated by the sectional characters. From the three following species it is abundantly distinguished by its stout aciculi and setæ, usually ternate leaves and large floral leaves. The dentate-apiculate margin of its leaves distinguishes it from all the British species except *R. Leightonianus*, with which however it cannot be confounded, that not being a glandulose plant.

Obs. 2. The var. *β. Bloxamii* has a panicle of very different aspect from that of the typical *R. Babingtonii*, the branches being short and distinctly corymbose, the floral leaves larger, especially towards the summit of the panicle, and more usually pilose. The prickles of the growing shoot are neither so numerous nor so strong, the setæ and aciculi are very short and more equal, the hairs much more numerous; the leaves more frequently quinate. In one instance the terminal leaflet of a ternate leaf is subdividing at its base as in *R. suberectus*, so as to form a partially pinnate leaf.

19. *R. rudis* (Weihe); caule arcuato procumbenteve paululum sulcato aspero, aculeis subæqualibus validis declinatis in caulis angulis permulto locatis aciculis setis pilisque æqualibus multo longioribus, foliis quinatis grosse duplicato-serratis subtus albis, paniculæ longæ foliosæ superne ultra-axillaris ramis corymbosis ascendentibus, sepalis lanceolatis aciculatis setosis a fructu reflexis petioloque adpressis.

R. rudis, *Bell Salter in Ann. Nat. Hist.* xvi. 367.

Stem dark fuscous. Prickles not passing into the aciculi or setæ. Leaves dark green above; lower pair of leaflets stalked. Panicle much-branched; prickles long, slender and nearly horizontal; rachis usually very setose. Sepals generally ending in a foliaceous point, clothed with dark setæ.

α. rudis; foliolo terminali obovato-lanceolato.

R. rudis, *Rub. Germ.* 91. t. 40.

R. Radula, *Leight. Fl. Shrop.* 232.

R. Radula γ. *Hystrix*, *Bab. Man.* 96.

β . *Leightonii* (Bell Salt. !); foliolo terminali rotundato-obovato abrupte cuspidato. *Ann. Nat. Hist.* xvi. 367.

R. *Leightoni*, *Lees in Leight. Fl. Shrop.* 233.

γ . *Reichenbachii* (Bell Salt. !); foliolo terminali subrotundo, caule hirsuto aciculis setisque paucis. *Ann. Nat. Hist.* xvi. 368.

R. *Reichenbachii*, *Rub. Germ.* 87. t. 37.

δ . *attenuatus*; foliolo terminali obovato longissime acuminato subtus pallide viridi.

R. *echinatus*, *Bab. Man.* 96. not. *Lindl.*

Hedges in the south. β . Shropshire; γ . Isle of Wight, *Dr. Bell Salter*; δ . Somersetshire, Shropshire and Leicestershire. July.

Obs. 1. After much consideration I have formed the same opinion as Dr. Bell Salter upon this and the following species. The usually very setose rachis of the much-branched panicle, and the coarsely serrate and even jagged leaves distinguish this plant from the following, although occasionally one or the other character is wanting. In *var. \beta*. the leaves are usually rather finely but yet irregularly serrate, and in some forms of *var. a*. the rachis has a few setæ. In all the forms the sepals are very strongly reflexed from the fruit, and even closely adpressed to the peduncle; they are also clothed with numerous dark setæ and have generally a leafy point.

Obs. 2. The *vars. \gamma*. and δ . have very much the appearance of being distinct species, and would be so considered did not intermediate states occur. *Var. \delta*. is remarkable for having its leaflets gradually narrowed into a long jagged point, the base being occasionally narrowed in a similar manner. An incorrectly named, and supposed authentic specimen caused me formerly to consider this as *R. echinatus* (*Lindl.*), which I have now ascertained to belong to *R. fusco-ater* of *Weihe*.

Obs. 3. A Silesian specimen named *R. Kæhleri* from *Grabowski*, one of the authors of the excellent 'Fl. Silesiæ,' does not agree with the description in that work, and appears to be a much less prickly form of my *var. attenuatus* of the present species.

20. *R. Radula* (*Weihe*); caule arcuato procumbenteve anguloso aspero, aculeis inæqualibus tenuibus basi dilatatis sparsis aciculos et setas pilosque inæquales crebros longe excedentibus, *foliis* quinatis inæqualiter *argute serratis*, foliolis acuminatis, paniculæ longæ foliosæ superne ultra-axillaris ramis brevibus corymbosis, sepalis ovatis tomentosissimis a fructu laxè reflexis.

R. *Radula*, *Bell Salter in Ann. Nat. Hist.* xvi. 367.

Stem green or greenish purple. Prickles mostly large, but a few smaller passing insensibly into aciculi. Leaves dark green above, paler beneath; lower pair of leaflets stalked. Panicle

slightly branched, the branches usually short and with few flowers or even 1-flowered; prickles slender; rachis rather sparingly setose. Sepals without any leafy point, clothed with a whitish tomentum and a few setæ.

α. Radula; caule valde setoso pilis paucis, foliis glabris superne venis impressis subtus albo-viridibus pubescentibusque, foliolo terminali ovato acuminato.

R. Radula, *Rub. Germ.* 89. t. 39.

R. Radula β. rudis, *Bab. Man.* 96.

β. Hystrix (Bell Salt. !); caule pauci-setoso, foliis pilis sparsis venisque paulo impressis subtus subhirtis, foliolo terminali inferne attenuato. *Ann. Nat. Hist.* xvi. 369.

R. Hystrix, *Rub. Germ.* 92. t. 41.

γ. pygmæus (Bell Salt. !); caule tereti, aculeis aciculis setis pilisque multis, foliis pilis sparsis subtus viridibus tomentosis; foliolo terminali obovato-acuminato: petiolo aculeis multis inæqualibus paululum decurvatis aciculisque brevibus validis armato. *Ann. Nat. Hist.* xvi. 369.

R. pygmæus, *Rub. Germ.* 93. t. 42.

δ. foliosus (Bell Salt. !); caule subanguloso, aciculis setis pilisque brevissimis, foliis pilis sparsis subtus viridi-albis tomentosis, foliolo terminali ovato-acuminato: petiolo aculeis multis inæqualibus paululum decurvatis aciculisque brevibus validis armato. *Ann. Nat. Hist.* xvi. 369.

R. foliosus, *Rub. Germ.* 74. t. 28.

Hedges and thickets. *α.* Dumfries-shire; Edinburghshire; Dorset. *β.* Sussex; Isle of Wight. *γ.* Renfrewshire; near Bristol. *δ.* Glen Falloch, N. B. July and August.

Obs. 1. The paler tint of the stem, much less strongly toothed leaves and closer panicle appear to distinguish all the above forms, which Dr. Bell Salter has combined under the name of *R. Radula*, from the *R. rudis*. Here also the prickles are not so nearly equal, although the larger ones are usually almost equal, and greatly exceed in size the under series which gradually merges in short very thick aciculi and setæ.

Obs. 2. The partial and general petioles, and also the midrib of the leaves on the barren stems, are furnished with moderately numerous rather slender but short hooked prickles, with a very few short rigid points interspersed: but in the less frequent forms referred above to *R. pygmæus* and *R. foliosus* of the German botanists, these rigid points become very numerous, and together with the prickles vary so much in size as to merge insensibly into each other.

Obs. 3. The plant referred above to *R. foliosus* (Weihe) differs slightly from the figure and description in the 'Rubi Germ.' Its

panicle is not leafy to the summit, but the upper branches are subtended by trifid bracts. It agrees so well in most other respects and in general appearance with that plate, that I have very little doubt of its claims to the name of *R. foliosus*.

21. *R. Lingua* (Weihe); caule procumbente arcuatove subanguloso aspero, aculeis inæqualibus subrectis declinatis, aciculis setis pilisque paucis brevibus, foliis quinatis ternatisve subglabris subtus pallide viridibus albidisve hirtis, foliolo terminali ovato abrupte cuspidato, *paniculæ laxæ ramis sæpissime unifloris*, foliis floralibus simplicibus magnis, sepalis ovatis tomentosis cuspidatis a fructu laxè reflexis.

R. Lingua, *Rubi Germ.* 88. t. 38.

Stem green or greenish purple. Prickles not very numerous, moderate, purplish yellow, fewer than in the preceding species and less decidedly larger than the aciculi. Leaves usually green on both sides; terminal leaflet generally remarkably abrupt, lower pair stalked. *Panicle nearly simple with very long pedicels* or 2—3-flowered branches, leafy below; lower floral leaves ternate, upper simple; rachis and branches clothed with an ashy tomentum, short setæ and slender purplish prickles. Calyx greenish.

β. tomentosus; foliolo terminali acuminato subtus tomentoso albidocinerascente, *paniculæ ramis corymbosis subtrifloris*.

R. scaber, *Rub. Germ.* t. 32?

Oakhampton, Devon; Jardine Hall, Dumfries-shire. *β. Jersey*. Poole, Dorset, *Dr. Bell Salter*. July to September.

Obs. 1. The Oakhampton plant agrees very exactly with the plate in the 'Rubi Germ.' In it one or two of the lowermost branches of the panicle have more than one flower, the others being reduced to a single flower, which thus appears to be provided with a peduncle of at least an inch in length. The Dumfries-shire specimens only differ by having these branches all very much shorter so as to give a close appearance to the panicle. In this latter plant the flowers and fruit are contemporaneous.

Obs. 2. The *var. β. tomentosus* has the general appearance of *R. scaber* (Weihe) as represented in the 'Rubi Germ.,' but that plant has much smaller and more decidedly hooked prickles on its barren stem, and the under side of all its leaves pale green and only slightly pubescent. It probably is a state of this species.

It seems doubtful, as suggested by Dr. Salter, if *R. Lingua* will not ultimately be shown to be a form of *R. Radula*.

[To be continued.]

XXXIII.—*Abstract of a memoir on the Embryogeny, the Anatomy and Physiology of the Simple Ascidiæ, &c.* By M. VAN BENEDEN, Professor in the Catholic University of Louvain, &c.*

I HAVE the honour to present to the Academy a new memoir on some animals that inhabit our coasts. It is a sequel to those I have already communicated, and is entitled 'Recherches sur l'embryogénie, l'anatomie et la physiologie des Ascidiæ simples,' &c. In a short time I hope to lay before you a work on the embryogeny of the Acephala, and another on the Acarides, on which I have been occupied for several years.

To the present time I have observed four species of simple *Ascidia* on our coasts, three of which appear to be undescribed. The abundance of one of them on the oyster-beds at Ostend, and to which, because of its form, I have given the name *ampulloides*, has permitted me to study with care both its anatomy and its growth; and I have seen all the phenomena of its embryo-evolution from the first appearance of the egg and of the spermatozoa in the sexual organs. When young the *Ascidia* is nomade, as Milne Edwards stated in 1828; when adult it is fixed, and in this last stage of its existence, all the functions are reduced to those of nutrition and of reproduction.

What relates to the embryogeny has, in an especial manner, engaged my attention. It is, we may say, a new science, and yet it almost already claims its due place, for without its guidance we cannot take a step towards the solution of the highest questions in anatomy, physiology and zoological classification. Hence the reason which has induced me to give it here the same preference it has in my previous memoirs.

Cuvier and Savigny have carefully anatomized these *Ascidia*; and Sars in Norway, Dalyell in Scotland, and Milne Edwards in France have studied their genesis with equal care. The favourable circumstances in which I am placed have enabled me to add to the excellent works of these naturalists some new facts and rectifications of others. It seemed to me also that it would be not uninteresting to represent, in a continuous series, all the metamorphoses which the *Ascidia* undergo in their different ages.

The memoir is divided into four parts. The first is historical; the second contains the exposition of their anatomy; the third has the embryogeny for its subject; and the fourth comprises some reflections on the place which the Ascidiæ ought to have in the animal scale, and an enumeration of the species I have observed on our shores up to this date.

Hitherto no one has seen in the *Ascidia* either eyes or any

* Extrait du tome xiii. no. 2. des Bulletins de l'Académie Royale de Belgique.

other organ of a special sense. I have ascertained the existence of eyes in one species in its adult condition, at the end and all round each of the tubes; and in its embryos, other eyes are situated upon the side of the body in the spot in which we see them in other animals of the same form. The latter disappear with its nomadic life. Milne Edwards has seen some black specks in the fry of the compound Ascidiæ, but he has not assigned them a function. This is the first ascertained instance of an animal having two kinds of eyes—the one for the embryonic period, the other for the adult and perfect estate*.

In the anatomical section I have been able to complete what was known of the reproductive system. Milne Edwards had determined the existence of the male and female organ in the same individual, but the learned professor of the "Muséum" avows that he could not discover in what way the eggs and the spermatozoa were ejected. That gap I have also filled up. I have found a species, which, from the transparency of its parietes, was a favourable subject for observation; and I have seen that in it there were several outlets for the passage of the spermatic fluid into the cloacum, but one oviduct only for the exclusive passage of the eggs. The hypothesis which had been made in reference to this subject has not been confirmed.

Notwithstanding the assertions to the contrary† of the physiologist who, quite recently, has obtained such an honourable distinction from the Academy of Sciences of Paris, I more than ever persist in my belief that the spermatozoides are analogous to the globules of blood: I cannot consider them as animalcules, nor consequently as organized beings. I have not yet had an opportunity of studying the spermatozoides of the Tritons, but that cannot hinder us believing the pretended inhabitants of the spermatic liquor in the *Anodontes*, the *Ascidia*, the *Bryozoa*, and other inferior animals in which we have observed them, to be free cellules, and usually or always vibrating. It is not by inductive reasoning that I have been led to this result, as M. Pouchet thinks,

* There still exists a prejudice in science,—a prejudice born of the anatomy of the superior animals,—that an animal cannot be sensible of the light without eyes, that eyes necessarily require the existence of an optic nerve, and that where this nerve exists there must also be a brain or cerebral ganglion. The study of the inferior animals has completely overturned this error. In fact, it ought to have been perceived long ago that the *Hydra* and many other inferior animals are sensitive to light, moving freely and spontaneously, and fulfilling all the functions of relative and conservative life, and that too without eyes, without nerves, without muscles and without brain. I believe that Trembley had observed, towards the middle of the last century, that *Hydræ* in a glass of water wandered to the side of the glass whence the light came.

† Journal l'Institut, 1845, p. 167.

but rather by an examination—mature, comparative, and based on the genesis of organization. It is four years since I studied with care the development of this product in the *Alcyonella*—nor has the delay in the publication of that work depended on me—and since then the facts in general have come to the support of my views.

It has been said that reproduction by buds in some of the *Ascidiæ* is a very recent discovery; and Milne Edwards assumes, for the basis of his classification, the twofold mode of reproduction by eggs and by buds. But in 1761 Bohadsch had observed the gemmiferous reproduction, and that even in a simple Ascidian, the *A. intestinalis*. Hence it was that, in the 'Encyclopédie Méthodique,' Bruguière wrote,—“It is probable that, independently of their multiplication by eggs, they enjoy also a propagation by the integuments, according to the observations of Bohadsch and Müller.”

The able Norwegian naturalist, Sars, has made some very curious observations upon the mode of formation of the compound or aggregated *Ascidiæ*, which perfectly explain the symmetrical arrangement of these little animals. Milne Edwards does not admit the plurality of germs to explain the aggregation, and he believes the formation by buds is sufficient to do so. Recently several important facts have appeared in support of the assertions of Sars, and it seems to me that doubt can no longer rest on the exactness of his observations. Some animals in their embryo condition, and before the adult form is reached, can divide themselves and disaggregate, by a natural fissiparous reproduction, into several other individuals, which sometimes remain grouped together and constitute a ready-made colony (*Ascidiæ compositæ*), and sometimes they separate to live freely (*Campanulariæ*, *Medusæ*, &c.). An animal of the lower classes can thus reproduce itself in its young age when it has still the embryo form: it dies in giving birth to another generation before having attained adulthood, and that second generation has not passed through the same phases of the mother that gave birth to them.

To explain the passage of the water from the respiratory cavity to the anal tube, openings or stigmata between the branchial vessels have been supposed necessary, but I rather coincide in the opinion of the naturalist who has lately denied the existence of these communications. I have always seen a thin membrane between the vessels; and the communication, in my opinion, is effected by an interruption of continuity between the parietes which separate the respiratory cavity from the cloacum.

Without having recourse to an alternating generation, as a learned Dane, Steenstrup, has lately advocated in a small but very remarkable book, it is easy, if we do not deceive ourselves,

to explain these singular embryogenic phænomena, by keeping simply in view the facts which, within these few years, have been added to science.

The class Tunicata exhibits these modes of reproduction:—

1. The simple *Ascidiæ* reproduce themselves by bud and by egg, and the embryo runs through different phases:—if it is born of an egg, it will be nomade in its youth, and its figure will be that of a tadpole;—if, on the contrary, it proceed from a bud, the embryo will attain its adult character more quickly and by the most direct means, without ceasing to remain united to its colony, and without presenting any great external changes.
2. The compound *Ascidiæ*, all reproduced by buds, present nevertheless two distinct modes of embryonic evolution after their escape from the egg. Instead of undergoing simply its metamorphoses as in the preceding instance, the tadpole embryo may spontaneously divide itself into several germs which remain grouped in a determinate order. That little colony, formed at first by the reunion of several germs naturally fissured, may root itself upon a solid body, and never again leave this resting-place. Or again,
3. as in the *Pyrosomæ*, the colony may remain afloat and continue to swim freely in the bosom of the waters.
4. The *Salpæ* offer still another phænomenon: there are *Salpæ* which live in isolation and free, and there are *Salpæ* which form long chains composed of individuals joined together. We see in this peculiarity, which has been explained in different ways, nothing more than a phænomenon exactly alike to that which the *Ascidiæ* have shown us. Whether it is the effect of age or not, this always holds, that it is the same species which presents the phænomenon of the free and separate life and of the aggregated or combined life. The interpretation of the latter phænomenon by Chamisso, generalized by Steenstrup, appears to me inadmissible, and little at conformity with the great simplicity we everywhere observe to prevail in nature. We may from this time forward reduce to a formula the theory of embryonic development in the animal scale.

When on this subject I may be permitted to say a word upon that mystery of mysteries—the generation of the Aphides. It is known that these insects bring forth young throughout the summer without the concurrence of males; that eight or nine generations in succession are exclusively composed of fruitful females; that all these generations are viviparous, and that at the end there is born a generation composed of males and of females; that then there is a coupling, and, instead of producing living young, the female now lays her eggs. These are facts, notwithstanding that some naturalists still disbelieve in them, and remain unconvinced by experiments conducted through years by the most celebrated observers. However inexplicable the phænomenon appears at a

first glance, it becomes easy of comprehension by a study of some of the lowest animals, and its solution might have been given long ago. The *Hydræ* are reproduced in the same way during the summer, without the assistance of males, and are viviparous during several generations which follow each other successively until the approach of winter; then, instead of buds, eggs appear, and we observe, at the same time, spermatozoides, representing the male organ, which fructify the eggs that are to preserve the species until the following spring. Is it not the same phænomenon in the Aphides? and, to give an explanation of it, is it not sufficient in fact to say that they are gemmiparous throughout the summer, and have consequently no need of the male element? All that appears to me surprising here is to see this double mode of reproduction, so common in several of the lowest animals, in animals so high in rank as the Articulata.

I have satisfied myself that in the egg of the *Ascidiæ*, as everywhere else, there are the two vesicles of Purkinje and of Wagner. The former only had been hitherto noted.

The manner in which the blastoderm is formed is a point of the highest interest in the history of embryonic development. At first the vitellus runs through the same phases as in other classes, viz. it divides itself into lobules which become small and smaller, and which have each a clear and transparent vesicle in their centre: we may say there are so many individual vesicles of Purkinje. This phænomenon has also escaped the notice of my predecessors. After this change in the vitellus the blastoderm appears. Is the blastoderm then formed, as in the superior animals, upon a determinate point, whence it extends slowly over the whole vitellus, or rather is it formed simultaneously upon all the points without forming a disc? I believe the latter view is the correct one, but the former is adopted by my predecessor in this matter. It has always seemed to me that the blastoderm appears at once upon every point of the surface of the vitellus; and that it constitutes, from the moment of its appearance, a continuous membrane without any aperture.

The caudal appendage of the tadpole of the *Ascidiæ*, instead of being formed, as has been pretended, by separation, is developed by extension, in the same way as appendages in general. We have seen nothing in these *Ascidiæ* that resembles the zigzag that has been figured in that caudal appendage.

Other appendages are formed on the side opposite to the tail, but these are constant neither in their number nor in their respective positions. They have been called suckers, but I have seen nothing to justify this designation. The embryo is affixed by its integuments, and these presumed suckers are often not even long enough to reach the exterior envelope.

In the last part of the memoir, consecrated exclusively to what has been called the zoological portion, as if zoology was reduced to the distinction of species, I have availed myself of the opportunity to say a word upon the general classification of animals, when discussing the place proper to be assigned to the *Ascidia*.

In my opinion we ought to return to the classification of Linnæus in the distribution of the animal kingdom. In invertebrate animals there are only two types, viz. insects and worms, and the mollusca and radiata of Cuvier, which properly make one branch only. It is not the organization which ought exclusively to serve as a basis for the primary divisions, but rather the embryogeny. There are in nature animals in which the vitellus enters inwards by the belly; others in which it enters by the back; and again, others in which it enters neither by one nor the other way. The first are the vertebrated, or the Hypo-cotyledones; the second are the articulated, or the Epi-cotyledones; and the third embrace the mollusca and radiata, or the Allo-cotyledones.

It is very remarkable that in botany the three great divisions of plants into dicotyledons, monocotyledons and acotyledons has been more and more corroborated by every subsequent investigation; and there should be, if I do not deceive myself, in the two kingdoms of organic beings, the same divisions based upon the same embryogenic organs.

Many almost insurmountable difficulties disappear in a great measure when we admit the conjunction of the mollusca and radiata of Cuvier in one section, as Linnæus has done.

The Allo-cotyledones embrace several classes, just as the vertebrated and articulated animals do. We may arrange them in the following order: Mollusca, Polypes, Vermes, Echinodermata, Rhizopodes, Infusoria and Sponges. In the class Mollusca we may preserve the established divisions, with the exception of the Cirrhipedes, which are Epi-cotyledones. The Tunicata form a distinct order of the same value as the Acephala, the Gasteropoda and the Cephalopoda.

The class Polyypi embraces the *Bryozoa*, the *Medusæ*, the *Anthozoa* and the *Alcyonians*.

In the class Vermes there remain the *Nematoidea*, the *Acanthotheca*, &c. In the Echinodermata there are no changes required excepting for some doubtful genera. The Rhizopodes, embracing the greater part of the microscopic Cephalopoda, in my opinion should constitute a distinct class, having, at its head, the *Noctiluca miliaria*, which seems to be a naked Rhizopoda. Lastly, the classes of Infusoria and of the Sponges.

Some zoologists consider the Cirrhipedes as crustaceans, because in their early age they have all the characteristics of these;

but this is not sufficient, it seems to me, to justify the association; and the true place for the Cirrhipedes is, as a distinct class, between the Myriapoda and the Annelides. The *Campanulariæ* are not *Acalephæ*, because that, in their embryo state, they have their characters and aspect; nor are the *Acalephæ* members of the order *Anthozoa*, because the young Medusans resemble that order. Such facts indicate an affinity, but do not call for a coalition in one order.

The *Medusæ* are Anthozoans in their young age, and many *Anthozoa* are at first Medusans; hence they necessarily belong to the same class, in which they constitute distinct orders.

The *Hydræ* are not Anthozoans, but rather freshwater *Medusæ*, as I have long ago published. They cannot be separated from each other by any character of importance.

The Tunicata, which more especially occupy our present attention, are very closely connected with the Bryozoa and the Acephala. I have thought it proper to leave them in the class Mollusca, because of the presence more especially of a heart. If they had not that organ, there would have been no more reason to place them amongst the Mollusca than amongst the polypes. In the branch or tribe of the Allo-cotyledones, the first class only, that of the mollusca, possesses a true heart.

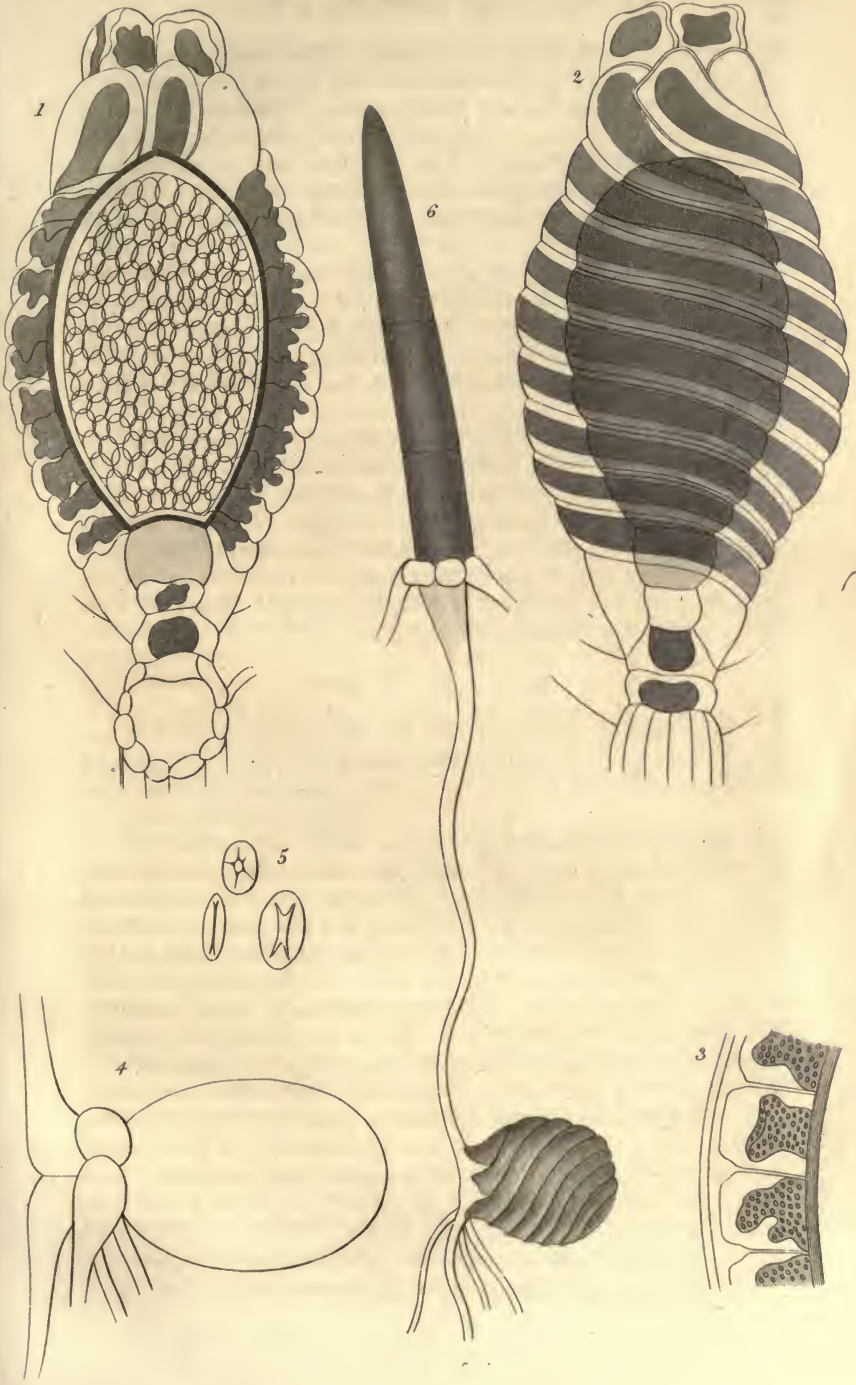
XXXIV.—On the Development of Chara. By C. MÜLLER*.

[With three Plates.]

§ 1. Introduction.

ALTHOUGH this subject has occupied the attention of many observers from an early period, and notwithstanding great light has been thrown upon it by these numerous investigations, still a history of its development combining the diffused observations has hitherto been wanting. My object has been to effect this, and its accomplishment appeared to me the more requisite, inasmuch as this family, which is characterized by so many important structural peculiarities above all other cryptogamic families, nevertheless holds a doubtful position in systematic arrangement. Although from these investigations I do not venture to decide upon its systematic affinities, still, by describing the production of the spores to which so much importance is attached, I hope at least to adduce facts which may bring us nearer the truth. I would willingly have added the development of the anthers at the same time, on which numerous but not conclusive observations have been made; but as the time has arrived at which these

* Translated from the *Botanische Zeitung* for June 12 and 19, 1845.





organs can be no longer obtained, the substance being destroyed by winter, and as at the next opportunity I may not have the leisure for continuing these researches, I shall present here the observations which I have collected.

As regards the history of this family, we find in Kaulfuss's paper* a complete sketch of it up to that time, to which I must refer; subsequently, Bischoff †, Schultz ‡ and Meyen § have made valuable contributions. Kützing || has detailed some general observations, and Fritzsche some beautiful investigations on the anthers in his paper, "Ueber den Pollen" ¶, which however leave several points open for future observations. Nägeli has lately written on the moving spiral fibres in the mucous threads of the anthers**, and Mettenius on the same subject in the 'Bot. Zeitung,' 1845.

Considering the labours of these observers as known, I shall confine myself strictly to my own investigations. But as we have to commence the history of the development with the germ, I do not consider it superfluous again to give a description of the spore in that stage in which it has attained its greatest development (especially as it contains some new facts), because by a knowledge of the organ, in which the formation of the new plant occurs, our knowledge of the process itself must become more perfect.

§ 2. *The Ripe Fruit.*

When divided through the axis it appears composed of three distinct coverings: 1. an external one (the spore-sac); 2. a middle one (the sporular membrane); and 3. an internal one (the nucleus) (Plate V. fig. 1).

The *spore-sac* is a thick, more or less pyriform covering, upon the apex of which five approximated thick cells are situated, forming a kind of crown. This covering is formed of five cells, which are spirally wound around the spores several times—usually twice. The former five short cells form the summit of the spores. Each of these cells when divided appears four-sided, their inner surfaces being flattened towards the spores, the outer ones towards the atmosphere, and the lateral ones towards each other. The planes of the latter however are arranged in an undulatory manner. These, like the former cells, are composed of three distinct membranes; an external one or epidermoidal mem-

* Erfahrungen über das Keimen der Charen, Leipzig, 1825.

† Krypt. Gew. 1 Lief. 1828.

‡ Natur d. lebendigen Pflanze, Bd. 2. p. 470.

§ Physiologie, especially in the third volume. || Phycolog. general.

¶ Mém. de l'Acad. Imp. des Sc. de St. Petersburg.

** Ztschr. f. phys. Bot. Bd. 1. Heft 1. p. 168.

brane*, a secondary, which is easily separated from the latter, and an internal more mucous one, in or upon which the true cellular contents (gonidia of Kützing) are situated. The latter is Mohl's primordial utricle. When treated with nitric acid the entire mass of the secondary membrane separates in an undulatory form (Pl. V. fig. 3). The contents of the cells, which consist of a greenish granular mass, in this stage of the spores are frequently absorbed at several places. The same occurs with the above five terminal cells, the surfaces of which press so closely together that there is no inlet into the spore (Pl. VII. fig. 35). The spore-sac is alone subjected to various alterations in form, the spore always remaining oval.

The *sporular membrane* is likewise a closed covering of a roundish-oval form, with a rounded summit and a truncated base (Pl. V. figs. 1. and 2), which flattens into a cell which will be subsequently considered. It is uniformly thickened, and thence cartilaginous, of a more or less brown colour, and has the same spiral windings as the spore-sac. They correspond to one another with tolerable accuracy, so that they are entirely or very nearly in the same plane. This spiral plane turns from left to right. The five extremities of these thickened, flattened cells of the sporular membrane unite at the apex as in the spore-sac, without forming any appendages. At the highest point the upper portion of the windings projects somewhat at an acute angle (Pl. V. fig. 6).

The *membrane of the nucleus* lies close to the sporular membrane, but quite separate. It of course depends on the form of the sporular membrane, and differs from it merely in its more delicate, transparent, uniform texture, which is neither cellular nor spiral.

The *contents of the nucleus* consist of starch-cells only; these vary in size and are of a more or less rounded, somewhat compressed form. They are perfectly hollow, bursting either lengthwise or in the centre (fig. 5) to discharge their fine granular contents, which also consist only of starch, as shown by the deep blue colour produced by iodine, and which is not unfrequently found between the parent-cells. By gentle pressure I was able to force these contents from the parent-cells, but I have not been able to observe this in loose pieces.

As we have mentioned above, the spore is attached at its base to a *four-sided, tolerably large cell* (figs. 1 and 2). This contains a white, granular, densely aggregated substance, and whilst within the spore-sac might be expected to perform some important part in its nourishment. Moreover in it the nutritious fluid which comes from the stem is rendered assimilable by the nucleus.

* See § 6, where this is compared to the cuticle.

Two other cells, which lie beneath its base and thus flatten it, are also situated within the spore-sac, which surrounds them like a collar. They only form the means of attaching the spores and constitute the direct conductors of the nutritive fluid for the latter. They contain a green mass which is usually spherical. The lowest cell fixes the whole fruit, and to it the spore-sac is also attached between two branches of the stem (Pl. V. figs. 1 and 2).

§ 3. The Germinating Spore.

The period of the development of the germ appears to vary in different species. Bischoff* states on this point, that those *Chara* which mature their fruit in autumn germinate in the mud of their pools in the spring, and that those which ripen earlier germinate in the autumn. I can confirm the latter statement in *Chara vulgaris* and *hispida*, both of which I saw germinating in the October of 1844. This disproves Kützing's remark †, that in our climate no *Chara* remain through the winter, and that all are propagated in the spring, partly from seeds and partly from buds. Moreover, much depends upon the temperature of the atmosphere, consequently also of the water, although this can hardly completely prevent the occurrence of a vernal germinating process from absence of heat.

However, as soon as the parent plant fulfils its purpose, the development of the fruit, it decays from the disintegration of its parts, and the fruits thus reach the mud of the water, or before this happens spontaneously separate from the cells of the stalk, as in *Chara crinita*, in which the parent plants continue to live for a considerable time afterwards.

After having arrived in this medium, the spore-sac is dissolved from the spores; this is usually caused by decay. The spore is thus exposed to the immediate action of the water, but nevertheless requires a considerable time before it is capable of development.

A simple process ensues within it; for the starch-cells swell from the imbibed water and assume another state of aggregation. They break up into a mucous, oily-looking mass, which is filled with extremely delicate and minute granules. I have observed this disintegration directly and distinctly, as seen in fig. 20. After having looked at the small brown cells for some time under the microscope, and carefully moved them to and fro with a lancet to ascertain their form and size they suddenly became flattened, and in their place there appeared a considerably larger globular mass (fig. 20), which only differed from the former in its uncommonly delicate mucous structure and its much greater transpa-

* L. c. p. 8.

† L. c. p. 318.

rence. This globule did not deliquesce, was moveable to and fro much as before, and was only rendered slightly brown by iodine, whereupon the above delicate granules became again perceptible, having become coloured somewhat more brown.

Thus the starch-cells enter into direct combination with the elements of the water, as they are now no longer coloured blue, but brownish by iodine. But the bursting leads us to imagine that the softened and metamorphosed starch-cells are inclosed by an extremely delicate membrane, which cannot be again rendered evident, and the existence of which would also indicate that the formative process takes place from within outwards. According to Schleiden it is the reverse; but this appears to me the only deduction on the point. He has also correctly supposed* that the starch gradually becomes *merely* finely divided and not chemically dissolved; for in consequence of the constant existence of the above minute granules, which are here constituted of starch *only*, no further inference can be made. As there is no other substance in the spore than starch, the granules *must* be formed from it. Hence we have *merely* another state of aggregation, from which new modifications, such as cellulose, dextrine, membranous substance and all their isomeric compounds, may be formed, but into which we cannot enter any further.

This sufficiently proves that an apparently oily mucous liquid is formed from the starch, and several observers attest the existence of true globules of oil in it. Whether such really exist in the fertile starch-cells, whether they are formed simultaneously with the starch in a different state of aggregation, or *whether they exist at all*, I must leave undetermined. It is more important that by this formation the starch is prepared so as to be assimilated by the membrane of the nucleus. Hence we may designate the above fluid with good reason and correctly as *cytoblastema*.

As soon as this is assimilated the *above membrane* expands lengthwise, ruptures the sporular membrane at the apex, presses back the five cells of the sporular membrane which confine it like five valves, and thus appears in the form of a simple transparent vesicle, which now only elongates, so as to proceed rapidly towards the formation of the germ-plant. That it is merely the membrane of the nucleus which here expands, may be seen with the greatest certainty—although Bischoff doubts it—in a true nucleus-sac taken out of the sporular membrane (fig. 4).

§ 4. The Embryo.

The vesicle now elongates so as to form a utricular cell, the apex of which then speedily becomes spherical, and oblique septa

* Grundz. i. p. 179.

are formed within it, whence it acquires as many subdivisions, parts or cells (fig. 6). These subdivisions are at first of equal length; but as they continue progressively to be developed, the lowermost takes the lead and becomes more elongated. The lower ones are then usually the most transparent; the green contents of the cells are more developed in the upper ones, although they are subsequently formed also in the former, seldom however to the same extent. The elongation of the stem now proceeds simply in the same manner, until finally new cells, the whorl of branches, are likewise formed from its subdivisions. These are either developed, as is usually the case, in the earlier stage of the development of the stem *on one side only*, or subsequently in a *complete whorl*. Moreover new cells, i. e. *shoots*, are formed from their joints according to the same laws as from the stem, for there can be no question here of any development of leaf.

As soon as the stem contains a few cells in its interior, a remarkably higher development ensues from its lowermost subdivisions. The whorls do not stop short at the formation of shoots as in the upper portions, but are developed into *new plants* (figs. 6, 7, 8 and 10). This formation is a perfect repetition of the development of the nucleary membrane. As in it, the knotty-looking cells at the joints (fig. 7) elongate in a sacciform manner (fig. 8), their apices at the same time becoming enlarged (fig. 10); these again form new cells in their interior; the lowest appear more transparent, whilst in the uppermost the green cellular contents are formed. At the base of the axis, close above the orifice of the spore, a similar cell-formation has occurred. For as soon as the nucleary membrane began to burst through the sporular membrane like a bladder and to expand it in a sacciform manner, it began to be developed in a sacciform manner on the opposite side (figs. 4 and 6). Thus the spore, which is at first perpendicular, acquires a horizontal position. Each utricle forms a rootlet, and others follow it from simple vesicular expansion of the nucleary membrane, so that it acquires, at this end, a complete head of root-fibrils.

The question now is—*how are all these cells formed?* The direct answer is—*by cytoblasts and by these alone*. I have not been able to observe this so distinctly in the earliest cells of the stem, although there can be no doubt about it, because there is not the least appearance of a secondary membrane, which might perhaps have become contracted by the well-known process of division, and thus formed new cells. But in the formation of the branches and of the new plants from them, the whole process may be traced most unequivocally.

The cytoblastema, or the above-described liquid which is formed from the starch, possesses the remarkable peculiarity that it is

very readily formed into globular masses. This may be very easily seen by the action of iodine, in the lowest simple elongation of the nucleary membrane (figs. 7 and 8). This lowermost portion of the stem is always filled with the cytoblastema as far as the first internal cell, whilst the rootlets are separated at their base from the interior of the nucleus by septa which have likewise originated from cytoblasts by the formation of cells, so that it empties its contents at once into the former subdivision.

The ready tendency to spherical aggregation of the cytoblastema favours the formation of the cytoblasts, or rather constitutes their very commencement. When this fluid cytoblastema is taken up endosmotically by the cells, we see how it is also deposited between every two septa of the cells; hence in each segment of the stem (fig. 7), separate globular masses are soon formed in the very substance of the cytoblastema with which the formation of the cytoblasts commenced. Increasing rapidly in circumference, their outline appears sharper, and in a short time they become so swollen as to protrude the cell-membrane of the axis externally, in the form of a bladder. The process continues until the vesicular projections have become cylindrical (fig. 8). It then ceases in the branches, between the articulations of which the same process subsequently commences for the formation of the shoots. On the further evolution of these to form new plants the cells become utricular (figs. 6, 10). Finally a new cell-formation commences in them by cytoblasts, as we may certainly suppose to happen in the main stem, since in this case it is merely a simple repetition of its formation. By this new cell-formation the apex of a utricular cell is protruded like a knob (fig. 1, a very early stage!), and we have a new stem presented to our view, which is capable, like the main stem, of further development. This property of the plants, to form new individuals by *intercalary* growth, explains the great power of diffusion of the *Chara*, which is so considerable, that when a *Chara* has been removed from the water we cannot determine in most cases its true point of attachment to the soil. We have a large number of separate plants on a single plant.

In fig. 9 we have the complete process of cell-formation before us. The two upper cells are separated from the membrane of the stem by the action of iodine. The remains of the cytoblasts are still distinctly perceptible at the walls. Here and in fig. 7, mucilaginous threads arise from them, and are diffused in the form of a web throughout the cells, as we frequently see in *Algæ*. On account of the great transparency of the object (fig. 9), it could not be ascertained whether currents occurred in the sap; these threads cannot be confounded with them, as they are coloured brown by iodine. Generally speaking this can rarely be

observed in *Chara*, because the cells become opaque too soon and rarely permit of their contents being distinguished, as they are rapidly deposited on the walls of their cells. One circumstance however remains inexplicable, which is, that in one cell (fig. 9) there are cytoblasts which appear as if they were divided into two parts; one in the third upper cell still with its apex in the third, the greater part being in the upper one (had the cytoblast, which was formed in the third cell, really ruptured this to form a new cell?); and lastly, that the cytoblast of the uppermost cell, as also the cell itself, appeared as if contracted exactly at the centre!

The membrane of the new cells, which is formed in an annular manner by the cytoblasts (this is also Schleiden's view), is Mohl's primordial utricle*. It can hardly be seen more beautifully *in situ* in other parts than in the lowermost joint of the stem of the germinating plant (figs. 7 and 8). It is here a simple induration of that external lamina of the cytoblasts which lies immediately on the internal periphery of the stem membrane. The membrane which surrounds the cytoblast is perfectly analogous to that produced by induration. Both are coloured yellowish or brownish by iodine. Hence Mohl is correct, when he says †, "The substance of which the primordial utricle consists, appears, if not identical with, at least nearly related to the mucous granular substance which usually envelopes the nucleus in the form of an irregular mass, and from which the mucous threads which are so frequently met with in the young cells emanate, since these different portions react in the same manner with iodine and sulphuric acid." We ought to consider them, as stated above, to be identical. The same author's opinion also ‡, that the primordial utricle might be of a nitrogenous nature, considering the above reaction of iodine and sulphuric acid, the latter of which does not cause it to disappear, regarded by French chemists as a proof of its containing nitrogen, appears susceptible of direct proof from the above facts. For if the formation of the cytoblastema from starch and that of the cytoblasts and primordial utricle from the former can be directly observed, the conclusion regarding nitrogen is not too bold, if we remember the large amount of nitrogen contained in the gluten of starch. And starch is always found naturally combined with this substance!

When the primordial utricle is once perfectly formed, it appears as a transparent, completely closed peripheral membrane, which is entirely separated by iodine from the outer cell-membrane and envelopes the cell-contents. It adheres to it in the upper cells equally as strongly as we previously found it do in

* Grundzug, 2te Ausg.

† Bot. Zeit. 1844, p. 244.

‡ L. c. p. 305.

the utricular cells of the spore-sac. The primordial utricle is however completely isolated in the lower cell, *i. e.* the immediate elongation of the nucleary membrane itself, the contents of which do not consist as before of chlorophylle, but of cytoblastema. When acted upon by nitric acid, it frequently contracts so much, as to appear torn into large band-like fragments, which become somewhat spirally twisted (fig. 25). Its membrane is not perfectly smooth but finely granular. This does not occur so much in the lowest segments of the stem. It is remarkable, that when treated with nitric acid, which contracts it considerably, it exhibits various-sized conical prominences. Hence it appears somewhat angular or wavy. The small projections appear generally to pass into minute depressions on the axial membrane. At a subsequent period a secondary membrane is formed between it and the axis.

From what has been stated, it appears that the stem consists of an epidermoidal membrane, subsequently also of a secondary one, the primordial utricle and the cell-contents. The above epidermoidal membrane, which is the direct elongation of the nucleary membrane, *continues to grow with the plant, and in such a manner that the plant remains in it as in a bag.* Kützing calls this membrane the *peridermis*, and considers it as identical with the cuticle of Brongniart, which covers the true epidermis of more highly organized plants*. There can however be no question here of a true epidermis, nor indeed in any of the Algæ.

[To be continued.]

XXXV.—*On the Occurrence of Tetraspores in Algæ.*

By G. H. K. THWAITES, Esq.

To the Editors of the Annals of Natural History.

GENTLEMEN,

2 Kingsdown Parade, Bristol, March 19, 1846.

IN the last December Number of your valuable Journal is an extract from a letter presented by M. Montagne to the French Academy on the subject of an interesting Alga belonging to the *Zygnemata*, and discovered by M. Durieu in Algiers, in which the fruit consists of four distinct spores in each sporangium.

The Rev. M. J. Berkeley obligingly favoured me with a sight of an authentic specimen of this species, in which the character was very obvious.

On examining, a few days ago, some spores of *Mesocarpus scalaris*, Hassall, I thought I could detect in them indications of a quaternary division, and I sent specimens to Mr. Berkeley for

* Kützing, *l. c.* p. 86.

his inspection, who wrote me in reply that he could see the division into four pretty distinctly.

I have since observed the same peculiarity in the spores of *Tyndaridea insignis*, Hass., and *Staurocarpus gracilis*, Hass., and, as Mr. Berkeley remarks to me, it may prove more general than has hitherto been supposed. The separation of the contents of the sporangium into four portions does not take place in our three species until the fruit is nearly mature, and this soon afterwards becomes too opaque for the character to be seen, so that it can be observed only in a particular state of the plant. The sporangium in all the species I have mentioned is more or less compressed vertically.

Mesocarpus scalaris may occasionally be observed with some of its cells considerably inflated; and each of these enlarged cells is found to contain a globose echinulate body very much resembling the sporangium of some of the *Desmidiæ*, and respecting the character of which it is difficult to determine: this body may first be seen as a very small spherical cell, apparently quite smooth, and containing an oily-looking fluid; it subsequently grows much larger and becomes furnished with several long curved spines: its texture seems to be corneous. It does not appear to be developed at the expense of the endochrome of the cell which contains it, but in some instances I have thought the quantity of endochrome rather larger than usual in the inflated cells. Can this curious body be an abnormal growth of the nucleus, or is it an internal parasite? Some of the cells of a *Tyndaridea* received from Mr. Ralfs, have within them a fusiform transversely ribbed body, which is probably of a similar character to the spherical ones found in the *Mesocarpus*.

I am, Gentlemen, your very obedient servant,

G. H. K. THWAITES.

XXXVI.—*Botanical Notices from Spain.*

By MORITZ WILLKOMM*.

[Continued from p. 196.]

No. XI. GRANADA, July 5, 1845.

BEFORE my departure from Malaga I visited, in the beginning of last month, the southern portion of the Sierra de Mijas, lying near the village of Chuniana. Along the bank of the Guadalhorce occurred *Scolymus maculatus*, L., *Achillea Ageratum*, L., and various *Carices* in flower, and on boulders and sand above Chuniana and on the slopes of the mountain-chain blossomed *Ruta montana*, L., a small form of

* Translated from the *Botanische Zeitung*, Nov. 21, 1845.

Jasione montana, L., various *Rubiaceæ* and several *Centaureæ*, especially *C. Prolongi*, Boiss., a pretty species with orange flowers tolerably frequent up to the summit. I also found on the acclivity and in the valleys of the mountain-chain *Iberis umbellata*, L., *Helminthia echioides*, L., *Pulicaria odora*, Rehb., *Lagacia cuminoides*, L., *Aphyllanthes monspeliensium*, L., *Coris monspeliensis*, L., *Genista hirsuta*, Vahl., *G. umbellata*, L., *G. ramosissima*, L., *Herniaria polygonoides*, Cav., *Xeranthemum erectum*, Presl, plentiful; more rare occurred *Chasmone argentea*, F. Mey., *Campanula Rapunculus*, L., *Erythræa major*, L., *Leuzea conifera*, DC., and a *Brassica*. In fissures of the rock on the summit I gathered *Anthyllis podocephala*, Boiss., in plenty; and here grow also *Umbilicus hispidus*, DC., several species of *Sedum*, some grasses and *Saxifraga globulifera*, Desf., in large thick beds.

On the 7th of June I left Malaga to travel over the coast chain lying between this place and the boundaries of the province of Almeria, with a view to proceed thence toward the interior of Andalusia. The coast country appeared already very much parched, and in consequence nothing of any importance was collected as far as Velez-Malaga, excepting a rare plant, namely *Withania frutescens*, Boiss. (*Atropa frut.*, L.), a rare shrub, often exceeding a man's height, of the growth of a *Lycium*, with white-gray virgate, hanging branches, obtuse-elliptic dark green leaves and pendent yellow-green flowers. This shrub is found in the hedges around Velez-Malaga, as well as further towards the east around Motril, tolerably frequent. The town of Velez-Malaga lies two miles distant from the sea, near the left bank of the river of the same name, in the middle of a beautiful woody plain, in which sugar-canes are largely grown, and which is on three sides surrounded by a hilly table-land, rising higher and higher and wholly covered with vines. Behind this table-land rises the very steep and rocky Sierra Tejada*, a dolomitic range more than 7000 feet in height, which divides the hilly land of the coast from the plain of Granada. The Sierra Tejada is the highest portion of a long mountain-chain, which, under various names, stretches from W.N.W. toward the E.S.E., and fills up the space between the Guadalhorce and the Rio de Motril. The rocky mountain-range of Antequera, lying north of Malaga, forms one of the principal chains, but of no very important height, a branch of which stretches far to the north, which takes its name of Sierra de Loja from the town of Loja lying at its eastern foot, and is separated from the Sierra de Montefrio by the Jenil which here breaks through. The continuation of the chief mountain-chain, which connects the Sierra of Antequera with the Sierra Tejada, is called Sierra de Alhama, and this is separated by a deep rocky cleft, the Puerto de Zafarráya, from the highest part of the Sierra Tejada. The lower continuation of the Sierra Tejada, running in a south-eastern direction, passes imperceptibly over into the many-branched Sierra of the Al-

* The Sierra Tejada has its name from *Taxus baccata*, in Spanish *Tejo*, which tree, according to tradition, once wholly covered it. It is still found in isolated specimens at the spring Fuente del Tejo, which is situated in the alpine region of this mountain-chain.

mijarras, which is separated by the deep valley of the Rio de Motril or Guadalfeo from the Sierra de Lugar lying opposite, to the east, and by the broad valley of the Rio Grande*, coming from the western and lowest portion of the Sierra Nevada, from the southern declivity of this mountain-range, with which the Sierra de las Almirarras is connected by a broad, barren and rocky table-land, which divides the valley of the Rio Grande from the plain of Granada.

The best starting-point for a visit to the Sierra Tejada is the village of Canillas de Aceytuno, on its southern acclivity, which is three leagues distant from Velez-Malaga. The path leads continually upwards through the numerous vine-hills, where I found in great plenty *Tolpis barbata*, L., a *Jasione*, *Brassica batica*, Boiss., *Centaurea muricata*, L., and *Cleome violacea*, L. In the highest part of the village, which is surrounded by many olives, lies a convent most romantically situated on a projecting rock of the Sierra, in whose clefts I found *Galium pruinatum*, Boiss., a beautiful species with coriaceous leaves, dark green on the upper side and covered with a white powder beneath, as well as *Thymus longiflorus*, Boiss., *Th. hirtus*, W. *δ. erianthus*, Boiss., *Linaria origanifolia*, DC., *Sedum acre*, L., *S. amplexicaule*, DC., and various grasses.

From hence I ascended to the Peñon Grande, an immense wall of dolomitic rock, of great height, lying in the lower mountain region of the chain, and gathered on the boulders of rock *Santolina squarrosa*, W., which had just begun to flower, *Passerina Tartonraira*, L., a pretty *Orchis*, *Anthyllis tejedensis*, Boiss., *Thymus longiflorus*, *Linaria satyroides*, Boiss.; and near to the Peñon Grande, in the clefts of which grow *Barkhausia albida*, Cass., a rock-plant common in all the mountains of Upper Andalusia, but never occurring in profusion,—a small yellow-flowered *Linaria*, which seems to me to be *L. Raveyi*, Boiss., and is very rare.

The following day I ascended to the highest summit of the mountain-range, and was unfortunately compelled to turn back before I wished by the falling mists and rainy weather. At about a height of 5000 feet is an immense rocky projection, called the Cerro la Matanza, which parts two deep abysses. Here in fissures of the rock are found *Arabis auriculata*, Lam., *Cerastium repens*, L., *Valeriana tuberosa*, L., *Melissa alpina*, Bth., *Taraxacum obovatum*, *T. lævigatum*,

* The Rio de Motril, or Guadalfeo, which is its true but less-known name (among the people it takes its name of Rio de Velezillo from the little town of Velez de Benandalla lying on it), is composed of the Rio Grande, issuing from the western part of the Sierra Nevada, but which is not considerable, and the full stream of the Rio de Orgiva, which forms the chief valley of the western Alpujarras, and brings down the whole water from the southern acclivity of the Sierra Nevada. The two rivers join below Lanjaron, whilst the Orgiva previously receives the river or streamlet of Lanjaron. The Rio de Orgiva is formed of the three chief portions of the western Alpujarras, the Barranco de Cadiar, Barranco de Trelevez and Barranco de Poqueira, and from that point where the Rio Poqueira joins it (a mile and a half above Orgiva), takes the name of Rio Grande. The Guadalfeo or Rio de Motril also often bears the same name.

*Barkhausia albid*a, *Xeranthemum erectum*, Presl; and on loose strong soil on the steep acclivity, over which the road from Canillas to this rock ascends, *Cistus monspeliensis*, L., *C. crispus*, L., *Helianthemum origanifolium*, P., *H. glaucum*, P. var. *suffruticosum*, Boiss., *H. hirtum*, P., *Passerina Tartonraira*, *Thymus longiflorus*, Th. *Mastichina*, L., *Anthyllis tejedensis*, *Chasmone argentea*, *Biscutella saxatilis*, Boiss., and others. In the drift-sands of the lower alpine region, above the Cerro la Matanza, occurred rarely the *Centaurea bombycina*, Boiss., peculiar to this mountain-range, a small elegant species with procumbent stalks, pinnate, white downy leaves and violet flowers, which began to unfold its little heads of flowers; also a beautiful purple variety of *Linaria tristis*? in great abundance, and various grasses of the genera *Festuca* and *Bromus*, an erect form of *Linaria origanifolia*, DC., *Galium verticillatum*, Danth., *Filago arvensis*, L. β , *Lagopus*, DC., *Bunium Macuca*, Boiss., and along the rock thick beds of the shrubby *Coronilla eriocarpa*, Boiss., beginning to flower,—only a few plants had already developed their peculiar white woolly pods. From near the foot of the mountain-range up to the summit, the pretty *Armeria filicaulis*, Boiss., is tolerably plentiful, which in the upper alpine region forms small patches of turf with stems scarcely a finger high, whilst in the lower parts it reaches a height of from half a foot to a foot.

From the Fuente la Gitana, a spring lying about 500 feet above the Cerro la Matanza, the path winds zigzag upwards on the extraordinarily steep acclivity of the summit, covered almost wholly with loose masses of rock. Here blossom *Alyssum alpestre*, L., *A. calycinum*, L., *A. montanum*, L., α . *atlanticum*, Desf. and β . *vulgare*, *Iberis nana*, All., *Draba hispanica*, Boiss., *Onosma echioides*, L., *Bunium Macuca*, Boiss., *Genista aspalathoides*, DC., β . *confertior*, Boiss., *Erodium trichomanæfolium*, L'Hérit., *Senecio minutus*, DC., the rare *Vella spinosa*, Boiss., *Erysimum canescens*, Rth., and *Ranunculus graminifolius* β . *luzulæfolius*, Boiss., in great plenty, more rarely *Callipeltis Cucullaria*, DC., and *Valerianella hamata*, DC. On rocks on the summit I found *Valeriana tuberosa*, *Saxifraga spathulata*, Desf., and *Draba hispanica*, and moreover on the whole of the broad coomb *Vella spinosa*, *Anthyllis erinacea*, *Ptilotrichum spinosum* and *Arenaria erinacea*, Boiss., the last not yet in flower. The broad, gently rounded surface, of considerable extent, forming the summit, descends toward the north into a table-land filled with many hollows, in which there were still large fields of snow, and which bears the name of Los Ventisqueros. Here, at the edge of the melting snow, I again found *Bulbocodium vernum*, as well as on the whole of the northern acclivity of the summit the root leaves of the rare and remarkable *Andryala Agardhii*, Boiss., and under low shrubs of *Berberis vulgaris* β . *australis*, DC., *Sisymbrium laxiflorum*, Boiss., *Fritillaria messanensis*, Raf., *Cerasus prostrata*, DC., in flower, *Centaurea montana*, L., *Pæonia coriacea*, Boiss., with buds, and the remarkable white-blossomed *Geum heterocarpum*, Boiss. On sandy places flowered *Androsace maxima*, L., *Veronica præcox*, All., *Myosotis stricta*, Lk., *Lithospermum incrassatum*, Guss., *Arabis auriculata*, Lam., and other alpine plants, and in

clefts of sunny rocks a pretty *Saxifraga* in company with *S. spathulata*, Desf., and *Brassica humilis*, DC. On the way back, I moreover gathered on the southern edge of the summit *Biscutella saxatilis*, Boiss. var. *lanata*, a pretty little variety with narrow woolly silvery-white leaves, which is peculiar to these mountains, and at some hundred feet below the summit a small *Cerastium*, as well as the rare *Arenaria modesta*, Desf.

On the 11th of June I set out from Canillas for the little town of Nerja, lying on the coast, the road to which leads along the southwest foot of the Sierra Tejada and in part through its lower portion, passing over a number of valleys and coombs. On moist, shady, rocky spots *Anarrhinum bellidifolium*, Desf., grows here luxuriantly in the valleys, constantly with blue flowers; on sunny rocks *Leobordea lupinifolia*, Boiss., and in the hedges *Rubia peregrina*, L., and other climbing plants. On shady rocks near the village of Salares I found *Scrophularia peregrina*, L., in small quantity, and on sunny hills between this place and Canillar de Albayda various *Silene*, *Helianthemum lavandulæfolium*? P., *Ruta angustifolia*, DC., and some specimens of a narrow-leaved *Iris* which is different from *I. Xiphium*. In the mountains between the villages of Competa and Frigiliana, *Adenocarpus telonensis*, Gay, and *Sarothamnus affinis*, Boiss., occur plentifully, as well as the splendid *Orobanche fœtida*, Desf., on the roots of various species of *Ononis*. Lastly I gathered on stony and sunny spots at Frigiliana *Cneorum tricoccum*, L., and between here and Nerja a pretty white-flowered *Teucrium* with dense, ovate heads of flowers and longish white woolly curved leaves.

The following day I travelled nine leagues further toward the east through the ramifications of the Sierra Tejada and Sierra de las Almirarras, which here cover the whole coast, toward Motril, with the view of seeking *Celastrus europæus*, Boiss., which I soon found behind Nerja. It is a common shrub throughout the whole coast mountains between Nerja, Almuñecar and Motril, but it had now neither flowers nor fruit. I have observed two varieties with respect to the form of the leaves and the colour of the branches, which occur promiscuously, namely one, *foliis oblongo-lanceolatis subintegris, cortice ramulorum purpureo*; and another, *fol. subrhomboideis sinuato-dentatis, cortice griseo* (the branch which is figured in the work of Boissier is of this latter variety). Besides the above, the following plants grow luxuriantly on these mountains: the *Teucrium* mentioned above, *Artemisia Barrelieri*, Boiss., *Cneorum tricoccum*, L., plentiful, on isolated spots *Buxus balearica*, L., which is in fruit, *Beta maritima*, L., and the splendid *Nepeta tuberosa*, Desf. Near Almuñecar is a remarkable tract on the coast thickly covered with *Aloë vulgaris*, Lam., which was mostly out of flower. In the hedges of the Vega de Motril *Elæagnus angustifolia* is common, *Withania frutescens* is rare, and along the ditches everywhere flowers *Senecio Doria*, L. In the environs of Motril I now observed various sea plants in flower, especially *Atriplex glauca*, L., and the large bushes of *Salsola oppositifolia*, Desf.; and on the gypsum hills on the north of the town on the road toward Granada, a small *Statice*, together

with *Frankenia corymbosa*, Desf. In other respects the vegetation had nothing peculiar.

From Motril I ascended on the 15th of June the Sierra de Lujar, lying some miles to the eastward, a dolomite range of mountains more than 6500 feet high according to the measurement of Clemente, which runs parallel with the Sierra Nevada, from which it is separated by the deep valley of the Rio de Orgiva. This range is joined on the east by the considerably lower and vine-clad Sierra de Contraviesa, which forms the southern boundary of the eastern Alpujarras, and is divided by the valley of the Rio de Adu from the Sierra de Gador situated in the province of Almeria. In the hilly country lying between Motril and the Sierra de Lujar, *Thymus capitatus*, Lk., Hoffm., occurred in flower, and around Motril it covers large tracts; I also gathered here in corn-fields *Reseda lanceolata*, Lag., and on shady walls near the little village of Laguna a species of *Scrophularia* resembling *S. crithmifolia*, Boiss., but differing from that, and probably a new species. The vegetation of the Sierra de Lujar is on the whole very similar to that of the Sierra Tejada, but less rich in species. In the upper portion however occurred some interesting plants, which I had not before gathered, as *Centaurea Boissieri*, DC., *Serratula pinnatifida*, DC., *Helianthemum canum*, Dun., *H. niloticum*, P., *Æthionema saxatile*, R. Br., *Thlaspi perfoliatum*, L., and *Arenaria grandiflora*, L. Here grow, as in the Sierra Tejada, *Cerastium repens*, *Alyssum alpestre* and *montanum* β . *vulgare*, *Saxifraga spathulata*, *Draba hispanica*, *Vella spinosa*, *Ptilotrichum spinosum*, *Anthyllis erinacea* and others in great numbers. This mountain-range is in part wooded with *Quercus Ilex*, and from the foot to the summit occurs *Aphyllanthes monspel.*, L., which is wanting on the Sierra Tejada, as well as in some places *Callipeltis Cucullaria*, DC., in great abundance.

On the 16th of June I left Motril, and had the good fortune to find, upon limestone rocks in the neighbourhood of the little town of Velez de Benandalla, the hitherto little-known *Lafuentea rotundifolia*, Lag., a remarkable *Personata*, with very fragile thickly interlaced stalks, round fleshy curved leaves and dense naked heads of small yellowish white flowers resembling those of a *Crucianella*. In Velez I crossed the Guadalfeo, which was extremely swollen by the snow-water, in order to go a roundabout way through the Sierra de las Alpujarras to Granada. This wild romantic limestone chain, which is partly wooded with *Pinus Pinea*, *P. halepensis* and *P. Pinaster*, as well as by *Quercus Ilex* and *Qu. lusitanica* α . *faginea*, rises scarcely to 5000 feet, and forms a half circle open toward the east, or more properly takes a horse-shoe shape. The centre of this extensive chain, west of the village of Guajar Alto, passes imperceptibly over to the Sierra Tejada, and from hence a lofty southern mountain-chain stretches along the coast as far as the Guadalfeo, whilst a second lower chain goes parallel with the former and the western part of the Sierra Nevada, terminating in the country of Lanjaron, and forming the rocky wall on the right of the Rio Grande. The two chains are separated by a broad valley, which is watered by a rivulet and in part filled with hills: in this valley lie three villages, Guajar Fondo,

Guajar Faraguit, and Guajar Alto. From the valley of the Guadalfeo the road ascends to the Sierra de las Almijarras over the Cuesta de Lacedada, a steep rocky slope, on which I found among other plants *Thymus longiflorus*, Boiss., *Allium Ampeloprasum*, L., and *Haplophylum linifolium*? Juss. In the valley dividing the two mountain-chains, which narrows into a deep rocky defile between the villages of Guajar Faraguit and Guajar Alto, occurred in tolerable plenty upon the drift-sand a pretty *Helianthemum* and a viscous *Silene*, and also among a variegated and thick shrubby vegetation *Rhamnus velutinus*, Boiss., and near the village of Guajar Alto the splendid *Salvia Candelabrum*, Boiss., in full flower, although very rare. It forms shrubs from four to six feet high. Above the village of Guajar Alto grew luxuriantly the beautiful *Ononis speciosa*, Lag., in the greatest plenty; and in the broad rocky mountain-chain through which my path from hence led me, occurred *Brassica humilis*, DC., *Dianthus brachyanthus*, Boiss., *Anthyllis tejedensis*, Boiss., the very rare *Reseda Gayana*, Boiss., *Campanula mollis*, L., *C. Löflyingii*, Bert., *Helianthemum atriplicifolium*, W., *Cistus ladaniferus*, L. &c. On the hilly, stony and barren high table-land between the Sierra de las Almijarras, the Sierra Nevada and the plain of Granada, *Cleonia lusitanica*, L., blossomed in immense quantities, covering large tracts of ground, and in the corn-fields *Turgenia latifolia*, DC., in company with *Ræmeria hybrida*, DC., *Saponaria Vaccaria*, L., *Agrostemma Githago*, L., and other plants.

The environs of Granada were still clothed in the most luxuriant green of spring and formed a magical contrast with the Sierra Nevada, which was still deeply covered with snow. Whilst on the coast the harvest had already begun, the young corn was here still green, and the hills, which in the summer are arid and brown, now appeared clothed with *Thymus tenuiflorus*, Boiss., *Th. Mastichina*, L., and other aromatic plants in bloom, diffusing a balsamic perfume far around. At present, although little more than a fortnight later, the Veya and the whole environs have already another appearance, and the beautiful green is limited to a few moist tracts. The Sierra Nevada on the other hand is still in its winter's garb, and it is as yet impossible to ascend to its higher part, for in the memory of man such a great fall of snow has never been known as in the past winter; Granada even and Veya were buried two feet deep in the snow!

The grassy declivities of the valley of the Darro are clothed at this season with a variegated carpet of flowers. *Helianthemum marifolium*, P., *H. guttatum*, P., and other species of this numerous genus; a pretty white *Armeria*, common throughout the hilly land and the lower part of the Sierra Nevada, as well as in the mountains east of the town; a *Dianthus*, various *Linaria*, *Antirrhinum molle*, L., and others occur in the same localities in plenty, whilst on the banks of shady ditches, especially along the aqueduct of the Alhambra (rich in plants), flower *Colutea media*, L., *Ononis speciosa*, Lag., *Tamus communis*, L., *Agrimonia Eupatorium*, L., *Lythrum Salicaria*, L., *Lapsana communis*, L., *Iris fetidissima*, L., *Medicago Helix*, L., *Med. lupulina* var. *Willdenovii*, Mérat, *Spartium junceum*, and many other plants.

On the borders of the corn-fields upon the barren hills around Granada I observed the very rare *Cirsium echinatum*, DC., and also *Alchemilla Aphanes*, L., *Minuartia montana*, Löffl., and other plants. From the 24th to the 27th of June I stayed on the Sierra Nevada, and ascended on the 25th to a height of 8000 feet, but could not proceed further on account of the immense quantity of snow. Here, on the edge of the melting snow, above the limestone rocks of the Dornajo, I gathered *Pyrethrum radicans*, Lag., as well as *Ranunculus acetosellæfolius*, Boiss., in great plenty, which I had never before seen growing at so low an altitude. On the alpine meadows known by the name of Prado de las Yeguas, which are situated above the Cortijo de San Geronimo on the right acclivity of the valley of the Monachil, flowered *Ranunculus chærophyllus*, L., *Silene conica*, L., *Papaver Argemone*, L., *Cerastium ramosissimum*, Boiss., *Tetragonolobus siliquosus*, DC., a *Myosotis*, various grasses, and in its highest part *Doronicum scorpioides*, W. On the western acclivity of the Dornajo, which I then ascended for the fourth time, I gathered, amongst other plants, the pretty *Helianthemum piliferum*, Boiss.; also on the south upon boulders *Convolvulus nitidus*, Boiss., which was just beginning to flower, and on shady rocks of the eastern acclivity *Sisymbrium laxiflorum*, Boiss., *Linaria verticillata*, Boiss., *Bunium Macuca*, Boiss., *Butinia bunioides*, Boiss., *Saxifraga spathulata*, Desf., *Draba hispanica*, Boiss. On the way down from the Dornajo into the valley of the Jenil over the woody Dehesa de la Vibora I found *Passerina elliptica*, Boiss., which occurs very sparingly on limestone rocks below the Dornajo, and in the copse-wood the pretty *Anthericum bæticum*, Boiss., also *Ononis arragonensis*, Asso., *Sarothamnus scoparius*, Wimm., and *Pæonia lobata*, Desf., *Adenocarpus decorticans*, Boiss., was still in flower; and lastly I found on my return to Granada between the villages of Guejar Sierra and Pinos del Jenil on sandy soil *Linaria Salzmanni*, Boiss., a pretty species with purple flowers.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

LINNEAN SOCIETY.

June 17, 1845.—Edward Forster, Esq., V.P., in the Chair.

Read "Characters of undescribed species of British *Chalcidites*." By Francis Walker, Esq., F.L.S. &c.

The following are the characters of the species described:—

1. *PTEROMALUS ACROTATUS* ♀, viridis, abdomine cupreo, antennis piceis, pedibus fulvis; coxis femoribusque basi viridibus, alis fuscis.—Long. corp. lin. 1; alar. lin. 1½.

Hab. in Scotiâ, prope Lanark, mense Julio.

2. *PTEROMALUS SUNIDES* ♂ et ♀, viridis, abdomine æneo; maris fulvo-maculato, antennis nigris, pedibus maris flavis fœminæ fulvis; femoribus fusco-variis, alis limpidis.—Long. corp. lin. 1¼; alar. lin. 1¾—2.

Hab. in Scotiâ, prope Edinam, Dr. Greville.

3. PTEROMALUS ODITES ♀, cupreus, abdomine basi viridi, antennis piceis, pedibus flavis, alis limpidis.—Long. corp. lin. $1\frac{1}{4}$; alar. lin. 2.
Hab. in Scotiâ, prope Edinam, *Dr. Greville.*
4. PTEROMALUS BUBARIS ♀, æneo-viridis, abdomine cupreo, antennis nigris, pedibus fulvis; femoribus fusco-cinctis, alis limpidis.—Long. corp. lin. $\frac{3}{4}$; alar. lin. $1\frac{1}{4}$.
Hab. in Scotiâ, prope Edinam, *Dr. Greville.*
5. PTEROMALUS NESTOCLES ♂ et ♀, viridis, abdominis disco æneo vel cupreo, antennis fuscis piceisve, pedibus fulvis flavisve; femoribus viridibus, alis sublimpidis.—Long. corp. lin. $\frac{3}{8}$ — $\frac{3}{4}$; alar. lin. 1— $1\frac{1}{4}$.
Hab. in Scotiâ, prope Edinam, *Dr. Greville, Rev. G. T. Rudd.*
6. PTEROMALUS CERCIDES ♂ et ♀, viridis, abdomine cupreo, antennis nigris, pedibus fulvis; femoribus viridibus, alis limpidis.—Long. corp. lin. 1; alar. lin. $1\frac{1}{2}$.
Hab. in Cambriâ Boreali, mense Septembri captus.
Fœminæ abdomen ovale subtùs carinatum.
7. PTEROMALUS ECTION ♂, viridis, scutello æneo-viridi, abdomine nigro-cupreo basi fulvo-maculato, pedibus fulvis; femoribus piceis, alis fuscis.—Long. corp. lin. 1; alar. lin. $1\frac{1}{2}$.
Hab. in Scotiâ, prope Edinam, *Dr. Greville.*
8. PTEROMALUS XANTHE ♂, viridis, abdominis disco æneo, antennis piceis, pedibus fulvis; femoribus piceis; tarsis flavis, alis limpidis.—Long. corp. lin. $1\frac{1}{4}$; alar. lin. $1\frac{3}{8}$.
Hab. in Scotiâ, prope Edinam, *Dr. Greville.*
9. PTEROMALUS AOLLIVS ♂, viridis, scutello viridi-æneo, antennis fuscis basi viridibus, pedibus fulvis; coxis femoribusque viridibus; tibiis fusco-cinctis, alis limpidis.—Long. corp. lin. $\frac{3}{8}$ — $\frac{3}{4}$; alar. lin. 1— $1\frac{1}{4}$.
Hab. in Cambriâ Boreali, mense Septembri captus.
10. PTEROMALUS ANTHO ♂, viridis, abdomine purpureo, antennis nigris, pedibus piceis; femoribus viridibus, alis sublimpidis.—Long. corp. lin. 1; alar. lin. $1\frac{3}{4}$.
Hab. in Angliâ, *Rev. G. T. Rudd.*
11. PTEROMALUS LEARCHUS ♂, viridis, abdomine æneo-viridi, antennis fulvis basi flavis apice piceis, pedibus flavis, alis limpidis.—Long. corp. lin. $\frac{1}{2}$; alar. lin. $\frac{3}{4}$.
Hab. in Scotiâ, prope Edinam, *Dr. Greville.*
12. PTEROMALUS ANTORIDES ♂, viridis, abdomine purpureo flavo-maculato, antennis fuscis, pedibus flavis, alis limpidis.—Long. corp. lin. $1\frac{1}{4}$; alar. lin. 2.
Hab. in Angliâ, *Rev. G. T. Rudd.*
13. PTEROMALUS SARAVUS ♂, viridis, abdomine cyaneo-viridi disco cupreo, antennis piceis, pedibus flavis; femoribus viridibus, alis limpidis.—Long. corp. lin. $1\frac{1}{4}$; alar. lin. 2.
Hab. ———, ex Musæo *Rev. G. T. Rudd.*
14. PTEROMALUS ANAXENOR ♀, viridis, abdominis disco cyaneo-viridi, antennis nigris, pedibus fulvis fusco cinctis; tarsis flavis, alis limpidis.—Long. corp. lin. $1\frac{3}{8}$; alar. lin. 3.
Hab. ———, ex Musæo *Rev. G. T. Rudd.*
15. PTEROMALUS TEDANIUS ♀, viridis, abdomine basi fulvo, antennis piceis, pedibus flavis, alis subfulvis.—Long. corp. lin. 1; alar. lin. $1\frac{3}{4}$.
Hab. ———, ex Musæo *Rev. G. T. Rudd.*

16. *PTEROMALUS* *AMYNTOR* ♀, aureo-viridis, capite viridi, abdomine cyaneo-viridi fasciis cupreis, antennis ferrugineis, pedibus flavis; femoribus viridibus, alis limpidis.—Long. corp. lin. 1; alar. lin. 1 $\frac{3}{4}$.
Hab. ———, ex Musæo Rev. G. T. Rudd.
17. *PTEROMALUS* *NAUBOLUS* ♀, viridis, abdominis disco cupreo, antennis piceis, pedibus flavis; femoribus viridibus, alis limpidis.—Long. corp. lin. 1—1 $\frac{1}{4}$; alar. lin. 1 $\frac{3}{4}$ —2.
Hab. ———, ex Musæo Rev. G. T. Rudd.
18. *PTEROMALUS* *AGLAUS* ♂, viridis, abdomine cupreo basi viridi, antennis piceis, pedibus fulvis; femoribus fusco cinctis, alis limpidis.—Long. corp. lin. $\frac{3}{4}$; alar. lin. 1.
Hab. prope Londinum, mense Julio.
19. *PTEROMALUS* *URGO* ♀, cyaneo-viridis, abdominis segmentis basi purpureis, antennis piceis, pedibus flavis; femoribus viridibus, alis limpidis.—Long. corp. lin. 1 $\frac{1}{4}$; alar. lin. 1 $\frac{3}{4}$.
Hab. ———, ex Musæo Rev. G. T. Rudd.
20. *PTEROMALUS* *ORINUS* ♀, viridis, abdomine cupreo basi viridi, antennis fuscis, pedibus fulvis; femoribus viridibus, alis limpidis.—Long. corp. lin. $\frac{3}{4}$; alar. lin. 1 $\frac{1}{4}$.
Hab. prope Londinum.
21. *SCLADERMA* *LALAGE* ♀, viridis, abdomine cyaneo, antennis nigris, pedibus fulvis; femoribus viridibus; tibiis tarsisque apice fuscis, alis sublimpidis.—Long. corp. lin. 1 $\frac{1}{4}$; alar. lin. 2 $\frac{1}{4}$.
Hab. in Scotiâ, prope Edinam, Dr. Greville.

Nov. 4.—The Lord Bishop of Norwich, President, in the Chair.

Read a memoir “On the *Ambrosinia ciliata* of Roxburgh.” By the late William Griffith, Esq., F.L.S. &c. Communicated by R. H. Solly, Esq., F.R.S., L.S. &c.

In this paper, written at Calcutta in the year 1835, Mr. Griffith enters into a lengthened examination of the characters and development of the singular plant above named, to which he states his attention to have been first directed by Dr. Wallich, who was previously acquainted with many parts of its structure. It forms, in conjunction with *Ambrosinia spiralis*, *retrospiralis* and *unilocularis* of Roxburgh, a genus of *Aroideæ*, for which Mr. Griffith regrets his inability to adopt the highly appropriate name of *Myrioblastus* proposed by Dr. Wallich, inasmuch as M. Fischer had previously proposed the generic name of *Cryptocoryne* for the *Ambr. ciliata* and *spiralis* of Roxburgh, together with *Caladium ovatum*, Vent., in which latter, however, the structure of the fruit, as described by Rheedee, appears to be somewhat different.

The following are the amended characters of the genus, proposed by Mr. Griffith:—

CRYPTOCORYNE, Fisch. in Schott and Endl. Mel. Bot. fasc. 1. p. 6.

Spatha tubo brevi ad apicem septo obliquo incompleto semipartito; limbo elongato. *Spadiæ* basin versus ovariis cincta, medio filiformis nuda, supra antherifera, apice conico nudo callosio spathæ septo pilei instar tecto. *Antheræ* biloculares, transversim dehiscentes. *Glandulæ* nullæ. *Ovaria* 5—7, coalita; *styli* nulli; *stigmata* 5—7, obliqua. *Fructus* nudus, 5—7-locularis (in unicâ specie 1-locularis); dehiscentiâ septidâ.

Semina indefinita, adscendentia; testâ cellulosâ, tenuissimâ. *Albumen* nullum. *Plumula* polyphylla, hilo subopposita.

Obs. Character ex *Crypt. ciliatâ* omninò excerptus.

Crypt. ciliata, foliis oblongo-lanceolatis, spathæ limbo tubuloso-convuluto apice dilatato oblongo-lanceolato ciliato.

Crypt. ciliata, *Fisch. l. c.*

Ambrosinia ciliata, *Roxb. Corom. Pl. t. 262. Fl. Indica*, iii. p. 491.

Hab. ad ripas limosas fluminis Hooghly æstibus alternis ferè omninò submersa. Floret fructusque fert per totum ferè annum.

After a detailed description of the plant, and an indication of the errors into which Roxburgh and those who have followed him had fallen with reference to it, Mr. Griffith proceeds to trace the more remarkable anomalies from their origin through their various stages of development, with the view of reducing them to the ordinary type.

The anthers, he states, may from a very early period be compared to two cups joined together by their contiguous margins, the wide and open mouth which they present in their mature state being originally closed by an extremely fine membrane, which also lines the cavity of the cup, in the interior of which the pollen is formed. As the anther enlarges this membrane assumes the form of a gradually lengthening cone, which at length becomes subulate and perforated at the apex. But this opening appears to be insufficient for the escape of the grains of pollen, and the membrane finally separates from the edges of cup-shaped theca, leaving the grains of pollen free and uncovered. The agency of insects appears, however, to be generally resorted to to ensure fecundation, the lower portion of the spatha being found during impregnation to contain many small flies, which have perished from inability to escape after the performance of their important duty.

The *ovula*, at the earliest period of observation, are described as oblong bodies, having, a little below their points, a slight constriction, above which they are papilliform. At a somewhat later period the base of the papilliform nucleus is surrounded by an annulus, which Mr. Griffith describes as a growth from that part of the ovulum situated below the constriction, and which is the rudiment of the integument of the ovulum: it soon increases and forms a sort of cup, beyond which the nucleus at first projects considerably. This Mr. Griffith regards as a good example of the correctness of Mr. Brown's opinion as to the comparatively late origin of the integuments in the generality of ovula. As the development proceeds the nucleus becomes entirely enclosed in the cup, the mouth of which is gradually narrowed. After impregnation, the period of which is marked by the withering of the spatha, the centre of the nucleus becomes more transparent, and is evidently excavated. The foramen is still visible, but soon afterwards becomes indistinct. The cavity of the nucleus gradually extends upwards to near the apex of that body and downwards towards the hilum; its lower portion is occupied by cellular tissue, assuming the form of a sac, and quite free from adhesion inferiorly; while the upper third contains an oblong cellular body with a conical apex, which constitutes the rudimentary

embryo. A little later, the conical, originally rectilinear apex of the embryo has become somewhat oblique, and a depressed areola makes its appearance on one side of the head of the embryo. In the next stage the conical and rather oblique apex of the embryo protrudes through the apex of the nucleus, and its base has become enlarged and roundish. The conical apex and head of the embryo become still further protruded, and from the margin of the depressed areola are produced minute, oblong, obtuse, cellular bodies, which are the rudiments of the outer processes of the plumula. These gradually enlarge, and others are developed within them from the centre or disc of the areola; and at the same time the conical apex of the embryo becomes more and more oblique. At this period the chief bulk and enclosed part of the embryo occupies about the upper two-thirds of the excavation of the nucleus, but does not as yet extend into its lower globular portion; and the enclosed part is firmly embraced by the neck of the nucleus, the tissue of which has become more and more callous or indurated. Still later the testa becomes more enlarged and cellular, and its foramen more indistinct; the nucleus is denser and more cellular, and the embryo extends downwards into the globular portion of its cavity, displacing the sacciform cellular tissue with which it was previously filled. The exerted portion of the embryo now ceases to elongate, but increases greatly in a transverse direction; the area on which the processes of the plumula are developed is much enlarged, they become more numerous and elongate rapidly, and, as the testa does not increase with equal rapidity, their apices become recurved. The radicle increases much less rapidly, but becomes gradually more and more oblique, and is soon imbedded in the lax testa, which it finally perforates.

The fully-developed seed is oblong, somewhat compressed, depressed on its inner, convex on its outer surface, and constricted towards the hilum, where it is of a brownish tint and hard to the touch. The testa closely embraces the plumula; it is cellular towards its base and where it surrounds the dense internal globular body, membranous throughout the rest of its extent, and so thin that the processes of the plumula are visible through it and give it a greenish tint. The descending portion of the embryo, which constitutes the cotyledon, is clavate and nearly enclosed within the dense indurated nucleus, the enclosed part separating with the nucleus with great readiness, and about the time of the dehiscence of the fruit spontaneously. The exerted portion of the embryo consists exclusively of the base of the cotyledon, of a fleshy plano-convex body, the plane surface of which is depressed towards the centre, where the cotyledon is attached, and gives origin on one side to the conical and acute radicle, which is always directed away from the placenta. The circumference of the convex surface is entirely occupied by the processes which constitute the plumula, and the outermost of which are about an inch in length. These processes are furnished with vessels, but their chief bulk is cellular, and they are (with the exception perhaps of the outermost) furnished with stomata. After

the spontaneous separation of the enclosed portion of the cotyledon, the testa is frequently found ruptured, but Mr. Griffith does not concur with Roxburgh in regarding this as the stage of germination, which he thinks cannot be said to take place until the radicle has elongated and the innermost of the plumular processes become expanded. The axis contains the rudiments of additional radicles, which after germination become exerted.

Mr. Griffith thinks that the whole of the anomalies existing in the structure of the embryo may be referred to the density of the texture of the nucleus and to the shape of its cavity. The direction of the radicle appears at first sight to be an exception to a very general rule; but this anomaly is proved to take place subsequently to the earlier stages of development, during which the apex of the radicle corresponds exactly with the apex of the nucleus and with the foramen. He adds in a note that he would limit the expression of the law to "radicle pointing or corresponding to the apex of the nucleus," since there are exceptions to its correspondence with the foramen.

The perforation of the testa by the radicle is explained by the anomalous direction of the radicle in the later period of its development; and the separation of the chief part of the cotyledon by the constriction exercised upon it by the indurated apex of the nucleus. Mr. Griffith is inclined to believe from this and some other instances that there is no *absolute* necessity for a cotyledon, but that its presence may be supplied by a highly developed plumula; the enormous development of the plumula in the present case being evidently adapted to correct what would otherwise be a destructive anomaly.

Finally, the author adduces the examination of this plant as a striking proof of the advantages to be derived from tracing anomalous forms back to the earliest period of their development. Going back to the period immediately before the conical apex of the radicle projects through that of the nucleus, we arrive at a stage when the form of the embryo closely resembles the usual form of the *Aroideæ*, since we have a superior radicle, a cotyledon, and a tendency to the formation of a lateral slit, as indicated by the depressed areola.

BOTANICAL SOCIETY OF EDINBURGH.

Feb. 12, 1846.—Dr. Balfour, President, in the Chair.

A large collection of plants from Chippawa, Niagara, and various parts of Canada, was presented from Dr. Philip W. Maclagan; and specimens of some of the rarer alpine plants of Scotland by Dr. Balfour.

The following communications were read:—

1. "On the Potato Disease," by John Goodsir, F.R.S.E., Demonstrator of Anatomy in the University of Edinburgh, and Secretary of the Botanical Society.

In reference to the nature of the potato disease, Mr. Goodsir stated that there could be no doubt as to its general resemblance to an epi-

demic. Although we may not have discovered the causes of epidemic diseases, we know they depend partly on local or individual circumstances which may be obviated, and which influence some epidemics more than others; and partly to general influences, commonly supposed to be atmospheric, but regarding which we actually know nothing but their existence. Mr. Goodsir then alluded to the striking general resemblance between the rise and progress of epidemics, and the appearance, non-appearance, and increase of fungi from season to season. Coupling this analogy with the opinion generally gaining ground, that certain epidemics owe their existence to the growth of fungi or analogous beings in the animals afflicted, Mr. Goodsir conceived that we are bound, in our attempts to explain the nature of the potato disease, not to overlook the fungi which exist in the diseased tubers. After stating Mr. Berkeley's late researches into the fungoid nature of the disease, Mr. Goodsir observed, that he was still inclined to believe in the organic nature of the brown matter; and he founded his belief chiefly on its peculiar form, and on its position in the cells. This view of the nature of the potato disease did not afford an indication of cure or prevention, for the diseases with the nature of which we are best acquainted are not always those we can most certainly cure. It holds out, however, a hope that the murrain may not recur. The occurrence of fungi as the cause of disease was pointed out in various instances, especially diseases of the skin where mycodermatous fungi are seen, diseases of the mucous membrane, and diseases of the stomach. The occurrence of cellular plants (*Torula cerevisiæ*) during fermentation was also alluded to as corroborative of Mr. Goodsir's views. The paper was illustrated by large drawings of the diseased structure of the potato, of the brown granules, and of *Botrytis infestans*, &c.

Dr. Greville in making a few observations, commenced by paying a high compliment to the talents of Mr. Goodsir, and the general accuracy of his microscopical researches. "With reference to that gentleman's theory," said Dr. Greville, "I see nothing improbable in the potato murrain being analogous to epidemic diseases in the animal kingdom. In fact the analogies between the two great kingdoms of organized matter are so many and so strong, that he might reasonably look for much similarity among some of the phænomena exhibited in both, with regard to disease. Like epidemics in the animal world, the one under consideration has appeared almost simultaneously in various and remote parts of the globe; a fact which seems to indicate some atmospheric influence. The real cause, as in the case of all epidemics, is involved in the greatest mystery. Possibly a union of conditions may have taken place favourable to the development of the fungus which appears to be invariably present. We all know that in the germination of monocotyledonous and dicotyledonous seeds a union of three conditions is essential,—the presence of air, warmth, and moisture. If any one of these conditions be wanting, the seed will not germinate, but, if otherwise favourably circumstanced, will remain in a dormant state for an indefinite period. In like manner I think it not improbable that certain con-

ditions—one or more of them being of a meteorological character—may have combined in the course of the past season to promote the growth of the potato fungus. The question has been asked, how do the spores of the fungus obtain access to the vegetable tissue? This at present is a matter of mere speculation. They are excessively minute; and it has occurred to me that they, as well as the spores of other of the minute fungi, may at all times inhabit the tissue of those species of plants to which they are respectively peculiar without, under ordinary circumstances, deranging the vegetable functions, in the same manner as minute parasites infest different parts of the animal structure. In addition to this, there must be in plants as well as in animals a *predisposition* to receive the disease; for even epidemics make a selection of their victims. The fungus did not attack all plants of the potato indiscriminately; some varieties throughout the infected districts having, comparatively speaking, escaped,—a most valuable fact for the consideration of the practical agriculturist. With reference to the brown granules, which Mr. Goodsir believes to be organic, I confess I have been quite unable to satisfy myself regarding their nature. Their form is not constant, and under the microscope I sometimes find it impossible to distinguish them from the grains of starch. I cannot, besides, detect any determinate arrangement of the granules, which the microscopical observer would naturally expect to exist in a series of more or less spherical organic bodies. Certainly, the brown spots in the tuber require more investigation than they (so far as I know) have received. My attention was directed to the potato disease late in the season, and no opportunity was afforded me of examining the leaves or the stalks. It has struck me, however, in reading Mr. Berkeley's valuable memoir, that the black spots on the stalk, where the cellular tissue is described as filled with a dark grumose mass, may correspond with the brown spots in the tuber, the cells of which contain the brown grumose granules, and that the one may throw some light on the other."

Mr. Walter Crum of Glasgow detailed his experiments on the brown colouring matter in diseased potatoes, and stated that it contained nitrogen. He had carefully examined the brown granules alluded to by Mr. Goodsir, but did not believe it was a fungus.

Dr. George Wilson was much interested in what Mr. Goodsir had said in reference to the connexion between the disease in the potato and the appearance of a fungus, and in the comparison which he had drawn between it and a solution of sugar undergoing the vinous fermentation in which a cryptogamic plant always showed itself. Dr. Wilson was of opinion, however, that the vegetable physiologist was not entitled to refer to the fungus as the *cause* of fermentation, or to speak of it as more than an accompaniment. On the other hand, he was free to acknowledge, that as the chemist could not point to a single example of the vinous fermentation having been observed without the *Saccharomyces* being seen also, he was not at liberty to explain the fermentation without reference to the fungus as he generally did. Dr. Wilson believed that fermentation was at present

an Oregon territory in science, which the chemist and physiologist must in the meanwhile agree to hold in joint occupancy till it could be settled which had the best right to it, or on what terms it should be divided. Mr. Goodsir had not done himself the justice to mention, that in a remarkable case of disease in the human subject, in which the contents of the stomach underwent a change exceedingly like that which vegetable juices suffer when the lactic or viscous fermentation is going on within them, he predicted the great likelihood of a cryptogamic plant being found, and discovered a very curious one, the *Sarcinula ventriculi*. Dr. Wilson would suggest to microscopic observers, that it was possible each of the true fermentations might have a fungus peculiar to itself, and that it was well worth their attention to investigate the subject. Sugar could be fermented into alcohol and carbonic acid, into lactic acid, or into mannite and mucilage. It was desirable to know if a new fungus appeared when the fermentation changed its character. Dr. Wilson anticipated that no cryptogamic plant would be found when diluted alcohol was converted into acetic acid by platina black, because no azotized compound was present to yield nitrogen to the fungus, without which, in all probability, it could not be developed. The acetous fermentation, however, differed in several important particulars from the others referred to.

Dr. Douglas Maclagan entertained no doubt, from the observations of Mr. Goodsir, Mr. Berkeley, and others, that the fungus present in the diseased potato had originated in the leaves, and been propagated down along the stem to the tubers. He had himself observed, and rudely sketched, an organism in the diseased tubers, which, from the drawings exhibited this evening, he had no doubt was identical with that observed by Mr. Berkeley growing from the stomata of the leaves. There was also, he thought, little doubt as to the nature of the brown matter which pervaded the diseased portions. Although it had not been demonstrated microscopically to be a fungus, the fact of its having been separated by M. Payen, by maceration, and subsequent boiling with diluted sulphuric acid, and its being ascertained to contain a proportion of nitrogen equal to that found in analogous parasitical vegetable organisms, appeared to warrant the conclusion that it really was of the nature of a fungus. He thought, however, that the question as to the nature of the potato disease was not settled by proving the presence of a fungus in the altered portions. It was still a disputable point, whether the fungus was antecedent to, or consequent upon, the morbid state of the tubers; it was yet doubtful, whether the discrimination of the first advances towards the disease fell within the province of the chemist or the botanist. He had frequently observed, on making sections of affected potatoes, portions in the interior of the tubers in which no discoloration had commenced, but which were in a softened pulpy condition. A portion of this could at once be lifted out on the point of a knife, and on being subjected to microscopic examination, no fungus, or brown granular matter could be observed; but the amyloiferous cells of the tuber, and these contained starch grains, were found in a swollen

state, as if they had been filled with fluid by endosmose, and the compartments of the cellular tissue had thus become so entirely detached from each other, as to have assumed a complete round form, instead of their characteristic hexagonal shape. It appeared to him to resemble what might be expected from the maceration of the textures in water, and it was a possible supposition that this might be the first stage of the disease, and that the change thus effected in the tuber formed a nidus fitted for the development and growth of the fungus already existing in the aerial parts of the plant.

Mr. Milne being invited by the President to give his opinion, stated the gratification with which he had listened to the statements made by Mr. Goodsir and other speakers. Nothing could be more distinct than the description given of the nature of the fungus which appeared to accompany the disease, and the parts of the potato affected by it. The discussion, however, had been confined entirely to a description of the fungus, and to speculations on its probable effect in altering the condition of the potato. No one had as yet offered any opinion as to the circumstances which led to the production of the fungus. If it arose from seeds dormant in the potato, what was it which had caused them to germinate? If it arose from seed or matter in the atmosphere, was there anything in the state of the atmosphere to account for it in one part of the globe and not in another? He had been devoting attention to the meteorological branch of the inquiry, and he thought that he had made a discovery, which would explain the appearance of the disease in some places and not in others. But he had not come prepared to enter into particulars, not supposing that any persons, unless they were members of this Society, could take part in the proceedings; he would therefore indicate generally the results. Mr. Milne then described some peculiarities of the weather in England and Scotland during the summer and autumn of last year, as shown by meteorological returns which he had obtained from a number of places, both in those districts where the disease prevailed, and in those from which it had been absent. He mentioned that the maximum summer heat had occurred in England and the southern parts of Scotland in June, whereas in the northern parts of Scotland, where the potato disease had not appeared, the maximum heat had occurred in August as usual. He alluded also to repeated and sudden thermometric changes which had occurred in the south of England.

Mr. Brand and Mr. Girdwood remarked, that potatoes in the early part of the season were not affected, and that where the stems and leaves had been cut away early, the disease had not appeared in the tubers left in the ground. These facts seem to indicate some atmospheric influences which had come into operation late in the season, or some cause which did not take effect till the tubers were fully developed.

2. "A Synopsis of the British Species of the genus *Rubus*," by Charles C. Babington, M.A., F.L.S. &c. (This paper is in the course of publication in these Annals.)

March 12, 1846.—Dr. Balfour, President, in the Chair.

Various donations to the library and museum were announced, and thanks voted to the respective donors.

The following communications were read:—

1. "On the altitudinal range of the Mosses in Aberdeenshire," by George Dickie, M.D., Lecturer on Botany in the University and King's College of Aberdeen. (This paper will be published in these Annals and in the Society's Transactions.)

2. "Remarks on the state of the Sibthorpean Herbarium at Oxford, suggested by the announcement of a new edition of the 'Flora Græca,'" by Dr. R. C. Alexander.

3. "Botanical Excursion in Lower Styria in 1842," by the same. (This paper will be published in these Annals and in the Society's Transactions.)

A letter from Dr. Bidwell was read, announcing the discovery of *Vaccinium macrocarpum* near Mold in Flintshire in August last; and one from Mr. W. A. Stables noticing the discovery of *Neottia nidus-avis* in Cawdor Woods, Nairnshire.

Dr. Balfour exhibited specimens of diseases in plants caused by insects; one of these consisted of peculiar stipitate excrescences on the leaves of a North American tree, concerning which Dr. Balfour read some extracts from a letter which he had received from Mr. Adam White of the British Museum:—

"The swellings on the leaves of the plant seem to be caused by some species of *Aphis*; one kind is very hurtful to the peach-tree, but attacks the leaves in a different way from the insect on your specimen. Dr. Harris, in his admirable work 'On the insects of Massachusetts injurious to vegetation,' speaks of some *Aphides*, 'the punctures of which affect plants in a most singular manner, producing warts or swellings, which are sometimes solid and sometimes hollow, and contain in their interior a swarm of lice, the descendants of a single individual, whose punctures were the original cause of the tumour. I have seen reddish tumours of this kind as big as a pigeon's egg growing upon leaves, to which they were attached by a slender neck, and containing thousands of small lice in their interior.' Possibly the excrescences may be caused by some minute moth (Tortricidous or Tineidous), as there are evidences of some little larva that has eaten away the parts between the cuticle at the base of some of the excrescences. Your specimens I have examined, but do not find any fragments of the insects, although there are traces of dung and a small part of a web, certainly remains of a moth; and there is no reason why the excrescences may not be the nidi for the eggs of an *Eriosoma* (an aphididous insect), and the web, dung, and eaten part, evidences of some *Tinea*. Mr. Doubleday has observed similar warts on leaves, but knows not how they are produced."

ENTOMOLOGICAL SOCIETY.

October 7th, 1844.—G. Newport, Esq., President, in the Chair.

Mr. Bedell exhibited specimens of *Tortrix rutilana*, Hb. (a species new to Britain), taken at Sanstead Down near Croydon, on juniper bushes.

Mr. Wollaston exhibited numerous specimens of the rare *Cossonus Tardii*, taken in decayed beach and sycamore trees in Lord Mount-Edgcombe's park, Cornwall.

Mr. Raddon exhibited a number of caterpillars of a species of *Agrotis*, which had proved very destructive to the potatoe crop in Devonshire, eating through the young shoots just beneath the surface.

Mr. Edward Doubleday exhibited a box of Chilian *Coleoptera*, some of which were new, and of interesting forms.

The President exhibited a number of specimens of *Vanessa Io*, which he had subjected in the larva state to a series of experiments, with the view of determining the question as to the power of reproduction of the limbs in those orders of insects which undergo a complete metamorphosis, and which had fully determined the existence of such a power, the entire legs, including the whole of the coxa and the different parts of the legs, being reproduced: in some cases the limb reproduced was small and comparatively imperfect; but in all the ungues were reproduced, although the tibial spines were generally absent, as he had also observed to be the case in the *Lithobiidae*. He had also determined that the reproductive process took place in the antennæ of the *Iulidae* when cut off in the middle. Many of the caterpillars had however died from excessive hæmorrhage, and he had found that the best period for prosecuting the experiment was, preceding the last stage of the insect's existence as a caterpillar, two or three days before or after the moulting takes place: in moist weather the number of caterpillars which died was far greater than in fine weather, the blood coagulating slowly. [See the details of these experiments published by Mr. G. Newport, in a subsequent part of the Philosophical Transactions of the Royal Society of London.]

Mr. H. Goodsir gave an account of his experiments and observations on the reproductive powers of the Crustacea (which he had communicated to the preceding meeting of the British Association). He had found the reproductive power greater in this class than in Insects; but he had observed that the antennæ in the Crustacea are not capable of reproduction. He exhibited an extensive series of drawings illustrating the process of reproduction. He had observed, that when the leg is injured in any part, the Crab throws it off at a spot in the coxa distinguished by a slender annulus, the extreme base of the coxa not being capable of reproduction. In the lower Crustacea, however, he had observed that reproduction takes place from any part of the legs, and not merely at the middle of the coxa, as in the *Brachyura*. He had detected a system of oil-vessels within the

shell circulating over the surface of the limb, perfectly analogous to the system of vessels in the ova for the supply of nourishment to the young; and he had no doubt that this system in the limbs had for its object the reproductive process. In *Cancer Pagurus* the embryo claw was found coiled upon itself within its sac during the process of reproduction, but in the Lobster it was not thus coiled up.

Extracts from letters were read from Colonel Hearsey and Capt. Boys, addressed to Mr. Westwood, containing various observations on the habits of Indian insects.

In the former communication Colonel Hearsey mentions the capture of specimens of different species of *Paussidæ* by Mr. Benson and Dr. Bacon, also a pair of a new species of *Æstrus* in copulâ, and a new *Hister* with white spots on the elytra, and other *Necrophaga*, taken out of the dead body of a Cobra de Capella which had destroyed a quantity of Mrs. Hearsey's poultry.

In the other communication Captain Boys describes the habits of a species of *Orthoptera* belonging to Latreille's genus *Tetrix*, about an inch long, which readily takes to the water and dives under it, remaining at the bottom attached to a stone for many minutes together, the dilated foliaceous appendages of the hind legs being well-adapted for swimming,—being the first instance recorded of a natorial Orthopteron insect. He also mentions as remarkable, that he had never taken a *Lucanus* either in the plains of India or in the Vindyah range of hills, although they are not uncommon in the Himalayan range, where he always found them feeding on the fungi of various trees, and he had been informed that a friend had even noticed them feeding upon excrementitious matter. He had never taken *Meloë* except at an elevation of 11,000 feet above the level of the sea in the Himalayahs. At an elevation of 14,000 feet he took a *Tenthredo*; they were common at 10,000 feet, where the diurnal *Lepidoptera* were scarce, and he had not there met with a single true *Papilio*: several species of *Vanessa* were more common, and at 13,600 feet he took two specimens of a species allied to *Doritis Apollo*. He had also taken two or three very fine *Bolboceri*, and a *Megacephala* nearly allied to, if not identical with, *M. Euphratica*.

Extracts were also read from a letter addressed by Dr. Cantor to the Rev. F. W. Hope, on the insects of Prince of Wales Island; in which the writer gives the following extract from his note-book respecting a species of the singular genus *Trochoides* (of which he also inclosed a highly magnified figure):—

“ Nov. 7, 1842. *Trochoideus Amphora**, mihi. The night was very dark, and numerous minute insects were attracted by the flame of the lamp, this among the rest. It is the first and the only one of the *Paussidæ* I ever observed here. Those few which I have seen up in Bengal were captured precisely under similar circumstances.

* *T. Amphora. Piceus nitidus, punctatissimus, punctis minutis, tenue setosus, prothorace lateribus marginatis et in medio angulatis, antennis, clypeo, oris partibus et pedibus piceo-testaceis. Long. corp. lin. 1 $\frac{3}{8}$.*

T. Amphora appears to be closely allied to *T. Desjardinsii*, Guérin (Trans. Ent. Soc. ii. 97), inhabiting Mauritius."

The Rhinoceros-beetles (*Oryctes*) are very destructive to cocoa-nut plantations, as they devour the flowers and leaves; and coolies are regularly employed to clear the trees thus infested: yet he never saw more than twenty-five to thirty at the time destroyed in a single tree. The presence of the beetle is indicated by the appearance of the gigantic leaves, which have the edges regularly indented. Koombang is the Malayan name for a beetle, but the Malays denominate this species Koombang *κατ' ἐξοχήν*. He had particularly attended to the araneideous genus *Attus*, several of the species of which are of the most exquisite colours, and had drawn them from the life, the metallic colours generally fading, after the insect is plunged into spirits, into a dull black. He had also made some notes on their habits which he proposed to publish. Of the genus *Myrmarachne* he had observed four or five species. He also inquires, "Is it known that many of the *Arachnida* are covered with scales similar to those of the *Lepidoptera*? I can find it nowhere recorded, and I never knew so till I examined mine under the microscope, since which discovery I have always added a magnified *scale* to my sketches."

November 4th.—G. Newport, Esq., President, in the Chair.

Mr. Weaver exhibited an extensive collection of *Lepidoptera* captured during a recent visit to Scotland, including various new species of *Tortricidæ*, *Tineidæ*, &c., and also a fine series of specimens of *Hipparchia Melampus* of Fuesslin (a species new to this country), taken in July on marshy ground amongst the mountains near Kinloch Rannock in Perthshire, and which he stated are only to be found on the wing during the sunshine, dropping into the grass on the sun being obscured.

Mr. Evans exhibited various insects from New Holland and North America.

Mr. E. Doubleday exhibited specimens of a new American species of *Saturnia* allied to *S. Promethea*, having the sexes alike. Also a beautiful moth belonging to the genus *Lophocampa*, several specimens of which had been captured alive in the London Docks, supposed to have been imported in cargoes of mahogany from Honduras.

Mr. F. Bond presented some oak-leaves, each covered with two distinct species of oak-spangles, or minute galls.

Mr. Westwood exhibited various Indian insects from Captain Hutton, including his *Plectropteron Dianae*, which proved to be *Saturnia Selene*, and the instruments described by that gentleman as the means by which the insect cuts its way out of its cocoon, were thereby ascertained to be the patagia or tippets. Also a new species of moth closely allied to the *Bombyx Mori*, which Captain Hutton had discovered on mulberries in India, and of the transformations of which an account was read from a letter addressed by him to Mr. Westwood, in which he also mentioned having discovered another Indian silk-moth closely allied to the Tusseh silk-moth.

Drawings of two Indian species of Locusts, made in that country by Lieut. Edwards, M.E.S., were exhibited, and a memoir read by the Rev. F. W. Hope on the Asiatic species of that family, and by whom a large collection of nearly allied species from various localities was exhibited.

The species which for two successive years had ravaged India from one end to the other is regarded by Mr. Hope as undescribed, and of which he gives the following character:—

Cedipoda Edwardsii, Hope. *Fusca, capite thorace pectore pedibusque rubescentibus, elytris dilutè fuscis, brunneo-maculatis, dentibus rubris.*—Long. corp. unc. 2, lin. 4. Long. tegm. singuli, unc. 2, lin. 6.

A paper by Mr. Westwood, containing the description of a new genus of exotic *Cimicidæ*, was read.

STENOTOMA, Westw. Genus novum inter *Coreidas* locand um. *Caput lobo antico porrecto bispinoso; lateribus ante oculos bispinosis. Ocelli 2. Antennæ articulo 2^{do} clavato, 3^{to} ovali lato, 4^{to} ovali oblongo, præcedenti minori. Prothorax lateribus acutè spinosis.*

Stenotoma Desjardinsii, W. *Lutea, fulvo parum variegata undique fusco punctata; antennis fuscis, abdominis lateribus fusco et albido alternatim maculatis.* Long. corp. lin. 3.—Hab. in Insulâ Mauritiî. D. Desjardins. Mus. nostr.

December 2.—G. Newport, Esq., President, in the Chair.

Mr. Desvignes exhibited a specimen of *Coccinella lineata*, Fab., now ascertained to be an extremely rare variety of *C. ocellata*.

Mr. Pelerin exhibited specimens of the New Zealand caterpillar and its parasitic *Clavaria*, already figured and described in the Transactions of the Society.

Mr. Milton exhibited numerous specimens of Dipterous larvæ, evidently those of a moderate-sized *Tipula*, 852 individuals of which he had extracted, mostly alive, from the crop of a pheasant recently killed.

Mr. Evans exhibited a numerous collection of New Holland insects, several being of new and interesting species.

Mr. Westwood exhibited the case formed by the larva of *Porrectaria vibicipenella* (a species new to this country, discovered by Mr. Weaver in Worcestershire during the past season), and which he had received from the senator Van Heyden of Frankfort. Mr. Marshall stated that he had also obtained the cases of this species from Mr. Weaver, by whom the insect had been reared from the caterpillar state.

Mr. Westwood also exhibited a new genus of *Carabidæ* from Guinea, allied to the genus *Morio*, received from M. Westermann: also drawings of an allied new genus from Ceylon, in the collection of Mr. Melly, and of various other new genera of Coleoptera.

Mr. F. Bond exhibited a specimen of the caterpillar of *Bombyx potatoria*, entirely covered with a white fungus very similar to muscardine.

Mr. W. W. Saunders exhibited a dragon-fly which had been captured flying over the Atlantic 600 miles from land; by Mr. Stephenson.

A memoir by Mr. Stevenson on the Entomological peculiarities of New Zealand was read. After commenting upon the peculiarities of the climate and the vegetation of New Zealand, the author remarks, that the opinion that there are but few insects in New Zealand is erroneous; the great masses of vegetation requiring vast numbers of insects to keep them in check, and hasten their decay when dead by boring into the timber more or less superficially; the *Tetramera* in fact form three-fourths of the *Coleoptera*. Only two *Cicindela* were observed, and but few *Carabida* and *Brachelytra*. The *Elaterida* were more numerous, but no *Buprestida* were met with. The *Clavicornia* also are not numerous, and but very few *Lucanida** and *Cetonia*, no traces of *Geotrupida*, and only two or three *Heteromera*. Some of the *Curculionida* are of singular forms; some species allied to *Brentus* burrow in the larva state into the hard wood of trees, and the *Longicornes* are very abundant; the larvæ of some of the larger species being eaten by the natives either in a raw or half-roasted state. Two *Coccinella* and two *Forficula* only were captured, and only seven or eight species of *Hymenoptera*, including a species of Bee, with large burthens of farina on its hind legs. Five or six species of *Libellula* and three of *Cicada* were observed, and a large formidable-looking apterous *Gryllus* (*Deinacrida*, White), which is very abundant in old trees, secreting itself in crevices of the bark. The small grasshoppers are numerous. In *Diptera*, the carrion flies perform a more important part in nature, as scavengers, than elsewhere. *Tipulida* and mosquitoes abound, but there are decidedly but few *Lepidoptera*, some of which are very analogous to the English species, such as the Painted Lady and Red Admiral Butterflies.

ZOOLOGICAL SOCIETY.

Oct. 14, 1845.—William Yarrell, Esq., Vice-President, in the Chair.

The following extract was read from a letter, dated Madeira August 18, 1845, received from the Society's Corresponding Member, the Rev. R. T. Lowe:—

“The Rev. R. T. Lowe has the pleasure of adding to the Society's collection a fine specimen of a new *Zeus* (*Zeus conchifer*, Lowe) of the greatest rarity; the present being the second example only which has hitherto occurred.”

The specimen was exhibited to the Meeting.

“On the genus *Anous*, Leach (*Megalopterus*, Boie).” By John Gould, Esq., F.R.S. &c.

There is no family of birds more generally diffused over the globe than the Terns, and certainly no group of the Natatorial Order less understood, or which would more amply reward the studious investi-

* *Mitophyllus irroratus*, Parry, was found under bark.

gation of the scientific ornithologist. The present short paper is limited to some species of the genus *Anous*, for the purpose of describing three or four new ones, rather than aiming at anything like a complete monograph of even this little group. It will not, however, detract from the interest of the paper if I give a list of the species with which I am familiar, and reserve to some future time the completion of the subject. Upon the present occasion I shall exhibit five well-defined species; a sixth, of which I am not aware that an example exists in the museums of this country, is figured in the 'Planches Coloriées' of M. Temminck. They are—

1. *ANOUS STOLIDUS*: *Sterna stolidus*, Linn.; *Gavia fusca*, Brehm; *Anous niger*, Steph.
2. *ANOUS LEUCOCAPILLUS*, NOV. SP. *A. vertice et nuchâ albis; loris, et partibus circumocularibus, intensè nigris; omni inferiore corpore alisque fuliginosis, necnon occipite, dorso, et caudâ, sed cinereo tinctis.*

Crown of the head and nape of the neck white; lores and space surrounding the eye deep black; near the posterior angle of the upper and lower eyelids a small patch of white; breast, all the under surface and the wings deep sooty black; back of the neck, back and tail the same, slightly tinged with ash; bill black; feet brownish black.

Total length, 14 inches; bill, $2\frac{1}{4}$; wing, 9; tail, 5; tarsi, $\frac{7}{8}$; middle toe and nail, $1\frac{1}{2}$.

Hab. North coasts of Australia.

3. *ANOUS MELANOPS*, NOV. SP. *A. vertice et nuchâ pallidè cinereis; dorso saturatè griseo; maculâ ante oculum, alterâque minore post oculum intensè nigris.*

Crown of the head and back of the neck light ash-colour, passing into deep grey on the mantle and back; immediately before the eyes a large patch, and behind a smaller one, of jet-black; posterior half of the lower and a smaller space on the upper lash snow-white; throat, fore-part of the neck and all the under surface deep sooty black; wings and all the upper surface of the same colour, but rather browner; bill black; tarsi and toes brownish black.

Total length, 12 to 13 inches; bill, $2\frac{1}{4}$; wing, $8\frac{3}{4}$; tail, 5; tarsi, $\frac{7}{8}$; middle toe and nail, $1\frac{1}{2}$.

Hab. Very abundant during the breeding season on the Houtman's Abrolhos, off the western coast of Australia.

Remark.—This species, although very nearly allied to, is distinct from the *Anous tenuirostris* (*Sterna tenuirostris*, Temm.) of Western Africa, from which it may at once be distinguished by the black marks before and behind the eye, of which no trace is represented in M. Temminck's figure in the 'Planches Coloriées'; neither is this conspicuous mark alluded to in his description. It is just possible that this may be the species described by M. de la Fresnaye in Guerin's Magazine, under the generic name of *Procellosterna*.

4. *ANOUS TENUIROSTRIS*: *Sterna tenuirostris*, Temm. Pl. Col. 202.
5. *ANOUS CINEREUS*, NOV. SP. *A. capite, collo, et corpore inferiore argentato-albis; parvâ plumarum lineâ oculum circumeunte nigrâ*

ad rostrum, ad nucham albâ; dorso, alis, caudâque latè griseis; secundariis ad apices albis.

Head, neck and all the under surface silvery greyish white; round the eye a narrow ring of feathers, the anterior half of which is deep black and the posterior half white; back, wings and tail light grey; secondaries tipped with white; bill black; tarsi and toes brownish black; interdigital membrane yellowish.

Total length, 11 inches; bill, $1\frac{1}{2}$; wing, 8; tail, 5; tarsi, $1\frac{1}{8}$; middle toe and nail, $1\frac{3}{8}$.

Hab. The north-eastern coasts of Australia.

Syn. *Pelecanopus pelecanoides*, Brit. Mus. Coll. Part iii. p. 180.

6. ANOUS PARVULUS. *A. toto corp ore cinereo-griseo; parvo plumarum annulo oculum cingente, parte anteriore nigra, posteriore albâ.*

The whole of the plumage ashy grey, being somewhat lighter on the head and neck than on the other parts of the plumage; round the eye a narrow ring of feathers, the anterior half of which is black and the posterior half white; bill black; tarsi and toes brown.

Total length, $9\frac{1}{2}$ inches; bill, $1\frac{1}{4}$; wing, $6\frac{1}{2}$; tail, $4\frac{1}{4}$; tarsi, $\frac{7}{8}$; middle toe and nail, $1\frac{1}{4}$.

A single specimen forms part of the collection of the Zoological Society, to whom it was presented by F. Debell Bennett, Esq., who procured it at Christmas Island, in the South Seas. It may be distinguished from all the other species by its small size and delicately-formed bill.

Mr. Gould then exhibited two new birds from New South Wales:

PODARGUS PLUMIFERUS. *Pod. plumis nares tegentibus, quæ sunt in cristæ formam erectæ, nigro-fusco et albo alternatim fasciatis; mediâ gulâ et pectore brunneo-albis, fusco minutè maculatis, nec aliter colli pectorisque lateribus, nec corpore subtùs, nisi singulis plumis lined saturatè fuscâ in medio, et duabus maculis quadratis ad apicem, ornatis.*

Feathers covering the nostrils, which are erected into a tuft, alternately banded with blackish brown and white; all the upper surface mottled brown, black and brownish white, the latter predominating over each eye, where it forms a conspicuous patch; the markings are of a similar but of a larger kind on the wings, and on the primaries and secondaries assume the form of bars; tail similar but paler, and with the barred form of the markings still more distinct; centre of the throat and chest brownish white, minutely freckled with brown; sides of the neck and breast and all the under surface similar, but with a dark line of brown down the centre and two large nearly square-shaped spots of brownish white near the tip of each feather; bill and feet horn-colour.

Total length, 20 inches; bill, $2\frac{3}{8}$; wing, $9\frac{1}{2}$; tail, 10; tarsi, 1.

In another specimen the markings are altogether of a much darker hue, particularly on the under surface, where the light markings are less distinct and more chestnut.

Hab. The brushes of the Clarence and MacLeay rivers of New South Wales.

Remark.—This species differs from all its Australian allies by the more lengthened form of the tail and the conspicuous tuft of feathers which spring from the fore-part of the head, and it is from this character the specific name has been taken.

PLATYCERCUS SPLENDIDUS. *Plat. capite, colli lateribus, et medio pectore, coccineis; genis albis; dorso inferiore, et tectricibus caudæ superioribus pallidè viridibus; lateribus pectoris, et abdomine splendidè flavis; crisso pallidè viridi.*

Head, sides of the neck and centre of the breast scarlet; cheeks white, faintly tinged with blue; feathers of the back and scapularies black, broadly margined with gamboge-yellow; lower part of the back and upper tail-coverts pale green; on the shoulder a patch of black; wing-coverts pale blue; primaries black, with the exception of the basal portion of the external web, which is rich deep blue; two central tail-feathers dark green at the base, passing into deep blue on the apical half of the external web, and tipped with black; the next on each side is black on the internal web, green at the base of the external web, blue for the remainder of its length, and slightly tipped with white; the remainder of the tail-feathers are deep blue at the base of the external, and black at the base of the internal web, the remaining portion of both webs being pale delicate blue, passing into white at the tip; sides of the breast and the abdomen bright gamboge-yellow; vent pale green in some, in others pale bluish green; under tail-coverts scarlet; irides dark brown; bill horn-colour; feet mealy brown.

Total length, 12 inches; bill, $\frac{5}{8}$; wing, 6; tail, 7; tarsi, $\frac{3}{4}$.

Another specimen, probably immature, has the general colour similar, but has the head and breast pale yellow, interspersed with scarlet feathers.

Hab. Darling Downs, New South Wales.

Remark.—Very nearly allied to, but a more beautiful species than, the *Platycercus eximius*, from which it differs in the extent of the scarlet on the breast, which in this species merely occupies the centre, while in the former it forms a broad band across the breast; the rump also is of a paler green.

“A Description of new species of *Ostrea*, in the collection of H. Cuming, Esq.,” by Sylvanus Hanley, Esq., was then read:—

OSTREA CHEMNITZII. *Ost. testâ obovali, plerunque sinistrorsâ, valdè compressâ, solidâ, nitidâ, luted aut sordidè rubro-purpurâscente, subtuberosâ, nonnunquam paululùm subvesiculosâ, nullis lamellis asperatâ; margine plicato, intusque persæpe scabro; plicis plerunque parvis; superficie internâ albido-virescente; cicatrice satis magnâ, subreniformi.* Long. 3 poll.

Hab. China? Mus. Cuming, Hanley, &c.

A species which is closely allied to *rosacea*, with a peculiar resinous gloss, and invariably attached by the entire surface of the lower valve. The colour varies from dirty yellow to dull reddish purple. The apices are not much attenuated. The figure 994 of Chemnitz is a fair representation.

OSTREA LACERATA. *Ost. testâ elongatâ, solidiusculâ, valdè inæquivalvi, haud lamellosâ, ad nates acutas angustatâ, ad latera basinque laceratâ; valvulâ superiore planulatâ, sublævigatâ, aut lutescente radiis sordidè rubro-purpureis ornatâ, aut rubro-purpureâ radiis duobus centralibus nigrescentibus aream angustam albidam includentibus; valvulâ inferiore profundâ, radiis latis atropurpureis strigatâ, costisque raris subangulatis armatâ; superficie internâ albidâ, submargaritacè; cardine denticulis nullis munito.* Long. 2 poll.

Hab. Senegal? Mus. Petit, Cuming.

Not unlike *parasitica*, but distinguishable by its claw-like lateral projections. I have never met with any valves attached by the entire surface. The dull crimson specimens, adorned with two central dusky rays, which usually enclose a narrow space of yellowish white, are peculiarly beautiful.

OSTREA MULTISTRIATA. *Ost. testâ suborbiculari, compressâ, æquivalvi, solidiusculâ aut subtenui, vix lamellosâ, brunneo-rufescente, confertissimè radiatim rugosâ; superficie internâ valvulâ superioris niveâ, purpureo marginatâ; inferioris disco centrali rufo pulcherrimè tinctâ; cardine dentibus validis munito; natibus haud eminentibus; cicatrice satis magnâ.* Long. 3·3 poll.

Mus. Saul, Cuming, Hanley.

The lower valves were attached by their entire surfaces to a ship returning from the coast of Africa.

OSTREA MEGODON. *Ost. testâ falcatâ, glabrâ, solidâ, subæquivalvi, pallidè livido-purpurascente, margines versùs plicatâ; plicis anticis 5 aut 6, maximis, subangulatis; posticis minimis, angulatis, paucis, subobsoletis; margine valdè plicato, intusque magis minusve scabro; natibus incurvatis; superficie internâ albo-virescente, nunquam margaritacè; cicatrice satis magnâ, reniformi.* Long. 5 poll.

Hab. Peru (Cuming). Mus. Cuming.

A rare and extraordinary species, which bears not the slightest resemblance to any of the recent *Ostreæ*. The narrow sickle-shaped contour and the gigantic marginal tooth-like folds form its most distinctive characteristics. The adult specimens are attached by their apices only.

OSTREA PES-TIGRIS. *Ost. testâ ovali, aut ovali-subtrigonâ, solidâ, concolore, atro-purpureo aut rubro-purpurascente, undique sublamellosâ, ad margines densè plicatâ; lamellis imbricatis, confertis, depressis; plicis regularibus, rotundatis; valvis in longitudine paribus; inferiore profundâ, superiore planulatâ atque in costas planas sulcis latis remotis radiatim divisâ; superficie internâ albidâ, margine interno denticulato; denticulis elongatis; cicatrice satis magnâ, obovali aut suborbiculari.* Long. 2 poll.

Hab. Isle of Luzon; on rocks (Cuming). Mus. Cuming, Walton.

In typical specimens the shell is subtriangular, from the anterior side sloping in a produced and straightish line, abruptly from the beaks. The sculpture is both elegant and peculiar, the extremely depressed ribs being divided by rather broad grooves, and assuming

a scalloped appearance at their edges, from the crowded sublamellar imbrications which cover the entire surface.

OSTREA BICOLOR. *Ost. testâ obovatâ, nunquam elongatâ, subtenui aut solidiusculâ, subcompressâ, vix lamellosâ, purpureo-fuscescente radio uno vel radiis duobus albidis ornatâ; margine simplici; natibus subacutis; superficie internâ, albidd colore externo marginatâ; cardine denticulis nullis munito.* Long. $2\frac{1}{2}$ poll.

Hab. Senegal? Mus. Cuming, Hanley.

As the few specimens I have yet examined of this elegant species have been attached by the entire surface to the sheathing of vessels, I am unable to describe the characteristics of the lower valve. The lamellæ, when existing, are flattened, so that the shell presents a smooth surface, and appears inclined to expand laterally whenever unobstructed in its growth by adjacent substances.

OSTREA COLUMBIENSIS. *Ost. testâ subinæquivalvi, subtenui, lamellosâ, albidd, purpureo radiatâ, subcompressâ; valvulâ inferiore magis convexâ; superficie internâ albidd, submargaritaced; cardine denticulis nullis munito; cicatrice satis magnâ, reniformi.* Long. 2 poll.

Hab. St. Elena, West Columbia, adhering to rocks at half-tide (Cuming). Mus. Cuming.

All the specimens I have seen are attached by the entire surface of the lower valve. The shape varies from oblong to suborbicular, and the valves are of equal length, but the shelly substance of the shallow upper valve fits into the lower one, and is only continued to the margin by the lamellæ, which, when the habitat permits, branch into wavy foliations.

OSTREA CALLICHOA. *Ost. testâ obovatâ aut suborbiculari, solidiusculâ, subæquivalvi; valvulâ superiore purpureo alboque lutescente radiatâ, concentricè lamellosâ; lamellis depressis; valvulâ inferiore magis minusve purpureo tinctâ, costisque radiantibus subobtusis densè armatâ; superficie internâ, albâ; margine simplici; cardine denticulis distinctis munito.* Long. 2 poll.

Hab. Island of Chiloe, adhering to stones at low-water mark (Cuming). Mus. Cuming.

The general appearance is that of our edible oyster, but the colouring is magnificent.

October 28.—George Gulliver, Esq., F.R.S., in the Chair.

A paper was read containing "Descriptions of new species of Shells," by Lovell Reeve:—

MUREX MACULATUS. *Mur. testâ ovatâ, subpyramidali, anfractibus brevibus, tuberculato-varicosis, varicibus interstitiisque subtiliter liratis, liris, lirarum interstitiis quoque pulcherrimè fimbriato-cancellatis; albidd, maculâ rubido-fuscâ inter varices conspicuè tinctâ; columellâ et aperturâ fauce pallidè rosaced; canali brevisculo, recurvo.*

Hab. —?

The whorls of this species are strongly tubercled by the varices, which are very delicately cancellately ridged across.

MUREX RUSTICUS. *Mur. testá ovatá, spirá acuminato-turritá, anfractibus medio tumidis, transversim subobscurè liratis, tuberculato-varicosis, varicibus frondosis, frondibus brevibus, interstitiis minutissimè squamatis; lutescente-albá, varicibus nigricante-fuscis; aperturá parvâ, limbo producto; canali breviusculo.*

Hab. — ?

A rather solid shell, with an elevated tubercled spire.

MUREX TURRITUS. *Mur. testá trigono-ovatá, liris convexis subnodosis irregularibus confertis undique cingulatá, tuberculo unico inter varices, trifariam varicosá, varicibus peculiariter laminato-frondosis, frondibus erectis, lateraliter convexis; lutescente livido-olivaceo hic illic saturatiore tinctá.*

Hab. North Australia; Ince, R.N.

The entire surface of this interesting new species is encircled with very close-set convex ridges, each terminating on the varices in an erect frond, connected together at the side so as to form a continuous laminated frill extending from the suture to the base. From Mr. Cuming's collection.

MUREX CROCATUS. *Mur. testá trigono-fusiforimi, transversim lirátá, liris parvis, granoso-squamatis, tuberculo inter varices; tri-varicosá, varicibus frondosis, frondibus obtuso-ramosis; canali subelongato, frondoso, fuscescente, frondibus rubido-crocatis.*

Hab. — ?

An olive-brown shell, with varices of a bright saffron colour. From Mr. Norris's collection.

MUREX PUDORICOLOR. *Mur. testá abbreviato-fusiforimi, obliquè trigoná, transversim lirátá, liris singulis tuberculis duobus, basim versus evanidis, inter varices, lined minutá elevatá inter liras; trivaricosá, varicibus rotundatis, prominentibus, squamis frondibusque prototomis basim versus præcipuè, pulcherrimè ornatis; eximè rubente.*

Hab. Island of St. Thomas, West Indies.

An interesting blush-coloured shell, received from M. Grüner of Bremen, of which I have since observed specimens in the British Museum from the island of St. Vincent.

MUREX PLEUROTOMOIDES. *Mur. testá pyriformi-ovatá, anfractibus supernè depressis, transversim liratis et minutissimè crispato-squamatis, multifariam varicosis, varicibus muricato-squamatis; canali subelongato, patulo; columellá labroque intus dentatis, labro supernè sinuato; albidá aut flavicante.*

Hab. — ?

A small pyriform prickly shell, having a sinus in the upper part of the lip, after the manner of a *Pleurotoma*.

MUREX PISTACHIA. *Mur. testá ovatá, subfusiformi, solidiusculá, anfractibus rotundatis, sulco subobsoleto prope suturam cinctis,*

transversim crebriliratis, longitudinaliter subobliquè unduloso-varicosis, varicibus obtusis; castaneo-fuscescente, columellâ et aperturâ fauce subrosaceis; canali brevi.

Hab. — ?

A small chestnut-brown shell, quite distinct from any hitherto described.

MUREX EURYPTERON. *Mur. testâ ovato-oblongâ, basim versus contractâ, spirâ breviusculâ, acuminato-turritâ, suturis subexcavatis; anfractibus supernè depressis, transversim obscurè obtusoliratis et punctato-striatis, tuberculo superficiario inter varices; trivaricosâ, varicibus tenuibus, erecto-alatis, ultimo latissimè expanso, supernè falcato-recurvo; aperturâ parvâ, ovatâ; canali breviusculo.*

Hab. Japan?

For this new and remarkable shell I am indebted to the kindness of the Rev. W. R. Crotch, whose manuscript name *eurypteron*, from εὐρύς, widely extended, and πτερόν, wing, I feel great pleasure in adopting, as being peculiarly expressive of its curious alate growth. It approaches nearest to the *Murex falcatus*, but in that species there are five varices on a whorl, whilst in this there are but three, and the winged expansions of the *Murex falcatus* are folded over at the superior margin. The specimen above described, and which is, I believe, unique, was received from Holland, and is supposed to have come from Japan.

The following paper, entitled "Description de quelques nouvelles Nérites Fluviales, du cabinet de H. Cuming, Esq.," par C. A. Récluz, was then read:—

I. NERITÆ SUBHEMISPHERICÆ.

1. **NERITA ROSSMASSLERIANA.** *Ner. testâ subhemisphæricâ, convexâ, luteo-fulvâ, nigro-irregulariter reticulatâ; anfractu unico levissimè perlongum striato; peritremate ovato-rotundato, basi obtusè anguloso; aperturâ crocâ; columellâ planissimâ, declivi, margine acuto, in medio subarcuato et obsoletissimè 3-4-denticulato.*

Hab. — ?

Alt. 10, lat. 18, convex. 10 mill.

2. **NERITA VIOLACEA,** Gmelin; *Ner. crepidularia,* Lamk.

Var. β . *Testâ ellipticâ, luteo-pallidâ, violaceo-nigricante reticulatâ; aperturâ nigricante; peritremate continuo.*

Hab. — ?

II. SERRATÆ.

A. Globosæ.

3. **NERITA SOBRINA.** *Ner. testâ globoso-ovatâ, lutescente, lineis nigris distantibus latiusculis undatis vel angulato-flexuosis fulgurantibusque pictâ; anfractibus tribus, ad suturam nigro-marginatis; spirâ semisphæricâ; columellâ convexiusculâ, supernè plus*

minusve callosa, infernè compresso-subcanaliculatâ, margine rectâ, vix denticulatâ; labro semi-elliptico, intus incrassato.

Hab. Cayenne?

Alt. 20, lat. 23, conv. 15 mill.

B. *Ovatæ vel ovato-oblongæ.*

4. *NERITA ZELANDICA.* *Ner. testâ ovato-oblongâ, ventricosâ, tenuisculd; anfractibus 3-4 supremis sæpiùs derosis, infimo sub-suturâ horizontaliterque compresso; nigrâ lineis ravidis longitudinalibus angulato-flexuosis creberrimis pictâ, interdum lutescente supernè et infernè latè fasciatâ; columellâ subcompressâ, croceâ, margine denticulatâ et in medio vix arcuatâ; labro tenui, margine sordidè rubente, intus lacteo ac parùm incrassato.*

Hab. New Zealand: on stones in mountain-streams.

Alt. 19-20, lat. 18-19, conv. 12 mill.

MISCELLANEOUS.

ON A NEW GENUS OF DOGS. BY J. E. GRAY, ESQ.

CYNALICUS, Gray.

CUTTING teeth $\frac{6}{2}$, slightly and unequally 3-lobed, the outer on each side and in each jaw larger: canines conical, hooked. Grinders $\frac{5.5}{6.6}$, the three false grinders oblique, diverging; the flesh tooth thick, broad, with a very small lobe on the front of the inner edge; the tubercular grinder rather large, oblong, transverse, 3-tubercled: the four lower false grinders in a regular series, the tubercular grinders small, roundish.

The head large, the legs short, thick. Toes 5-4; claws compressed, curved, rather elongated, rather acute. Tail moderate, rather bushy, reaching to the heel.

This genus agrees with *Cuon* in the shortness and broadness of the face and of the skull, and in the absence of the second hinder tubercular grinder in the lower jaws, but differs from it in this tooth being also absent in the upper one. In this latter character it agrees with *Hyæna*, but is at once known from that genus by the larger size of the upper tubercular grinder and the number of the lower grinders.

CYNALICUS MELANOGASTER.

Fulvous, face and back slightly blackish, varied; chest, lower parts of sides, belly, limbs and tail black.

Hab. Brazils. British Museum.

Length of body and head 26 inches; of tail 5 inches; entire 31 inches.

I may here remark that *Canis sumatrensis* and *Canis alpinus*, the red wolves of Sumatra and Siberia, belong to the genus *Cuon*. *Canis simensis*, the long-nosed Abyssinian wolf, is a true dog, but the face of the skull is very narrow, and even more elongated than that of the

greyhound. The tubercular grinders are very variable in this tribe, as will be seen in the following table :—

	False grinders.	Tubercular grinders.	In all.
<i>Cynalicus</i>	$\frac{3}{4}$	$\frac{1}{1}$	$\frac{5}{6}$
<i>Cuon</i>	$\frac{3}{4}$	$\frac{2}{1}$	$\frac{6}{6}$
<i>Canis</i> and <i>Vulpes</i>	$\frac{3}{4}$	$\frac{2}{2}$	$\frac{6}{7}$
<i>Otocyon</i>	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{7}{8}$

TROPHONIA GOODSIRII.

(*Ann. Nat. Hist.* vol. iv. p. 371.)

The description of this worm was made from specimens preserved in spirits. These, it now appears, were mutilated, having had their tentaculated proboscis detached by the shakings to which they had been exposed in their carriage from the Shetlands hither; the more easily done, since they were mixed up in the phial with other marine animals. A few days ago I procured three fine living individuals, and I thus learned that the worm has a small membranous retractile proboscis furnished with two antennæ and eight tentacula. The antennæ are larger and twice as long as the tentacula, filiform and subannulated; the tentacula are rather pointed and smooth, and in these specimens were flesh-coloured. They encircle the orifice of the proboscis, and are easily detached by pressure with a needle after the worm has been killed in spirits.

The discovery of this structure leads to further corrections, for there cannot be the slightest doubt of *Trophonia Goodsirii* being synonymous with the *Amphitrite plumosa* of Müller, and with the *Flemingia muricata* of the author of this note. See for the synonyms, *Ann. and Mag. Nat. Hist.* vol. xvi. p. 447.

The anterior portion of this worm is often bulged like that of an *Arenicola*. Its resemblance, both in outward figure and in motions, and in mutability of shape, to a *Holothuria*, e. g. to the *Holothuria inhærens* of Müller, is very remarkable.—GEORGE JOHNSTON, Berwick-upon-Tweed, March 6.

On the possibility of obtaining healthy Tubers from diseased Potatoes.

By M. DURAND.

About the beginning of October I planted diseased tubers in the earth where they were first developed. They were planted in a hot-house, the temperature of which was constantly from 48° to 54° Fahr. These tubers, buried to a depth of about four inches, appeared above ground in six weeks. Their vegetation was fresh and vigorous; the leaves attained a height of forty inches.

I lately pulled up these plants, and ascertained that they all bore a certain number of new tubers, the largest of which were of the size of a hen's egg; that none of these tubers has the least spot externally or internally; on the contrary, they bear all the characters of perfect health.—*Comptes Rendus*, March 9, 1846.

Description of a new species of Conovulus. By C. A. RÉCLUZ.

CONOVULUS CUMINGIANUS. *Con. testâ oblongo-acutâ, lævigatâ, nitidâ, castaneâ; anfractibus 10-12, planis, angustis, ultimo supra medium obtusissimè carinato, carinâ zonâ lutescente cinctâ; spirâ conico-acutâ; aperturâ angustatâ; columellâ obliquâ, triplicatâ, plicâ superiori parvulâ, secundâ majori, ab inferiori porrectâ sulco profundo disjunctâ; labro acuto, fulvo, intus albo, subcalloso et sulcato; umbilico nullo.*

Long. 16 mill. larg. 7 mill.

Hab. Isle of Negros : in a rivulet.

Collected by Mr. Cuming.—*Zool. Proc.* Oct. 28.

THE LATE MR. LOUDON.

We are happy to learn that a pension for life, of 100*l.* per annum, has been granted by Her Majesty to Mrs. Loudon.

METEOROLOGICAL OBSERVATIONS FOR FEB. 1846.

Chiswick.—February 1. Very fine : rain. 2. Fine. 3, 4. Overcast : rain. 5, 6. Very fine. 7. Overcast : windy, with showers. 8. Clear : cloudy : very clear at night. 9. Frosty : fine, but cold. 10. Frosty : cloudy and cold. 11. Frosty : fine : partially overcast. 12. Foggy : cloudy and fine. 13. Densely clouded. 14, 15. Cloudy and fine. 16. Densely overcast. 17, 18. Overcast and fine. 19. Hazy. 20. Overcast. 21. Exceedingly fine. 22. Cloudy : boisterous, with rain at night. 23, 24. Rain. 25. Heavy clouds and mild. 26. Cloudy in the morning : afterward cloudless and exceedingly fine. 27. Slight haze : showery. 28. Very fine.

Mean temperature of the month	43°·32
Mean temperature of February 1845	33 ·07
Average mean temperature for the last twenty years	39 ·36
Average amount of rain.....	1 ·61 inch.

Boston.—Feb. 1. Fine. 2. Fine : rain early A.M. 3. Cloudy. 4. Fine. 5. Cloudy : rain early A.M. 6. Fine. 7. Stormy : rain early A.M. 8. Fine : rain early A.M. 9. Fine : snow early A.M. : snow A.M. and P.M. 10. Fine : snow on the ground. 11. Cloudy : snow on the ground. 12. Fine : snow on the ground. 13. Cloudy : snow all gone : melted snow. 14—22. Cloudy. 23. Cloudy : rain early A.M. 24. Cloudy. 25. Fine : rain early A.M. 26. Cloudy. 27. Fine : rain A.M. 28. Fine. This month has been usually fine.

Sandwich Manse, Orkney.—Feb. 1. Sleet-showers. 2. Cloudy. 3. Cloudy : sleet-showers. 4, 5. Hail-showers. 6. Showers : rain. 7. Showers : snow-showers. 8. Snow-showers. 9. Snow-showers : frost. 10. Snow ; showers. 11. Clear : cloudy. 12. Cloudy : damp. 13. Showers. 14, 15. Cloudy : showers. 16. Rain : cloudy. 17. Showers : cloudy : drizzle. 18. Showers : drizzle : cloudy : drizzle. 19. Bright : cloudy. 20. Clear : cloudy. 21. Rain : cloudy. 22. Rain. 23. Clear. 24. Damp : showers. 25—27. Clear : cloudy. 28. Cloudy : showers : clear.

Appletharpe Manse, Dumfries-shire.—Feb. 1. Occasional showers. 2. Fair and fine. 3. Heavy rain. 4. Sleet and rain P.M. 5. Showers. 6, 7. Heavy showers. 8. Slight fall of snow. 9. Frost : fine : clear. 10. Frost : fine. 11. Thaw : fair : mild. 12. Slight frost. 13. Very slight frost. 14, 15. Fine. 16. Very fine. 17. Fine. 18. Frost A.M. 19. Fine, but cloudy : shower. 20. Slight showers : mild. 21. Wet and stormy. 22, 23. Damp and drizzling. 24, 25. Heavy rain. 26. Wet. 27. Remarkably fine. 28. Damp and drizzling.

Mean temperature of the month	43°·4
Mean temperature of February 1845	34 ·5
Mean temperature of Feb. for twenty-three years. 37 ·0	
Mean rain in February for eighteen years.....	2 ·0 inches.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 113. MAY 1846.

XXXVII.—*Description of a new genus of Pulmonary Gasteropods.*
By G. J. ALLMAN, M.B., F.R.C.S.I. &c.

[With a Plate.]

IN the autumn of 1842, William Andrews, Esq., of Dublin, discovered in the county of Kerry a molluscous animal nearly allied to *Arion*, which, as he perceived it to be possessed of considerable interest, he kindly placed in my hands for investigation.

A careful examination of the mollusk now proved, that though it came very near to *Arion*, it was nevertheless incapable of being united either with that or with any other previously established genus, and the construction of a new generic group was accordingly deemed necessary.

At a meeting of the Dublin Natural History Society in January 1843, I described the new mollusk under the name of *Geomalacus maculosus*, characterizing the genus as follows:—

Nov. gen. GEOMALACUS.

GEN. CHAR. *Corpus* productum, lanceolatum, carinæ expers; *pallium* scutiforme, ovatum; *spiraculum* in margine anteriori pallii; *foramen genitale* pone radicem tentaculi minoris dextri; *testa* solida, plana, subovata.—Ab *Arione* differt hoc genus situ foraminis genitalis, a *Limace* cauda glandulifera et situ anteriori spiraculi.

1. *G. maculosus*, unica species quam in rupibus madidis comitatus Kerriensis repentem invenit Gulielmus Andrews. Pl. IX.

From the above description it will be seen that *Geomalacus maculosus* is a species of much zoological interest, constituting as it does a remarkable link between *Arion* and *Limax*. It is an exceedingly beautiful animal, measuring when creeping about two inches in length; the colour of the shield and upper part of the body is black, elegantly spotted with yellow; the under surface of the foot light yellow, and divided into three nearly equal bands; the edge of the foot is brown with transverse sulci.

Besides the typical variety, which is that now described, a second variety is described in the *Ann. & Mag. N. Hist.* Vol. xvii.

Y

cond is occasionally met with ; it is characterized by the spots being of a pure white.

Geomalacus is at once distinguished from *Arion* (to which however it appears to approach more nearly than to *Limax*) by the position of the generative aperture, this orifice being placed in *Arion* just below the entrance to the respiratory chamber, while in *Geomalacus* its position is similar to that in *Limax*, being just behind the base of the smaller tentaculum of the right side. The presence of a solid testaceous rudiment may be placed in conjunction with the last as a character distinguishing it from *Arion* ; though upon this, viewed isolatedly, much stress should not perhaps be laid, as in the last-named genus the rudimental shell would appear sometimes to assume a considerable degree of solidity. From *Limax* the distinction is well-marked, being found in the presence of a caudal muciferous follicle, and in the position of the respiratory orifice anterior to the centre of the lateral margin of the shield ; the total absence of a dorsal keel also is a character by which *Geomalacus* resembles *Arion* rather than *Limax*.

The habits of our mollusk are somewhat curious. It possesses a singular power of elongating itself so as at times to assume the appearance of a worm. By this means it can insinuate itself into apertures which we could scarcely conceive it possible for it to enter. This curious property indeed was very nearly the cause of my losing the first, and at the time the only specimen I had seen. I had placed the mollusk, as I supposed, securely in a botanical collecting-box, when to my surprise I found shortly after that it had transgressed the limits I had assigned it. The creature not liking its confinement had insinuated itself beneath the lid, which not closing very perfectly had afforded for its escape a fissure of about a line in width. I was fortunately in time to recapture my prisoner, and the knowledge which I had thus gained of its habits suggested a stronger prison for the future.

I have since been favoured by Mr. Andrews with numerous very fine healthy specimens from the original locality, where the mollusk is abundant, and beyond which it has not as yet been detected. In an interesting letter which I have received from this gentleman is a highly graphic description of *Geomalacus* among its native rocks. From Mr. Andrews's letter I cannot do better than select the following extract as a conclusion to the present notice :—

“ Lake, or Loc Carogh, lies to the south of Castlemain Bay, in the county of Kerry, and stretches nearly north and south five miles. The lake narrows at the centre, where huge cliffs (principally of the old red sandstone group) rise precipitously from the margin on either side to a great height. On the east side

are those of Oulough, formed of enormous blocks of rock promiscuously wedged and resting upon each other, frequently forming caves and pits, the retreat of numerous foxes, and which are screened by the rather gigantic vegetation of *Osmunda regalis*, *Ulex europæus* and *Calluna vulgaris*. The broad surfaces of the rocks are beautifully pictured with a map-like coating of *Lecidea* and *Lecanora*, and on those rocks within a limited circuit and at the distance of about fifty yards from the water, the *Geomalaci*, on a misty or showery day, may be noticed quiescently stretched, their richly maculated character being strikingly conspicuous. On what they feed I know not; I never could detect them in an eating mood; but I found several amid *Oscillatoria Friesii* and *Hypnum proliferum*, which abound in masses at the shaded bases of those moist rocks. At the opposite and west side is the romantic little Glen of Limnavar, its huge cliffs shaded with a luxuriant indigenous growth of oak (*Quercus sessiliflora*), *Pyrus Aucuparia*, *Populus tremula*, *Betula alba* and *Ilex aquifolium*; and on similar rocks, at the same range from the water, I again met with the *Geomalaci*, particularly the white variety, but more sparingly than at Oulough. On no other rocks around the lake or the country are they to be observed."

XXXVIII.—*Notes on the Altitudinal Range of the Mosses in Aberdeenshire.* By G. DICKIE, M.D., Lecturer on Botany in the University and King's College of Aberdeen*.

SOME time ago an excursion was made into the interior of Aberdeenshire, with the view chiefly of obtaining data for remarks on the altitudinal range of the flowering plants growing in that county. During this journey notes were taken of the range of such Mosses as happened at the time to attract notice. The more prominent results in connexion with flowering plants were published in the 'London Journal of Botany'; those having reference to the Mosses were retained, in the expectation of being able to repeat the observations and measurements made with the mountain sympiesometer, and of adding to the data ascertained at that time. Such an opportunity not having occurred, these remarks have been put together, incomplete although they be, principally with the view of directing attention to this very interesting subject. A few statements are added on the general distribution of the Mosses in Britain, founded chiefly on catalogues of species from several localities, which were sent me by Mr. Ralfs. These lists have reference to the following places:

* Read before the Botanical Society of Edinburgh, 12th March, 1846.

Penzance ; Truro, by Miss Warren ; Bristol, by Mr. Thwaites ; Sussex, by Mr. Jenner, and Hitchin : I also consulted a list of Mosses found in Devonshire by Dr. Greville, and published many years since in the 'Transactions of the Wernerian Society,' one on the Mosses of Teesdale by Mr. Spruce, and Dr. Greville's 'Edinburgh Flora' ; Mr. Edmondstone also furnished notes on those found in Shetland. Those interested in this subject may consult a list of Mosses found in one of the Western Isles by Dr. Balfour, and published in the 'Transactions of the Edinburgh Botanical Society.' Several of the catalogues alluded to evidently do not comprehend all the species that might be expected to grow in the localities to which they refer, and the general remarks founded upon them must therefore be considered as mere approximations.

ANDRÆA.

All the British species of this genus are found in Aberdeenshire ; two of them grow near the sea, and not 100 feet above its level, viz. *Andræa rupestris* and *A. Rothii* ; they are also found inland and attain a considerable elevation ; *A. alpina* begins to appear in the vicinity of Ballater, forty-two miles inland, at an elevation of about 1200 feet ; *A. nivalis* is confined to the highest summits.

	Lowest.	Highest.
<i>Andræa alpina</i>	1200 feet.	3800 feet (highest?)
——— <i>rupestris</i> ...	80	3800
——— <i>Rothii</i>	80	3400
——— <i>nivalis</i>		4000 and upwards.

The first three of these are found within the limits of cultivation : *A. Rothii* has an extensive latitudinal range, since it is recorded in the list of Devonshire species already alluded to ; *A. rupestris* is more limited ; *A. alpina* first appears about the upper limit of cultivation.

Cedipodium Griffithianum. This fine species seems to be mostly confined to the subalpine region *, occurring sparingly at 2000 feet and usually barren ; I have seen it abundantly and with very fine fruit, near the summit of the highest table-land at the head of Glen Callater ; the height of this locality was not actually measured, but was estimated as being about 3000 feet.

Splachnum. All the British species occur in Aberdeenshire, some of them having a considerable altitudinal range.

S. ampullaceum is the only one I have seen near the sea-level, where it grows in bogs upon droppings of cattle. Some years ago I found it near Aberdeen in great profusion and of large

* The divisions into regions adopted here are those of Mr. H. C. Watson, and must be familiar to all who have studied the distribution of British plants.

size, associated with *Drosera anglica*, *D. rotundifolia*, *Schaenus nigricans*, *Lycopodium selaginoides* and others. I have also seen it of very small size in the vicinity of Ballater, forty-two miles inland, and about 900 feet above the sea-level, where it was discovered by Mrs. Mackay. *S. mnioides* and *S. sphaericum* are found upon the hill of Fare, thirteen miles west from Aberdeen; the former is the rarer of the two in that locality, but occurs lowest, viz. at 450 feet of elevation; the other is abundant near the top of the hill at 1000 feet, growing in moist places upon droppings of cattle. In the same locality, my friend Mr. James Barron found the carcase of a grouse completely incrustated with very large specimens. The most elevated point at which I have seen *S. sphaericum* in this county is on the highest table-land above Glen Callater. *S. mnioides* grows on the summit of Lochnagar at 3800 feet, where I have found it in tufts, each inclosing a fragment of bone. The same species occurs in great profusion in the different glens leading to the base of Ben-na-Muich-Dhu, the ground being literally sprinkled over with large tufts of it; the red-deer are numerous in these glens, and the species in question finds a suitable soil on their droppings. *S. tenue* appears to be rare in this county; I have seen it in Glen Callater in small quantity, and at an elevation of about 1600 feet. The range of *S. angustatum* has not been very accurately ascertained, being probably from 2000 to 3000 feet; nor that of *S. vasculosum*, which may however be about the same. I have searched in vain for *S. Frælichianum*, mentioned in the 'British Flora' on the authority of Mr. Dickson as growing on Bennachie, or Ben-High as it is sometimes called. This hill is about twenty miles west from Aberdeen, rising rather abruptly from the surrounding country, and attaining 1700 feet of elevation.

	Lowest.	Highest.
<i>S. ampullaceum</i>	100 feet.	900 feet.
— <i>mnioides</i>	450	3800 (highest?)
— <i>sphaericum</i>	1000	3000
— <i>tenue</i>	1600	?
— <i>vasculosum</i>	2000	3000?
— <i>angustatum</i>	2000	3000?
— <i>Frælichianum</i>	800?	1700?

The first three only of these (keeping out of view *S. Frælichianum*) occur within the limits of cultivation; the second exceeds all the others in altitudinal range.

Conostomum boreale. I have never seen it under 2000 feet; it attains the summit of Lochnagar (3800), which however is probably not its upper limit. Mr. Edmondstone informed me that in Shetland it grows near the sea with *Grimmia maritima*.

Weissia pusilla is abundant on limestone in the bed of a stream at the head of Glen Gairden: the height (not having my sympie-

someter) was guessed as being not under 1400 feet, and upwards of fifty miles inland from Aberdeen.

Grimmia spiralis. Has not been seen in this county lower than 2200 feet; the upper limit is unknown to me.

G. torta appears on cliffs in the vicinity of Ballater at 1400 feet; I have observed it in Glen Callater at 2300 feet, but cannot state its absolute highest limit.

G. ovata appears on the hill of Fare at 600 feet; I have also seen it on the top of Noath at 1830 feet; it grows on the inside of the wall of the vitrified fort. In general outline this ruin is elliptical; the walls are vitrified on the inside, and inclose a smooth grassy surface at the very summit of the hill. The wall is deficient at the east side; the species in question is mostly confined to the inside of the wall at the west end, and consequently opposite the opening alluded to. Are we to conclude that the seeds of the plant had been conveyed by the wind from some distant locality? for I did not see it on any other part of the hill.

Tortula tortuosa occurs on serpentine, near Ballater, at 1800 feet of elevation.

POLYTRICHUM.

All the British species grow in this county.

In the immediate vicinity of Aberdeen the following species are found: *Polytrichum undulatum*, *hercynicum*, *piliferum*, *juniperinum*, *commune*, *urnigerum*, *aloides*, *nanum*; of these *P. hercynicum* is rarest; I have seen it sparingly four miles inland on very old walls along with *Bartramia ithyphylla*. Mr. Mackay found it more abundant seven miles west from Aberdeen, and it grows in considerable quantity about the base of the hill of Fare. In the same vicinity, but at an elevation of 900 feet, *Polytrichum alpinum* grows in considerable quantity. *P. septentrionale* is confined to our higher summits; it is abundant about the top of Ben-na-Muich-Dhu. Mr. Mackay informed me that he had found it very sparingly on the top of Lochnagar.

	Lowest.	Highest.	
Polytrichum hercynicum ...	50 feet.	3000 feet (highest?)	
———— piliferum	50	1800	”
———— juniperinum ...	50	1700	”
———— septentrionale...	3800	4000	and upwards.
———— alpinum	900	3800	

Entosthodon Templetoni. Has been found in small quantity by Mr. Mackay near Ballater, forty-two miles inland, at about 800 feet.

Orthotrichum Hutchinsie. Is rare in Aberdeenshire; I have seen it very sparingly in Glen Callater, not lower than 2000 feet, but cannot state how much higher it attains.

Bryum julaceum. Grows in considerable quantity a few miles

west from Aberdeen, and not 100 feet above the sea-level; it is however always barren. I have seen it in the upper parts of the county at 2400 feet, which however may not be its highest limit.

Bryum Ludwigi. Glen Callater, at 2400 feet or upwards, and on Lochnagar at 3600.

B. Zierii. Chiefly at 2400 feet.

B. turbinatum. Sea-level to 2400 feet.

B. elongatum. Mostly at 2000 feet and upwards.

B. alpinum. Near Aberdeen at 280 feet, but always barren; upper limit unknown.

B. punctatum β . attains 3600 feet.

B. hornum. 1700 feet.

Bartramia ithyphylla. Grows near Aberdeen; it is abundant inland at 2000 feet and upwards; the highest point attained has not however been ascertained.

Pterogonium gracile and *P. filiforme* are chiefly confined to the inland parts of Aberdeenshire; I have seen them plentiful near Ballater at 800 feet to nearly 2000.

Neckera crispa is like the two last, an inland species; I have seen it attaining 1600 feet, but cannot state its absolute upper limit.

Hookeria lucens. From the sea-level to 2400 feet and upwards.

The altitudinal range of a few species of *Hypnum* have been ascertained. The following are abundant at 2500 feet: *H. denticulatum*, *curvatum*, *stramineum*, *pulchellum* (at this height also *H. rufescens* grows in great profusion); *Hypnum molluscum*, *aduncum*, *complanatum*, *cordifolium* and *filicinum* are all found at 1000 feet, and some of them attain a higher elevation. *H. purum*, *loreum*, *triquetrum* and *splendens* grow upon Morven at 3000 feet. *H. Crista Castrensis* is abundant in some woods near Aberdeen, but I have not been able to ascertain its absolute upper limit.

The following mosses were observed growing about the summit of Bennachie at 1700 feet, and twenty miles west from Aberdeen: *Polytrichum alpinum*, *Dicranum heteromallum*, *Bryum hornum*, *Dicranum scoparium*, *Hypnum denticulatum*, *purum*, *splendens*, *loreum*, *cupressiforme*, *Trichostomum lanuginosum*, *Didymodon purpureus*, *Polytrichum piliferum*, *Dicranum polycarpon*, *Bartramia ithyphylla*, *Andrea rupestris*, *Trichostomum fasciculare*, *Bryum nutans*, *Grimmia ovata*.

Adopting Mr. Watson's regions of vegetation, the following may be stated as an approximation to the species mostly characteristic of these regions:—

Region of the Plains.

Southern.—Most species of *Phascum*, *Schistostega*, *Weissia Starkiana*, *Tortula cuneifolia*, *Bryum Tozeri*, *Pterogonium Smithii*, *Leucodon*, *Neckera pumila*, *Daltonia*.

Northern.—*Andræa Rothii*, *A. rupestris*, *Splachnum ampullaceum*, *Weissia nigrita*, *Didymodon inclinatus*, *Trichostomum canescens*, *T. heterostichum*, *Bartramia ithyphylla*, *B. arcuata*, *Buxbaumia*, *Hypnum catenulatum*, *H. Crista Castrensis*.

Upland.

Splachnum mnioides, *S. sphaericum*, *Bryum julaceum* (?), *B. crudum*, *B. alpinum*, *Pterogonium filiforme* (?), *Polytrichum hercynicum*, *Weissia acuta*, *Polytrichum alpinum*, *Orthotrichum Ludwigii*.

Median.

Gymnostomum rupestre, *Splachnum tenue*, *Grimmia torta*, *Trichostomum patens*, *Bartramia gracilis*.

Subalpine.

Conostomum boreale, *Gymnostomum lapponicum*, *Cyrtodon splachnoides*, *Cedipodium Griffithianum*, *Bryum Ludwigii*, *B. elongatum*, *Dicranum Starkii*, *Grimmia spiralis*, *Bartramia Halleriana*, *Splachnum angustatum*, *S. vasculosum*, *Didymodon capillaceus*, and probably the following rare species discovered by Dr. Greville: *Weissia elongata*, *W. latifolia*, *Grimmia atrata*, *Didymodon glaucescens*.

Alpine.

Andræa nivalis, *Gymnostomum cæspitium* and *Polytrichum septentrionale*.

The following species appear to have an extensive range both in latitude and altitude: *Andræa Rothii*, *Tetraphis pellucida*, *Didymodon purpureus*, *Trichostomum lanuginosum*, *Dicranum scoparium*, *Tortula tortuosa*, *Polytrichum piliferum*, *P. juniperinum*, *Bryum punctatum*, *B. hornum*, *Bartramia fontana*, *Neckera crispa*, *Hookeria lucens*, and the following species of *Hypnum*: *H. complanatum*, *denticulatum*, *curvatum*, *purum*, *splendens*, *proliferum*, *cordifolium*, *lo-reum*, *triquetrum*, *aduncum*, *cupressiforme*, and *molluscum*.

XXXIX.—*Notes, &c. on the genera of Insects Cneorhinus and Strophosomus, with descriptions of two new Species.* By JOHN WALTON, Esq., F.L.S.

Genus CNEORHINUS, *Schönh.*; PHILOPEDON, *Steph.*

1. *Cneorhinus geminatus*, Fab., Gyll., Steph., Schönh.
— *albicans*, Schönh.
Curc. parapleurus et *maritimus*, Marsh., Kirb. MSS.
— *scrobiculatus*, Marsh., Steph., Kirb. MSS.
— *squamulosus* (α , β .) et *lineatocollis* (α , β , γ .), Kirb. MSS.

C. scrobiculatus of Marsh., according to a specimen in the collection of Kirby, which has a fovea on each side near the base of the thorax, and which agrees with Marsham's description, is be-

yond all doubt a small variety of this species. I possess a specimen nearly of the same magnitude with two very distinct oblong foveæ in a similar situation on the thorax, and a larger specimen which is less distinctly bifoveolated. Extremely variable in size and in the colour of the scales.

I have found this insect very abundantly on *Cynoglossum officinale*, on the sandy banks near Barham, on the shores of the Bristol Channel in June, and also on many other parts of the coast of England; it has however been taken inland near Bridgenorth, Shropshire, by Mr. Marshall.

2. *Cncorhinus exaratus*, Marsh., Steph., Schönh., Kirb. MSS.

Curc. plumbeus, Marsh., Kirb. MSS.

— *sexstriatus*, Marsh.

Distinguished from the last by a more distinct furrow on the rostrum and more prominent eyes, and also by the dissimilarity of the sculpture. *C. exaratus* has the thorax longitudinally rugulose, *C. geminatus* delicately and very minutely punctured; the elytra of the former are deeply punctate-sulcate, with the interstices convex; those of the latter are very finely punctate-striate, with the interstices broad and flat.

It has not hitherto occurred in Germany or in Sweden, and was wanting in the collections of Schönherr and Germar before I supplied them.

I have taken many specimens amongst grass and rushes in the boggy part of a meadow on the north side and adjacent to the bottom of Hampstead Heath. Common in some meadows near Hammersmith, Mr. S. Stevens.

GENUS STROPHOSOMUS, *Billb.*, *Schönh.*, *Steph.*

§ A. *Elytra ovate.*

1. *Strophosomus Coryli*, Fab., Mus. Banks, Steph., Germ. var. *a.*

— *illibatus*, Schönh.

Curc. Coryli, Marsh., Gyll. Ins. Suec. iii. p. 306. var. *c.*

— *Coryli*, Kirb. MSS. et Mus.

My British specimens of this insect were referred by Schönherr to "*Curc. Coryli*, Fab., Marsh., Steph., et *Stroph. illibatus* (v. p. 878) nobis," but Gyllenhal and Germar appear to consider it as only a variety of *St. obesus*, yet it is quite distinct. I sent to Germar four specimens of *Coryli* and eight of *obesus*, on which he has published the following*: "*Strophosomus Coryli* of Schönh. (i. 535, v. 877) is properly *obesus* of Marsh. and *St. illibatus* of Schönh., the true *Coryli* of Fab. and of Steph. I am however

* Ent. Zeit. Stettin, no. 5. 1842.

inclined to consider both varieties of the same insect, and I think their numerous varieties may be subdivided as follows:—

- a. With a distinct black sutural stripe at the base: *St. illibatus*, Schönh. ; *Coryli*, Fab. and Steph.
- b. Somewhat smaller, of an uniform brown or gray: *St. Coryli*, Schönh., Gyll. ; *obesus*, Marsh., Steph., and *cognatus*, Steph.
- c. Still smaller, the elytra marked with white at the sides: *St. cervinus*, Fab. ; *asperifoliarum*, Steph. ; *nebulosus*, Steph. ; *rufipes*, Steph. ; *atomarius* of Marsh. and Steph.”

I have examined some hundreds of *Stroph. Coryli*, and I have never seen a specimen without the black stripe at the base of the suture ; I am therefore inclined to think it is a constant character, and not the result of abrasion ; nevertheless it may always be distinguished by the more solid characters of form and sculpture ; the elytra are of a different and less variable form than *obesus* ; the humeral angles more prominent, subrectangular, abruptly rounded and narrowed towards the base, the sides from the shoulders to beyond the middle nearly straight ; in *obesus* the form is nearly oval ; in *Coryli* the thorax is coarsely granulate-rugose, with a narrow dorsal channel sometimes obsolete ; in *obesus* it is rugulose-punctate and not channeled ; the striae on the elytra of the former are distinctly broader and deeper than in the latter, the interstices more convex, and the sixth from the suture elevated behind the middle ; these differences of sculpture are remarkably distinct in denuded specimens. It is a larger insect and not so variable in size ; and although specimens of *obesus* attain the magnitude of *Coryli*, yet the greater part of the former are considerably smaller than the least of the latter.

Very common on the birch and hazel.

2. *Strophosomus obesus*, Marsh.

— *rufipes*, Steph.

— *subrotundus*, Marsh., Kirb. MSS.

— *asperifoliarum*, Steph., non Kirb. MSS.

— *atomarius*, Marsh.

— *cognatus*, Steph.

— *nigricans*, Steph., non Kirby.

— *nebulosus*, Steph.

Curc. Coryli, Payk., Gyll., Schönh., Germ. var. *b*, *c*.

— *obesus* (var. *δ*.), Kirb. MSS.

I have recently examined an authentic specimen of *Curc. subrotundus* from the collection of Marsham, which agrees exactly with his description, and I have likewise examined another in the collection of Kirby ; these I have no doubt are large varieties of this species ; *Curc. atomarius*, according to a specimen from the late Mr. Marsham's cabinet and which agrees with his descrip-

tion, is certainly a very small immature variety of his *obesus* with the elytra clouded with fuscous spots, and the body and legs pale rufous; *Curc. nigricans* of Kirby's manuscript and collection is decidedly a dark variety of *Curc. tessellatus* of Marsh.; *Stroph. rufipes*, *asperifoliarum*, *cognatus* and *nebulosus* of Steph. 'Illustrations' are all varieties of this protean insect. I sent fifteen specimens including varieties to Schönherr, who referred them to *Curc. obesus*, Marsh., *Corçli*, Payk., Gyll. and Schönh. It is so extremely variable in size (length $1\frac{1}{2}$ — $2\frac{1}{2}$ lines) and in the colour of the scales, that scarcely two individuals out of many hundreds can be found exactly alike. I have found it very abundantly on its first appearance in the middle of May, and again about the beginning of September, from which it seems to be double-brooded; and specimens frequently occur at those periods with the body and legs rufous, densely clothed with bright scales of various shades of coppery-red and golden-yellow or fuscous, or with cinereous and silvery-white or fuscous, rarely with shining brassy-green and coppery-red scales, beautifully and irregularly variegated or nebulous, or with pale spots on the punctures of the elytra; older specimens found in July and August have the body black, the legs dusky ferruginous or the femora and tibiæ piceous, and with the scales of an uniform dull gray or brown and much obscured by earthy matter; the general form of the elytra is nearly oval, but it has a tendency, particularly in large specimens, to become broader in proportion to the length and more convex; but these varieties in a long series are closely linked together by a regular gradation from one form to another, and by the general character of the sculpture, so that no separation can be made.

I have found this insect very plentifully on low underwood and amongst thick herbage in Bishop's Wood, near Hampstead, and in Birch Wood, likewise in Yorkshire.

3. *Strophosomus fulvicornis* (Curt. in litt.), Walt.

Black or piceous, sparingly or rather densely clothed with cinereous and fuscous scales. Head very short, transverse, longitudinally rugulose, with a deep lineolet in the centre; eyes extremely prominent; rostrum short, broadest at the base, distinctly longer and a little narrower than the head, triangularly emarginated at the apex above, transversely strigated and deeply foveolated at the base, with a very broad and rather deep longitudinal furrow, which is carinated in the middle. Antennæ as long as the head and thorax, fulvous and finely pubescent. Thorax short, subquadrate, the base and apex truncate, nearly of equal breadth, moderately rounded at the sides, convex above, rather coarsely

but not thickly punctured, sometimes rather rugose. Elytra ovate with the apices acute, convex above, punctate-striate, the interstices rather broad, flat and smooth, the fourth from the suture on each elytron sometimes slightly raised behind the middle. Clothed with cinereous and fuscous scales, variegated or concolorous, and of a subelliptical form; the interstices with a series of very short and fine suberect hairs, sometimes very obsolete. Legs and antennæ entirely fulvous. Length $1\frac{2}{3}$ — $2\frac{1}{3}$ lines.

The above description is taken from three insects kindly lent to me by Mr. Curtis. It approaches very closely to the two preceding, but the general form appears to me somewhat different; it is neither so thickly clothed nor so variable in the colour of the scales; the head is longitudinally rugulose; in *Coryli* and *obesus* with seven deep sulci and the transverse striga much more distinct; the thorax subremotely punctured; in *obesus* rugulose-punctate; the depressed scales on the elytra when magnified appear to be of a subelliptical form, whereas in its congeners they are subrotundate; the suberect hairs are finer and shorter and sometimes very obsolete. I am strongly inclined to consider it specifically distinct, but for want of a sufficient number of specimens, I am unable to ascertain whether the characters of the sculpture and the form of the scales are constantly different. I therefore hesitate to speak positively until I have had an opportunity of examining more specimens.

Taken by Mr. Curtis on heath in a fir plantation on Parley Heath in October, and likewise I believe by Mr. Dale.

4. *Strophosomus retusus*, Marsh., Steph. Illustr.

— *squamulatus*, Steph. Manual.

— *alternans*, Schönh., et *oxyops* (Chevr.), Schönh.

Curc. obesus (α , β , γ .), Kirb. MSS.

I possess foreign specimens of *Curc. squamulatus* of Fab. from Schönherr and Germar, which are specifically different from *Curc. retusus* of Marsh., and not yet to my knowledge discovered in Britain. I likewise possess foreign specimens of *St. oxyops* from Chevrolat; these are decidedly identical with this species. It may be known from the two preceding by its short robust form, by having the thorax very broad, transverse, and by being very sparingly clothed with short, indistinct erect hairs; the colour of the legs varies from pale rufous to dull ferruginous or piceous: it is not so variable in size nor in the colour of the scales as *St. obesus*.

Found on hedge-banks on the north side of Turner's Wood, Hampstead, in June, and on *Ulex nanus* near Hastings in September.

5. *Strophosomus hirtus*, Schönh., Mant. Curc. viii. p. 399.

Subovate, ferruginous, clothed with fuscous scales and with short erect hairs. Head small, very short, transverse, black, closely and very minutely punctured, the punctures longitudinally confluent; eyes small, moderately prominent; rostrum of uniform breadth, a little narrower and rather longer than the head, deeply furrowed in the middle and elevated at the sides, piceous with the apex testaceous. Antennæ long, slender and entirely testaceous, the scape as long as the flagellum, curved and clavate. Thorax as broad as long, piceous, distinctly constricted near the base and apex, dilated and rounded at the sides, convex above, thickly and minutely rugulose-punctate, and indistinctly foveolated on each side behind the middle. Elytra ovate, ferruginous, deeply sulcate, the sulci obsolete punctured, the interstices convex, smooth, and with a series of short, claviform, erect hairs, and sparingly clothed with decumbent fuscous scales, deeply cleft at their apices, bifid and trifid. Legs entirely testaceous. Length $1\frac{1}{3}$ line.

I have the authority of Schönherr for the generic and specific name of this insect; but it differs considerably from all the other species of this genus, by having the head narrower, the eyes smaller and much less prominent; the rostrum narrower, of uniform breadth, and without a transverse striga at the base; the scape of the antennæ longer and curved. I think in general habit and affinity it has a greater resemblance to the insects in the genus *Omius* than to the British forms of *Strophosomus* with which it is associated by Schönherr.

Taken in the neighbourhood of Southampton by Mr. Walcot of Bristol, and subsequently near Arundel amongst moss in February by Mr. S. Stevens.

§ B. *Elytra oblong-ovate.*6. *S. Faber*, Herbst, Germ., Schönh.

— *chætophorus et septentrionis*, Steph.

Curc. limbatus, Marsh. secund. ejus descr.

— *pilosellus*, Gyll., Steph.

— *Sus* (α , β .), Kirb. MSS.

According to Schönherr and Germar, *St. pilosellus* of Gyll. and Steph. is identical with *Curc. Faber* of Herbst.

Immediately recognised from the following by having the thorax sinuated at the base, and by having the body densely clothed with depressed lanceolate scales and with slender erect hairs.

Not very common; I have occasionally found it in damp meadows in June.

7. *Strophosomus limbatus*, Fab., Payk., Gyll., Steph. Manual.
Curc. Sus (var. γ .), Kirb. MSS., Steph. Illustr.

Distinguished at first sight from the preceding by having the thorax exactly truncated at the base; the sides of the thorax and elytra more thickly clothed with subelliptical shining silvery-white scales, and by being without erect hairs; the upper surface is frequently glabrous.

I have many times taken this insect in the north and south of England, invariably on the common heath (*Calluna vulgaris*), in June and October.

XL.—*Notes on Birds*. By T. C. EYTON, Esq., F.L.S.

No. VI.

[With a Plate.]

[Continued from p. 29.]

Trogon melanocephalus, Gould (male).

LENGTH of intestine from gizzard to cæca seven inches. Length of cæca one inch two-tenths. Length of rectum two inches four-tenths. Œsophagus large at its upper extremity, contracted in the middle, but at its lower extremity expanded into a proventriculus, measuring nearly one inch in length and four-tenths in diameter when inflated; stomach round and slightly flattened. Epithelium longitudinally rugose, not hardened, extending slightly into the proventriculus. Intestine of large diameter for the size of the bird; rectum only slightly larger than the lower end of the small intestine. Cæca small at their junction with the rectum, and at about half their length expanding into a sac. Cloaca small, the membranes thickened. Trachea simple, acted upon by one pair of sterno-tracheal muscles only. Bronchiæ of large diameter in proportion to that of the trachea. Tongue arrow-shaped, four-tenths of an inch long, armed with a strong spine on each side at the base, and with numerous smaller ones scattered round the epiglottis. The stomach and œsophagus were filled with hard seeds about the size of a pea mixed with a pulpy matter.

The sternum is very broad in proportion to its length; it is narrowest at the junction of the ribs, where it measures half an inch in breadth. The anterior margin is narrower than the posterior; at the former it measures seven-tenths of an inch in breadth, at the latter one inch. The total length of the sternum including the manubrial process is one inch. The posterior margin is indented on both sides with two deep and wide fissures, the exterior ones largest. The keel is four-tenths of an inch in depth, much arched on its inferior margin, and with its anterior one much scolloped; it extends quite to the hinder edge of the sternum. The manubrial process is long and strong, somewhat deflexed and triangular.





J. Basire. del.

Trogon melanocephalus.

The *os furcatum*, coracoids and scapulæ, and indeed the whole of the skeleton is light and weak; the former is much arched anteriorly; when *in situ* the branches are rather suddenly divided, spreading very wide at their extremities; each branch is laterally flattened on its upper half; the process at the point where it approaches the sternum is small and rounded.

The coracoids are seven-tenths of an inch in length, much expanded at their junction with the sternum, and jointly, with the exception of that portion occupied by the manubrial process, spreading over the whole breadth of its anterior margin.

The scapulæ are twelve-tenths of an inch in length, nearly straight to within a short distance of their posterior extremities, where they are abruptly deflected and pointed; the internal surface is slightly concave.

The pelvis is eight-tenths of an inch in length, fourteen-tenths in breadth at its posterior extremity, and five-tenths of an inch at its anterior one; on viewing it from above it appears very broad for the size of the bird; and its upper plane is slightly arched. On viewing the posterior extremity from behind it presents a wide and regular arch formed by the sacral vertebræ in the centre, and the posterior edges of the ilium, ischium and *os pubis* on each side; the points of the latter bones are turned upwards at their extremities; the posterior extremity of the ischium is much expanded, and incloses on one side a very large ischiadic foramen; the obturator foramen consists of an elongated slit inclosed between the ischium and *os pubis*, and extending from immediately behind the femur to the membranous junction of those bones near their posterior extremities. The whole of the bones of the legs are very light and weak; the femur is eight-tenths and a half in length; the tibia eleven-tenths in length; the fibula, which is somewhat broad and flattened transversely, extends for two-thirds of its length, forming a sort of keel. The tarsus measures six-tenths of an inch in length. The bones of the wing are the strongest and most powerful of the whole skeleton; they are however short in proportion to the size of the bird, which, together with the large size of the head, contributes somewhat to give the skeleton rather a clumsy appearance; the humerus is twelve-tenths of an inch long; the ulnar bones measure fourteen-tenths of an inch in length, and the metacarpal bones six-tenths.

The inferior maxillary bones are united for only three-tenths of an inch from their tips, and divaricate abruptly and widely; at the extremities of their rami they have two very wide and powerful capsules for articulation with the *os quadratum*.

The cranium is broad in proportion to its length, measuring from the tip of the bill to the occiput one inch and six-tenths,—its greatest diameter; the posterior extremities of the zygomatic bones measure one inch.

The occiput when viewed either laterally or from above has a truncate appearance, when viewed from behind it has a quadrate figure; the articulation however of the *os quadratum* with the inferior maxillary bone projects considerably beyond the lateral perpen-

dicular line of the cranium. The crotaphyte impression between the zygomatic and post-orbital processes is deep and well-defined; above this, is a well-defined impression of the temporal muscle. The lachrymal bones project in the form of a broad process anteriorly to the orbits of the eyes, and must in a great degree protect that organ; the septum between the orbits is perfectly closed. The formula of the vertebræ is—

Cer. 12; Dor. 7; Sac. 11; Caud. 7.

The terminal caudal vertebra is deep and narrow, measuring perpendicularly half an inch.

The ribs are seven in number, two false ones being placed anteriorly and one posteriorly. The ring of the cornea is rather elevated, and consists of fifteen distinct and divisible segments.

REMARKS.—The anatomy of the soft parts of this bird approaches very nearly to that of some of the *Cuculidæ*; the stomach however in the latter family has the epithelium smooth, and is proportionately of larger size. The cæca, œsophagus and proventriculus are of nearly the same form.

The trachea is in *Trogon* acted upon by one pair of sterno-tracheal muscles only, in which respect and also in the large size of the bronchia it agrees with the Kingfishers. The intestinal canal in *Trogon* is of larger diameter than among the Cuckoos, and the rectum smaller in proportion to the size of the small intestine.

In the structure of the trachea as before mentioned, *Trogon* agrees with the Kingfishers, but differs as regards its soft anatomy in almost every other respect. Its intestinal anatomy is that of an insect-feeding bird; but I should not have supposed, from the slight muscular power of the stomach and its only slightly hardened epithelium, that it fed upon seeds had I not found them in the stomach, and it is perfectly possible that they might have been swallowed with some small and soft insects which had become decomposed into the soft pulpy matter which was mixed with the seeds. In the general contour of the skeleton and in the lightness of the bones *Trogon* closely resembles *Alcedo*; in fact the skeleton might, if the head was removed, be easily mistaken for a species of that genus; there are however distinctions which a more minute examination renders apparent; it must however be placed in contiguity with that form in a natural arrangement, as it approaches more nearly to it than to any other with which I am acquainted. From all the scansorial forms it is at once distinguished by all those distinctive characters which divide the typical genera of that order from the fissirostral or volitorial* group.

* I propose to divide the class Aves into the following eight orders, which may be all distinguished by their skeletons: Raptores, Volitores, Scansores, Insessores, Rasores, Cursores, Grallatores, Natatores.

The sternum of *Trogon* has the inferior edge of the keel much arched, among the Kingfishers it is nearly straight; it is also proportionately deeper, and has its anterior edge more deeply scolloped than in that family.

The branches of the os furcatum are less laterally flattened, and not so broad in *Trogon* as among the Kingfishers; the former has also a process where that bone approaches the sternum, which is wanting among the latter. The terminal joint of the caudal vertebræ is also larger in *Trogon* than among the *Alcedia*.

The remainder of the skeleton is so precisely similar to that of the smaller species of Kingfishers that it is impossible to point out any distinctions. It is to be regretted that so little is known of the habits of the Trogons; I am informed however by Capt. A. Charlton, who has lately returned from Malacca with a large collection of objects of natural history, that they frequent only the dense forests of that country, sitting nearly perpendicularly on branches of trees, and making, when an insect comes in view, a sudden dart in a straight line at it, returning often to the same bough which had previously been occupied. I am also informed by Mr. Gould, that Mr. Dyson, who has lately returned from Honduras with a collection of birds in spirits, of which the subject of this paper formed a part, made the same remark to him regarding the position of the bird when at rest.

These observations confirm in a certain degree what the osteology shows, namely a near affinity between the Kingfishers and Trogons in habit and in the mode of taking their prey by a sudden dart.

The intestinal anatomy merely bears that resemblance to the *Cuculidæ* which the anatomy of one insect-feeding bird often bears to another.

The *Trogonidæ* therefore, as far as I am at present acquainted with them, appear to be, if I may be allowed the expression, a family of partially or wholly insect-feeding Kingfishers, and must be classed in a natural system near to that family.

EXPLANATION OF PLATE VIII.

- Fig. 1.* Tongue, œsophagus, proventriculus and stomach.
Fig. 2. Cæca.
Fig. 3. Sternum.
Fig. 4. Coracoid.
Fig. 5. Scapular.
Fig. 6. Portion of cranium, showing the lachrymal bones.
Fig. 7. Pelvis, upper surface.

XLI.—*A Synopsis of the British Rubi.*

By CHARLES C. BABINGTON, M.A., F.L.S., F.G.S. &c. *

[Continued from p. 247.]

†† Aculei inæquales, sparsi, in aciculos setasque adeuntibus.

22. *R. fusco-ater* (Weihe); caule decumbente anguloso sparsim piloso setoso, aculeis multis inæqualibus rectis, foliis quinatis opacis subtus pallidis mollibus nitidis sericeis, *foliolo terminali cordato-ovato acuminato undulato, infimis intermediis incumbentibus*, paniculæ inferne foliosæ setosæ ramis corymbosis.

R. fusco-ater, *Rub. Germ.* 72. t. 26.

R. Radula (*Lindl.*), *Leight.* !

Barren stem with numerous rather unequal moderately large prickles, and more or less numerous unequal smaller ones connecting them with the small aciculi and the setæ. Petioles with strong declining or deflexed prickles, lower leaflets (in our plant) nearly or quite sessile, terminal leaflet rather broad at the base, all pale green beneath. Panicle clothed with numerous short hairs and setæ and long and strong prickles. Calyx patent or loosely reflexed from the fruit.

β. candicans; caulis petiolorumque aculeis paucioribus pilis numerosioribus, foliis subtus albis, foliolo terminali rotunde obovato, infimis petiolatis, panicula hirsuta.

R. Radula, *Lees MSS.* !

γ. echinatus; caulis petiolorumque aculeis multis, foliis concoloribus subtus duris rigide pilosis, foliolo terminali obovato, infimis petiolatis, paniculæ pilis longis setis aciculisque longioribus aculeis crebris minimis tenuibus.

R. echinatus, *Lindl.* ! *Syn. ed.* 1. 94; *Leight.* ! *Fl. Shrop.* 235. not *Bab.*

Isle of Wight and Dorset, *Dr. Bell Salter*; Shropshire; Leicestershire, *Rev. A. Bloxam*. *β.* Little Malvern, Worcestershire, *Mr. E. Lees*. *γ.* Almond Park, Salop. July and August.

Obs. 1. I have received from my friend the Rev. W. H. Coleman a plant gathered in Mangrove Lane, Hertford, which appears to be referable to the type of this species. Its leaves are almost exactly cordate and cuspidate, glabrous above, very finely tomentose beneath; the petioles have fewer prickles. The barren shoot has scarcely any hairs, few setæ, very few and short aciculi; its prickles are rather numerous and mostly large and equal, but there are a few very unequal and smaller. Another plant sent to me by Mr. F. Adamson, who states that it is "not uncommon near Gouroch" in Renfrewshire, has fewer large prickles on its

* Read before the Botanical Society of Edinburgh, Feb. 12, 1846.

barren shoots than Mr. Coleman's plant, and about the same amount of setæ, aciculi and hairs; its petioles and flowering shoot are armed in the manner usual to the species. These plants are very nearly allied to those included in the preceding section, and might without much impropriety be placed in it; but they are so closely connected by intermediate forms with the type of *R. fuscoater*, and that through the *var. echinatus* with *R. Kæhleri*, that I feel confident that this is their true position. Indeed the armature of the barren shoots, if carefully examined, will be found to be rather that of this section than of the preceding.

23. *R. Kæhleri* (Weihe); caule decurvato procumbenteve hirtoseto, aculeis multis validis inæqualibus sæpissime rectis, foliis quinatis opacis subtus hirtis mollibus, foliolo terminali obovato vel elliptico acuminato, infimis intermediis dissitis, panicula ramosa inferne foliosa spinosa setosa, sepalis patentibus fructuve reflexis.

α. Kæhleri; aculeis permultis inæqualibus rectis paulo declinatis, pilis paucis, foliolo terminali obovato acuminato, paniculæ superne tomentosæ ramis corymbosis patentibus aculeis multis longis rectis.

R. Kæhleri, *Rubi Germ.* 71. t. 25; *Eng. Bot. Suppl.* 2605.

The surface of the barren stem is almost covered by the very unequal prickles, aciculi and setæ. Leaves pale green beneath, coarsely serrate; general and partial stalks and midrib beneath very prickly; stipules linear. In a subvariety the leaves have fewer prickles on their midrib and stalks and linear-lanceolate stipules; its barren stem is rather less prickly. In another form the prickles on the panicle are rather hooked.

β. cuspidatus; aculeis brevibus rectis horizontalibus, pilis paucis, foliolo terminali obovato cuspidato, paniculæ superne tomentosæ, ramis corymbosis brevibus patentibus setis multis aculeis paucioribus brevibus rectis.

R. glandulosus, *Sm.*! *Eng. Fl.* ii. 403. *exc. syn.*

I do not find a figure of this plant in the 'Rubi Germanici.' Its aspect is considerably different from the typical *R. Kæhleri*, and it may be known by its cuspidate leaves, which are usually deeply inciso-serrate at the end, and the fewer and shorter prickles throughout. I believe this to be the *R. apiculatus* from Beeston Castle referred to by Dr. Salter (*Phytol.* ii. 132). In some forms of this plant the leaves are very much truncated, and in a specimen from Killarney, quite abrupt like those of *R. Lingua*.

γ. pallidus; aculeis tenuibus rectis declinatis, pilis multis, foliolo terminali obovato-elliptico acuminato, paniculæ superne subtomentosæ ramis racemoso-corymbosis setis multis aculeis multis brevibus validis declinatis deflexisve.

R. pallidus, *Rub. Germ.* 75. t. 29.

When the leaves are ternate, as occasionally occurs, this is al-

most exactly *R. apiculatus* (Weihe), 'Rub. Germ.' t. 24, in which the leaves are sometimes quinate, and are so represented on that plate; but the leaves of our plant are not "pubescenti-albida" on the under side.

δ. *infestus*; *aculeis* multis *validis* brevibus *valde declinatis*, pilis setis aciculisque brevissimis paucis, *foliolo terminali oblongo-acuminato* subtus pallide viridi tomentoso, paniculæ oblongæ ramis brevibus paucifloris *aculeis multis longis tenuibus declinatis*.

The short declining or even hooked prickles with very thick bases are characteristic of this plant. Its panicle is nearly simple, with a few simple floral leaves below and lanceolate or trifid bracts in its upper part. It differs slightly from *R. infestus* (Weihe), 'Rub. Germ.' t. 30, which has roundish-cordate leaflets and shorter prickles on the panicle.

ε. *fuscus*; *aculeis* paucioribus *declinatis*, *aculis* setis pilisque multis, *foliolo terminali elliptico subcordato cuspidato*, paniculæ angustæ ramis brevibus paucifloris corymbosis *aculeis brevibus tenuibus*.

R. fuscus, *Rubi Germ.* 73. t. 27.

R. fusco-ater (Lindl.), *Leight. Fl. Shrop.* 235.

R. Kœhleri β. *fuscus-ater*, *Bab. Man.* 97.

The panicle of this plant is usually furnished with numerous long unequal setæ standing prominently out from its hairy covering; but in a plant from Bearhaven, co. Cork, which seems referable to this variety, the setæ on that part are almost altogether wanting, and the few that exist are hidden in the dense hairy coat.

Very common. β. Rydal Woods, Westmoreland, *Mr. Borrer*; Dumfries-shire; Durham; Killarney. γ. Near Bath; Stock Gill near Ambleside, *Mr. Borrer*; Worcestershire, *Mr. Lees*. Near Ware, Herts, *Rev. W. H. Coleman*. δ. Killarney. July and August.

Obs. 1. The several plants which I have now included under the name of *R. Kœhleri* have all been considered as distinct species by high authorities. I firmly believe that they are so connected together by intermediate forms as to constitute but one species. It is often difficult to determine under which of the named forms some specimens should be ranged. They are all well marked by the numerous strong and very unequal prickles on the barren shoots, of which the smaller so merge in aciculi and stiff aciculiform setæ, those in true setæ and these last in hairs, that it is impossible to say where one of those forms of armature begins and another ends. The typical variety is known by its very strong and very numerous prickles combined with acuminate leaflets; β. by similar but shorter prickles and cuspidate leaflets. In γ. the prickles of the barren stems are more

slender, whilst those of the panicle are increased in strength and sometimes even hooked, those of the same part in α . and β . being straight. The *var.* δ . is well marked by its short stout declining or often hooked prickles accompanied by long slender ones on the panicle. And the great decrease in the number of the larger prickles, combined with the increased number of aciculi, setæ and hairs in *var.* ϵ , point out its relationship to the next species. By the kindness of Mr. Lees, I possess two specimens of a plant from "the western base of the Malvern Hills" closely resembling *var.* ϵ ; it is densely hairy throughout, but has very few setæ or aciculi on the barren stems.

Obs. 2. A specimen received from Mr. Lees under the name of *R. pallidus* β . *foliosus* (Lees), seems to occupy an intermediate station between this and the next species; it may be described as follows, and should its peculiar panicle prove constant is probably specifically distinct.

Stem procumbent (?), angular, dark purple, hairy; setæ very numerous and unequal; prickles numerous, slightly declining, straight, rather strong, yellow. Leaves quinate or ternate (?), opaque above, hairy, soft and paler beneath; terminal leaflet broadly obovate cuspidate. *Panicle very long*, with numerous short *axillary* ascending corymbose (?) *branches*, the three uppermost extrafoliaceous and subtended by long foliaceous bracts; rachis and peduncles very hairy, and with numerous unequal yellowish setæ with purple heads, and straight slender declining yellow aciculi and prickles; *floral leaves* pilose above, soft beneath, *simple* and cordate-ovate, 3-lobed, or the lower ones ternate. Calyx hairy, with numerous unequal setæ and aciculi; sepals with a long leaflike point. Plant only in bud.

Found on the "banks of the Wye near Vaga Cottage, Great Doward, Monmouthshire," *Mr. E. Lees*.

24. *R. hirtus* (W. et N.); caule "procumbente tereti" hirtio setoso, *aculeis parvis tenuibus* valde inæqualibus multis rectis declinatis, *foliis quinatis* vel ternatis concoloribus pilosis subtus hirtis, foliolo terminali ovato-cuspidato vel ovato-lanceolato, paniculæ valde setosæ tomentosæ vel hirtæ aciculatæ racemosæ inferne foliosæ *setis valde inæqualibus* purpureis, sepalis patentibus fructuive adpressis setosis.

Setæ very numerous and very unequal. Panicle with rather distant axillary branches, which are somewhat corymbose and short; in a Scottish specimen the panicle is quite simple. Upper part of the flowering shoot with strongly deflexed or declining prickles.

α . *hirtus*; foliis magnis quinatis, foliolo terminali ovali cuspidato, panicula tomentosa.

R. hirtus, *Rub. Germ.* 95. t. 43.

β. Menkii; foliis mediocribus quinatis vel ternatis, foliolo terminali ovali-lanceolato, panícula hirta, sepalis aciculatis.

R. Menkii, *Rub. Germ.* 66. t. 22.

Rare. *α.* Dumfries-shire. Alborne, Sussex, *Mr. Borrer*. Almond Park, Salop. *β.* Mount Nod near Tunbridge Wells, *Mr. Borrer*; Haughton Dale, Cheshire, *Mr. Sidebotham*.

Obs. 1. It is very difficult to point out upon paper any good character by which to distinguish this plant from the following, between which and *R. Kæhleri* it forms the connecting link.

Obs. 2. The Rev. W. H. Coleman has sent a specimen under the name of *R. horridissimus* (Colem. MSS.) which seems to be referable to this species. The panicle appears to have been taken from a young plant, and so does not admit of accurate determination; it is short, narrow, nearly simple; the two lower axillary branches 3-flowered, very short; the rest single-flowered and short. Barren shoot rather angular, thickly covered with prickles, aciculi, setæ and hairs merging gradually into each other; prickles slender, nearly or quite straight, declining. Petioles both general and partial, similarly armed, except that the prickles are deflexed and the hairs much more numerous. Leaves quinate, dull green and pilose above, rather paler, hairy and finely tomentose beneath. Terminal leaflet oblong-obovate acuminate. This plant is well deserving of attention; it was found in Easney Park Wood near Ware, Hertfordshire, in flower on the 26th of June 1844.

25. *R. glandulosus* (Bell. !); caule arcuato declinatove tereti vel subanguloso hirta setoso, *aculeis parvis tenuibus* inæqualibus rectis declinatis, *foliis ternatis* vel quinatis concoloribus pilosis subtus hirtis, foliolo terminali ovali obovato vel obovato-lanceolato, paniculæ valde setosæ hirtæ vel tomentosæ aciculatæ corymbosæ inferne foliosæ *setis brevibus subæqualibus* purpureis, sepalis fructui laxe adpressis reflexisve setosis.

α. Bellardi (Bell Salt. !); caule tereti sparsim piloso valde setoso, *aculeis parvis* permultis, *foliolo terminali ovato* cuspidato æqualiter subtiliterque serrato, paniculæ tomentosæ aculeis multis tenuibus rectis horizontalibus apice et ramis paucis longis distantibus paucifloris corymbosis.—*Ann. Nat. Hist.* xvi. 370.

R. Bellardi, *Rub. Germ.* 97. t. 44.

R. glandulosus, *Eng. Bot. Suppl.* 2883.

β. Lejeunii (Bell Salt. !); caule subanguloso sparsim piloso setoso, *aculeis plurimum parvis* nonnullis longioribus, foliolo terminali ovali cuspidato vel obovato-lanceolato inæqualiter subtiliterque serrato, paniculæ ramosæ valde tomentosæ setis multis reconditis brevibus aculeisque tenuibus declinatis vel subreflexis.

R. Lejeunii, *Rub. Germ.* 79. t. 31.

γ. rosaceus (Bell Salt. !); caule subanguloso hirta valde setoso, aculeis valde inæqualibus, foliolo terminali obovato vel obovato-

lanceolato acuminato *grosse* inæqualiter serrato, paniculæ inferne ramosæ (sæpe ramis duobus maximis) corymbosæ superne hirtæ *setis longis prominentibus* aculeis declinatis vel subdeflexis.

R. rosaceus, *Rub. Germ.* 85. t. 36.

Rare. *a.* Terrington Car, Yorkshire, *Mr. Spruce.* *β.* Selborne, Hants, *Dr. Bell Salter*; Haughton Vale, *Mr. Sidebotham*; Channel Islands. *γ.* Selborne, Hants, *Dr. Bell Salter*; Twycross, Leicestershire, *Rev. A. Bloxam*; S. Molton, Devon; Guildford, Isle of Wight. July and August.

Obs. 1. Observation both of the wild and cultivated plants teaches us that these three varieties are only forms of one species. Although believing this and the preceding species to be specifically distinct, I have found very considerable difficulty in defining them, so as at the same time to include all the varieties of each and also distinguish the species. The leaves of this are nearly always ternate, those of *R. hirtus* quinate, but they both vary in this respect. In that the panicle is rather racemose than corymbose, the contrary being the case in *R. glandulosus*. Here the setæ are usually short, and but little longer than the hairs on the panicle, and mostly equal in length (in *R. Bellardi* (Weihe) they vary in this respect, and on foreign specimens are often very variable both in length and number), in that they are many of them very long and prominent and very various in length.

Obs. 2. Dr. Bell Salter considers my plants from the Channel Islands to be *R. rosaceus* (Weihe), and therefore refers the *R. Lejeunii* of my 'Manual' (p. 97) to that variety. They seem to me to correspond far more with the figure and description of *R. Lejeunii* (Weihe) as given in the 'Rubi Germanici.' Similarly he refers the plant found at Guildford in the Isle of Wight, and at Twycross, Leicestershire, to *R. Lejeunii*, whilst I consider it to belong to *R. rosaceus*. This shows how closely the plants are allied.

26. *R. humifusus* (Weihe); caule procumbente tereti hirto setoso, *aculeis tenuissimis inæqualibus multis* declinatis, foliis ternatis vel quinatis subtiliter inæqualiterque serratis subtus pallide viridibus pilosisque, *foliolo terminali cordato-ovato cuspidato*, paniculæ ramosæ inferne foliosæ pilis laxis setis prominentibus aculeisque longis tenuibus declinatis.

R. humifusus, *Rubi Germ.* 84. t. 35.

Stems, flowering shoots, peduncles and petioles beautifully clothed with slender yellow prickles and aciculi which have a purple base and pass insensibly into very long and slender and very unequal setæ. The lower branches of the panicle elongated, ascending, 3—4-flowered; the others mostly 1-flowered. Stems slender, fuscous, purple.

Glen Falloch, Perthshire. July and August.

27. ? *R. Schleicheri* (Weibe?); caule arcuato vel procumbente subanguloso vel subtereti pilis setisque sparsis, aculeis sparsis inæqualibus rectis declinatis, foliis quinatis vel ternatis pilosis subtus viridibus molliter pubescentibus, foliolo terminali rotundo breviter acuminato inferne attenuato, paniculæ parvæ setosæ ramis 3—4 distantibus valde paucifloris brevibus corymboque terminali simplici: aculeis multis longis rectis declinatis, sepalis fructus erecto-patentibus.

R. Schleicheri, *Leight. ! Fl. Shrop.* 237; *Bell Salt. ! in Phytol.* ii. 131.

Rare. Shropshire, *Rev. W. A. Leighton*; Hants, *Dr. Bell Salter*. July and August.

Obs. 1. Although *Dr. Salter* and I have continued the use of the above name for this plant, we are far from being convinced that it is the species figured and described in the 'Rubi Germanici'; I have therefore not quoted that work. *Leighton* sent specimens to *Nees von Esenbeck*, who named them as above, but that does not remove my doubts. Neither am I satisfied that this is a distinct species; it has much the appearance of a plant in one of its earlier stages of growth.

28. *R. Wahlbergii* (Arrh.); caule arcuato obtusanguloso, pilis setisque paucis vel subnullis, aculeis multis valde inæqualibus, foliis quinatis subtus pallide viridibus, foliolo terminali late ovato acuminato inferne cordato, ramorum floriferorum cordato inferne lato, panícula longa foliosa aciculata, sepalis fructus patentibus, petalis obovatis inferne attenuatis, "stylis virescentibus."

R. Wahlbergii, *Arrhen. Rub. Suec.* 43; *Godron, Rub. Nancy*, 16; *Bell Salt. ! in Ann. Nat. Hist.* xvi. 371.

Stem nearly terete at its base, obtusely angular above. Prickles very numerous and very unequal, straight, rather declining; on the autumnal shoots and the petioles hooked. Leaves cuspidate-dentate-serrate. Stipules of the flowering shoot narrow. "Torus conical. Fruit blue-black." Panicles with very numerous, long, strong, declining prickles.

Hedges in the south of England. August.

Obs. 1. In some states this plant closely resembles *R. corylifolius*, which differs from it by having equal prickles on a subterete stem, those on the petioles nearly straight; the torus "roundish-clavate." Between this and the following species the specific character is a sufficient distinction.

Obs. 2. A state of arrested development occurs in this plant in more shady places when the plant is suberect and the panicle very short with large leaves amongst the flowers; it is the *R. Wahlbergii* β . *frustratus* (*Bell Salt.*), 'Ann. Nat. Hist.' xvi. 371. Similar states occur in other species.

29. *R. nemorosus* ("Hayne"); caule arcuato subanguloso, pilis se-

tisque paucis, aculeis multis valde inæqualibus, foliis quinatis subglabris subtus pallidioribus mollibus, *foliolo terminali rotundato-cordato cuspidato, ramorum floriferorum ovato inferne attenuato*, panicula subsimplici, petalis subrotundis, "stylis dilute carneis."

R. nemorosus, "Hayne, *Arzneyg.* iii. t. 10;" Wimm. et Grab. *Fl. Siles.* ii. 34; Arrhen. *Rub. Suec.* 45.

R. dumetorum, *Rub. Germ.* 98. t. 45; Godron, *Rub. Nancy*, 12; Bab. *Man.* 97.

R. corylifolius, *Wallr. Sched. Crit.* 230.

Stem nearly terete at its base, obtusely angular above. Prickles most numerous and shorter near to the base of the stem, straight, nearly horizontal; on the autumnal shoots and the petioles hooked. Leaves cuspidate-serrate. Stipules of the flowering shoot narrow. "Torus conical. Fruit blue-black."

a. glabratus; foliis subtus hirtis pallide viridibus, caule florifero tomentoso, caule subtereti subglabro.

β. pilosus; foliis subtus molliter hirtis pallide viridibus, caule florifero et sterili subtereti tomentosus.

γ. bifrons; foliis subtus albidis tomentosus, caule florifero tomentoso pedunculis pedicellisque aculeis longis rectis validis armatis, caule subglabro similiter aculeato.

R. bifrons, *Vest. in Tratt. Ros. Monog.* iii. 28.

δ. horridus; foliis subtus viridibus pilis longis mollibus ornatis, caule florifero hirtis aculeis multis longis subtenuibus, sepalis sæpissime aciculatis, caulis aculeis multis longis inæqualibus declinatis.

R. diversifolius (*Lindl. !*), *Leighton, Fl. Shrop.* 237.

Hedges and thickets. July and August.

Obs. 1. There seems to be no doubt of this being the plant intended by Hayne, although I have not seen the work quoted, and as his name is older than that of Weihe I have adopted it. None of the figures in the 'Rubi Germanici' exactly represent our plants.

Obs. 2. Some of the forms of this plant, especially *var. γ*, have been mistaken for *R. corylifolius* (Sm.), from which it differs in the same respects as the preceding species.

30. *R. cæsius* (Linn.); caule procumbente tereti glauco, aculeis tenuibus subulatis inæqualibus rectis, *foliis ternatis, foliolo terminali rhomboideo-ovato acuminato*, panicula simplici, "petalis obovatis emarginatis stylis virescentibus," sepalis fructui glauco adpressis.

R. cæsius, *Eng. Bot.* 826; *Rub. Germ.* 102. t. 46.

Stems usually slender. Prickles very various in number but always slender. Occasionally the terminal leaflet is divided quite to its base into three distinct leaflets, the whole thus forming a quinate-pinnate leaf, when the plant is the variety *pseudo-idaeus*

of the 'Rubi Germanici'; sometimes, in the variety *pseudo-cæsius* of the same work, that leaflet is deeply three-lobed and slightly cordate below; both may be found upon the same stem. The lateral leaflets are often deeply divided into a larger and a smaller lobe, but I have never seen true *R. cæsius* with the lobes separated into distinct leaflets, neither do authors mention any such case.

Hedges and thickets. June to August.

Obs. The ternate leaves, of which the lateral leaflets are strongly lobed below, and the terminal leaflet rounded but scarcely ever at all cordate at its base, all of them coarsely serrate, inciso-serrate or even lobed; the very slender prickles on the round stem; the simple panicles and glaucous fruit, which usually consists of very few large drupes; distinguish this plant from all the preceding, except *R. tenuis*, in which the prickles are much stronger on all parts of the plant, and there are no setæ on the barren stem.

B. HERBACEI.

31. *R. saxatilis* (Linn.); caule tenui radicante inerme vel aciculis paucis herbaceis distantibus exasperato, caule florifero erecto, *corymbo terminali paucifloro*, petalis ovalibus calycem subæquantibus, foliis ternatis.

R. saxatilis, *Eng. Bot.* 2233; *Rub. Germ.* 30. t. 9.

Root perennial. Rooting stems annual, very slender and long. Flowering shoots 3—12 inches high, downy. Flowers yellow. Fruit of 1—4 large red drupes.

Stony mountains; rare. July and August.

32. *R. arcticus* (Linn.); caule erecto inermi herbaceo, flore terminali solitario, petalis obovatis calyce duplo longioribus, staminibus conniventibus, foliis ternatis.

R. arcticus, *Eng. Bot.* 1585; *Rub. Germ.* 3. t. 48.

Root perennial. Stems subterraneous, creeping. Flowering shoots 4—6 inches high. Flowers rose-coloured. Fruit of rather numerous purplish-red drupes.

Said to have been found on mountainous parts of the isle of Mull, *Rev. Dr. Walker*; and on Ben-y-Glo, *Mr. Cotton*; but a very doubtful native. May.

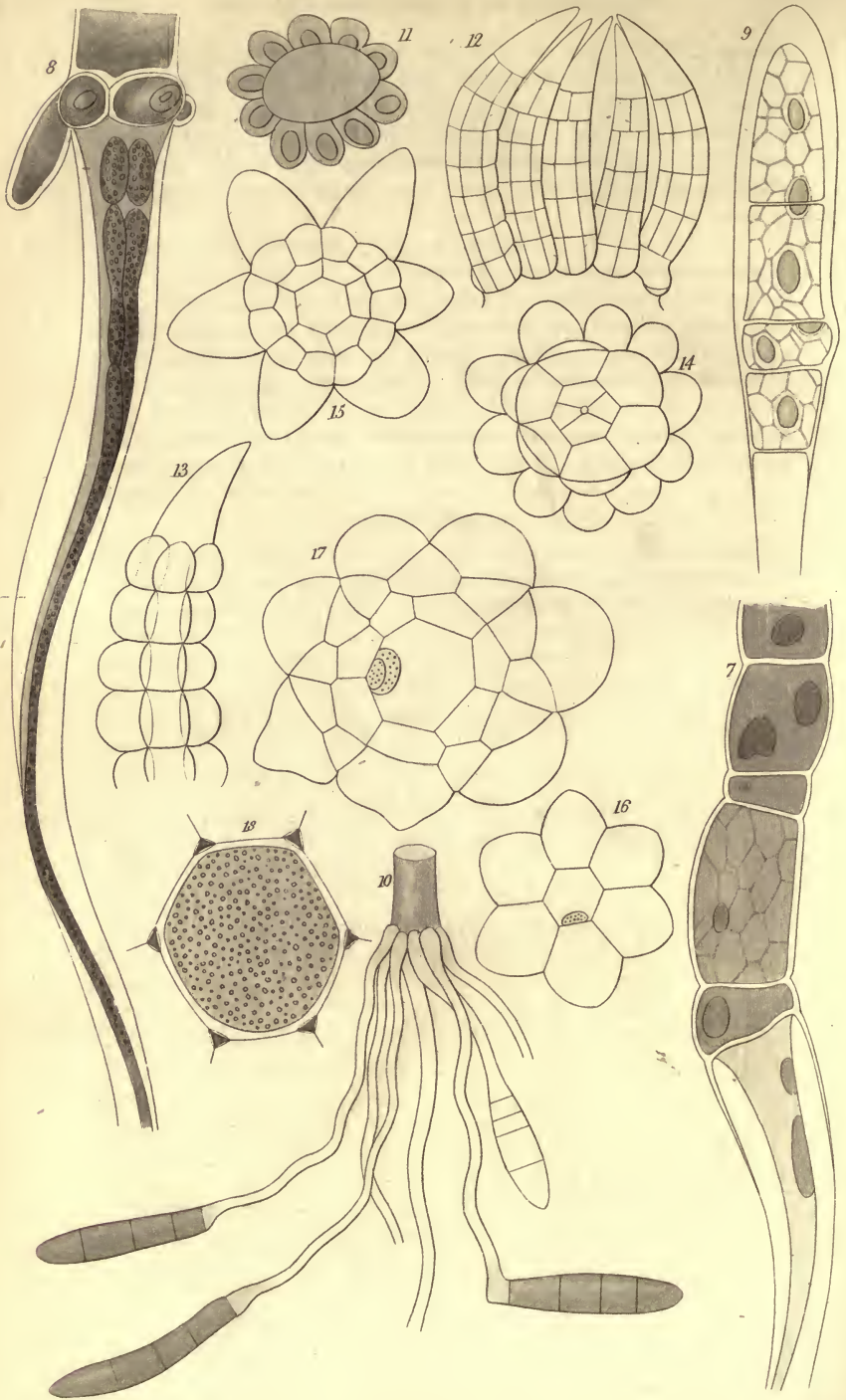
33. *R. Chamæmorus* (Linn.); caule erecto inermi herbaceo, flore terminali solitario, *foliis simplicibus lobatis plicatis*.

R. Chamæmorus, *Eng. Bot.* 716; *Rub. Germ.* 113. t. 49.

Root perennial. Stems subterraneous, creeping. Flowering shoots 6—10 inches high. Flowers large, white, diœcious. Fruit large, red, afterwards orange-yellow.

Alpine turfey bogs. June.





XLII.—On the Development of Chara. By C. MÜLLER*.

[Continued from p. 262.]

§ 5. *The perfect Plant.*

THE modifications of the development of the stem in *Nitella* have been traced with tolerable completeness. In *Chara*, however, the simple tubes are covered externally with utricular cells which are arranged spirally around them. These are not formed until after the germinating plant has become much elongated and its ramifications have acquired considerable increase. In a plant which has attained this stage of development several peculiarities are apparent. Such are the evolution of axillary cells to form axillary branches, and the formation of other more or less rounded cells in ascending and descending rows at the articulations of the stem; lastly, the formation on the stem itself of new papillary cells which are identical with those last mentioned, as in *Chara hispida* and *crinita*, where they sometimes again elongate into articulated tubes, and thus give the plants a very rough appearance. The cells themselves do not differ at all in their internal structure from those of the spore-sac. *How are these organs formed? How are the utricular (cortical) cells formed around the central utricle?* Here the process of development of the entire plant is far more complicated than that of the germ. Moreover the history of the development of all the organs, of the branches, shoots, and even of the stem itself, is intimately connected, and we must again commence with the stem.

To trace the formation of the *stem*, we must search for that point at which it is developed. This is *its apex, the terminal bud*; which consists externally of a single large cell forming the immediate continuation of the stem, and as such, terminating it in the form of a cupola (Pl. VI. fig. 11). The bud appears of the same form in the centre of the recently formed whorl of branches whilst still short. Its membrane is extremely delicate and therefore easily injured. It contains a reddish granular matter (cytoblastema), which too frequently renders it impossible to arrive clearly at the structure of the bud. If we succeed, however, in any way in removing it—which can only be effected by dissection, for iodine and acids render the contents still more obscure—we find the whole of the interior already covered with cells with exceedingly delicate walls (fig. 14). [In this figure the preparation fig. 11 is placed on its vertex, and we are supposed to look internally from above towards the vertex.] This cellular structure consists of a central cell, around which some other cells are de-

* Translated from the Botanische Zeitung for June 26, 1845.

posited. There are usually six of them, but sometimes seven, eight or more. Hence, according to their number, the central cell is six-, seven-, eight- or more sided, since they directly limit and compress it. They are themselves also naturally flattened at their points of contact, but are spherical towards the exterior. If at this time, as is usually the case, many layers of them are arranged together, the central cell becomes a short, six- or more sided column; the cells surrounding it therefore possess only four longitudinal surfaces—the external of which are thus spherical, the three inner flattened—and two transverse surfaces bounded by four sides. Each cell contains a cytoblast. There are four perfect cells also, having very delicate walls, on the apex of the bud. But exactly at that part where they meet in the centre of the axis they inclose a small and very pale body, which is the true vegetating point—perhaps it is the newly forming cytoblast of the central cell. This point is likewise of importance for the further formation of the cellular tissue of the axial bud.

The central cell is the commencement of the true stem, or, as it is usually called, of the central utricle in all *Chara* provided with a cortical layer. But the cells which surround it do not constitute the commencement of this layer, but of the *branch*.

As the plant elongates, of course the central cells also elongate and form long tubes. At first lying close to the cells of the branch they continue to become more expanded, especially when they have acquired the cortical layer. Its cells then become rounded both externally and internally, and thus the central utricle appears distinct, whilst previously (fig. 18) it could only be made perceptible by iodine, which coloured the delicate intercellular spaces and the walls of the utricle blue. Thus it is transformed from the cytoblastema into an amylaceous substance, which subsequently becomes converted into membranous matter, and is then no longer coloured by iodine. As soon as this happens the central utricle becomes considerably thickened by the absorption of more nutriment, and it is very beautiful to see how this is deposited in layers. Hence the stem of the perfect plant differs considerably from that of the germinating plant in the manner of its development. In the former it is primary—an immediate expansion of the nucleus; in the latter secondary, but formed by a higher process.

When the branches are about to form, the cells which surround the central cell become expanded in the form of simple cylinders (figs. 11, 14). Internally they exhibit exactly the same structure as the axis, for we find the same central cells and external cells also with extremely delicate walls already formed in them (fig. 16). They also have a terminal bud, from which new cells are formed as in the case of the stem. The principal difference

between it and the stem-bud is merely, *that this can be elongated to infinity, whilst the growth of the bud of the branch is very limited.* This limit is shown in the apex of a branch (figs. 12, 13), which no longer appears as a bud, but as a simple terminal cell. The explanation of this limited and unlimited development is to be sought for in the fact that the cytoblastema of the stem has to take a direct ascending course, whilst in the branches this is at first indirect, *i. e.* dependent upon the stem, devious, and limited by the amount of nutritious fluid. Thus the more the organs are removed from the centre of the individual, so much the more simple must they become, since enough nutriment is not present for a higher development. We also see this in a greater degree in the formation of the shoots. *This is effected by the simple cylindrical expansion of the external cells which are deposited upon the central cell of the branch*; consequently exactly in the same manner as the branches were formed from the stem. The difference between them is merely, that here the further formation ceases, so that we have no more to do with buds, but merely simple cells, exactly as at the apex of the branch. Hence both agree in not possessing the property, like the other parts of the stem and branch, which lie nearer to the axis of the individual, of forming a cortical layer. At the most they can only produce a few cells (articulations) in their interior.

The peculiarity of the branch, that its membranes rapidly become thickened, is opposed to another property of the axial bud. This always possesses closed branches, *i. e.* rolled up over it, which are only subsequently separated from it when the individual whorls of branches separate from each other by fresh increase. New whorls of branches, *i. e.* the most recently formed, appear in their place and surround the delicate terminal bud. Thus they defend it from accidental injury, since the oldest always cover the youngest, until the latter have become sufficiently strong to be able to undertake the same office for the younger branches. Of course this function does not occur in the shoots; they are therefore protected by becoming rapidly thickened.

If we now compare the formation of the branches and the stem in the germinating and the perfect plant, we find the following essential difference, that *in the former* these organs are formed *by intercalary or intermediate growth*, whilst *in the perfect plant they are produced directly.* In the germinating plant the whorls of branches follow the formation of the stem; in the latter the branches and stem go hand and hand in development. In the former there are at first always two cells where an internode is about to form; in the latter the whorls of branches mark the internodes from the very commencement. Hence the former, strictly speaking, are only accidental, the latter are essential.

Both however agree perfectly in being effected through cytoblasts. But I consider it hardly necessary again to bring forward proofs of this kind of formation. They lie however, in the absence of anything like a secondary membrane, in each cell containing cytoblasts, and in the existence of real, although very minute intercellular spaces; hence the formation of new cells by the contraction of secondary membranes, or from the deposition of membranous matter upon projecting portions, as in Unger's view, is here quite out of the question.

We shall now consider *the cortical layer*. In the further progress of the growth of the plant, the whorls of branches and of shoots become separated from one another (figs. 12, 13). Between each whorl an internode is formed; and if we trace this process in its earliest condition, we find the cortical layer already prepared, running from internode to internode: hence it must happen that the number of utricular cortical cells is constantly double that of the number of branches; thus if there are six branches, there are twelve cortical cells, &c. We do not find any instances in which there is any great variation from the above laws. *Thus, in each cell of the branches, which is immediately attached to the stem, two cytoblasts are usually transformed into two new cells; there is rarely only one present (fig. 17).* Although this process is very difficult to trace, I have directly observed it. It is most easily followed by making extremely delicate longitudinal sections through the axis of the plant; we then find the new cells with their cytoblasts, but always considerably turbid. In a transverse section I have also found two cytoblasts in a cell, which were on the very point of expanding into cells. These new cells which are thus formed from cytoblasts now expand longitudinally, and thus run in a longitudinal direction between the epidermoidal membrane of the apex of the stem and the central utricle; hence they do not run externally but internally, being inclosed by the membrane. In other respects their formation is similar to that of other cells, as already described in the germinating plant. Fig. 17. Pl. VI. represents a transverse section with the internode cut through beyond its margin. This section, and such may be frequently found, exhibits a central cell in its interior and seven placed around it. These are provided with separating walls, and divide the cavity of the stem into internodal cells. This is distinctly seen in a longitudinal section, as in fig. 19. Pl. VII., and in a transverse section when made distinct by iodine, as in fig. 18, also in fig. 15. Thus it is at the same time clear that the formation of the cortical layer occurs upwards, and consequently resembles the growth of the apex. The entire process however proceeds simultaneously with the development of the stem, the branches and the shoots. Its cytoblasts are formed at the same moment

as the external cells are transformed into branches and shoots. The cortical layer is thus attached in its very earliest stage, subsequently attaining very great strength, and is readily separable from the central utricle. The intercellular spaces which are formed between its separate cells and the former become filled with a formative mass, from which new cells may arise according to circumstances.

The following question is closely connected with this development: *How is it that this cortical layer is wanting in the Nitellæ?* I cannot offer any history of the development of the *Nitellæ* which will solve this question; still it appears to me that it may be better answered here than from them alone. Moreover the structure of the *Nitellæ* does not differ from that of the germinating plant. We have therefore both stages in the *Charæ*: the simple stem of *Nitella*, and one surrounded with a cortical layer, the genus *Chara*. We must be able to draw some conclusion from the observation of the successive development of the two. If we expose a plant of *Chara* in a glass of water to the warmth of a stove and light, the stems are developed with uncommon rapidity into long thready utricles. If they are examined more closely, we observe not only that the above double relation of the cells in the cortical layer to those in the stem is disturbed, because generally speaking fewer must always be seen than would be necessary to completely cover *the central utricle, the stem*; but we find very frequently, in fact nearly always, that the cortical cells are completely wanting*. I think that we may directly solve the question from this observation. If this phenomenon is merely produced by the rapid growth of the articulations of the stem, when we apply this to the *Nitellæ*, we have the solution. First, the rapid growth is unfavourable to the formation of cytoblasts; secondly, the cytoblastema present is rapidly assimilated by the membranes of the stem; whence, thirdly, the very remarkable circumstance happens in the *Nitellæ*, that there are formed in the internodial cells a very considerable quantity of starch-cells, in which those cells abound. This has been already observed by several persons and may be readily repeated; it is an essential period in the formation of *Nitella* and of its structure in general, such as we find no instance of in *Chara*, at least as far as I know. The cytoblastema which is produced from the transformation of starch again becomes converted into starch, when the proper time arrives for its again acquiring the state of aggregation of starch. This also occurs in the internodial cells of the *Charæ* and of the papillæ of many species; but whilst in

* This fact appears also to have been observed by Quekett (see Jahresbericht, &c. von J. Em. Wickström, translated by Beilschmied for 1838, Breslau, 1843, p. 26) in *Chara hispida*. The author thinks it follows hence, that all *Charæ* are only modifications of one and the same species.

them the further development of starch ceases, in the *Charæ* it is converted into chlorophylle. Hence the above papillæ, for instance—in which this is very readily and beautifully observed—become at first deep blue, and subsequently brownish when treated with iodine. Thus the ready conversion in *Nitella* of the internodial cells into new plants is explained; and they have been distinguished as gemmæ, although they are not true buds, upon which the organs are situated, but rather mere formative cells. The step to the new formation of cells is certainly not great; if cytoblastema is formed from starch, then the power exists of forming cytoblasts and consequently new cells. We have not far to seek for its analogues, when we recollect the fermentation-cells. *Wherever formative matter is present, there cells may form; and as many are formed from them as correspond to the matter deposited in them.*

From what has been stated it appears to me to follow, that we must still separate *Chara* and *Nitella*; for the latter constantly forming simple stems only, proves that the power of rapid growth must be inherent to them as a principle; and although on the other hand the *Charæ* may exhibit the same phænomenon, it is only a deviation from their natural condition*.

As regards several accidental cells in the *Charæ*, for instance, the above papillæ, as also those which are developed beneath and above the internodes but still upon their cells, their formation invariably occurs by intercalary growth as stated above, or by the simple elongation of cells which are already formed. All the axillary branches are likewise formed by interrupted growth. The above-mentioned papillæ frequently or always fall off subsequently, for instance, in *Chara crinita*, leaving round brown spots at the points to which they were attached. They appear unsusceptible of further development. It is moreover remarkable, that frequently three cells are formed from a single articulation at the internodes. This great power of increase of the plant explains how the internodes are frequently surrounded with one or more whorls of cells (those below them assuming a descending direction, as they are prevented from ascending by the branches, those above an ascending direction).

The last phænomenon which requires notice is the formation of new cells at the apex of the branches. It appears to me in this case that the new cells are formed by subdivision. The first commencement of this process appears as a dark line surrounding the circumference of the cell. The secondary membrane then becomes constricted. [We saw above that the very apex of the

* Kützing (*l. c.* p. 319) has formed a third group "*Charopsis*" of *Chara Braunii*, *scoparia* and *barbata*.

branches and the shoots soon formed strong membranes.] The primordial utricle also follows this course until it is completely drawn in. This also agrees with Mohl's observations. We have some striking proofs of it in the preparations of Pl. VII. figs. 21, 22, 23, 24 and 26. In fig. 21 the preparation was treated with iodine, and the primordial utricle has become retracted from the walls of the cells; but it is not completely separated, for it is distinctly seen under the microscope to pass through both of the cells. The part which was not contracted appeared much more transparent and clear than the other portions. In Pl. VII. fig. 22 the apex is sliced longitudinally, and it is distinctly seen how the secondary membrane projects into the interior, but has not yet come into contact: I have observed this *once only*. In fig. 23 the apex is seen to be entirely separated by constriction: it appears exactly as if it passed into the previous articulation. The same occurs in fig. 24. The preparation was treated with nitric acid, and the primordial utricle of the lower cell has separated from the cell-wall, so as to resemble an open utricle, into which we can easily see. Fig. 26 exhibits the two extremities of the primordial utricle so remarkably torn, and agreeing in this particular so much, that we cannot help believing that they must once have been connected. Moreover I have frequently perceived this form. Are we now authorized to conclude from these transitions that there occurs a division of the cells? I think we are! and I could have added many more sketches of preparations which are in my manuscript. One thing appears to me remarkable, viz. that all other parts of the plants are certainly formed from cytoblasts, and in this instance we have a division of already formed cells. However, I see no other deduction from the observations than the division of the cells.

It is remarkable in the primordial utricle, that it (as in fig. 24) appears as completely separated as if it had been cut with a knife; it also seems not to be so important in these cells as in those formed from cytoblasts. *Double septa* formed from secondary membranes (one belonging to each cell) are in tolerably close contact and perfectly close the separate cells. Now as the primordial utricle is firmly attached to this, the interior of the cell is closed as regards the regular course of the circulation of the sap. And when it is completely absent in the old cells, as Mohl observed, this from its gradual absorption could not produce any interruption to the cell-life.

[To be continued.]

XLIII.—*Descriptions of some apparently new species of Homopterous Insects in the Collection of the British Museum.* By ADAM WHITE, M.E.S., Assistant in the Zoological Department of the British Museum.

APHANA (*Guérin*), *Burm.*

Aphana imperialis, White. Elytra olive-green, the basal portion with numerous black spots, most of which are traversed by green veins; the tip black, beautifully reticulated with olive-green. Wings at the base purplish madder, with eleven or twelve large black spots, the purplish part reticulated with whitish; the end brownish black; a bluish green band-like mark across the middle of the wing, not nearly reaching the hind margin, the three nerves traversing it are black. Under sides of elytra and wings almost similar to the upper side. Head and thorax above greenish. Prothorax finely transversely striated, a line down the middle shining. Abdomen black, margins yellow, segments slightly powdered with white, vulvar scales red. Legs brown; tibiæ of hind legs with three teeth on the outside.

Expanse of elytra 2 inches 5 lines.

Hab. Silhet.

In marking and general appearance similar to *Aphana delicatula*, sent to the Museum from Canton by the late Tradescant Lay, Esq.; the *Aphana amabilis*, Hope (Linn. Trans. xix. 132. t. 12. f. 1), from Silhet is somewhat allied to it, but neither *A. delicatula* (Ann. and Mag. Nat. Hist. vol. xv. 37) nor the present species have the slender, sharp, erect horn which is on the head of *A. amabilis*.

Aphana scutellaris, White. Elytra with the base dark green, the tip ochrey yellow, the basal portion except on the outer margin thickly covered with a white sponge-like matter, the veins green, the tip with a good deal of white sponge-like matter, some roundish spots in the middle free from it. Wings at the base green, mixed with violet-blue; in the middle a large red mark reticulated with yellowish, inner and part of the outer margin of a pale ochrey yellow, the tip deep brownish yellow, beyond the middle of the wing a dark brownish line not quite reaching the hind margin: middle of the wing with nine or ten white spots of different sizes; several small bluish white spots on the apical part, under sides somewhat similar, the base of elytra green, marked and thickly spotted with black. Head and thorax above of a very deep blackish green, the vertex with two white patches in a depression, ridged in front and on the sides. Prothorax strongly ridged in the middle; scutellum (mesonotum) covered with white sponge-like matter. Abdomen very deep blackish green above, the segments at the base above, powdered with

white, the abdominal spiracles white. Legs deep brown; the tibiæ of hind legs with five teeth on the outside (exclusive of terminal).

Expanse of elytra from 2 inches 1 line to 2 inches 6 lines.

Hab. Borneo. H. Low, Esq.

This species in the system comes near *A. atomaria* (Fabr.).

ENCHOPHORA, *Spinola*.

Enchophora guttata, White. Elytra brownish red, tip yellowish, the basal portion with some scattered subocellated spots; interior red, nearly surrounded by a black ring; front margin yellowish green. Wings brownish black, the base and disc with several crimson spots of different sizes; under side of elytra at the base of a deeper red than above. Cephalic protuberance short, not thickened at the end, and but slightly bent back, compressed on the sides. Prothorax yellowish green, with a transverse brownish mark in front. Abdomen dull orange, the last segment having under it a white waxy secretion, composed apparently of closely compressed filaments not extending beyond the abdomen. Legs reddish brown; tibiæ of hind legs with six spines on the outside.

Expanse of elytra 2 inches 7 lines.

Hab. S. America. Presented by Edward Doubleday, Esq.

This species, somewhat allied to *Enchophora Servillei*, Spinola (Ann. Soc. Ent. Fr. viii. 227. t. 2. f. 3), seems to form a connecting link between *Enchophora* and *Aphana*.

TOSENA, *Serville and Amyot*.

Cicada (T.) melanoptera, White. In the Javanese *C. (T.) fasciata* the nerves of the elytra and the wing are of a very clear ferruginous colour; on the front of the nasus is a ferruginous yellow line sometimes interrupted, and on the fore edge of prothorax are four small ferruginous yellow spots; the tips of the femora are yellow: in the species or variety *melanoptera*, the nerves of the elytra and wings are nearly entirely black, the band on the wing is whiter and generally broader than in *C. fasciata*; the nasus is entirely black, there are no spots on the fore-edge of the prothorax, the yellow marks above the antennæ are smaller, and the legs are of a uniform black. There are several specimens in the Museum collection from Silhet and other parts of N. India; in size and general colour it resembles the *Cicada (Tosena) fasciata* of Fabricius, of which eventually it may prove to be a local variety, to which the name *melanoptera* may be applied.

GÆANA, *Serville and Amyot*.

In this subdivision of the genus a beautiful species of *Cicada* from Nepal ought to be placed; it is figured in Royle's 'Illus-

trations of the Botany, &c. of the Himalaya Mountains,' pl. 10. f. 2, under the name *Cicada pulchella*; Mr. Westwood in the Introduction, p. 54, describes it as *Cicada sulphurea*, Hope's MSS., the specific name *pulchella* being pre-occupied. In the Museum cabinet are several specimens named *Gæana pulchella*.

HUECHYS, *Serville and Amyot*.

Cicada (Huechys) vidua, White. Elytra deep uniform blackish brown. Wings white, transparent, slightly tinged with brownish round the edge. Head black, nasus of a clear gamboge-yellow, very prominent. Thorax black, two large gamboge-yellow spots on mesothorax. Body above black in male, brownish in female. Abdomen in the middle, below, and at the end vermilion-red; in the female the sides of the abdomen at the end are also red.

In one specimen in the Museum (a female) are two or three lighter streaks on the elytra not far from the posterior margin.

Expanse of wings from 1 inch $8\frac{1}{2}$ lines to 2 inches 4 lines.

Hab. New Holland?

In the division *Huechys* come *Cicada (H.) splendidula* from the East Indies, described by Fabricius (Syst. Rh. 42. 49), and figured in Donovan's 'Insects of China,' fig. * * * *, and *Cicada (H.) octonotata*, Westwood (Arc. Ent. t. 57. fig. 2), both which species are in the Museum collection.

TETTIGARCTA, *White*, in the Appendix to Eyre's Travels in Australia, i. 412 (Aug. 1845).

Head very small, in front blunt; lateral ocelli close to the eyes, the space between them furnished with long hairs. Prothorax very large, extending back in a rounded form beyond the base of the hind wings, sharp-pointed on the sides; the back convex and wrinkled. Body and under parts densely clothed with hair.

This genus differs from all the Stridulantes in the size and shape of the prothorax: in the neuration of the wing it is allied to *Platypleura* (*Serville and Amyot*); in the size of the head and the hairiness of the body it approaches *Carineta* (*Serv. and Am.*).

Tettigarcta tomentosa, *White*, l. c. 413. tab. 4. fig. 4. Brownish ash, hairs on the upper part of the body short, deep brown, hairs on the sides and under parts long and gray. Prothorax varied with black, in front are two large patches covered with gray hairs. Elytra spotted and varied with brown. Wings clear, somewhat ferruginous at the base.

Expanse of elytra 3 inches 4 lines.

Hab. Australia, near Melbourne.

NOTE.—*Eurybrachys lata*, *White*, in the Appendix to Eyre's 'Travels', where it is figured and described (pl. 4. f. 3. p. 412), is

closely allied to but distinct from the *E. abbreviatus*, Guérin, Voy. Coq. Zool. ii. 193.

CEROPLASTES, Gray.

Coccus (Ceroplastes) jamaicensis, White. Mr. Gray in the 'Spicilegia Zoologica' (p. 7. tab. 3. f. 6. and 7) has described and figured two species of a singular insect of the family *Coccidae*, found by the late Lady Callcott during her residence in Brazil. For their reception he has formed the genus *Ceroplastes*, characterized as follows:—

“The seven plates, of which the covering of the female is composed, are arranged in two lateral pairs, and a central series consisting of an anterior, a dorsal and a posterior plate; the nucleus of the six marginal plates is close to the lower edge, that of the dorsal one nearly central.” The two species described are *C. chilensis*, large, white, pellucid, the plates nearly equal in size, the dorsal flattish; it was found on the branches and peduncles of a tree with pinnated leaves: the second species, *C. janeirensis*, is smaller, brownish, subopaque, hemispherical, the dorsal plate convex; it was found on a species of *Solanum* with simple lanceolate velvety leaves.

In the 'Philosophical Transactions' for 1794, p. 383, Dr. Pearson described an insect allied to the above under the name of “White-lac,” somewhat similar to the Pe-la of the Chinese. Mr. Gray, in his memoir, refers to species of similar insects as having been found by Humboldt and D'Azara. The occurrence of another distinct species of this genus, in a collection made by Mr. Gosse in Jamaica, induces me to make this note and add its description. They were taken from the trunk of a lance-wood tree. Mr. Gosse mentions that they melt in a candle like wax: in size it approaches Mr. Gray's second species, in colour and form it is different; it may be called *Ceroplastes jamaicensis*. *It is of a yellowish green colour; the base is almost hexagonal; there are six marginal plates, each of which is slightly notched in the middle below; the upper plate is notched behind and has two prominences in front.*

XLIV.—*Mode of the Formation of the Spore in a species of Vesiculifera.* By G. H. K. THWAITES, Esq.

To the Editors of the Annals of Natural History.

GENTLEMEN,

2 Kingsdown Parade, Bristol, March 24, 1846.

HAVING recently met with a species of *Vesiculifera* just in that state of maturity calculated for showing to advantage the various stages in the development of the spore, I did not let slip the op-

portunity of satisfying myself as to the real character of the process, and I can give the following as the result, not only of my own observations, but fortified by the opinion of Mr. Berkeley as to their correctness, to whom I submitted specimens for examination.

The species in question may possibly be the *V. lacustris* of Mr. Hassall, with which species it would appear to agree in size, but I cannot determine with any certainty from his figure and description. The plant occurs in ponds on a common near Bristol, and is of a pleasant pale apple-green colour. The cells are usually from five to seven times as long as broad, and are lined with but a small quantity of endochrome which is disposed in a reticulate manner. Some of the cells, however, may be observed to be slightly inflated, and to contain a larger amount of endochrome than the rest: in each of these inflated cells a spore is subsequently formed, and in the following way:—The endochrome, after attaining a certain degree of density from an increase in its development, not from any derived from a contiguous cell, moves towards one end of its cell; it (the endochrome) shortly becomes divided into two very unequal portions, the larger and terminal one of which becomes converted into the spore, and the smaller portion is found to be separated from this by a single septum. A process has, in reality, taken place analogous to the fissiparous division of the cell of *Zygnema*; two cells have been formed within the original one, but in the *Vesiculifera* one of these new cells is the spore.

This is a fact of considerable physiological importance, and I shall have more to say on this subject in a future communication.

P.S. March 25, 1846.—Since writing the foregoing I have received a letter from Mr. E. Jenner, who is well-acquainted with the species intended by Mr. Hassall's descriptions, informing me that the *Vesiculifera* mentioned above is the *V. concatenata* of that gentleman's work.

I have today examined very carefully specimens of *Vesiculifera æqualis*, Hassall, and find that the process of the formation of the spore is similar to what I have stated to take place in *V. concatenata*. In the *V. æqualis*, however, I have been able to trace the mode of development of the two or three contiguous spores, which are sometimes to be seen in the filaments of this species: the first spore is formed in the way I have previously mentioned, and arrives at considerable maturity before there is any appearance of one, contiguous to it, being produced; but it may then be seen that the smaller portion of endochrome, which had been separated just previously to the first spore being formed, and

which then occupied but little space in the cell, has become considerably increased in amount, an increase having also taken place in the length of the cell: at length the process of division, &c. occurs as before, and a second spore is formed adjoining the first. The formation of a third spore involves a similar chain of phenomena.

I am, Gentlemen, your very obedient servant,
G. H. K. THWAITES.

XLV.—On a species of *Semnopithecus* from the Peninsula of Malacca. By THEODOR CANTOR, Esq., M.D., Civil Surgeon, Prince of Wales Island.

To Richard Taylor, Esq.

DEAR SIR,

Library, East India House, April 6, 1846.

[THE first notice of the species of *Semnopithecus* described in the accompanying essay by Dr. Cantor, is given in the 'Proceedings of the Zoological Society' for 1837, p. 14, by Mr. James Reid, who characterized it under the name of *obscurus* from a specimen in the Society's collection; the locality of the particular specimen exhibited was unknown. Temminck subsequently described a *Semnopithecus* very concisely with the name of *Semn. leucomystax*, stating doubtfully that the *S. obscurus* of Reid might perhaps belong to the same species. See *Verhandelingen over de Natuurlyke Geschiedenis der Nederlandsche Bezittingen: Monographisch Overzicht van Semnopithecus*, p. 59, no. 4. Mr. Martin, in his 'Natural History of Quadrumana,' gives a more detailed account of the external characters of *Semnopithecus obscurus* of Reid, or the *Dusky Monkey*, referring to some specimens brought from Singapore by Mr. Cuming, and presented by him to the museum of the Zoological Society, and also to a specimen in the Paris museum, adding, that no particular details of the habits of this species had as yet been received; science is therefore indebted to Dr. Cantor for the first satisfactory account of the habits and peculiarities of this monkey, and I submit this essay to your consideration as deserving perhaps a place in the 'Annals of Natural History.'

The 'Proceedings of the Linnean Society' for April 1, 1845, contain the specific character of the *Semnopithecus halonifer*, with a few remarks extracted from Dr. Cantor's more detailed essay.—T. Horsfield.]

Semnopithecus halonifer, Cantor.

S. nitide cinereo-nigrescens; crista occipitis cana, abdomine subalbido; cauda subcinerea; facie, auribus, manibus, pedibus, tuberi-

busque ischiaticis nigris; palpebris labisque lacteis, uti halonibus circumdatis, tarsis palpebrarum nigris; phalangibus digitorum primis membrana inter se junctis.

Juvenis: Pallidior; crista occipitis cinerea, facie nigro-cærulescenti.
Neonatus: Nitide fulvus.

The colour of the face, ears, hands and feet, and of the ischiatic callosities is intense shining black. The back and external surface of the extremities blackish or dark brownish ash, as well as the chest and the inner side of the extremities. The tail is cylindrical, with a small terminal tuft of a lighter ash-colour. The skin is milky-white, and is left to view on the abdomen, which is thinly covered with ash-coloured hairs. The forehead is completely hidden by hairs, so closely adpressed to the skull, that they appear as if they had been brushed backwards to the occiput, which is covered by a long crest of grayish hairs lying flat down the back, unless agitated by the movements of the head, when they may be said to "stand on end." The eyebrows are prominent, rendered more so by a ridge or bandeau of long, half-erect, diverging, shining black hairs. The eye is dark brown, nearly black, of great brilliancy, heightened by the milky-white colour of the eyelids, which forms a broad halo, bordered by the black tarsus and eyelashes. A similar broad halo is formed by the white lips and chin. These white markings, which are most developed in the young, impart a very singular expression to the physiognomy. The nose is a little prominent. The nostrils open laterally, and the fleshy part between them is elevated.

The lips and chin have a short grayish beard; the cheeks are covered with long, backwards pointing whiskers, which nearly hide the black, rather large ears. The thumbs of the anterior extremities are very minute. The first phalanges of the four fingers are united by an interdigital membrane sufficiently lax to allow of the fingers being widely separated. This character exists not only in the different species of Gibbons and Monkeys enumerated by the author of 'The Natural History of Monkeys, Opossums and Lemurs,' but also in *Semnopithecus cristatus*, Horsfield (*Simia cristata*, Raffles), *Cercopithecus* (*Macacus*) *cynomolgus*, Ogilby, and *Papio nemestrinus* (*Simia aygula*), Ogilby. It is however difficult to recognise in preserved specimens, in which it becomes shriveled, and may therefore easily escape observation. The sexes of the present species appear not to differ in colour or size. The young ones are of the same but paler colours, and the face is blackish blue. Immediately after birth the colour is a shining fulvous. The fur consists of long soft hairs of a silky texture. This species is very common on the hills and forests of the Malayan Peninsula, Prince of Wales Island, and other neighbouring islands. The dimensions of the adult are:—

	ft.	in.
Length from the tip of the nose to the root of the tail ...	2	1½
From vertex to ditto	1	9½
Length of the arm	1	1½
——— of the hand	0	4½
——— of the leg	1	2
——— of the foot	0	6
——— of the tail	2	2½

The dentition is similar to that of *Semnopithecus maurus*, Horsfield. With old age the external margin of the iris turns gray, and forms what in the human eye is denominated *arcus senilis*. From the peculiar structure of the stomach of the *Semnopithecus*, Professor Owen has expressed an opinion, that their food consisted of leaves and tender buds of trees, rather than of fruits and roots, the food of ordinary monkeys (*Zoolog. Transact.* vol. i.). Dr. Horsfield has recorded that *S. maurus* during its young state feeds on tender leaves, and when adult on wild fruits (*Zool. Researches in Java*). The author of the above-quoted interesting work upon Monkeys (vol. i. p. 214) has pointed out the peculiarity of the molar teeth of the *Semnopithecus* being triturated at an early period, and justly infers a longitudinal grinding motion from front to rear. The present species, as well as *S. cristatus*, exhibits an additional peculiarity about the teeth, which at an early age become covered with a dark brown crust similar to that observed in ruminating animals. The food of the present species consists of leaves, tender buds of different kinds of trees as well as of soft fruit; and the occasional visits of foraging parties in nutmeg and coffee plantations and gardens is anything but welcome to the owners. In its adult state, this, like other *Semnopithecus*, is sullen and morose, and is scarcely susceptible of domestication. Such however is by no means the case during early age. A young male, some months in my possession, appeared immediately reconciled to his new mode of life, allowed himself to be handled, and showed he was not insensible of caresses. But being tied up and left in solitude he showed a gentle impatience by a most melancholy cry, repeating slowly the syllable "O O," and stretching its arms towards the nearest person, with whom he would remain quiet, frequently throwing its arms round his keeper's neck. When disturbed by a sudden movement, or when about being removed from his chosen seat, he would recommence his lamentations. In short he expressed a decided aversion to solitude and neglect. He frequently used to be in my lap or sit on my shoulder while I was reading, and as he was remarkably cleanly, these indulgences were readily granted. As already observed of others of this genus by the author of '*Nat. Hist. of Monkeys*,' &c., he manifested a great indisposition to action, and

possessed none of the petulance, mischievous curiosity and restless activity of the Cercopithecus. In his predilection for the society of man, in gentleness, in his cry and also in physiognomy, he strongly resembles the Gibbons, which struck me so much the more, as I at the same time had an opportunity of studying the habits of a young *Hylobates leuciscus*, Ogilby (captured in the Purlis territory on the Malayan Peninsula, which therefore must be added to the habitats of that Gibbon). But with these points the resemblance ceases, for the latter is active, nay even remarkably so, when compared to *Semnopithecus halonifer*. A very interesting feature in this monkey is its attachment to children, whereas gibbons and monkeys, generally speaking, entertain a marked aversion towards them. The one I am now describing would go to my native butler's daughter, a little girl of five years, in preference to any other person, and cling with its arms round the child's neck as long as permitted. Leaves and young shoots* of mulberry, coffee, jambu-trees and a kind of gossypium, as well as the large pink flower of the latter, were his favourite food. Of fruit he preferred plantains, jambu and mulberries; but he would also eat mangustin, mangas, rambutan and papayas, not however unless the latter-mentioned fruits were opened or cut in small slices. But a very small quantity was taken in the mouth at a time, and in the absence of cheek-pouches it was slowly masticated and swallowed. Insects and animal food of every description he refused. Occasionally he would swallow twigs or sand. His beverage was water, which was taken after each meal in considerable quantity, and he took more fluid than solid food. He drank stooping to the water's edge, but not by means of the hand. Having finished his meal, he would sit down, close the eyelids, occasionally gnaw his fingers' ends, and slowly grind the teeth and chew very small particles of the food regurgitated under frequent eructations. Thus he would continue for a considerable time till he fell asleep. Although a rumination takes place, it is in a limited and far less degree than in Ruminants. In fact, it is, as Prof. Owen has truly suggested, "analogous to rumination" (Zool. Proceed. 1833, i. p. 75). The disparity between the extremities and the size of the stomach, which imparts a considerable corpulency even in early age, renders the monkey a ludicrous object in his awkward movements on the ground. The back is raised into a high arch, the centre of the back being elevated above the vertex, while the long hair of the head and body is

* A young male orang-outan, *Simia Satyrus*, from New Guinea (with the nails and two joints of the hind thumbs perfectly developed) greedily devours young shoots of plantain-trees and other plants, and it has therefore been found desirable to watch his rambles in my flower-garden.

disheveled. Thus he rolls heavily along to reach the nearest tree. Should the distance be found too long, he frequently rests.

In the jungle I have never observed this monkey on the ground, but troops from five or six to some twenty watch with curiosity from on high the intruder, and when frightened they will perform astounding leaps, while they express their fear or annoyance by a hoarse short cry. If one is shot, the others fly to a short distance, stop and observe the wounded, but attempt not to carry him off. Judging by the physiognomy and the proportions of the limbs, this species appears to be nearest allied to *S. maurus*, Horsfield. The white lips occur in *S. Nestor*, Bennet, but the white eyelids have hitherto been considered to be a character almost confined to certain African Cercopithecus (Nat. Hist. of Monkeys, &c., vol. i. p. 318). But *Semnopithecus cristatus* of the Malayan Peninsula and Prince of Wales Island has the eyelids of a much lighter, almost whitish, colour than the rest of the face, and in *Cercopithecus (Macacus) cynomolgus (Simia aygula)* of the same localities the upper eyelids are whitish.

The white marks however become obliterated shortly after death, and are scarcely discernible in preserved specimens. *S. halonifer* is denominated by the Malays of Prince of Wales Island by the general appellation of "Lutung" (a monkey), or "Lutung itam" (black monkey), both of which names however are also indiscriminately applied to *S. cristatus* and *S. maurus*.

Dissection of a young male of the following dimensions:—

	ft.	in.
Length from the nose to the root of the tail	1	1 $\frac{1}{2}$
——— from vertex to ditto	0	10 $\frac{1}{2}$
——— of the tail	1	3 $\frac{1}{2}$

The stomach consists of three distinctly separated divisions, as described by Prof. Owen in *S. entellus*, but presents in this species a much less sacculated appearance, and differs more particularly in the second or middle compartment having smooth and not sacculated parietes, and being of a crescent shape. The pyloric portion is a cylindrical canal, gradually diminishing in diameter towards the pylorus; first of a sigmoid figure, then turning upon itself. It is in a less degree puckered up upon the two bands than is the case in the *Entellus*, and the sacculi cease about 3 $\frac{1}{2}$ inches from the pylorus. When distended the stomach measured:—

	ft.	in.
Length along the greater curvature, beginning at the left extre- mity	1	3
Ditto along the less curvature	0	9
Greatest circumference one inch to the left of cardia	0	7 $\frac{1}{2}$
Circumference one inch from pylorus	0	1 $\frac{1}{2}$

Length of the Intestinal Canal.

	ft.	in.
Small intestines	8	0
Large ditto	1	5½
Cæcum.....	0	1½

The cæcum is of a conic figure with the fundus constricted. The liver extends from the right hypochondriac to the right lumbar region, and is nearly hidden behind the stomach. The upper surface of the right lobe adhered in this specimen firmly to the corresponding surface of diaphragma; it is of very reduced size. The gall-bladder is of a cylindric, pyriform shape, three-quarters of an inch in length. The spleen is small, triangular, somewhat flattened, measuring one inch in length, and five-eighths in its broadest diameter. The pancreas is linear, flattened, two inches in length, three-sixteenths in diameter.

Costæ veræ seven, spurixæ five = twelve pairs.

XLVI.—*Botanical Notices from Spain.*

By MORITZ WILLKOMM*.

[Continued from p. 270.]

No. XII. GRANADA, August 10, 1845.

SOME miles to the east of Granada lies an extensive mountain tract, consisting of limestone, which bears the name of Montes de Granada, and is formed of several mountain-chains, which have various names, although they constitute one and the same range. The Sierra de Alfacar forms the western limit of the mountains of Granada, with which the Sierra de Jarana lying behind it, about 7000 feet high, runs parallel; this is the highest part of the whole range, and forms its northern limit. With this is connected on the north several lower mountain-ranges, as the Sierra del Rallo and Sierra de las Navas, which divide the provinces of Granada and Jaen; whilst in the south, the Sierra de Jarana and the Sierra de Molinillo, and that of Alfacar pass over into the rocky Sierra de Huétor, both which are separated from the outliers of the Sierra Nevada partly by the valley of the Darro, and partly by the Rio Aucharón. This many-branched mountain district, whose vegetation varies remarkably in its different parts, divides the noble Vega de Granada from the barren and arid high plains of Guadix, and the basin of the Jenil from that of the upper Guadalquivir. I have examined this interesting district in all its parts, during several excursions, and will here endeavour to give in short sketches as true a picture as possible of its rich vegetation.

The greatest part of the whole mountain-chain is quite barren; and in the broad hollow between the Sierra de Alfacar and the first chain of the Sierra de Jarana, as well as in the valleys and ravines

* Translated from the *Botanische Zeitung*, Jan. 16, 1846.

of the Sierra del Molinillo, are woods, consisting of *Pinus Pinaster*, Ait., *Quercus Ilex*, L., and *Q. lusitanica*, Lamk. *α. faginea*, and under them a luxuriant underwood composed of the shrubs common in the south of Spain, among which I observed in the above-mentioned hollow the beautiful white-blossomed *Cistus laurifolius*, L., and a dwarf rose with small white blossoms in great abundance. The lower part of the western declivity of the Sierra de Alfacar, as well as the northern ridges known by the name of the Sierra del Rallo and de las Navas, are thickly clothed with *Lavandula Spica*, L., which does not occur in the Sierra Nevada even at the same elevation, but is there supplanted by *L. lanata*, Boiss., as well as by various common *Cistineæ*, as *C. albidus*, *C. crispus*, *C. monspeliensis*, *Helianthemum guttatum*, *salicifolium*, *Fumana*, &c. Under shady bushes occur not rarely, throughout the whole range, *Pæonia lobata*, Desf., and *Leuzea conifera*, DC., and on the rocks of all the chains, reaching into the alpine region, a number of the oft already-mentioned rock plants, which are also found in all the mountain-chains of Granada; especially *Barkhausia albida*, Cass., *Saxifraga spathulata*, Desf., *Draba hispanica*, Boiss., *Alyssum alpestre*, L., *Arabis auriculata*, Lam., and many others. On loose rocky soil of the western acclivity of the Sierra de Alfacar occur *Helianthemum origanifolium*, P., *Arenaria Armeriastrum*, Boiss., *Thymus granatensis*, Boiss., *Satureja cuneifolia*, Ten., *Convolvulus lineatus*, L., and on shady rocks of the east side, *Ononis arragonensis*. Also, on loose rocky soil along the crest, *Helianth. piliferum*, Boiss., and *Haenselera granatensis*, Boiss., a beautiful Cichoriaceæ plant, hitherto only found by Boissier in the Sierra Nevada at a single locality, and which grows here in great plenty. Under the shrubs on the oft-mentioned broad hollow between the Sierra de Alfacar and Sierra de Jarana, I observed *Geum sylvaticum*, Pourr., and *Polygala rosea*, Desf., in plenty; upon marshy meadows, *Spiræa Filipendula*, L.; and on rivulets in woody dells, isolated shrubs of *Viburnum Lantana*, L.

The Sierra de Jarana consists of two parallel mountain-chains, the western one of which forms lower, unusually steep and strangely shaped rocks, which are characterized by their sterility; the eastern and higher chain rises in gentle slopes and presents a richer vegetation. I here found, among other plants, *Adonis dentata*, Del., *Tragopogon crociflorum*, L., *Scorzonera hispanica*, L., *Jurinea humilis*, DC., *Matthiola varia*, DC., *Ononis arragonensis*, Asso, *Dianthus brachyanthus*, Boiss., *Anthyllis erinacea*, L., *Ptilotrichum spinosum*, Boiss., and very rarely, *Passerina elliptica*, Boiss.

A remarkably varied flora is found on the much lower but very rocky Sierra de Huétor, which I had an opportunity of visiting on the 8th of July, on my journey into the mountains of eastern Andalusia. On the steep rock-walls of this mountain-chain grew luxuriantly *Anthyllis tejedensis*, Boiss., and a pretty orange-flowered *Centaurea* very plentifully; and on sunny rocky soil occurred, from the foot to the summit, the delicate *Paronychia aretioides*, Pourr., *Reseda Gayana*, Boiss., and *Pistorinia hispanica*, DC., which also covers the grassy levels of the summit in company with *Serratula flaves-*

cens, Poir., and other mountain plants. I found rarely in this mountain-chain the beautiful silver-coloured *Pterocephalus spathulatus*, Boiss. (*Knautia spath.* Lag. gen. et sp.), forming patches, on fallow land *Anagallis verticillata*, All.; and along the road-side and in ditches *Hypericum tomentosum*, L., and the beautiful *Salvia phlomidis*, Asso. Lastly, I gathered in the valleys of the Sierra del Molinillo, whose vegetation agrees on the whole with the already-described Sierra, a very beautiful yellow *Astragalus*, and in clefts of the shady limestone rocks the *Sarcocapnos crassifolius*, DC., forming very brittle beds.

With this mountain district is connected on the east a broad, partly undulating and barren high table-land, which on the south is surrounded by the Sierra Nevada and its branches, on the east by the Sierra de Gor, and on the north by other lower mountain-chains, and in whose soil (which consists of tertiary and diluvial formations) the rivers descending from the Sierra Nevada have worn very peculiarly formed ravines, or deep valleys. This is the Plain of Guadix, which possesses only a scanty but peculiar vegetation. The whole ground is evidently very much charged with salt, which is partly proved by the neighbouring mineral waters of Graëna, and partly by the saline plants which occur. The following plants grow here very plentifully: *Lygeum Spartum*, L., *Peganum Harmala*, L., *Astragalus tumidus*, W. (*Anthyllis tragacanthoides*, Desf.), *Macrochloa tenacissima*, Kth., *Artemisia campestris*, L., *A. Barrelieri*, Boiss., various *Chenopodiaceæ* and *Salsolaceæ*, and on isolated places *Sideritis linearifolia*, Lag., a delicate species with lineal subulate leaves and whitish-yellow flowers. On walls and ditches in the environs of the pleasant town of Guadix, which lies in a wide valley, were at this time in blossom *Ephedra altissima*, Desf., *Lepidium latifolium*, L., *Althæa officinalis*, L., and *Vitex Agnus-castus*, L., in abundance.

Further eastwards, and separated from the Plain of Guadix by the Sierra de Gor, which is extremely poor in plants, but partly covered with fir-trees, is the broad gypsum basin of Baza, in the midst of which rises the Sierra de Baza, a perfectly isolated great rocky mountain, which I regret that I have not been able to visit. The limits of this plain, destitute alike of trees and water, and intersected by a thousand small valleys, are, on the south, the mountain-chains of Lucar and Serón, on the east the chains of Cullar, Oria and Periate, and on the north the lofty chains of Huescar and Cazorla, in which are the sources of the Guadalquivir. The town of Baza lies on the acclivity of a chain of sand-hills, on which *Santolina canescens*, Lag., flowers in great abundance, and near to the river of the same name, on whose sandy banks I gathered, under shrubs of *Tamarix gallica* and oleanders, *Frankenia pulverulenta*, L., and *Cynanchum monspeliacum*, L. As soon as the river is crossed, you enter on the so-called gypsum formation, the shining white ground is covered with a purely saline vegetation. Immense tracts were exclusively covered with *Macrochloa tenacissima*, Kth.; on other localities the flora consisted of a number of interesting plants, as *Lygeum Spartum*, *Obione portulacoides*, Mocq., *Frankenia thymifolia*, Desf.,

Ajuga Pseudo-iva, DC., *Lepidium subulatum*, L., the elegant *Helianthemum squamatum*, P., and the remarkable *Ononis crassifolia*, Duf., and also *Artemisia*, *Chenopodiæ*, and *Salsolacææ*.

The northern and eastern margin of this broad basin, which still belongs to the province of Granada, is formed by the lofty limestone range of the province of Almeria, whose average height is about 6000 feet, and whose branches stretch into the neighbouring kingdom of Murcia. Close to the boundaries of the kingdoms of Granada, Jaen and Murcia, lies the highest point of this many-branched chain, the Sagra de Huescar, nearly 8000 feet high, an immense conical limestone mountain, which is connected by a low thickly-wooded mountain-chain with three lofty limestone chains running west and east, the Sierra de Maria, Sierra de Velez-Blanco, and Sierra de Oria. The most important of these three mountain-chains, in a botanical point of view, is the Sierra de Maria, which, according to the trigonometrical measurement of Clemente, is nearly 7000 feet high; it takes its name from the hamlet of Maria lying at its north-eastern foot, where I staid for a week. This descends, like all mountain-chains going parallel to it, towards the north in steep rocks, and is covered on its northern base with woods of *Pinus Pinaster*, in which *Cistus laurifolius*, L., *Helianthemum halimifolium*, *Arctostaphylos Uva-ursi*, *Salvia officinalis* and other shrubs occur in great profusion. Of herbaceous plants, I found in these woods *Vincetoxicum nigrum*, Schult., *Teucrium Webbianum*, Boiss., *Nepeta Nepetella*, DC., *Rubia Tinctorum*, L., *Bunium Macuca*, Boiss., *Centaurea granatensis*, Boiss., in plenty; more rarely *Telephium Imperati*, L., and *Dictamnus Fraxinella*, L. In the shady rocky valleys of this side, especially in the romantic Barranco Agrio, stretching up into the alpine region, I again met with some alpine trees of the Sierra Nevada, namely *Lonicera arborea*, Boiss., *Sorbus Aria*, L., and *Acer opulifolium*, Vill., under whose shade on moist loose rocky soil *Geranium lucidum*, L., *Smyrnum perfoliatum*, Mill., and other umbelliferous plants, as well as the beautiful *Scopolina atropoides*, Schult., grew in luxuriant profusion. The clefts of the rugged limestone rocks of the alpine region were filled with thick beds of numerous alpine plants; amongst others, the delicate *Stachys circinnata*, L'Hér., *Hypericum Ericoides*, L., just beginning to flower, *Hieracium saxatile*, Vahl., a beautiful and perhaps new *Globularia* with woody stem and coriaceous, stiff, thorny-serrate leaves, an *Arenaria* with elliptical, grayish-green, almost succulent leaves and large white flowers, forming much interlaced and fragile patches, a stemless, white, woolly *Centaurea* with orange-coloured flowers, a *Silene*, and many others; and at the foot of the same rocks I observed *Senecio quinqueradiatus*, Boiss., *Rumex pulcher*, L., and the beautiful *Andryala Agardhii*, Boiss., in full flower. In shady clefts of the highest rocks I found *Erinus alpinus*, L., *Ptilotrichum longicaule*, Boiss., and a splendid *Saxifraga*, growing in most luxuriant beds, with large blossoms and succulent, serrate, viscous leaves; also on the highest ridges *Erodium trichomanafolium*, L'Hér., *Anthyllis Webbiana*, Hook., *Sideritis scordioides*, L., var. *vestita*, Boiss., *Arenaria tetraquetra*, L., and a number of alpine shrubs, as *Ptilotri-*

chum spinosum, Boiss., here constantly with white flowers; *Anthyllis Erinacea*, L., *Vella spinosa*, Boiss., *Genista aspalathoides*, DC., var. *confertior*, Boiss., and *Juniperus phœnicea*, L. On loose rocky soil and fields at the foot of the mountain-chain I remarked *Minuartia campestris*, Löffl., in plenty, *Lagacia cuminoides*, L., *Polygonum Convolvulus*, L., and various grasses. Almost the same, but a much poorer vegetation is found on the lower Sierra de Oria.

Between Maria and the lofty Sagra de Huescar, which I ascended on the 15th of June, is a wide, undulating, high table-land, destitute of water and trees, which presents only a few plants. I however gathered some rather scarce plants here in plenty, as the pretty *Jurinea pinnata*, DC. (*Stæhelina*, Lag.), *Thymus membranaceus*, Boiss., *Allium sphærocephalum*, L., a pretty *Onobrychis* and a beautiful large-blossomed *Lavatera*. Some low mountain-ridges, almost wholly covered with *Lavandula Spica*, have to be traversed before reaching the foot of the Sagra, on which lies the large hamlet of La Puebla de Don Fabrique, in whose neighbourhood occurs *Santolina pectinata* in plenty, and distant several miles from the Sagra, on which some fields of snow were still visible. This colossal mountain is on its southern and western acclivity up to half its height thickly wooded with firs, in whose shade I met with a pretty little *Campanula* on the loose vegetable soil. The whole of the upper portion of the mountain is entirely barren, and covered on almost all sides with loose limestone debris. The summit is formed of a narrow, grassy level, on which the remarkable rose-red *Senecio Boissieri*, DC., flowers in company with a *Paronychia*, *Anthyllis Webbiana*, Hook., and *Galium pyrenaicum*, Gou. On the rocks of the northern acclivity below the summit I gathered a small *Saxifraga* with *Valeriana tuberosa*, DC.; and upon barren limestone debris, almost wholly concealed among the loose stones, here and on the western acclivity, two peculiar plants in great profusion, namely a *Platycapnos* with nearly round heads of small flesh-coloured flowers and finely divided, grayish-green leaves, and a pretty stemless Cichoriaceous plant with almost spatulate long petiolated leaves, covered on both sides with a white wool, and a long stalked head of large blossoms of yellow flowers, on the underside of a carmine colour. On the debris of the southern acclivity occur the pretty *Scutellaria orientalis*, L., more frequent *Ptilotrichum spinosum*, *Vella spinosa*, *Anthyllis Erinacea*, and *Andryala Agardhii*.

About six miles east of Maria and a mile from Velez-Blanco rises a remarkable rugged mountain somewhat of the form of the Lilienstein in the Saxon Switzerland, which has the name of Muela de Montalbiche, and may be about 5000 feet high. This immense limestone rock forms the highest point and the most western abutment of a chain, the greatest part of which belongs to the kingdom of Murcia, and is only accessible from the western side. I ascended it on the 19th of July, and found here in the rocky clefts from the foot to the summit the elegant *Hypericum ericoides*, L., in great plenty; and moreover on the shady rocky walls of the upper part a small, half-shrubby, fragile, whitish-gray *Teucrium* forming patches,

together with *Sarcocapnos enneaphyllos*, DC., but rather scattered. Upon loose rocky soil on the acclivities of the mountain grew luxuriantly *Thymus membranaceus*, Boiss., and *Lavandula Spica*, L.; and on the extensive surface of the summit *Cerasus prostrata*, DC. Between the two mountain-chains of Velez-Blanco and Oria is a broad, barren and arid table-land, which descends toward the west into the gypsum basin of Baza, toward the east into the wide and fruitful valley of the Rio de Velez, and contains some miserable hamlets, affording scarcely the barest nourishment. Few plants are found in this country; but here grow luxuriantly *Centaurea granatensis*, Boiss., *Euphorbia serrata*, L., a *Barkhausia*, *Convolvulus lineatus*, L., *Thymus longiflorus*, Boiss., and especially the rare *Sideritis fatens*, Clem. in Lag. gen. and sp., somewhat frequent.

After crossing the Sierra de las Estancias, which presents a merely rocky and barren crest, a branch of the chain of Oria, and which runs east and west, forming the right wall of the valley of the river of Velez-Rubio, the ground sinks gradually more and more down toward the coast, which however is still above eight leagues distant. The whole of this south-eastern part of the province of Almeria, watered throughout by the Rio de Almanzora, is distinguished by its extreme barrenness, and the valleys alone yield the botanist any hopes of booty. Through the Rambla de las Carrascas, a valley now quite destitute of water, whose sides are covered in parts with vines, olives and fig-trees, I reached, near the little town of Huercal-Overa, the valley of the Almanzora, which is in summer only an insignificant rivulet. Huercal-Overa lies close to the northern foot of the bleak Sierra de Almagro, whose most western and lowest portion is intersected by the river. The mountain-chain consists of limestone, and appears to be very barren. Close behind the above-named little town, you enter the narrow, very rocky and picturesque valley, which is in parts well-cultivated. On sunny rocks I remarked here the rare *Lavandula dentata*, L., but already off flower, as well as a shrubby *Galium*, and on sand-hills the pretty *Brassica pendula*, Boiss. (*Sisymbrium pend.*, Desf.), in company with *Moricandia arvensis*, DC. Before reaching the little town of Cuevas-Overa, the river leaves the mountain-chain and hastens in numerous windings through a wide, flat and extremely beautiful valley toward the sea, which is distant scarcely four miles from Cuevas. The environs of Cuevas-Overa consist for the most part of gypsum, and have therefore, excepting some salt-plants, only a very poor vegetation. On the gypsum-hills, west of the town, there grows luxuriantly *Santolina viscida*, Lag., frequent; *Atractylis humilis*, L., occurs rare; whilst *Paliurus australis*, L., which I have followed up to the limits of Murcia and high up in the valley of the Almanzora, is very common in the whole country round. Six miles east of Cuevas, on the frontiers of Andalusia and Murcia, rises the Sierra Almagrera, which has latterly become so famous for its rich silver-mines—a mountain-range, scarcely 3000 feet in height, consisting of graywacke and clay-slate, the most eastern point of Andalusia. The vegetation of this chain, which I visited on the 21st of July, reduces itself to a small number of salt-plants,

as *Frankenia thymifolia*, Desf., which overgrows a great part of the Sierra, two species of *Salsola*, a *Statice*, *Artemisia campestris* and *A. Barrelieri*, &c. *Paliurus australis*, already mentioned, is also found throughout the chain in great plenty.

Through the centre of the province of Almeria runs a broad, lofty mountain-chain, the chief direction of which lies from N.W. to S.E., separating the two wide valleys of the Rio de Almanzora and the Rio de Almeria. The first of these rivers divides this mountain-chain from those of Seron, Lucar, Oria, and the frontier chains of Murcia; the other, on the contrary, from the Sierra de Gador and the eastern part of the Sierra Nevada. The chief portion of this range is formed by the Sierra de Filabres, which consists of the same gneiss that composes the lofty mountain-range of the Sierra Nevada, and is separated by a high plain from the Sierra de Aljamilla, which probably consists of limestone, and terminates in the immense porphyry rocks of the Cabo de Gata. I traversed the highest part of the Sierra de Filabres on my way back from Cuevas to Granada, after I had gone up the valley of the Almanzora as far as the little town of Purchena, where *Statice globulariaefolia*, Desf., occurs in great plenty. The Sierra de Filabres, whose highest point is the Teta de Vacares, rising nearly 7000 feet, forms broad, gently rounded summits; but it does not appear to be very rich in plants. It however possesses many plants which had hitherto only been met with in the Sierra Nevada, as *Adenocarpus decorticans*, Boiss., *Lavandula lanata*, Boiss., and others; also *Teucrium capitatum*, L., *Satureja montana*, L., *Thymus hirtus*, W., *Scabiosa tomentosa*, Cav., *Onopordon acaule*, L., *Cirsium flavispina*, Boiss., *Marrubium sericeum*, Boiss., *Bupleurum spinosum*, L., *Berberis vulgaris* var. *australis*, and on the summits the common alpine shrubs, *Ptilotrichum spinosum* and *Anthyllis Erinacea*.

Between the valley of the Rio de Almeria and the Plain of Guadix lies a gently sloped range of hills, which connects the Sierra Nevada with the Sierra de Gor, and belongs to the district of El Marquesado, by which name the plain along the north-eastern foot of the Sierra Nevada is known. This broad ridge is almost destitute of vegetation, but it has one rare plant, *Eurotia ceratoides*, C. A. M., which occurs here in great plenty.

After my return to Granada, I made the last excursion to the Sierra Nevada, at the beginning of this month, in which I again penetrated to the Corral de Veleta, and a second time ascended the Picacho de Veleta. The visit to the Corral was, from the immense masses of snow, under the icy covering of which the swollen alpine streams poured down, accompanied with some danger, but it repaid the risk and toil. Beside a great number of the plants I had gathered in the snow-region the previous year, I brought back from these two excursions some also which I had not before found, as for instance *Dianthus lusitanicus*, Brot., which occurs very plentifully on the gneiss rocks of the Barranco de Gualnon, *Aretia Vitaliana*, L., *Senecio Boissieri*, DC., *Cirsium odontolepis*, Boiss., *Sedum anglicum*, L., var. *rivulare*, Boiss.; and from the highest summit of the

Picacho de Veleta some specimens of the extremely rare *Linaria glacialis*, Boiss., and several grasses, among others *Trisetum glaciale*, Boiss., and *Festuca Clementei*, Boiss.

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A History of the Fossil Insects of the Secondary Rocks of England.

By the Rev. P. B. BRODIE, M.A., F.G.S. London, 1845, 8vo.

A REMARKABLE proof is afforded by the present work of the mode in which geology calls in to its assistance the different natural sciences. Few would have supposed that entomology could have been made to perform its part in the elucidation of the ancient physical history of our planet, but here we have a work presented to us in which beautiful representations, from the pencil of Mr. Westwood, of very many fossil insects are contained. Portions of nearly all the orders have been found. By far the greater number of the specimens consist of the wings and elytra only, but in some instances, especially amongst the *Diptera*, the insect is presented to us in a nearly perfect state.

The fossils are derived from several strata. The first locality noticed by the author is in the Purbeck strata in the Vale of Wardour in Wiltshire. He there finds very numerous specimens and species, chiefly however confined to a thin bed of limestone. He remarks that "the remains of insects are so abundant, and present such a variety of genera, that we are in this instance forcibly reminded of the rich collection of these beautiful fossils in the more modern deposits of Aix and Æningen." The *Coleoptera* seem to have been abundant, but very few perfect beetles were found, single elytra being of most frequent occurrence. Amongst them are species both terrestrial and aquatic, herbivorous and carnivorous, of the families *Buprestidæ*, *Carabidæ*, *Curculionidæ*, *Chrysomelidæ*, *Elateridæ*, *Cantharidæ*, *Tenebrionidæ* and *Helophoridæ*. Of the other orders, specimens of *Orthoptera*, *Neuroptera*, *Hemiptera* and *Diptera* occur. We would more especially mention a nearly perfect *Acheta* and very numerous *Tipulidæ*.

We are next introduced to a few imperfect specimens, but apparently belonging to several genera from the Stonesfield slate in Gloucestershire, a numerous list of the other fossils from which is given. A few also occur in the Oxford clay and forest marble, which, together with the Stonesfield slate, are the only strata between the Purbeck and lias rocks in which remains of insects have been discovered in England.

In part of the lower lias of Gloucestershire, a few thin beds of limestone are found to be richly stored with fossil insects; "the total number of specimens submitted to Mr. Westwood amounts to 300." He detected many *Coleoptera* of the families *Buprestidæ*, *Elateridæ*, *Curculionidæ*, *Chrysomelidæ*, *Carabidæ*, *Telephoridæ*, *Dytiscidæ*, *Gyrinidæ* and *Melolonthidæ*; also *Orthoptera*, *Hemiptera*, *Homoptera*, *Neuroptera* (including several beautiful dragon-flies), and one species of *Diptera*.

The author gives a detailed account of the geological position of the insectiferous strata, and states that "one object of the present imperfect sketch has been to show the value and importance of even *minute* investigations, in elucidating the conditions under which certain strata were deposited, and more especially to point out the existence of many of those fragile but beautiful forms of animal life which tenanted our earth at very early geological periods. Our minds are so constituted that we readily admire everything grand or sublime in nature; but we are apt to overlook those small and less striking objects, which are, in fact, equally worthy of our observation and regard."

We strongly recommend Mr. Brodie's work not only to our geological readers, but also to entomologists and other naturalists, and will conclude by quoting a portion of his last paragraph, in which we need not add that we fully concur:—"In all our labours and reasonings it should never be forgotten that every examination into the wonders and beauties of God's creation, whilst it increases our knowledge and improves the understanding, has also a far higher and better purpose in displaying the glory of God, and in leading us to adore and praise the wisdom and omnipotence which are daily displayed in the material world."

Flora Calpensis: Contributions to the Botany and Topography of Gibraltar and its neighbourhood. By E. F. KELAART, M.D. London, 1846. 8vo.

In his 'Voyage Botanique dans le Midi de l'Espagne,' it is observed by Boissier, when writing about Gibraltar, that he is "astonished that such a work (a flora) has not already been undertaken by some of the officers of the garrison." Such astonishment cannot in future be expressed by botanists visiting this singular place, for we have now before us a work of very high character by "one of the officers of the garrison." Dr. Kelaart has availed himself of the knowledge which he obtained of the delightful science of botany during his studies in the University of Edinburgh, by employing that leisure time which his medical duties permitted in carefully exploring the rock of Gibraltar, and has now published a list which will be found highly valuable to the botanical geographer, and doubtless lead to a very complete acquaintance with the vegetable productions of "the rock."

The author appears to have made full use of the labours of former botanists who have visited Gibraltar, more especially of the account published by Boissier in his above-quoted work. He also refers to Willkomm's notice of his visit, a translation of which will be found in these 'Annals' (xvii. 118). In his Introduction the author remarks, that "the comparative botanist will find among the plants of Spain many which are also common to the Mediterranean coasts of Africa and Asia Minor. In this respect Gibraltar, being only a portion of the Peninsula, affords an opportunity of showing the extent of this similarity, and I have endeavoured to exhibit it in the habi-

tats given to the plants in the Synopsis." This seems to us a very valuable addition to the list of species, showing at a glance the countries in which each plant has been observed. Dr. Kelaart enumerates 456 species of flowering plants and ferns as native to Gibraltar; of these he considers forty as generally distributed in Europe; fifty-eight as South-European; sixty-three as common to Europe and Africa; 174 common to the South of Europe and Africa; thirteen confined to Spain and Barbary; ninety-six common to Europe, Asia Minor and North Africa; and twelve confined to Europe and Asia Minor. There are 140 British species, 170 Madeira; about as many Canary species, 160 Sicilian, about two-thirds Maltese, and seventy-three Azorean. The *Iberis gibraltatica* is the only species peculiar to the rock, although several others derive their names from it.

The volume is divided into four parts: Part I. gives a very full and interesting account of the Topography, including observations on the geology (in which the author deplors that the publication (Journal of the Geolog. Soc. ii. 41) of the valuable geological account of Gibraltar by Mr. Smith of Jordan Hill did not take place until the greater part of his work was printed), climate and medical statistics. Part II. is a general account of the Botany. Part III. contains the Synopsis of Plants growing in Gibraltar. Part IV. the Botany of the neighbourhood of Gibraltar. And in the Appendix is Boissier's account of his visit and the descriptions of new plants found by him. The illustrations consist of three interesting views of the rock and a small map: we could wish that another map, on a larger scale, had been added.

We can cordially recommend Dr. Kelaart's book. We have often wondered that so few of the enthusiastic young botanists found amongst the medical students of Edinburgh and other schools have done anything to advance scientific botany, although the employment of many of them in the army or navy cannot but afford them numerous opportunities. We trust that they will follow Dr. Kelaart's example.

WORKS JUST PUBLISHED.

Outlines of Structural and Physiological Botany. By A. HENFREY, F.L.S. Part I.

"The chief object of this work," observes the author, "is to give a concise view of the actual state of our knowledge at the present time, to the exclusion of all hypotheses, hazarded without sufficient ground or negated by experience. The various points are treated as they rise progressively in complexity; by this means the development and morphology of structures and organs will be more easily explained, and at the same time will conduce to the simplification of the subject, by leading to the recognition of an unity of plan throughout the Vegetable Kingdom."

PROCEEDINGS OF LEARNED SOCIETIES.

LINNEAN SOCIETY.

November 18, 1845.—The Lord Bishop of Norwich, President, in the Chair.

Dr. Lankester exhibited specimens of a *Fucus* sold in the London shops under the name of "Australian Moss," of which he also furnished a brief notice. On referring to Sir W. J. Hooker, Dr. Lankester obtained for it the name of *F. stiriatus*, Turn. ; but a comparison with a specimen in the Linnean Herbarium marked *F. stiriatus* by Mr. Turner himself, and with Mr. Turner's description in the 'Historia Fucorum,' has induced Dr. Lankester to regard the Australian moss as distinct. He believes it to agree better with *F. spinosus*, L. It is brought from Swan River, where it grows on rocks washed by the sea, and is composed principally of Lichenin, a form of starch which also constitutes the bulk of such gelatinous plants as Iceland Moss, Carrageen Moss, Ceylon Moss, and the *Gelidium* used by the *Hirundo esculenta* in the formation of its nest. Its dietetical and medicinal qualities strongly resemble those of the Carrageen Moss (*Chondrus crispus*, Lyngb.).

Read a paper "On the Natural History, Development, and Anatomy of the Oil Beetle, *Meloë*, more especially *Meloë cicatricosus*, Leach." By George Newport, Fellow of the Royal College of Surgeons, &c. Communicated by the Secretary.

Mr. Newport commences his paper with the remark, that although the genus *Meloë* includes some of the most common insects, scarcely anything has yet been ascertained respecting their œconomy, which, hitherto, has remained one of the most difficult unsolved problems in the natural history of the *Articulata*. Many naturalists, more particularly Goedart, Frisch and DeGeer, have well described the perfect insect, and have even given detailed observations on the oviposition of the female and the early stage of the larva, but they have invariably failed to carry their inquiries further, and have been quite unacquainted with the adult larva and the nymph, as well as with the early stage of the imago. This deficiency in our knowledge of the history of these common insects is attributed to two causes—first, the anomalous habits of the insect in its earliest stages; and secondly, the little credit that has been given to the statements of former observers, whose accounts Mr. Newport verifies in almost every particular.

Mr. Newport commenced his observations on the habits of *Meloë* about fifteen years ago; but although he succeeded at that time in rearing the larva from the egg, as had been done by Goedart and DeGeer, and soon afterwards obtained the full-grown larva, the nymph and the imago, before it left its cell, he has never been able to obtain the larva in a stage intermediate between its earliest and its full-grown condition; and on this account he has delayed to publish a statement of what he already knew of the natural history of these singular insects.

The species on which Mr. Newport has made his investigations are *Meloë violaceus*, *Meloë proscarabæus* and *Meloë cicatricosus*, all which he has procured at Richborough near Sandwich in Kent. The first two of these species come forth about the middle of March, and the latter from ten days to a fortnight later in the season. They feed chiefly on the buttercup (*Ranunculus acris*), and one species, *M. cicatricosus*, also on the dandelion.

When the Meloës first appear they are feeble, and have the body very small and contracted. In the course of a few days they become more active and are increased in size. They expose themselves much to the sun, and pair in the middle and warmest part of the day. On the 8th of April 1830, the author first observed a female preparing to deposit her eggs, and he has since had numerous opportunities of observing her thus occupied. She excavates a burrow, to the depth of about two inches, beneath the roots of grass in a dry soil exposed to the sun, usually at the side of a foot-path. Into this burrow she passes her body backwards, and having deposited a large packet of yellow-coloured cylindrical eggs, she closes up the burrow with earth and begins again to feed. Each female deposits eggs from three to four times during the season, at intervals of from one to two or three weeks. The greatest number are deposited at the first laying, and fewer at each succeeding laying. In order to ascertain the number deposited at the first laying by *Meloë proscarabæus*, Mr. Newport removed the ovaries from a specimen that had recently been impregnated, and having divided one ovary into pieces counted the number of eggs in each under the microscope, and found that one ovary contained 2109 eggs ready for deposition; so that the two ovaries contained the astonishing number of 4218 mature eggs, besides an almost equal number in the course of formation.

The structure of the egg, the membranes of the shell and embryo, the manner in which the embryo is liberated from the egg, the length of time it has remained in the egg state, and the circumstances which affect its development are then minutely detailed; as well as the changes produced in the instinct of the unimpregnated female.

The larva of *Meloë*, as it comes from the egg, is a yellow, slender, active little hexapod, scarcely one-twelfth of an inch in length. It attaches itself with great readiness to bees and flies, and clings so securely to them, that the insects are not able to remove it from their bodies, as was noticed in several experiments. These facts confirm the observations of Goedart and DeGeer, who first bred the larva from eggs deposited by *Meloë*.

The structure of the larva is next described, and compared with that of the *Pediculus apis* of Linnæus, as found on Hymenopterous insects, and the two are shown to be identical in every particular. The *Meloë* larva is also compared with the *Pediculus Melittæ* of Mr. Kirby, with which also it agrees exactly in form and general structure, but differs in colour, that of the latter insect being always black, while the larva of *Meloë* is yellow. From this circumstance

the author concludes that Mr. Kirby's insect is the larva of some species of another genus of the same family.

The habits of the larva of *Meloë* are then investigated, and the effects produced on it by exposure to light are minutely detailed. When light was totally excluded the larvæ remained perfectly quiet for several days, but the instant light was admitted they were in motion, travelling rapidly in a direction towards it. The experiments were made by enclosing larvæ in a phial, which was inverted and turned in opposite directions. When the phial was placed perpendicularly they invariably ascended to the top, and when placed in a horizontal direction they always ran to that end which was nearest the light, even when the stopper around which they had been lying was removed to allow of their escape. This influence of light Mr. Newport conceives may be that which induces them to ascend the yellow flowers of the dandelion and buttercup preparatory to their attaching themselves to bees that alight on the flowers to collect pollen, and which then carry them into their nests. This seems to be the object of their attacking the bees, to be carried to the nest where they are to reside as parasites, and subsist on the food stored up for the bee-larva, and not to prey on the bee itself.

The full-grown larva of *Meloë cicatricosus* is then described, and also the nymph and the imago. The author has found the insect in those stages in the nests of *Anthophora retusa*; but he has not hitherto succeeded in his attempts to rear the young larva of *M. violaceus* and *M. proscarabæus* in the nests of that insect. He concludes, therefore, that these species inhabit the nests of some other bees. In the stage between the very young and the full-grown period the larva is believed to be active and retain its six scaly feet, and to feed on the food prepared for the young bee. In its full-grown state the legs of the larva are reduced to six short tubercles. The insect is then very fat, inanimate, and of an orange-yellow colour, has ten pairs of spiracles, and greatly resembles the full-grown Hymenopterous larva. It remains but a short time in this condition before it changes to a nymph, and soon afterwards to an imago, in which form it passes the winter in a state of hibernation and comes forth in the spring.

In the course of this paper, while detailing the influence of light on the larva of *Meloë*, Mr. Newport stated that he had been led by these and other facts, which showed the great influence of light on the instincts of the young animal, "to regard light as the primary source of all vital and instinctive power, the degrees and variations of which may, perhaps, be referred to modifications of this influence on the special organization of each animal body." This view has suggested itself to him in connexion with the discovery recently made by Mr. Faraday of the analogy of light with magnetism and electricity, and the close relation, previously shown by Matteucci to exist between electricity and nervous power, on which not only all the vital actions, but also the instinctive faculties seem to depend.

December 2.—E. Forster, Esq., V.P., in the Chair.

Read a paper "On the Anatomy of *Eriocaulonea*." By the late William Griffith, Esq., F.L.S. &c. Communicated by R. H. Solly, Esq., F.R.S., L.S. &c.

The observations on which this memoir (written at Calcutta in 1835) was founded, were made at Mergui between the months of July and October 1834. The species examined were natives of that place, and six in number. They appear to be destitute of true spiral vessels, the place of which is supplied by ducts occasionally, but not freely, unrollable, aggregated in distinct fascicles and surrounded by more or less elongated cells.

Mr. Griffith describes the leaves of *Eriocaulon setaceum*, L., as the type of these organs in the genus, since they are in it reduced to the simplest state. They are submerged in this species, and the peduncles and their sheaths only rise above the surface of the water. The leaves are subulate, somewhat flattened and colourless below, green on their upper surface, and divided throughout their entire length into two distinct collateral tubes, by means of the central and only nerve which is attached both to the superior and inferior cutis by cellular tissue. Numerous transverse septa of cellular tissue divide each tube into chambers, which, however, have free communication with each other through fissures dependent on a partial separation of the cells. The green parenchyma is almost entirely confined to the upper half of each tube, and ceases abruptly without any apparent cause. It consists of a single layer of colourless oval or roundish sacs, arranged with the most beautiful regularity in longitudinal lines extending from the base to the apex of the leaf, and corresponding with the bodies of the cells forming the cutis and not with the intervals between them. The stomata are confined to the under halves of the leaves, or to that portion of the tubes which is destitute of parenchymatous tissue.

In the terrestrial species the structure of the leaves is essentially the same, but the number of longitudinal tubes is increased, and varies from six to twenty, the central ones only reaching the apex of the leaf. The longitudinal divisions between these tubes are marked externally by corresponding depressions, and each is furnished with a vascular fascicle similar in structure and position to that of *E. setaceum*. The parenchymatous cells are arranged with less symmetry than in that species, and are not so completely confined to the upper surface; and the lower surface abounds with stomata.

The sheaths which envelope the base of the peduncle have in all the same organization, which is exactly that of the leaves of the terrestrial species. The peduncles are also composed of tubes, circularly arranged; they are marked externally with elevated whitish lines, which (in the living plant) have a slightly spiral direction from left to right, and correspond to the longitudinal septa. The tubes meet in a cellular axis, around which the vascular fascicles are arranged in corresponding number; and the septa form so many spokes consisting of more or less elongated cellular tissue, which in

one species (*E. Wallichianum*) approaches in density to woody fibre. The parenchyma within the tubes is disposed with less regularity than in the leaves and sheaths, and their outer green parietes abound with stomata. With one exception, the number of tubes in the sheaths bears an exact relation to that in the peduncles of two to one.

The author describes the cavities existing in some *Alismaceæ*, *Pontederiacæ*, *Cyperaceæ* and *Nelumbineæ*, as originating in the same manner as the chambers in the tubes of *Eriocaulon*, from the interposition of cellular septa perforated by fissures caused by the separation of the cells and not by any interruption of the membrane. In *Pontederia dilatata* raphides are found in great abundance in cells attached to the septa in such a manner as to project at right angles beyond either surface, and to occupy the spaces left by the separation of the ordinary cells. The same disposition occurs in some *Aroideæ*.

The existence of stomata in the submerged leaves of *E. setaceum* is mentioned as rather corroborating than weakening the general rule laid down by M. Adolphe Brongniart, that submerged leaves are destitute of cuticle. The stomata of *Eriocauloneæ* are described at length, and regarded as offering excellent examples of the correctness of M. Brongniart's statements with regard to the nature of these bodies. Their aperture communicates directly with the interior of the leaves, and is invariably occupied by air; the communication in *E. setaceum*, and in two other species in which the parenchyma is confined to the upper surface, being uninterrupted; while in the leaves of those species in which the parenchyma is deposited on the lower as well as the upper cuticle, there is invariably an open space left in it, corresponding with each stoma, and this opening appears always to be occupied by a bubble of air. The author states, however, that he is far from considering it proved, that such a free communication through the stomata, although the same structure is obvious in other plants belonging to different families, is universally present.

As *Xyrideæ* present none of the peculiarities of organization above mentioned, Mr. Griffith considers these peculiarities as corroborative of the correctness of Richard's opinion, since adopted by Professor Von Martius, that *Eriocaulon* is the type of a distinct family.

December 16.—E. Forster, Esq., V.P., in the Chair.

Read a memoir "On the causes of disjunctions of Vegetable Substance, especially those which are horizontal." By the Rev. William Hincks, F.L.S. &c. &c.

After some preliminary observations on the subject of disruptions in general, the author briefly notices certain cases of vertical disruption, and then proceeds to the more immediate object of his paper, the horizontal separation of vegetable substance by natural means. This, he observes, may take place in the axis itself, or in any of the organs connected with it at their points of attachment, as in the fall of the leaf, of sepals and petals, of entire flowers and fruits, and in the separation of such buds as form caulinary bulbs; or it may occur

at some other part of the organ, a portion separating from the rest, or the whole breaking up into pieces. Every such separation, he argues, must depend on one of the three following causes: 1. on a stoppage of the circulation from ligature; 2. on unequal rapidity of growth of the two parts; or 3. on the confinement within coherent envelopes (which do not admit of extension) of a portion of the axis or of some growing part, so that the force of growth bursts the envelope, carrying off its upper portion. These general rules he then proceeds to apply to the explanation of particular cases.

Of stems usually termed Articulate, some, such as those of *Kleinia articulata*, have no tendency to disruption at the supposed joint, which is merely the commencement of a new branch. In the misletoe, on the other hand, the author believes that the tendency to divide at the bases of the branchlets may be consequent on the dichotomous structure, which causes a pressure equivalent to a ligature at the point of division.

With respect to the fall of the leaf, he refers to the observations of DeCandolle and Du Petit Thouars, which he does not think sufficient to account for that phænomenon in a multitude of cases, but regrets that he can throw no additional light on the subject. He attributes the separation of the sepals and petals when they are caducous, to the outward pressure occasioned by the more rapid development of the interior circles stopping the circulation of the fluids, and conceives this to be strikingly exemplified in *Papaveraceæ*, where the growth of the petals within the bud is great and rapid. He notices a specimen of *Eschscholtzia* in which the sepals cohering less firmly than usual, the calyx, instead of being thrown off in the form of a calyptra, remains after the opening of the flower partially adhering; and observes that the ordinary disruption in this genus takes effect, not at the base of the sepals, but at a point above this, where the pressure occasioned by the enlargement of the petals is greatest. He instances also the genus *Eucalyptus*, in which there is a strong coherence of the sepals, and the lower portion of the calyx being strengthened by the adherent torus, the growth of the interior organs supplies the force which separates the part of the coherent sepals above the torus in a solid piece like the cover of a vessel. On the cause of the horizontal separation of a portion of the anthers in the form of valves, which occurs in a few instances, he is not prepared to offer any opinion.

In the fruit, as in the calyx, the author believes that horizontal disruption arises from the force of cohesion of the parts of the circle, the absence of any of the causes favourable to dehiscence along the midrib of the carpellary leaf, and the operation of some force pressing either from without or from within on one particular line encircling the fruit; and he proceeds to offer explanations of those cases with which he is most familiar. He takes first the circumscissile capsule of *Anagallis*, in which he states that the central free receptacle with the seeds upon it continuing to enlarge in both diameters after the envelope has ceased to grow, and having occupied from the first the entire cavity, it is naturally to be expected, since the chief

extension of the interior parts is upwards (the natural direction of growth), while the enlargement of the seeds in the lower half tends to press back the parts of the lower hemisphere, that uniform and regular pressure will resolve a nearly spherical capsule into two equal hemispheres. This remark he applies to *Centunculus* also, but confesses himself at a loss to give any reason why the opening of *Trientalis*, which depends on the same general causes, should be irregular. For the separation of the lid of the capsule in *Hyoscyamus* he accounts by the contraction and rigidity of the throat of the calyx exercising a gradually increasing pressure around the upper part of the capsule, and thus causing its separation by the first of the general principles laid down.

The author then proceeds to the case of *Lecythis*, which he thinks is to be explained by the third of his general principles. In illustration of his principle he refers to a monstrosity, of the common Tulip, described and exhibited by himself some years ago at a meeting of the British Association. In this monstrosity, the upper leaf, being unusually developed, has cohered by its edges so firmly as to imprison the flower, and this constraint occurring at a period when the stalk was increasing in length, and previous to any considerable enlargement of the flower-bud, the force applied was chiefly vertical, and has carried off the upper part of the leaf in the form of a calyptra, leaving the lower part in the shape of a cup, from the centre of which the stem appears to rise. The separation of the lid of the capsule of *Lecythis* he believes to be effected in an analogous manner; the septa which form the two or four cells into which the fruit is divided meet in a thickened axis, and the outer part of the fruit becoming (partly from its natural texture and partly from the adherence of the torus and calyx) hard, solid and fully grown, while the axis continues slowly to extend, and thus to press upwards that portion of the capsule which rests upon it, causes that portion first to become slightly prominent, and finally by a strain upon the vessels of that particular part to fall off in the shape of a lid. In *Couroupita* the pressure is sufficient to mark the surface of the fruit with a prominence, but from the partitions giving way early, and from the abundant juices produced in the interior, there has not been, he conceives, sufficient pressure to occasion disruption. In all the species of *Lecythis*, he observes, the extent of the loose cover corresponds with the extent of the axis, and what remains of the latter continues attached to it.

As regards lomentaceous fruits in general, the author believes that the intervals between the seeds being sufficient to admit of the sides of the fruit cohering (which is promoted in particular instances by special causes), the swelling of the seeds afterwards stretches the parts over them in a degree which this coherence prevents from being equally distributed, drags the tissue forcibly from the junctures which are fixed points, and thus there being a strain in each direction from the middle line of the juncture, the contraction of drying during the ripening of the fruit effects the separation.

Finally the author refers to the horizontal separations in the cap-

sules of *Mosses*, and observes that the separation of the calyptra affords a plain example of the operation of his third principle; but with regard to the nature of the operculum, although he has an hypothesis under consideration, his mind is not yet satisfied. He states his object in the present paper to have been the investigation of the immediate physical causes of certain known effects, but he has not thought this the place even to touch upon their ultimate causes or the ends to accomplish which they are apparently designed, and which adapt them to the position and general structure of the particular plant.

—Read also the conclusion of Dr. J. D. Hooker's "Enumeration of the Plants of the Galapagos Islands, with descriptions of the new species."

In a brief introduction Dr. Hooker offers his acknowledgements to Mr. Darwin, by whom the collection on which this enumeration is chiefly founded was made, and to Prof. Henslow, in whose charge the collection had been placed, and who kindly relinquished his intention of publishing the novelties contained in it in favour of the author. He also notices the striking peculiarities which mark the flora of the Galapagos group, the plants composing which not only differ in a great degree from those of any other country, but are in many cases peculiar to the separate islands, although in those instances frequently representatives of others which are found on different islands.

The number of species enumerated is two hundred and twenty-eight. Of these upwards of a hundred are described as new, and six new genera are established, the characters of which are given as follows:—

Ord. BORAGINEÆ.

Gen. GALAPAGOA, *Hook. fl.*

Calyx 4-5-partitus; laciniis linearibus. *Corolla* infundibuliformis; tubo lato; limbo 5-fido patente; fauce nudâ. *Stamina* 5, inclusa, imo corollæ tubo inserta. *Ovarium* 4-loculare. *Stylus* terminalis, ad basin usque bipartitus; stigmata 2, obtusa. *Semina* pendula; albumine parco, carnoso; cotyledonibus planis; radiculâ majusculâ, superâ.—*Herbæ Insularum Galapagos, hispido-pilosæ. Caules prostrati, ramosissimi. Folia alterna, coriacea, versus apices ramulorum densissimè conferta. Flores parvi, in axillis foliorum omninò sessiles, valdè inconspicui.*

Obs. Genus *Ehretiearum* inter *Coldeniam* et *Rhabdium* (secund. clariss. Bentham) medium, ob stylum bipartitum staminaque fundo corollæ inserta singulare.

Ord. SOLANEÆ.

Gen. DICTYOCALYX, *Hook. fl.*

Calyx cylindraceus, 5-fidus; lobis acutis; tubo post anthesin subinflato, membranaceo, reticulatim venoso. *Corolla* membranacea, subinfundibuliformis; tubo gracili gradatim supernè ampliato; limbo plicato, brevi, vix explanato. *Staminum filamenta* elongata; antheræ inclusæ. *Ovarium* disco carnoso insertum; stigmatè capitato. *Capsula* evalvis, indehiscens, bisulcata, incompletè 4-locularis, calyce ventricosò inclusa. *Semina* plurima, majuscula, tuberculata, dissepimenti medio prope angulum parietalem affixa; testâ nitidâ, obscurè granulatâ. *Embryo*

arcuatus.—Herbæ Americanæ, repentes, glanduloso?—pubescentes, cum tribu Daturearum, suadente Clariss. Mierns, conferendæ. Folia membranacea, angulata v. sinuata, subopposita v. bina. Flores axillares.

Ord. COMPOSITÆ.

Gen. DESMOCEPHALUM, Hook. fl.

Capitula in axillis foliorum densissimè congesta, monoica, 6-flora; floribus 3 fœmineis ligulatis, cæteris masculis tubulosis. *Involucrum* compressum; foliolis 3–5 inæqualibus. *Receptaculum* minimum, epaleaceum. *Corolla fœminea* tubo brevi, lato, piloso; ligulâ latâ, involutâ, bifidâ: mascula 4-fida, dentibus extûs hispido-barbatis. *Antheræ* ecaudatæ. *Stylus* floris masculi indivisus, acutus; floris fœminei in ramos 2 elongatos desinens. *Achenium* latè obcuneatum, compressum, subtrigonum, supernè pilosum, foliis involucralibus immutatis tectum.—*Genus* Elviræ affine. Radix annua. Caulis pedalis, herbaceus, teres, erectus, a basi trichotomè divisus; ramis ascendentibus pubescentibus. Folia opposita, petiolata, ovata, obtusa, duplicato-serrata, coriacea, suprâ scabriuscula, nitida, subtûs pubescentia, nigricantia. *Capitula axillaria, densissimè congesta, massam depresso-sphæricam semunciam latam efformantia. Involucrum foliola latè ovata, acuminata, hispida. Corolla valdè inconspicua.*

Gen. MICROCÆCIA, Hook. fl.

Capitula axillaria, pauca, valdè compressa, monoica, subtriflora; floribus fœmineis ligulatis, masculis tubulosis. *Involucrum* compressum, 3–4-foliolatum; foliolo unico latè obovato, unilaterali, cæteris parvis collateralibus. *Receptaculum* minimum, epaleaceum. *Corolla* floris fœminei tubo gracili; laminâ rotundatâ, obscurè crenatâ: floris masculi 4-fida; tubo supernè ampliato; segmentis extûs barbatis. *Antheræ* semi-exsertæ, ecaudatæ. *Stylus* floris fœminei in ramos 2 elongatos desinens; floris masculi indivisus. *Achenium* cuneatum, compressum, obscurè trigonum, parcè pilosum.—Herba pusilla, repens, scaberula; ramis gracilibus, ascendentibus. Folia opposita, petiolata, rigidula, ovata, acuta, serrata, suprâ hispida, subtûs cana, venis prominulis. *Capitula minima, breviter pedicellata. Involucrum foliolum exterius planum, acuminatum, nervosum, marginibus basi involutis. Flores exserti, flavi.*

Gen. MACRÆA, Hook. fl.

Capitulum multiflorum, heterogamum, radiatum; floribus radii squamis involucrum tectis, paucis, 1-seriatis, fœmineis; disci tubulosis. *Involucrum* hemisphærici squamis sub-2-seriatis, disco brevioribus. *Receptaculum* convexum, paleaceum; paleis deciduis flores involucrantibus. *Corolla radii* tubo brevi gracili, ligulâ latâ bifidâ; disci tubo 4-fido, dentium marginibus incrassatis. *Antheræ* breviter appendiculatæ. *Stylus floris radii* in ramos duos obtusos desinens; disci ramis cono latiusculo terminatis. *Achenium* obovato-cuneatum, compressum, trigonum, hispidum, pappo brevi e squamis paucis ciliatis coronatum.—*Genus* Heliosideis relatum. Frutex; ramis erectis virgatis, nodosis. Folia in ramis abbreviatis fasciculata, rigida, linearia, integerrima, pilosa, suprâ nitida, marginibus revolutis. Pedunculi folia superantes, graciles, sericei. *Capitula spherica. Flores flavi, radii pauci. Receptaculi paleæ lineares, apicibus incurvis acuminatis, dorso hispidis.*

Ord. Incert.

Gen. PLEUROPETALUM, Hook. fl.

Calyx persistens, bipartitus; sepalis latè ovatis. *Petala* 5, subæqualia,

libera, concava, coriacea, siccitate multicostata. *Stamina* 8, toro inserta; filamentis in tubum membranaceum coalitis; antheris elongatis, ovarium vix superantibus. *Styli* 4, lineares. *Ovarium* 1-loculare, pluriovulatum; ovulis placentæ basilari funiculis elongatis adnexis.—Suffrutex? *perennis, glaberrima, siccitate nigricans*; ramis *teretibus, stric-tis, apicem versus foliosis*. *Folia petiolata, patentia, elliptica, utrinque attenuata, longè acuminata, integerrima*. Flores in *paniculas breves, paucifloras, terminales dispositi, breviter pedicellati, inconspicui*. Calyx *parvus, carnosus*. *Petala majuscula*.

Obs. Genus nulli ordini arctè affine, habitu *Phytolacæ*.

January 20, 1846.—R. Brown, Esq., V.P., in the Chair.

Read a memoir “On the Structure of the Ascidia and Stomata of *Dischidia Rafflesiana*, Wall.” By the late William Griffith, Esq., F.L.S. &c. Communicated by R. H. Solly, Esq., F.R.S., F.L.S. &c.

This paper bears date at Mergui, November 7th, 1834. In it the author gives a detailed description of the arrangement, form and structure of the ascidia of the species of *Dischidia* above-named, and comes to the conclusion that they are modified *laminæ* of leaves, in proof of which he adduces: 1st, their similarity in texture, internal structure, and structure of stomata with the limbs of the ordinary leaves; 2ndly, the slight but constant tendency in the limb of the leaves to assume an involute form; 3rdly, the occurrence of an imperfectly transformed pitcher, in which the body of the pitcher is clearly referable to the limb of the leaf; and 4thly, the general construction of the petioles in *Asclepiadææ*, which renders it more natural to refer the ascidia to the limb of the leaf in that family. He regards the inner surface of the pitcher as corresponding with the upper surface of the leaves; and is confirmed in this view by the greater abundance and development of the stomata on those surfaces. On the lower and outer surfaces the stomata are more or less imperfect; but on the upper and inner they show a considerable degree of complexity. They are particularly remarkable for the existence of an external cellular *bourrelet* or thickening, much elevated above the surface and of a whitish colour, giving rise to an appearance of minute white dots, which are especially conspicuous on the purple inner surface of the ascidia. They appear to have a very slight connexion with the cuticle, from which they are easily detached, and are not met with on old ascidia. Each *bourrelet* is composed of from three to five cells, assuming the appearance of a cup-shaped gland. The stomata themselves are also somewhat elevated above the cutis; the surrounding cells are parallelogrammic and disposed in circles, into the composition of each of which enter three or four cells, and each circle diminishes successively in size from without inwards. The stoma occupies the space of the innermost circle, and in itself presents nothing unusual.

Read also a paper by the same author, dated Calcutta Botanic Garden, July 1st, 1835, “On the Seeds of *Careya*, Roxb.”

The author gives a detailed description of the seeds of *Careya her-bacea* (those of *C. arborea* he states to be exactly similar), from which

it results that the fleshy body which constitutes the entire mass of the seed, after the removal of the testa, consists of a peripheral fleshy mass and a central subulate body firmly adherent with it, of similar texture, and having its apex directed towards one side of the hilum. At the opposite extremity the outer mass is surmounted by a number of colourless scales, surrounding and concealing other more minute scales which occupy the distal extremity of the central subulate body. There are no traces of cotyledonary division, and the subulate body, excepting at its divided upper extremity, is continuous with the rest of the fleshy mass. The commencement of the germination takes place while the seeds are still enclosed in the fruit. The integument is ruptured longitudinally, and generally with some degree of regularity along the apex; from this opening are exerted pale greenish scaly leaf-like bodies, consisting first of those which surmount the outer mass, and subsequently of the divided termination of the central subulate body. As this latter increases in length, it is seen to terminate in a green convolute leaf, in the axilla of which is placed another very rudimentary one. At this period the extremity of the subulate body next the hilum has also become exerted, and forms a subulate fleshy and undivided projection. Into this the cellular tissue of the fleshy body passes, although there is a faint line of demarcation between the two.

The absolute nature of the outer fleshy part, Mr. Griffith observes, can only be determined by pursuing the development of the ovula. The nature of the subulate body is evident: it is the root, the true plumula being the minute scaly body at its distal end. The root points, as it should do, towards one side of the hilum, the situation in fact of the foramen. At the collet it is continuous with the plumula, and laterally with the outer fleshy mass, which ought therefore to be cotyledonary, and taking it to be so, might be explained by supposing the cotyledons to be affixed in a peltate manner, and united into a solid mass.

Mr. Griffith was precluded from the further pursuit of the subject, with reference to the development of the ovula and the more advanced germination, by the departure of the Deputation for the investigation of the Tea-districts of Upper Assam, of which he formed part.

Feb. 3.—The Lord Bishop of Norwich, President, in the Chair.

Read papers on various subjects, bearing date in 1834 and 1835, by the late William Griffith, Esq., F.L.S. &c., communicated by R. H. Solly, Esq., F.R.S., F.L.S. &c.

The first of these contains the description of a plant found by Mr. Griffith in a small island near Mergui, called Madamacan, and which he has characterized under the generic name of *Corysadenia*, but which is evidently the same with Dr. Blume's genus *Illigera*, published in Europe in 1834, and consequently then unknown to the author. In common with that botanist, and acting on a suggestion of Dr. Wight, he indicates its near affinity to *Gyrocarpus*, with which he suspects that it should form an order, to be called "*Gyrocarpeæ*." He notices these genera as forming exceptions to a general rule

pointed out by Mr. Brown, that the ovarium of dicotyledonous plants, when single, never adheres to the calyx.

In the next paper, Mr. Griffith makes some additions to our knowledge of the genus *Henslowia*, which he characterizes as follows:—

HENSLOWIA, Wall.

Dioica. Mas: calyx suburceolatus, 5-partitus; laciniis æstivatione apertis. *Corolla* nulla. *Stamina* 5, calycis sinubus inserta; filamentis per æstivationem introflexis, demùm erectis longèque exsertis; antheris terminalibus, 2-locularibus, loculis angustis distantibus longitudinaliter dehiscensibus. *Ovarii* rudimentum centrale, biloculare. *Fœm.:* *calyx* ferè ut in mare. *Stamina* abortiva 5. *Ovarium* liberum, biloculare, polyspermum. *Stylus* filiformis. *Stigma* oblongum, peltato-capitatum. *Ovula* indefinitè numerosa, placentæ axili affixa. *Capsula* supera, bilocularis, bivalvis; valvis medio septiferis, mediante stigmate persistenti connexis. *Semina* plurima, minuta, reticulata, apiculata, placentæ transversim affixa, dorso secus racheos directionem cristata; *albumen* nullum; *cotyledones* parvæ; *radicula* ratione cotyledonum longa, clavata, hilum spectans; *plumula* inconspicua.—Arbores; ramis oppositis determinatè ramosis; foliis oppositis, *extipulatis*, *integr*is; racemis paniculatis; floribus minutis, inconspicuis.

A part of the additional information on this curious genus has already appeared (on Mr. Griffith's authority) in Prof. Lindley's 'Natural System of Botany.' After noticing the Combretaceous habit of the male tree when in full flower, Mr. Griffith adds, that it can scarcely be doubted that it is the type of a distinct order, and hazards an opinion that its true situation in the natural system will be found between *Lythariæ* and *Melastomaceæ*. He observes also that the ovula present the peculiarity of the raphe running along their upper or under faces, independent apparently of any twisting of the short funicle.

Mr. Griffith next characterizes a new genus of the order *Ternstræmiaceæ*, as follows:—

GEN. ERYTHROCHITON, Griff.*

Flores dioici, bibracteolati. *Calyx* inferus, profundè 5-partitus. *Petala* 5, hypogyna, libera, sepalis opposita. *Stamina* indefinita, hypogyna, multiplici serie. *Antheræ* adnatæ, truncatæ. *Ovarium* 2-loculare, 4-ovulatum. *Styli* 2. *Stigmata* 2, reniformia, foliacea. *Bacca* supera, 2-locularis, 2-4-sperma. *Semina* pendula, albuminosa. *Embryo* curvatus.—Arbor mediocris; foliis stipulatis, *perennantibus*, *integr*is; pedunculis extra-axillaribus; floribus solitariis; facie quodammodò Camelliæ.

ERYTHROCHITON WALLICHIANUM.

Hab. in sylvis secus littora Insulæ Madamacan, Mergui proximæ; lect. mense Decembris 1834.

Mr. Griffith adds in a note, that to this genus *Hopea eglandulosa*, Roxb., which Mr. Colebrooke in a MS. note in Roxburgh's MS. Synopsis stated long ago not to belong to *Hopea* (*Sarcostigma Roxburghii*, Wall. MSS., formerly called by Mr. Brown *Wahlenbergia*),

* Nec Nees et Mart.—SECR.

appears to have a considerable similarity in habit and in the structure of the stigmata and ovarium. And a similar correspondence exists, as far as can be judged from a drawing in the Botanic Garden at Calcutta, with another unpublished plant from Sylhet, probably forming a second species of Dr. Wallich's *Sarcostigma* *.

Lastly Mr. Griffith characterizes a new genus of *Anacardiaceæ*, under the name of

GEN. SWINTONIA, Griff.

Sepala 5, basibus coalita, persistentia. *Petala* 5, hypogyna, sub fructû demùm ampliata. *Stamina* totidem, toro cylindrico parùm elevato insidentia. *Ovarium* subæquilaterale, in apice tori staminiferi sessile. *Stylus* filiformis; *stigma* peltato-capitatum. *Fructus* siccus, exstipitatus, petalis ampliatis foliaceis suffultus.—*Arbor magna, resinosa, facie quodammodò Mangiferæ. Folia lanceolata, coriacea. Paniculæ axillares terminalesque; flores inconspicui.*

SWINTONIA FLORIBUNDA.

Hab. in colle alto Insulæ Madamacan Mergui proximæ, *Pator* dicto, copiosè; florens Novembri et Decembri, fructifera Febuario.

This genus is dedicated to George Swinton, Esq., late Secretary to the Bengal Government, who has always been ready to promote the interests of science and the welfare of the Tenasserim Provinces, and to whom Dr. Wallich had intended to dedicate his genus *Melanorrhæa*. In the structure of its fruit it is very nearly allied to *Melanorrhæa*; and in that of the flowers, particularly as regards the mode of adhesion of the petals and stamina to the torus, it approaches to *Syndesmis* of the same author.

ZOOLOGICAL SOCIETY.

October 28.—George Gulliver, Esq., F.R.S., in the Chair.

The following paper, entitled “Description de quelques nouvelles Nérîtes Fluviales, du cabinet de H. Cuming, Esq.,” par C. A. Récluz, was then read:—

III. SPINOSÆ (*Clithon*, Montfort, Leach).

C. *Muticæ*.

5. NERITA SOLIUM. *Ner. testâ ovato-ventricosâ, olivacâ, posticè maculis rufis triangularibus transversisque obsoletè pictâ; anfractibus* $1\frac{1}{2}$; *infimo supra medium vix anguloso, supernè depresso; apice puncto excavato notato; aperturâ albâ, margine pallidè lutescente sive aurantiâ; columellâ plano-compressâ, supernè callosâ, margine rugosâ et in medio excavatâ.*

Hab. Bencoonet, isle of Sumatra; in a muddy stream.

Alt. 22, lat. $26\frac{1}{2}$, convex. 18 mill.

6. NERITA CELATA. *Ner. testâ globoso-ovatâ, olivaceo-lutescente, posticè pallidiore, striis intensioribus longitudinalibusque pictâ;*

* Not *Sarcostigma* of Drs. Wight and Arnott in Edinburgh New Phil. Journ. vol. xiv. p. 299.—SECR.

anfractibus $1\frac{1}{2}$; *infimo supra medium subanguloso*; *aperturâ albidò-cærulescente pallido*; *columellâ plano-compressâ, supernè callosâ, margine denticulatâ, medio breviter ac rectè emarginatâ.*

Hab. — ?

Alt. 17, lat. $20\frac{1}{2}$, convex. 14 mill.

7. *NERITA DOINGII.* *Ner. testâ parvâ, globoso-ovatâ vel subglobosâ, parùm obliquâ, tenuiusculâ*; *anfractibus* $1\frac{1}{2}$ —2 *obliquè rugulosis, transversim et sub lente creberrimè ac obsoletè striolatis*; *aperturâ viridulâ*; *columellâ ferè pland, margine denticulatâ et in medio subarcuatâ*; *labro tenui, semicirculari.*

Var. *α.* *Testâ lineolis longitudinalibus undulatis nigris et luteis creberrimè pictâ.*

Var. *β.* *Testâ ut in var. α, et zonis lutescentibus plus minusve numerosis cinctâ.*

Hab. Hanover Bay, North Australia. Collected by Mr. T. E. Doing, R.N.

Alt. $9\frac{1}{2}$, lat. 10, convex. 7 mill.

8. *NERITA COLOMBARIA.* *Ner. testâ ovato-globosâ, lævissimè striatâ*; *anfractu unico, rufescente, viridescente pallido obsoletè fasciatâ, maculis minimis luteis nigro seu roseo marginatis pictâ*; *columellâ callosâ, subconvexâ, denticulatâ, medio vix emarginatâ*; *labro anticè subtruncato, basi et intus incrassato.*

Operculo crasso, externè viridulo, lutescente pallido undato, medio perlongum strid bipartito.

Var. *β.* *Testâ viridi-olivacè, striis luteis distantibus ornatâ, medio et infernè lutescente latè fasciatâ*; *fasciis nebulis rubris pictis.*

Hab. Colombo, Ceylon. Collected by Capt. Templeton.

Alt. 9— $10\frac{1}{2}$, lat. $10\frac{3}{4}$ —11, convex. 7—8 mill.

IV. SUBAURICULATÆ.

9. *NERITA JORDANI*, Butler, Sowerby, Conch. Illustr.

Var. *α.* *Major.* *Testâ ovatâ vel oblongâ, albidd, lineis undulatis nigris, rubris, violaceisve pictâ*; *aperturâ obliquè semi-ovatâ*; *labro interdum supernè dilatato.*

Var. *β.* *Strangulata.* *Testâ minor, rotundatâ, ovatâ seu subconicâ, medio horizontaliter compressâ, ferè strangulatâ, albidd lineis roseis rubrisve pictâ*; *spird sæpiùs obtusâ, interdum acutâ*; *labro supernè interdum dilatato.*

Var. *γ.* *Nitida.* *Testâ major, nigerrimâ, nitidissimâ.*

Var. *δ.* *Limosa.* *Testâ parvâ, sæpissime argillâ crasse obductâ, subtùs albidd aut luteo-viridescente lineis nigris, violaceis, rubrisve undulatis pictâ, interdum omnino nigerrimâ sive lutescente.*—*Nerita lutescens*, Megerle ?

Hab. La var. *α.* Le Jourdain; la var. *β.* Smyrne; la var. *γ.* La Syrie; la var. *δ.* Céphalonie.

A paper was read containing "Descriptions of new species of Shells," by Lovell Reeve:—

PLEUROTOMA ROSACEA. *Pleur. testâ ovato-turritâ, anfractibus rotundatis, supernè depresso-concavis, transversim subtiliter striatis,*

longitudinaliter crebricostatis; canali brevissimo; sinu lato, sub-amplo; undique eximie rosaced.

Hab. — ?

PLEUROTOMA BÆTICA. *Pleur. testá turritá, anfractibus supernè depresso-concavis, transversim elevato-striatis, obliquè costatis, costis plicato-nodulosis; canali brevissimo; sinu lato, amplo; bæticá.*

Hab. — ?

PLEUROTOMA OBLIQUI-COSTATA. *Pleur. testá ovato-oblongá, longitudinaliter costatá, costis angustis, obliquis, subundatis, supernè obtusè mucronatis; canali brevissimo; albidd, rubido-fusco parcè maculatá et variegatá.*

Hab. — ?

PLEUROTOMA FUCATA. *Pleur. testá ovatá, crassiusculá, anfractibus supernè depressiusculis, longitudinaliter costellatis, costellis subobtusis, striis transversis elevatis subobsoletis cancellatis, anfractu ultimo tuberculo gibboso munito; canali brevissimo; labro supernè subsinuato; albá, croceo-fuscescente fasciatá et variegatá.*

Hab. — ?

PLEUROTOMA IMPLICATA. *Pleur. testá pyramidali-turritá, anfractibus supernè peculiariter depressis, infra seriatim nodosis, nodulorum serie supremá transversim biliratá; canali brevissimo; apertura brevi; albidd, epidermide corned olivaced undique indutá.*

Hab. — ?

PLEUROTOMA RUBRIFASCIATA. *Pleur. testá abbreviato-fusiformi, anfractibus supernè concavis, lævibus, infra transversim striatis, et pulcherrimè crebrinodulosis, nodulis supremis, longitudinaliter confluentibus; canali subelongato; flavescente, rubro cinereoque fasciatá.*

Hab. — ?

PLEUROTOMA SACERDOS. *Pleur. testá subfusiformi, utrinque attenuatá, crassá; anfractibus supernè valdè depresso-concavis, subangulatis, tuberculis transversim compressis ad angulum cingulatis, infra seriatim nodulosis; canali breviusculo; carneo-albidd, flammis maculisque purpureo-rufis variegatá, anfractuum parte superiori cinereo tinctá.*

Hab. — ?

PLEUROTOMA CROCATA. *Pleur. testá pyramidali-oblongá, transversim elevato-striatá, longitudinaliter costatá, anfractu ultimo tuberculo parvo gibboso munito; canali brevissimo; apertura brevi; sinu lato, amplo; albidd, epidermide croceo-olivaced indutá.*

Hab. — ?

PLEUROTOMA OBELISCUS. *Pleur. testá pyramidali-ovatá, anfractibus supernè concavis, infra nodosis, anfractús ultimi parte inferiori granoso-liratá; canali brevi; sinu amplo; albidd, epidermide flavescente-olivaced undique indutá.*

Hab. — ?

PLEUROTOMA ARMILLATA. *Pleur. testâ pyramidali-ovatâ, subfusiformi, anfractibus spiraliter carinatis, carinâ medianâ gemmulatâ, gemmulis transversis, canali breviusculo, sinu amplo, profundo; albidâ, anfractibus supra carinam gemmulatam fuscescentibus.*

Hab. Philippine Islands; Cuming.

PLEUROTOMA AQUATILIS. *Pleur. testâ ovato-turritâ, solidâ, spirâ acuminatâ, anfractibus lævibus, supernè depressis, obliquè plicato-tuberculatis; canali brevissimo, sinu amplo; eburneâ, lineis plurimis subtilissimis undulatis, pallidissimè corneo-fuscescentibus, fasciatim pictâ.*

Hab. — ?

PLEUROTOMA FLAVESCENS. *Pleur. testâ ovato-turritâ, anfractibus supernè valdè concavis, infra transversim striatis, nodosis, nodis subirregulariter costellæformè confluentibus; canali brevissimo; flavescente-olivaceâ.*

Hab. — ?

PLEUROTOMA FRAGILIS. *Pleur. testâ ovatâ, ventricosâ, tenui, fragili, translucidâ, anfractu ultimo valdè maximo; lineis subtilibus elevatis undique creberrimè reticulatâ quarum transversæ fortiores; aperturâ amplâ, sinuatâ; columellâ basique truncatis, lucido-albâ.*

Hab. — ?

PLEUROTOMA PULCHELLA. *Pleur. testâ ovato-turritâ, anfractibus supernè depressis, medio plicato-tuberculatis, tuberculis angustis, confluentibus, anfractu ultimo tuberculo gibboso munito; canali brevissimo, sinu amplo; vividè rosaceâ, fasciâ linedque castaneis, spiraliter cingulatâ.*

Hab. — ?

PLEUROTOMA PUNCTATA. *Pleur. testâ fusiformi, anfractibus supernè valdè depressis, lævigatis, carinâ parvâ prope suturam medio nodosis, infra granulatis; canali longiusculo; sinu latiusculo; albidâ, rubido-fusco punctatâ, præcipuè super carinam et inter nodos.*

Hab. — ?

PLEUROTOMA LANCEOLATA. *Pleur. testâ lanceolatâ, anfractibus supernè concavis, tuberculis obliquis plus minusve obsolete medio ornatis, lævibus, anfractu ultimo minutissimè granulato; canali breviusculo; aurantio-fuscescente, tuberculis albidis.*

Hab. — ?

PLEUROTOMA SACRA. *Pleur. testâ ovatâ, solidiusculâ, basim versus subgibbosâ; anfractibus supernè depressis nodulorum serie unicâ prope suturam infra longitudinaliter granoso-costatis, transversim minutè liratis; canali brevissimo, sinu lato; albidâ, anfractu ultimo fasciâ pallidè fuscescente cingulatâ.*

Hab. — ?

PLEUROTOMA RUBINICOLOR. *Pleur. testâ ovatâ, subventricosâ, anfractibus supernè angulato-depressis, ad angulum obtuso-nodosis, nodis subplicato-confluentibus, lævibus, ultimo basim versus obso-*

letè striato; canali brevissimo; aurantio-rufè, nodis per angulum niveis.

Hab. — ?

PLEUROTOMA NUX. *Pleur. testà ovatà, subpyramidali, anfractibus convexis, supernè leviter concavis, ultimo subgibboso; canali brevissimo truncato; sinu latiusculo; rubido-castaneè, columellà et aperturæ fauce albis.*

Hab. Cape of Good Hope.

PLEUROTOMA CLARA. *Pleur. testà pyramidali, subelongatà, anfractibus obliquè plicato-nodosis, lævibus; canali brevissimo; sinu amplo; purpureo-fuscè, anfractuum parte superiori albà.*

Hab. — ?

PLEUROTOMA CASTANEA. *Pleur. testà subelongato-turrità, anfractibus supernè concavis, medio plicato-nodosis; lævigatà, basi subtiliter sulcatà; canali brevissimo; castaneo-fuscè.*

Hab. — ?

PLEUROTOMA VIDUA. *Pleur. testà subobeso-ovatà, spirà acuminatà, anfractibus supernè depressis, medio plicato-nodosis, nodis crebris, longitudinaliter confluentibus, lævigatà, basim versus granosà; canali brevissimo; anfractuum parte superiori nived, inferiori olivaceo-nigricante, granis albis.*

Hab. Island of Masbate, Philippines (under stones at low water); Cuming.

PLEUROTOMA PALLIATA. *Pleur. testà ovato-oblongà, anfractibus convexiusculis, transversim subtilissimè crebristriatis, granulorum serie unicà cingulatis, granulis conspicuis, elevatiusculis; canali brevissimo; albidd, epidermide pallidè fulvè undique indutà.*

Hab. — ?

PLEUROTOMA EXARATA. *Pleur. testà pyramidali, anfractibus transversim granoso-striatis, medio leviter angulatis, ad angulum minutè nodulosis, inter nodulos longitudinaliter exaratos; canali brevissimo, truncato; sinu amplo, pallidè fulvo, sulcis longitudinalibus fusco-punctatis.*

Hab. — ?

PLEUROTOMA VITTATA. *Pleur. testà abbreviato-ovatà, solidà, gibbosà, spirà subacuminatà, anfractibus supernè depressis, medio plicato-tuberculatis, infra granulatis; labro incrassato, sinu latiusculo; albidd, vittà fasciæ lutescente-fuscè conspicuè supra tubercula ornatà.*

Hab. — ?

PLEUROTOMA OLYRA. *Pleur. testà cylindraceo-ovatà, tenui, subpellucidà, spirà brevi; lævigatà aut obsoletè striatà; aperturà longiusculà; canali brevissimo, truncato; nived, apice roseo.*

Hab. — ?

PLEUROTOMA SUBULA. *Pleur. testà acuminato-attenuatà, striis elevatis transversis et longitudinalibus creberrimè reticulatà, carinè*

plano-obtusâ prope suturam; canali breviusculo, sinu distincto; albidd, maculis parvis pallidè aurantio-fuscis juxta suturam.

Hab. Island of Corrigidor, Philippines (found among coarse sand at the depth of seven fathoms); Cuming.

PLEUROTOMA AUREOLA. *Pleur. testâ acuminato-elongatâ, tenui, semipellucidâ, transversim liratâ, liris parvis, obtusis, longitudinaliter subtilissimè crebristriatâ; canali brevi, labro intus crenulato, sinu parvo, distincto; aureold.*

Hab. Island of Luzon, Philippines; Cuming.

PLEUROTOMA SATURATA. *Pleur. testâ pyramidali-acuminatâ, infernè subcontractâ, anfractibus striis transversis et longitudinalibus creberrimè granoso-reticulatis; canali breviusculo; labro subtiliter crenulato, sinu distincto; intus eatusque fuscâ, fasciis albis longitudinalibus subdistantibus, fasciâ unicâ transversâ in anfractu ultimo ornatâ.*

Hab. Island of Corrigidor, Philippines (found among coarse sand at the depth of seven fathoms); Cuming.

PLEUROTOMA IGNIPLUA. *Pleur. testâ ovato-oblongâ, transversim creberrimè elevato-striatâ, longitudinaliter costis latiusculis approximatis, apicem versus conspicuis, basim versüs obsoletis; canali brevi; labro intus crenulato, sinu superficiario; albidd, flammis fulvo-aurantiis undato-fluentibus ornatâ.*

Hab. ———?

PLEUROTOMA PATULA. *Pleur. testâ ovato-oblongâ, infernè ventricosâ, subobliquâ, anfractibus tenuibus, transversim subtilissimè et creberrimè striatis; canali brevissimo, truncato; labro simplici, sinu profundo, aperturâ amplâ; albidd, flammis fulvo-aurantiis, undatis, longitudinaliter fluentibus ornatâ.*

Hab. Bolinao, island of Luzon, Philippines (found under stones at low water); Cuming.

PLEUROTOMA PUTILLUS. *Pleur. testâ ovatâ, spirâ pyramidali-acuminatâ, anfractibus transversim subtiliter striatis, supernè concavis, infra nodosis, nodis longitudinaliter obliquè confluentibus; canali breviusculo; labro simplici, sinu lato; flavicante-albidd, lined undulatâ fulvo-aurantiâ inter nodos fluente.*

Hab. Calipan, island of Mindoro, Philippines (found among coarse sand at the depth of fifteen fathoms); Cuming.

PLEUROTOMA SPECTRUM. *Pleur. testâ fusiformi, transversim elevato-striatâ, anfractibus rotundatis, longitudinaliter fortiter obliquè plicato-nodosis, nodis in anfractu ultimo evanidè confluentibus; canali brevi; labro simplici; nived, nodis pallidè rufescente-fuscis.*

Hab. Puerto Galero, island of Mindoro, Philippines (found among coral sand at the depth of about nine fathoms); Cuming.

PLEUROTOMA BILINEATA. *Pleur. testâ ovato-oblongâ, subpyramidali, anfractibus medio tumidis, uniseriatim plicato-nodosis, nodis angustis compressiusculis, anfractûs ultimi dorso callositate munito; canali brevissimo, labro simplici, sinu amplo; incarnato-*

fuscescens, lineis duabus saturatoribus, quarum superior multo subtilior inter nodos cingulata.

Hab. Islands of Capul and Mindoro, Philippines (found on the reefs and among coarse sand at the depth of fifteen fathoms); Cuming.

PLEUROTOMA METCALFIANA. *Pleur. testá ovatá, crassiusculá, transversim creberrimè elevato-striatá, longitudinaliter apicem versus subobsoletè sulcatá; albd, maculis rufo-fuscis subquadratis fasciatim pictá; canali brevi.*

Hab. — ?

PLEUROTOMA GRAYI. *Pleur. testá ovatá, subventricosá, anfractibus supernè angulatis, longitudinaliter obtuso-costatis, transversim creberrimè sulcatis; canali brevi; labro incrassato, sinu amplo; castaneo-fuscá.*

Hab. — ?

PLEUROTOMA LUTEO-FASCIATA. *Pleur. testá subovato-oblongá, anfractibus prope suturam impressis, longitudinaliter fortiter costatis, costis crebris, obtusis; canali brevissimo; albd, fasciis luteis pulcherrimè ornatá.*

Hab. — ?

PLEUROTOMA PAGODUS. *Pleur. testá pyramidalí, anfractibus supernè depressis, subangulatis, ad angulum costatis, costis brevibus, confertis, lineis elevatis decussatis; cinereo-rufescente, maculis rubidis inter costas, columellá labroque rubido tinctis; canali brevi.*

Hab. — ?

PLEUROTOMA URNULA. *Pleur. testá ovatá, ventricosá, spirá breviusculá, longitudinaliter costatá, transversim elevato-striatá; castaneo-fuscá; canali breviusculo, aperto.*

Hab. — ?

PLEUROTOMA FORTHIENSIS. *Pleur. testá pyramidalí-oblongá, anfractibus supernè subangulatis, longitudinaliter obliquè costatis; basi truncatá; albidd.*

Hab. Frith of Forth; Gray.

PLEUROTOMA REFLEXA. *Pleur. testá ovatá, Tritoniformi, concentricè costatá, transversim fortiter lirátá; aperturá longiusculá sinuosá, labro reflexo, intus denticulato.*

Hab. — ?

PLEUROTOMA QUADRATA. *Pleur. testá ovatá, spirá turritá, anfractibus fortiter angulatis, longitudinaliter costatis, costis ad angulum mucronatis, infra striis duabus elevatis cingulatis, anfractús ultimi parte inferiori lírd mucronatá clathratá; flavicante, costarum interstitiis rufo-castaneis; sinu parvo.*

Hab. — ?

PLEUROTOMA PARVULA. *Pleur. testá fusiformi-ovatá, anfractibus tumidiusculis, longitudinaliter costatis, transversim creberrimè liratis; canali breviusculo; lutescente.*

Hab. — ?

PLEUROTOMA PSEUDO-CARINATA. *Pleur. testá ovatá, subpyramidali, anfractibus supernè concavis, subindistinctè carinatis, infra confer-tim plicato-costatis, transversim crebrisulcatis; basi truncatá; flavescente.*

Hab. — ?

PLEUROTOMA LANGUIDA. *Pleur. testá gracili-fusifor-mi, longitudinaliter noduloso-costatá, transversim elevato-striatá, costis striis-que subdistantibus; sinu amplo; albá, rufescente-fusco tinctá.*

Hab. — ?

PLEUROTOMA PUNCTICINCTA. *Pleur. testá ovatá, spirá breviusculá, longitudinaliter subobscurè plicatá, interstitiis minutissimè striatis; sinu subamplo; albidá, cingulá unicá punctatá spiraliter ornatá.*

Hab. — ?

PLEUROTOMA PYRAMIDULA. *Pleur. testá subpyramidali-elongatá, liris minutis longitudinalibus et transversis creberrimè clathratá, suturis unicar-natis; aperturá parvâ, sinu amplo; basi truncatá; albidá.*

Hab. — ?

PLEUROTOMA ÆRUGINOSA. *Pleur. testá acuminato-turritá, anfrac-tibus longitudinaliter subobsoletè plicato-costatis, interstitiis minu-tissimè impresso-striatis; albidá, suturis livido-viridescentibus, anfractús ultimi parte inferiori livido-viridescente, punctis nigri-cantibus marginatá, apice rufescente-fusco.*

Hab. — ?

PLEUROTOMA OBLIQUATA. *Pleur. testá ovatá, subobesá, spirá acu-minatá, anfractibus medio angulato-tumidis, obliquè costatis, costis ad angulum nodosis; intus extusque flavido-fuscá, zond pallidá angustá ad angulum cingulatá.*

Hab. — ?

PLEUROTOMA PELLIS-PHOCEÆ. *Pleur. testá pyramidali, anfractibus convexis, longitudinaliter fortiter et creberrimè granulatis, trans-versim subsulcatis, aperturá peculiariter parvâ, sinu indistincto.*

Hab. — ?

PLEUROTOMA VEXILLUM. *Pleur. testá acuminato-elongatá, longi-tudinaliter crebricostatá, basi transversim lirátá; aperturá parvâ, sinu amplo, albidá, suturis et anfractús ultimi parte inferiori fuscis.*

Hab. — ?

PLEUROTOMA CARDINALIS. *Pleur. testá pyramidali, spirá acumi-natá, anfractibus longitudinaliter subtiliter plicatis, transversim minutissimè striatis; sinu lato, amplo; albidá, fasciis violaceo-brunneis cingulatá.*

Hab. Island of Negros, Philippines (found among sand at the depth of four fathoms); Cuming.

PLEUROTOMA ARATA. *Pleur. testá pyramidali, suturis peculiariter*

excavatis, anfractibus lævibus angustis granulosis creberrimè cingulatis; aperturâ parvâ; albâ.

Hab. — ?

PLEUROTOMA GUILDINGII. *Pleur. testâ pyramidalis-oblongâ, anfractibus supernè depresso-concavis, infra obliquè nodoso-plicatis, transversim undique creberrimè striatis; intus extusque piceo-nigrâ.*

Hab. St. Vincent's, West Indies; Guilding.

PLEUROTOMA HYALINA. *Pleur. testâ elongato-acuminatâ, basi truncatâ, tenui, hyalind, longitudinaliter undique minutissimè et confertissimè elevato-striatâ; albidâ, lineis rufo-fuscis distantibus cingulatâ; labro simplici, sinu parvo.*

Hab. — ?

PLEUROTOMA TICAONICA. *Pleur. testâ oblongo-ovatâ, spirâ tereti, anfractibus subventricosis, transversim irregulariter liratis, lirarum interstitiis minutissimè clathratis; albidâ, aurantio-fusco hic illic flammâtâ; sinu parvo.*

Hab. Island of Ticao, Philippines (found on the reefs); Cuming.

PLEUROTOMA FULVA. *Pleur. testâ oblongo-ovatâ, subturritâ, anfractibus longitudinaliter multicostatis, costis angustis, prominentibus; fulvâ.*

Hab. — ?

PLEUROTOMA CANTHARIS. *Pleur. testâ obtuso-ovatâ, crassâ, solidâ, lævigatâ, anfractibus medio obliquè nodoso-plicatis; sinu subamplo; nigricante-fuscâ, nodis albidis.*

Hab. Sibonga, island of Zebu, Philippines (found under stones at low water); Cuming.

PLEUROTOMA VULTUOSA. *Pleur. testâ ovatâ, anfractibus subrotundis, longitudinaliter obtusè costatis, transversim creberrimè liratis; labro intus denticulato, sinu amplo, lato; albicante, apice pallide rosaceo.*

Hab. Baclayon, island of Bohol, Philippines (found under stones); Cuming.

PLEUROTOMA OPALUS. *Pleur. testâ oblongo-ovatâ, pentagonali, crassâ, lævigatâ, longitudinaliter costatâ, costis obliquè continuis, subnodosis, angustis, quasi vellicatis, interstitiis plano-concavis; aperturâ parvâ, sinu amplo, profundo; eburned, nitente, costarum interstitiis incarnato-fuscescentibus.*

Hab. Cagayan, province of Misamis, island of Mindanao, Philippines (found in sandy mud at the depth of twenty-five fathoms); Cuming.

PLEUROTOMA EBUR. *Pleur. testâ oblongo-ovatâ, pentagonali, crassâ, spirâ acuminatâ, longitudinaliter continuè costatâ, transversim striatâ, striis basim versus conspicuis; sinu amplo, profundo; eburned.*

Hab. — ?

PLEUROTOMA EGROTA. *Pleur. testá oblongo-ovatá, tenuiculá, sub-ventricosá, spiræ suturis profundis, striis impressis longitudinalibus et transversis undique decussatá; aperturá subelongatá, amplá; albicante.*

Hab. Singapore (found among fine sand at the depth of seven fathoms); Cuming.

PLEUROTOMA CONCENTRICOSTATA. *Pleur. testá gracili-fusiforimi, spirá acuminatá, anfractibus creberrimè concentricè costatis, suturis simplicibus; incarnato-fuscescente.*

Hab. — ?

PLEUROTOMA LIRATA. *Pleur. testá subfusiformi, basi contractá, transversim undique liratá, columellá excavatá, callositate supernè munitá, labro subeffuso, leviter incrassato, sinu lato, amplo, canali paululùm elongato; albidd, labri margine intus rufescente.*

Hab. Islands of Luzon and Mindanao, Philippines (found in sandy mud at the depth of seven fathoms); Cuming.

PLEUROTOMA NEXA. *Pleur. testá ovatá, Tritoniformi, anfractibus subrotundatis, plicato-costatis, funiculis exilibus angustis, costas super leviter nodulosas, cingulatis; aperturá subamplá, labro planulato, sinu lato; canali brevissimo, recurvo; albá, fusco undique tinctá et fasciatá, funiculis suturioribus.*

Hab. Islands of Masbate and Luzon, Philippines (found under stones at low water); Cuming.

PLEUROTOMA INQUINATA. *Pleur. testá acuminato-fusiforimi, anfractibus transversim exiliter liratis, longitudinaliter creberrimè striatis; sinu profundo; albidd, aurantio-fusco hic illic inquinatá.*

Hab. Gindulman, island of Bohol, Philippines (found among coral sand at the depth of seven fathoms); Cuming.

PLEUROTOMA UNDATICOSTA. *Pleur. testá fusiformi, anfractibus supernè leviter depressis, costis longitudinalibus undatis concentricè ornatá; albidd.*

Hab. — ?

PLEUROTOMA PAXILLUS. *Pleur. testá abbreviato-ovatá, spirá apice acuminatá; anfractibus supernè concavis, unicarinatis, medio creberrimè plicatis, plicarum interstitiis subtilissimè striatis, infernè liratis; sinu amplo; nigricante-fusca.*

Hab. — ?

PLEUROTOMA SORDIDA. *Pleur. testá ovatá, longitudinaliter subobliquè costatá, costarum interstitiis elevatis clathratis; sordidè albá.*

Hab. — ?

PLEUROTOMA PLURICARINATA. *Pleur. testá subfusiformi-oblongá, carinis plurimis acutis cingulatá, quarum interstitia striis longitudinalibus cancellata; aperturá oblongá, sinu subamplo; canali leviter recurvo; lutescente, aurantio-fusco pallidè strigato-tinctá.*

Hab. Island of Burias, Philippines (found in sandy mud at the depth of seven fathoms); Cuming.

PLEUROTOMA COMPTA. *Pleur. testá ovatá, spirá nodoso-turritá,*

anfractibus supernè concavis, infra latè costatis, liris angustis transversim funiculatis; labro incrassato, intus denticulato, sinu amplo, lato; lutescente-albâ.

Hab. Baclayon, island of Bohol, Philippines (found under stones at low water on the reefs); Cuming.

PLEUROTOMA HEXAGONALIS. *Pleur. testâ pyramidali-ovatâ, anfractibus costis sex continuis longitudinaliter ornatis; aperturâ parvâ, sinu distincto; fuscescente-albâ.*

Hab. Loay, island of Bohol, Philippines (found in sandy mud at the depth of seventeen fathoms); Cuming.

PLEUROTOMA ARCTATA. *Pleur. testâ pyramidali-elongatâ, anfractibus obliquè costatis, costis striis elevatis funiculatis; labro incrassato, peculiariter effuso, sinu amplo; sordidè albâ.*

Hab. Island of Corrigidor, Philippines (found among coarse sand at the depth of seven fathoms); Cuming.

PLEUROTOMA COCCINATA. *Pleur. testâ ovatâ, apicem versus acuminatâ, anfractibus lævigatis, supernè concavis, infra plicato-nodosis; basi truncatâ; albâ, inter nodos dorsumque coccinatâ.*

Hab. — ?

PLEUROTOMA VITREA. *Pleur. testâ cylindraceo-elongatâ, basi leviter contractâ, tenui, pellucidâ, vitreâ, lævigatâ, anfractibus supernè et infernè subtilissimè sulcatis; albâ.*

Hab. Singapore and island of Mindanao, Philippines (found at depths of seven and twenty-five fathoms); Cuming.

PLEUROTOMA FORAMINATA. *Pleur. testâ fusiformi-ovatâ, liris angustis longitudinalibus et transversis creberrimè clathratis; lutescente.*

Hab. — ?

PLEUROTOMA EFFICTA. *Pleur. testâ ovatâ, spirâ breviusculâ, acuminatâ, longitudinaliter subconcentricè costatâ, costis striis elevatis cancellatis; aperturâ subampâ, labro incrassato, sinu latiusculo.*

Hab. — ?

PLEUROTOMA CAVERNOSA. *Pleur. testâ oblongâ, spirâ angulato-turritâ, anfractibus supernè subangulatis, longitudinaliter costatis, costis distantibus, liris angustis elevatiusculis transversis clathratis, anfractu ultimo prope basim peculiariter cavernoso; fuscâ, liris costas super albicantibus.*

Hab. Philippine Islands; Cuming.

PLEUROTOMA POLYNESIENSIS. *Pleur. testâ acuminato-turritâ, anfractibus parvis, rotundatis, longitudinaliter crebricostatis, transversim striatis; labro incrassato, sinu amplo; albicante.*

Hab. Lord Hood's Island; Cuming.

BOTANICAL SOCIETY OF EDINBURGH.

April 9, 1846.—Prof. Balfour, President, in the Chair.

Donations to the library and museum were announced; particularly one from Mr. William Gardiner, jun., Dundee, of his elegant little work on the Mosses, intended as an introduction to the study of that interesting tribe of plants. It seems well-fitted to accomplish the object in view.

The following communications were read:—

1. "Botanical Excursions in Upper Styria in 1842," by Dr. R. C. Alexander.

In this paper Dr. Alexander gave an account of various excursions to the mountainous parts of Styria, during which he visited the Schökel, Lantsch, Leoben, Reiting, Yolling, Klagenfurt, and Saltzbach; also of the various plants observed during his tour. He collected in all about 900 species, of which upwards of twenty were new to the flora of Styria. The paper was accompanied by a list of the principal plants collected south of the Drave. Specimens from the Society's herbarium, contributed by Dr. Alexander, were produced to illustrate the paper, of which an abstract will appear in these 'Annals' and in the Society's 'Transactions.'

2. "Remarks on the Claims of certain Species of Plants to be considered indigenous to Britain," by Mr. R. M. Stark.

Mr. Stark adverted to the progress of Botanical Geography, and particularly to the labours of Mr. Hewett C. Watson. Passing over the instances of shrubs and perennial herbaceous plants found apparently wild, but which have undoubtedly escaped from the garden, he directed attention to the large family of annual corn-weeds. Though universally dispersed wherever the plough and the agency of man extended, the fact of their not being found associated with other annuals where the land was waste and uncultivated, seemed to prove that they were the companions of the cereal grains, and with them had been introduced at a very remote period. Some of them are confined to one side of the island, or to certain districts, which showed that, notwithstanding their probable exotic origin, they were more or less subject to the laws regulating the distribution of organic life. He expressed the opinion that it would be desirable, both for the interests of science and agriculture, that these plants, and their prevalence or rarity in various districts, should be recorded in our catalogues, local floras, and other works of a similar description.

Mr. James M'Nab exhibited flowering plants of two species of *Arum* (*A. cordatum* and *A. cornutum*), raised in the garden of the Horticultural Society, from seeds sent by William Jameson, Esq., from Saharunpore, in April 1843. The flowering spathe of one was two feet, and of the other eighteen inches in length, both being beautifully mottled with brown and yellow spots.

MICROSCOPICAL SOCIETY.

March 18, 1846.

A paper by the Secretary, John Quekett, Esq., "On the intimate Structure of Bone in the four great Classes of Animals; viz. Mammals, Birds, Reptiles and Fishes, with some Remarks on the great Value of the Knowledge of such Structure in classifying minute Fragments of Fossil Organic Remains," was read.

After alluding to the highly important results obtained by Prof. Owen, with the aid of the microscope, in determining the affinities of extinct animals by means of their teeth, the author went on to state that, having for some time paid considerable attention to the structure of bone in the four great classes of animals, he had found certain characters peculiar to each great class, by which a bone of one class could be distinguished from that of another. He then briefly described certain characters which were present in all bones, and then those which were peculiar to each class, viz. the Haversian canals, and the bone-cells with their little tubes (canaliculi) proceeding from them; and he applied the characters derived from the bone-cells to the determination of the class of animals to which any minute fragment may have belonged; for he had ascertained that the bone-cells were smallest in birds, a little larger in mammalia, and largest of all in the reptilia: the bone-cells of fishes were remarkable for their being so unlike either of the three preceding classes, that, having been once seen, they could not easily be mistaken. The author then noticed the relative proportions of the bone-cells and blood-corpuscles of the same animal, and concluded by remarking, that however different the size of animals of the same class may be, the bone-cells did not vary according to the difference in size. Thus the mighty iguanodon, some scores of feet in length, had no larger bone-cells than the lowliest lizard which we trampled under our feet, nor the horse or the ox than the smallest of our quadrupeds, the mouse.

MISCELLANEOUS.

CHAIR OF ANATOMY AT EDINBURGH.

WE are happy to hear that Mr. John Goodsir has been elected to the important office of Professor of Anatomy in the University of Edinburgh. The original and highly philosophical essays of that gentleman have gained him an European reputation as an anatomist and physiologist, whilst his services in the cause of natural history have placed him in an equally high position as a biologist. His memoirs on the *Amphioxus* and *Orthagoriscus*, on the anatomy of many mollusca, radiata and entozoa, and on certain vegetables parasitic on animals, are familiar to the readers of the 'Annals.' Anatomy and natural history will equally gain by this excellent appointment.

THE POTATO FUNGUS.

Mr. Moore of Glasnevin has sent me this morning a leaf of a potato clothed with our old enemy *Botrytis infestans*, from potatoes in the Royal Botanic Garden, Dublin. Everything seems to tend to a repetition of the ravages of last year. I can persuade nobody here that there are any fears, and all advice is vain.—M. J. B. (*Gardeners' Chronicle*.)

METEOROLOGICAL OBSERVATIONS FOR MARCH 1846.

Chiswick.—March 1. Overcast. 2. Very fine. 3. Cloudy. 4. Rain. 5. Showery: clear and fine. 6, 7. Very fine. 8. Clear: cloudy: clear. 9. Frosty: fine. 10. Frosty and foggy: fine: very clear. 11. Slight fog: very fine: clear. 12. Foggy. 13. Slight haze. 14. Cloudy and windy. 15. Showery. 16. Cloudy: boisterous: heavy showers. 17. Overcast: clear: slight frost at night. 18. Frosty: overcast: clear and frosty. 19. Frosty: overcast: hazy. 20. Snow early A.M., nearly two inches deep: cloudy: clear and frosty at night. 21. Sharp frost: densely clouded: boisterous, with rain at night. 22. Clear and fine: showery. 23. Rain: cloudy and fine: clear. 24. Cloudy and fine: clear. 25. Fine: overcast: showery. 26. Cloudy and fine. 27. Clear and fine. 28. Hazy. 29. Hazy clouds: fine. 30. Slight haze: cloudy and cold: clear. 31. Dry haze: clear and fine.

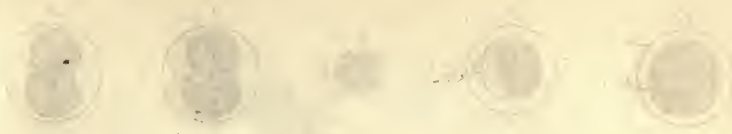
Mean temperature of the month	45°·43
Mean temperature of March 1845	38·49
Mean temperature of March for the last twenty years...	42·89
Average amount of rain in March	1·36 inch.

Boston.—March 1. Foggy. 2, 3. Cloudy. 4. Windy: rain early A.M. 5. Cloudy: rain early A.M. 6. Cloudy: rain P.M. 7—10. Fine. 11, 12. Cloudy. 13. Cloudy: rain at noon. 14. Cloudy: rain A.M. and P.M. 15. Cloudy. 16. Windy: stormy day: rain P.M. 17. Cloudy. 18. Fine. 19. Cloudy: snow early A.M. 20. Cloudy. 21—25. Fine. 26. Cloudy: thunder-storm, with rain P.M. 27, 28. Fine. 29. Fine: rain A.M. 30. Cloudy. 31. Fine.

Sandwich Manse, Orkney.—March 1. Bright: cloudy. 2. Clear: cloudy. 3. Showers: clear. 4. Bright: clear. 5. Fine: clear. 6. Clear. 7. Bright: hail-showers. 8. Showers: clear. 9. Damp: drops. 10. Damp: cloudy. 11. Clear: halo. 12. Cloudy: drops. 13. Cloudy: showers. 14. Sleet-showers: showers: sleet. 15. Sleet-showers: cloudy: sleet. 16. Sleet-showers: sleet. 17. Sleet-showers: snow. 18. Snow-showers: snow: cloudy. 19. Snow: clear. 20. Snow: clear: snow: cloudy. 21. Snow-drift: thaw: clear. 22. Cloudy. 23, 24. Bright: clear. 25. Rain: damp: clear. 26. Showers. 27. Showers: clear. 28. Clear. 29. Showers: cloudy. 30. Clear: cloudy. 31. Snow-showers: cloudy.

Applegarth Manse, Dumfries-shire.—March 1. Fine till 10: P.M. rain. 2. Heavy showers P.M. 3. Heavy rain all day. 4. Heavy rain all day: flood. 5. Very fine. 6. Showers. 7. Showers: hail: frost. 8. Hoar frost. 9. Slight showers. 10, 11, 12. Fine: fair. 13. Wet A.M. 14. Heavy rain A.M. 15. Rain P.M. 16. Showers: hail: sleet: rain. 17. Hard frost. 18. Frost: snow-showers. 19. Hard frost: clear. 20. Hard frost. 21. Frost: snow: hail: rain: thunder. 22. Rain: hail. 23. Slight drizzle: hail. 24. Showers. 25. Wet A.M.: cleared. 26. Hoar frost: drops. 27. Showers: hail. 28. Hail: rain. 29. Frost: clear and fine. 30. Frost: clear: cloudy. 31. Frost.

Mean temperature of the month	42°·2
Mean temperature of March 1845	36·3
Mean temperature of March for 23 years	39·0
Mean rain in March for 18 years	2·35 inches.

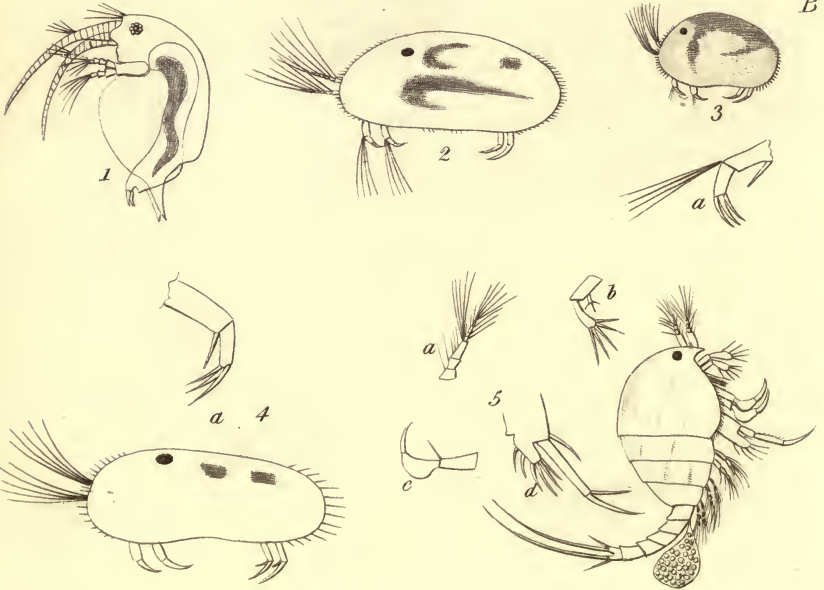




Geomalacus maculosus.

Geo. V. DuRoyer. del.

B



British Entomostraca.

Baird. del.

J.D.C. Sowerby. scil

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 114. JUNE 1846.

XLVII.—*On the Development of the Ova of the Nudibranchiate Mollusca.* By JOHN REID, M.D., Fellow of the Royal College of Physicians of Edinburgh, and Professor of Anatomy and Medicine in the University of St. Andrews.

[With a Plate.]

THE following observations upon the development of the Nudibranchiate Mollusca were made on the ova of the *Doris bilamelata*, *Doris tuberculata*, *Goniodoris Barvicensis*, *Polycera quadrilineata*, *Dendronotus arborescens*, *Doto coronata**, and a species of *Eolis* having numerous flattened papillæ, depressed and imbricated, arranged in fifteen or sixteen distinct rows, which I have not been able to refer to any of the species of that genus, the descriptions of which have yet come under my notice.

In the middle of last September I procured several specimens of *Polycera quadrilineata* found together near low-water mark, in each of which there was placed immediately beneath the external integuments of the upper surface a large white mass, slightly lobulated, lying behind and on each side of the heart, and prolonged forward as far as the external orifices of the reproductive organs. Two pairs of the animals were kept in separate vessels and daily supplied with fresh sea-water. Eight days after this one of the pairs was seen *in coitu*, lying side by side, the head of the one looking towards the tail of the other, and having the right edges of their bodies in close apposition. When examined twenty-four hours later neither had spawned, but two hours after this one had spawned, and the other was in the act of spawning. The spawn was seen to issue very slowly from the dilated vagina, and the animal very gradually shifted its position to permit the spawn to assume a ribbon-form, and cause it to adhere by one of its

* In naming these animals I have followed Messrs. Alder and Hancock in their 'Synopsis of British Nudibranchiate Mollusca,' in their beautiful monograph published by the Ray Society in 1845. These gentlemen consider the *Goniodoris Barvicensis* to be a variety of *Goniodoris nodosa*.

borders to the object upon which it was deposited. The process of spawning did not seem to occupy any very great length of time. The other pair was seen *in coitu* nine days after I had taken them home, and when examined thirteen hours after this neither had spawned, but two hours later one had spawned and the other was spawning. The animals by spawning became considerably reduced in size. They were kept alive for three weeks, and they deposited small portions of spawn between ten and fourteen days after the first spawning. It does not however appear to be absolutely necessary for the production of fertile ova in all, if in any of the individuals of the Nudibranchiate Mollusca, that a coitus should have so shortly preceded spawning as was observed in the *Polycera*, for an *Eolis* which was kept strictly confined in a vessel by itself, deposited, on the tenth and again on the thirty-second day of its isolation, abundance of fertile ova. During the high spring tides at the end of last February, I found near low-water mark several large assemblages of *Goniodoris Barvicensis* and *Doris bilamellata* among the rocks, collected for the purpose of breeding*. In one of these groups there must have been at least between sixty and seventy individuals of the *G. Barvicensis*, and abundance of their spawn adhered to the surface of the rocks, and in one place a portion about six inches square was almost completely covered by it. Many of the *Doris bilamellata* had also spawned, and were collected in smaller, more numerous and scattered groups, the greater number of which were farther from low-water mark and in more exposed situations than those of the *G. Barvicensis*. These assemblages do not break up for some time, but continue to occupy nearly the same position, and the animals composing them spawn more than once. I found some individuals still lingering among the rocks, and recent spawn deposited, as late as the end of April. Several pairs of the *Doris tuberculata* were also observed, and I procured four specimens of *Dendronotus arborescens* and two specimens of the *Eolis* mentioned above. The individuals of the two last genera mentioned were not found in pairs, and these, along with several specimens of *Goniodoris Barvicensis* and *Doris bilamellata*, were taken home and kept until they had spawned. About the same time I procured several specimens of *Doto coronata* from the deep sea adhering to *Plumularia falcata* and *Thuiaria thuia*, which were also kept alive, and began to spawn about the middle of March. Near the end of March I found a considerable quantity of the spawn of the *Doris tuberculata* adhering to the under surface of the ledges of rock near low-water mark.

The spawn of the *Doris bilamellata*, *D. tuberculata*, *Doto coro-*

* From the unusual mildness of this spring, the breeding-season may have commenced earlier than usual.

nata and *Polycera quadrilineata* is of a ribbon-shape and of a white colour, adhering by one of its edges to the substance upon which it is deposited; while in the *Goniodoris Barvicensis*, *Dendronotus arborescens* and in the *Eolis*, it assumes more or less the shape of a rounded chord. The ribbon-shaped spawn of the *Polycera quadrilineata* formed a small segment of a circle, and measured between half an inch and an inch in length, and about three-twelfths of an inch in height; that of the *Doris bilamellata* a large segment of a small circle, measuring in some cases eight-twelfths of an inch in height; while that of the *Doto coronata*, wound in a spiral manner round the branch of the zoophyte to which it adhered, and its free edge, instead of being straight as in the other ribbon-shaped spawn mentioned, presented under the microscope numerous and regular convexities. The spawn of the *Doris bilamellata* consists of two laminae of a structureless substance, between the layers of which, except for a small space near the edges, very numerous small ova are placed. These ova are firmly fixed in their position by a substance of the same nature as the external laminae which unites them together, and fills up the interstices among the ova. The ribbon thus formed is very elastic and tough, but when the ova are about to escape it becomes soft and gelatinous, the laminae separate at the edges, and at a later period may give way at different parts. This description applies to the spawn of the *D. tuberculata* and *Doto coronata*, and probably also to the *Polycera quadrilineata*, but my notes do not enable me to speak positively of this last. The spawn of the *Goniodoris Barvicensis* is either white or of a faint pink colour, has a disposition to assume the semicircular form, and some portions were from one to two inches in length, and from a quarter to nearly half an inch in circumference, and though rounded, it shows a slight tendency to the ribbon form. Its structure is essentially the same as that of the *D. bilamellata*, with this difference, that the external lamina approaches the cylindrical form with the ova arranged in the centre. The spawn of the *Dendronotus arborescens* was in the form of a small, long and waving chord, destitute of the strength and elasticity of the ribbon-shaped spawn, of a faint pink colour, attached to a branch of a *Plumularia*, along the side of which it formed a series of festoons. The circumference of this chord was formed of a transparent membranous-looking substance having no distinct structure, and the ova which occupied the interior were easily displaced and forced outwards. The spawn of the *Eolis* was deposited upon the inner surface of the vessel in which it was kept and upon a stone, and consisted of a small chord of a pale pink colour about one-twelfth of an inch in diameter, arranged in a close spiral form, the turns of which lay almost in apposition, and were surrounded

and connected together, and to the surface of the object upon which they were placed, by a transparent structureless substance. This chord when arranged in this manner made up a larger chord from three-twelfths to four-twelfths of an inch in diameter and several inches in length, which formed several coils, some of which crossed or were superimposed upon others. The structure of this chord was the same as that of the *Dendronotus arborescens*.

When the ova are examined under the microscope soon after the extrusion of the spawn, each is seen to consist of a thin transparent membranous case (Pl. X. fig. 1 *a*), with a round, smooth and opaque body in its centre (fig. 1 *b*). This membranous case (chorion), which I shall designate the *case-membrane*, is of a circular or oval form, is larger than what is sufficient to contain the opaque body within it, and its walls appear to be composed of at least two distinct laminæ*. The opaque body within is of a round form, and is chiefly composed of minute cells (nuclei), intermixt with a structureless substance which I suppose to be semifluid, and the whole is inclosed in an external transparent membrane (vitelline membrane†). I shall restrict the term *ovum* to this opaque body inclosed in the *case-membrane*‡. The ova of the *Doris bilamellata* vary in size from about 1-250th to 1-280th of an inch in diameter, those of the *Eolis* were nearly of the same size, while those of the *Doris tuberculata* were considerably larger and those of *Doto coronata* smaller than this. The minute cells (nuclei) composing the greater part of the vitelline mass are of a round or oval shape (fig. 3), vary in size in the *Doris bilamellata* from 1-6000th to 1-9000th—the greater number being from the 1-7000th to 1-8000th—of an inch in diameter, and no nucleoli were observed in their interior. A very great number of these ova were examined when subjected to very different degrees of pressure, and their structure appeared to be uniform, presenting no differences at different parts, and entirely composed of the materials we have described. I endeavoured to discover a clear cell in the centre of the vitelline mass, similar to that described by Kölliker and Dr. Bagge as existing in the ova of different species of *Ascaris*, and which plays so important a part in the cleaving of the yolk; but if such a cell exists, it escaped my notice from the opacity of the yolk. No evidence of the presence of this cell was obtained in any of the subsequent changes through which the ovum passed. In the spawn of the *Polycera quadrilineata*, *Doto coronata*, *Doris*

* I observed these laminæ separated from each other in some parts by a distinct interval in several ova of the spawn of the *Eolis*.

† Fig. 2 is a diagram showing the external or vitelline membrane imperfectly filled with its contents.

‡ No doubt the *case-membrane* is an accessory part of the *ovum*, and it is for convenience sake that I use the latter term in this restricted sense.

bilamellata, *D. tuberculata* and *Dendronotus arborescens*, one ovum is generally contained in each *case-membrane*; but in some portions of the spawn of the *Doris bilamellata*, two and even three ova were found in the same *case-membrane*. The greater number of the *case-membranes* in the spawn of the *Eolis* contained each two, three, four, and even five ova. The size of the *case-membranes* varies according to the number of ova which it contains. In the spawn of the *Eolis* the shape of the *case-membranes* is easily altered by external pressure, so that instead of being circular or oval they were frequently multangular.

One and sometimes two small transparent cells were seen in some of the ova examined soon after being spawned, adhering feebly to the outer surface of the external membrane (fig. 2 a) at the line of the first division of the ovum. These transparent cells were in general very easily detached by pressure, and were sometimes seen lying loose within the *case-membrane*.

I shall first describe the changes observed in the ova of the *Doris bilamellata* in the course of their development. A few hours after the extrusion of the spawn, a transverse groove presents itself on the surface of the ovum (fig. 4), and this gradually deepens and divides it into two equal parts, each part being of a circular form and completely inclosed in its own external membrane (fig. 5). Each of these again undergoes a bipartite division (fig. 6), and the four equal parts of which the ovum now consists proceed in their turn to divide in the same manner (fig. 7). In a portion of spawn examined between eleven and twelve hours after its extrusion, all the ova, with the exception of a very few which presented the primary division into two, had divided into four parts; and eight hours after this, or about nineteen hours from the time of spawning, most of them had divided into eight, some still consisted of four, and a few of six parts. Examined after twenty-seven hours from the time of spawning the ova had the appearance represented in fig. 8, and after fifty hours the appearance represented in fig. 9*. At the end of about seventy-five hours the cells of the ovum were still more subdivided, as is shown in fig. 10. Between this period and the end of the fifth day, the division of the cells of the ovum appeared to have reached its utmost limit, and the ovum gradually changed its shape, becoming somewhat elongated and broader at one end and narrower at the other, as in fig. 11. Up to this time these cells, though adhering by those parts of their external surfaces in contact, could sometimes be detached from each other by the application of pressure—more readily however at the earlier periods

* It is necessary to employ a fresh portion of spawn in each observation, as the development of the ova in those portions of the spawn used in such examinations under the microscope is very seriously disturbed.

of their division; but after this they began to coalesce, though some might be separated from the rest still later. Each of the small cells into which the ovum had divided measured from the 1-1500th to 1-2000th of an inch in diameter, and consisted of a cell-membrane, with several of the minute cells of which the ovum was originally chiefly composed placed like nuclei in its interior (fig. 12). The ovum at the time of its extrusion may perhaps be considered to be a single large cell with a great number of minute cells or nuclei in its interior. During the subdivision of this large cell into a number of smaller cells, I could detect no changes, after repeated examinations, in the form of the minute cells or nuclei, and none in their arrangement which were not apparently produced by the bending inwards of the external or vitelline membrane to effect the subdivision. I do not mean to assert that these central nuclei were not the efficient agents in producing these changes; I only wish to state that I was unable to detect any alteration in the form or in the arrangement of these nuclei preceding these subdivisions. At the end of the sixth day no additional change had taken place in the external form of the ovum, but the cells into which it had divided were continuing to coalesce, and minute cilia were observed on the upper surface of the broad extremity. On the eighth day it had assumed the form represented in fig. 13; its circumference had become somewhat translucent, especially at the lower and middle parts, where the external layer of cells had separated themselves from the others, and coalesced to form the commencement of the shell (fig. 13 *a*). The incipient shell contained many of the minute cells or nuclei, and bands of them passed between different parts of its inner surface and the dark mass in the interior. The cilia on the broad extremity had become larger and more active in their movements, and traces were observed of the division of this end into the *ciliated discs* (fig. 13 *c*) and the *foot* (fig. 13 *d**). The cells into which the ovum had divided had now almost disappeared, while the minute cells or nuclei of which the ovum originally chiefly consists seemed to be as numerous as ever, and were diffused, except where the shell was forming, through a glutinous-looking structureless substance. It is now entitled to the term of *embryo*. Instead of describing in their order of succession the different changes through which the embryo passes until it leaves the case-membrane and swims at large, I shall first describe its structure at that period, as this will save a good deal of repetition, and also render the description more easily followed. Some of the embryos left their *case-membrane* about the end of the fourteenth day after spawning, but the whole had not escaped until three or four

* These parts are indicated by the same letters of reference in a more advanced stage of their development in fig. 17.

days later. The *case-membrane* previous to the escape of the embryo becomes gradually thinner, and at last either entirely disappears or is reduced to shreds. This change in the *case-membrane* may probably be in some measure caused by the incessant strokes of the long cilia of the *ciliated discs* upon its inner surface during the active revolutions of the embryo round its interior. The embryo at the time of its liberation is provided with a shell (figs. 25 and 20 *a*), considerably longer in its antero-posterior than in its transverse diameter, from which it can protrude the upper part of its body and retract it at pleasure. Fig. 20 is a representation of the embryo when protruded from its shell, and fig. 21 when entirely drawn into its interior. The embryo with its shell is at this period considerably larger than the ovum at the time of its extrusion. Some of them measured about 1-145th of an inch in length and 1-200th in the antero-posterior diameter; others 1-170th in the former and 1-250th in the latter direction. The parts which can be protruded from the shell are two large and prominent ciliated discs (fig. 20 *c*), and a projecting process* attached to the upper part of the anterior surface of the body (fig. 20 *d*). The lower surface of this projecting process or *foot* is covered by a hard plate (fig. 20 *g*), which closely adheres to it and moves along with it. The *ciliated discs* are higher in front than behind, and are separated in front by a deep notch and by a shallower one behind. They are very contractile, and present very different appearances at different times; and their superior surface is provided with a thickened margin, to the upper and outer edge of which a row of long and strong cilia is attached, by whose movements they can swim rapidly in various directions through the water. When these discs are elevated and in the vertical position, as represented in figs. 20 and 18, the parts connecting their margins to the body of the embryo are translucent, and they may now be contracted from before backwards and a number of the central cilia collected into a tuft; or if the embryo be about to retire into the shell, they are pressed together, the translucent texture connecting their thickened margins to the body contracts and pulls them downwards, and the *foot* with its hard plate is raised, as is represented in fig. 21. This plate now acts as an imperfect operculum. When the embryo, on the other hand, is about to swim, the *ciliated discs* are thrown apart and flattened, as is represented in figs. 16 and 19; and in this position each disc approaches the circular form, is hollow on the upper surface, and their thickened margins are prolonged inwards along the edges of the anterior notch, at the bottom of which they are continuous.

* To an exactly similar structure in the embryo of the *Asplysia* Van Beneden (Annales des Sciences Naturelles, tom. xv. p. 123, 1841) has given the name of *foot*, and we have here retained the appellation.

In the bottom of this anterior notch, immediately in front of the point where the thickened margins of the discs become continuous, and at the base of the upper surface of the *foot*, the mouth (fig. 16 *y*), which is formed by a simple rounded aperture, is placed. The long cilia attached to the outer edge of the upper surface of the thickened margin of the discs are when at rest first bent inwards at an acute angle as far as the inner edge of the thickened margin, and then project upwards and outwards, but become more straight when in a state of action. The upper surface of the *foot* and the sides of the mouth are provided with cilia considerably smaller than the locomotive ones attached to the margin of the disc, and still smaller cilia are placed upon the hollow upper surface of the discs and other parts of the embryo outside the shell. Two very obvious and transparent cells (figs. 16 and 17 *x*), possessing much more refractive power than the other parts of the embryo, are placed in the base of the foot, at the sides of the gullet and immediately below the mouth. Each of these is apparently inclosed in a larger cell; at least each of them is surrounded by a well-defined ring, which however is more opaque than the cell which it encircles (figs. 20 and 21*). From the mouth the gullet leads downward and forwards to the stomach (fig. 20 *h*), and from the back part of the stomach the intestine (fig. 20 *i*) commences. The intestine bends to the right, proceeding upwards on this side, and terminates a little below and behind the right transparent cell in the root of the *foot*, and it is there surrounded by a portion of an irregular mass composed of a few cells (fig. 20 *o*) occupying that position. The whole of the inner surface of the gullet, stomach and intestine is covered with cilia, and in some cases, masses, chiefly composed of what appeared to be minute cells thrown off from the inner surface of the digestive tube, were revolving rapidly in the stomach. Two masses adhered to the lateral surfaces of the stomach and lower part of the gullet (fig. 20 *m* and *n*); one of these, by much the larger (*m*), was placed on the left side, and projected considerably in front of the stomach; the other adhered to its right side (*n*), and was placed immediately in front of the upper part of the intestine. Each of these two bodies was composed of a single cell only, having minute cells or nuclei similar to those originally composing the ovum, scattered over its inner surface with considerable intervals between each. In several cases some minute

* Van Beneden supposes that these transparent cells which he observed in the embryo of the *Asplysia* may be the rudiments of the nervous system. This opinion may be true, but at present it must be considered only in the light of a supposition. These cells, if I mistake not, may be occasionally seen vibrating slightly within the larger cells inclosing them. It has been suggested to me that these may be the rudiments of the auditory organs.

bodies were seen moving backwards and forwards in the interior of the largest of these two cells*. On the right side there is an irregularly-shaped aperture (fig. 16 *t*) immediately behind the termination of the intestine, and between the upper part of the body and the aperture of the shell, through which the water passes into the interior, and cilia were seen in active motion in this situation. A band passes from the upper part of the mass of cells placed at the termination of the intestine, round the neck of the embryo, close to the margin of the aperture of the shell, and forms the outer boundary of this opening by which the water passes into the interior of the shell †. As the largest of the cells, placed at the termination of the intestine, was seen to contract at irregular intervals, I imagined that it might be a rudimentary heart, and the band to be a vessel leading from it, but I obtained no satisfactory evidence of the accuracy of this supposition. A pyramidal-shaped mass projects from the upper and back part of the body (fig. 20 *s*), from the apex of which a thin membrane descends and passes round the body (fig. 20 *v*). A strong band of contractile fibres is attached to the lower part of the left side of the shell, and passing up on the same side divides into two portions, which terminate upon the back part of the neck and gullet. A very minute band passes from the same part of the shell to the lower part of the stomach. These muscular bundles, though distinctly seen, especially the strong band passing upwards, in the embryos of all the Nudibranchiate Mollusca examined, are remarkably distinct in that of the *Dendronotus arborescens* (figs. 22 and 23 *pp* ‡). It is by the contraction of these muscular bundles that the animal retreats into its shell, causing the descent of the posterior portion of the *ciliated discs*, and the parts to which the muscular fibres are attached. I could not make out the position and course of the muscular bundles by which the embryo protrudes the *ciliated discs* and *foot* from the shell. The upper and anterior part of the body a little below the base of the *foot* is attached to the anterior margin of the shell, so that it undergoes little change of position during these movements of retraction and extrusion. The whole structures of the embryo are much more transparent than at an earlier period of its development, no minute cells or nuclei now adhere to the inner surface of the shell, and their number in the other parts is much diminished. The other parts of the embryo ap-

* The nuclei adhering to the inner surface of the larger of these two cells appeared bigger than the nuclei of which the ovum was originally chiefly composed, and also than those in the other parts of the embryo.

† This band is more distinctly seen in the embryo of the *Dendronotus arborescens*.

‡ This muscular bundle is indistinctly indicated in fig. 19.

pear to be formed of a soft texture without any definite structure, having minute cells or nuclei scattered at short intervals through it. Some of the embryos escape from their *case-membranes* at an earlier stage than this, and their structures are consequently more opaque.

We now return to the earlier stages of the development. At the end of the ninth day the embryo had the appearance represented in fig. 15. The *ciliated discs* (*c*) and *foot* (*d*) were now distinctly seen, the central mass had separated itself to a greater distance from the shell (*a*), except at the upper part, and the portion within the shell had arranged itself into four imperfectly defined lobes, which are readily recognised to be earlier conditions of the structures described in the embryo when it is about to leave the *case-membrane*. The ciliated discs were however still small, but the embryos had now a greater or less degree of motion; some performing a rocking motion, and others more advanced were rotating slowly round the interior of the *case-membrane*. Besides the large cilia on the margins of the *ciliated discs*, smaller cilia were observed on different parts of the upper end of the embryo. The mouth was distinctly seen, the hard plate on the lower surface of the *foot* had begun to form, and the transparent cells in the base of the foot were seen on subjecting the embryo to pressure. A layer of the minute cells or nuclei covered the inner surface of the shell, giving it a considerable degree of opacity. From the ninth to the eleventh day the *ciliated discs* had become more developed, more separated from each other, and much more moveable. The largest of the four lobes of the body had arranged itself into a stomach and intestine, and occasional contractile movements were seen in these; and the transparent cells in the base of the *foot* were now very obvious. On the twelfth day the embryo had assumed the appearances represented in figs. 16, 17, 18 and 19, and all the parts described in it at the time of its leaving the spawn were now distinctly seen. Fig. 16 is an anterior view, showing that the two large cells at the side of the stomach are at this period connected by a ridge running across the front of the gullet, and which afterwards nearly disappears. The larger or left cell does not at this period project so much in front of the stomach, and the right cell is larger and lies near the anterior edge of the stomach. Fig. 17 is a view of the right side, showing the whole course of the intestine; fig. 18 is a view of the left side, in which the commencement of the intestine (*i*), curving itself to the right side, is the only part of that tube seen; and fig. 19 is a view of the posterior surface, showing the tortuous course of the intestine (*i*). The cilia on the inner surface of the stomach and intestine are now also visible. The course of the gullet is not yet distinctly seen, and all the

structures are much more opaque. The loose membrane surrounding the body at a later period (fig. 20 *v*) adheres to the inner surface of the shell, and like the other soft textures and the retractor muscle, contains numerous small cells or nuclei. At this period the embryo was never seen to draw the *ciliated discs* within the shell.

The ova of the other Nudibranchiate Mollusca examined passed through the same stages of development as those of the *Doris bilamellata*, and the embryos presented, with some slight modifications in size and position, the structures we have described. The embryo of the *Doris tuberculata*, at the time it leaves the *case-membrane*, is larger than the others, measuring about 1-100th of an inch in length and 1-130 in the antero-posterior direction; that of the *Dendronotus arborescens* measured 1-165 in length, and 1-250 in the antero-posterior direction; and that of the *Doto coronata* about 1-200 in the former and 1-260 in the latter direction. The shell of the embryo of the *Doris tuberculata* is relatively shorter in length or in the vertical direction than in the other embryos examined, and the parts which protrude beyond the shell are not only positively but relatively larger. The *ciliated discs* are especially large, the apex of the *foot* is narrower and more pointed, and the transparent cells in the base of the *foot* are relatively smaller. The gullet and stomach are short, and the two large cells at their lateral surfaces are placed near each other at a later period of its development than in the *D. bilamellata*. The cells at the termination of the intestine are more numerous and transparent, and occupy a considerable space of the upper part of the right side of the shell, so that the body of the embryo lies more to the left than to the right side of the mesial line of the shell.

The cilia were not observed on the upper part of the ovum of the *Goniodoris Barvicensis* and *Polycera quadrilineata* until the seventh day, or one day later than in that of the *D. bilamellata*, and the embryos of the *Polycera* did not begin to leave the spawn until the eighteenth day. The transparent cells in the base of the *foot* are, from the less opacity of the body, seen at an earlier stage in the embryos of the *Polycera* (fig. 14 *x*), and in a great number of these also at this stage, an opaque irregular patch, composed at least partly of aggregated cells, lay on the surface of the lower end (fig. 14 *b*). The development of all the ova of the same spawn does not proceed *pari passu*, but much greater irregularities were observed in the ova of the *Polycera quadrilineata* than in the others; for in many of these the bipartite division did not even proceed regularly, nor were the cells into which it divided of the same size. That these irregularities were not entirely dependent upon the artificial conditions under which

the spawn was placed, is rendered probable by the circumstance that they were seen in portions of spawn, in which, to judge from other portions of the same spawn examined at a later period, all these irregularities disappeared at a more advanced stage of their development. The external form of the embryo of the *Dendro-notus arborescens* presented a much greater departure from that of the *Doris bilamellata* than any of the others. Fig. 22 is a representation of the left side, and fig. 23 of the right side of the embryo of the *D. arborescens* as it was leaving the *case-membrane*. The shell (fig. 24) was more elongated in the vertical direction, the embryo occupied a smaller portion of the shell, and the parts which project beyond it were relatively considerably smaller. All the textures were transparent, and the retractor muscles were very distinctly seen. The membrane surrounding the body (*v*) was attached to the shell around the origin of the retractor muscles. When it retired within the shell, the *ciliated discs* and *foot* were drawn down to a considerable distance from the orifice of the shell. When examined at an earlier period of its development, the whole embryo was decidedly shorter and much less transparent. I have had no opportunity of examining the embryos of the *D. arborescens*, except when developed under artificial circumstances, but the embryos possessing the appearances described, seemed healthy and active.

To what extent the artificial circumstances under which the ova of these animals were kept, influenced the period of time occupied in their development, we are not prepared to form an opinion. That the changes of structure described are those that occur in ova of the *Doris bilamellata* and *D. tuberculata* when left in the situations where they are usually deposited, was proved by the examination of portions of the spawn removed at different periods after deposition upon the rocks. The development of the ova of the *Doris bilamellata* proceeded more favourably than that of the others; but sometimes a considerable number even of these had their development arrested, and otherwise rendered monstrous, though supplied daily with water fresh from the ocean. I have as yet failed, though I have made the attempt in various ways, to keep the embryos alive after they leave the spawn, sufficiently long to trace the further stages of their development. Sars* and Messrs. Alder and Hancock† have already announced that the young of the Nudibranchiate Mollusca undergo metamorphosis, that they swim about for a time inclosed in a nautiloid shell, and that at this period they differ

* Wiegmann's 'Archives' for 1841. I have not seen Sars's paper, and quote this reference to it from Alder and Hancock.

† Report of the British Association for the Advancement of Science, volume for 1844, p. 27.

entirely in their external form and in their organism from their parents.

I may here mention that three of the *Dendronotus arborescens*, which I kept alive at home for nearly a month, often emitted very audible sounds, which were heard distinctly at the distance of twelve feet. Dr. Grant, who first noticed these sounds, supposes that they are produced by the action of the jaws. They exactly resembled the noise produced by a stroke upon the surface of the earthenware vessel in which they were kept, so that I at first imagined that it might be caused in this way, though it would be difficult to conceive how these animals could strike blows so forcible as to occasion so loud a sound. I however heard these sounds when it appeared to me that the animals were removed from the surface of the vessel and resting upon the branches of some zoophytes. Messrs. Alder and Hancock mention that they have frequently kept these animals for several days together without detecting the emission of any sound. It is possible that the animal emits this sound only during the breeding-season.

EXPLANATION OF PLATE X.

- Fig. 1.* Ovum of *Doris bilamellata* : *a*, case-membrane (chorion) ; *b*, yolk or vitelline mass.
- Fig. 2.* Part of the vitelline mass evacuated, showing the vitelline membrane ; *a*, small clear cell, sometimes seen attached to outer surface of vitelline membrane.
- Fig. 3.* Small cells (nuclei) forming the greater part of the vitelline mass.
- Figs. 4, 5.* First or bipartite division of the yolk.
- Figs. 6, 7, 8, 9, 10, 11.* Subsequent divisions of the yolk.
- Fig. 12.* Greatly enlarged view of one of the numerous cells into which the yolk ultimately divides.
- Fig. 13.* Embryo on the eighth day after extrusion of the ova.
- Fig. 14.* Embryo of *Polycera quadrilineata* at the same period of its development.
- Fig. 15.* Embryo of the *Doris bilamellata* at the ninth day.
- Fig. 16.* Anterior view of the embryo of the *Doris bilamellata* at the twelfth day.
- Fig. 17.* View of right side of the same.
- Fig. 18.* View of left side of the same.
- Fig. 19.* Posterior view of the same.
- Fig. 20.* View of right side of the embryo when it is ready to leave the case-membrane.
- Fig. 21.* View of the same when it has retired within its shell.
- Fig. 22.* View of left side of the embryo of *Dendronotus arborescens* when about to leave its case-membrane.
- Fig. 23.* View of right side of the same.
- Fig. 24.* Anterior view of shell of *Dendronotus arborescens*.
- Fig. 25.* Lateral view of the shell of *Doris bilamellata*.

XLVIII.—On the Development of Chara. By C. MÜLLER*.

[Concluded from p. 329.]

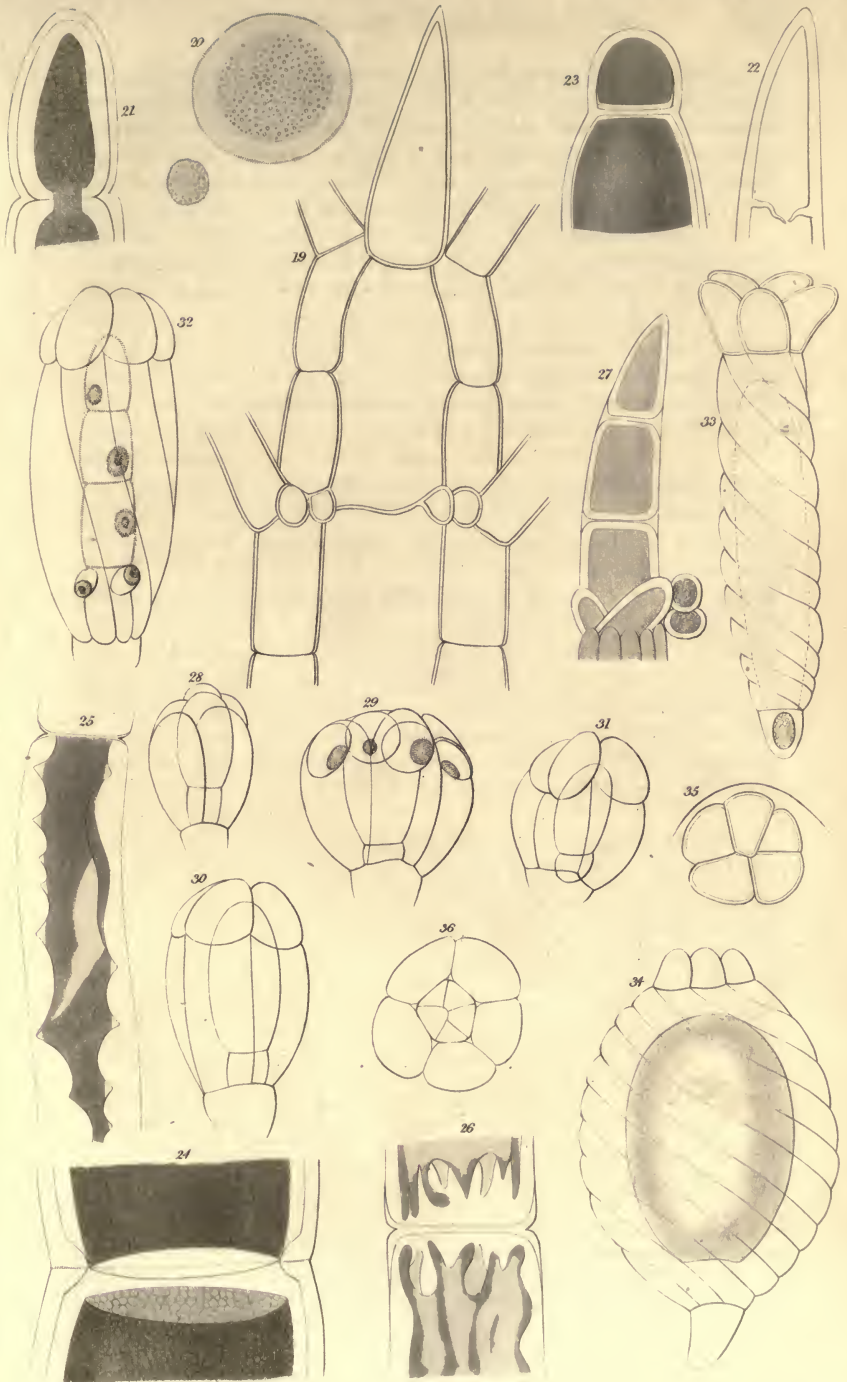
§ 6. Formation of the Fruit.

THE origin of the fruit must be sought for in the very youngest whorls of branches only. *It there exists as one of those external cells which surround the central cell*, and is either developed separately or in combination with the cells of the anther. It differs considerably from the latter, inasmuch as the latter is a cell produced by intercalary growth which is evolved from the articulations of the fruit-cell and is developed downwards, the former being directed upwards. Whilst at this period the other external cells are elongating to form branches, the cells of the anther and fruit merely become simply rounded, containing in their interior a yellowish white mass with defined globular outline (the cytoplasmata, Plate VII. fig. 27). The development of the anthers always proceeds more rapidly than that of the fruit, when both occur together; for they may be absent in one and the same species, as *Ch. crinita*.

The next step in the further evolution of the fruit-cell consists in the subdivision of its cytoplasmata into six parts. *It is exceedingly difficult to detect this*; I was only able to succeed by gently compressing the cell, whereupon all that I perceived was, that these globular masses had formed. These should be considered as so many cytoplasmata, hence we have one central and five external cytoplasmata. From these as many cells are formed by the process with which we are acquainted, during which however the cytoplasmata are usually perfectly absorbed (fig. 28). These six cells are so arranged, that the apex of each is situated externally. This is the first stage at which anything definite can be perceived in the young fruit, and although another very small cell *constantly* exists beneath the central cell, I cannot state anything more regarding its formation. Suffice to say that it exists there, and is seen in figs. 28—32. It forms the commencement of that cell, which has been described above (§ 2), in the ripe fruit, and which is shown in figs. 1 and 2. The statement there made, that it might be of importance to the existence of the spores, is remarkably borne out by its so early and constant presence, which clearly shows that it is an essential organ of the fruit.

The five terminal cells which are arranged upon the spore-sac in the form of a crown are next formed, and also from cytoplasmata, as may be most distinctly perceived in fig. 29. These here also become speedily absorbed, and the cells which are formed around them have become so firmly adherent to one another, that they

* Translated from the Botanische Zeitung for July 3, 1845.





completely inclose the central cell and prevent any access to it from without (figs. 30—35). As a proof I have given a figure (fig. 36) from these young fruits, which may be compared with § 2. fig. 35. from them when ripe. In it the existence of the central cell is distinct enough at the intercellular spaces. The preparation is placed upon its vertex, and thus the pressure of the five terminal cells against one another may be distinctly seen.

This central cell forms the commencement of the nucleus, and the five external with the five* terminal cells form the young sporal sac. The sporal membrane is not yet developed.

All parts of the fruit now become elongated, and as they increase, the cells of the sporal sac, which continue to become utricular, assume another position, *i. e.* they turn spirally around the nucleus, whilst in their youngest state they had merely an upright position.

When the fruit has arrived at the limit of its longitudinal extension it expands spherically, becoming at the same time filled with cells. These are again formed from cytoblasts, as may be seen in fig. 32, and it is probable that in the new cells thus formed *new* ones are again formed and so on, until the process of cell-formation ceases from the transformation of all the cells into starchy matter. This is a complete confirmation of Schleiden's observations on cell-formation in the embryo. I was not satisfied however by observing merely the true commencement of this formation (fig. 32); for the cells of the sporal sac become so speedily turbid, that the interior is rendered quite undistinguishable, nor could I succeed in extending my observations by dissections.

When the fruit has attained its proper dimensions the remaining cells become thicker; the primordial utricles, which were at first scarcely perceptible, now become distinct, and the contents of the cells are formed. These are at first of a reddish colour; they continue to become more intense, and subsequently become brownish yellow and green, which colour they retain. In the meantime the nucleal membrane has become thickened, and is now surrounded by another strong brownish membrane. This is the spore-membrane. It is merely the *internal membrane of the spore-sac thickened*, and may be subsequently completely separated from it. Thus are explained its perfectly homogeneous structure, flattened form, spiral windings and the interruption of this winding, the upper angles of which are always the most

* According to Meyen (Physiolog. vol. iii. p. 394) there are sometimes six sporal sac cells. I have never seen them myself. If however it be true, it is the same, as when we find the central utricle surrounded by six, seven, eight or more cells. Hence here the minimum is six, in the former case five.

acute (compare § 2), which evidently arises from their having been inserted in the intercellular passages between the nucleus and the spore-sac. In fig. 3 the ripe fruit, the internal membrane of the spore-sac cannot be any longer recognised. From what has been stated the simple deduction arises, that *the fruit is the metamorphosed bud of a branch or shoot*. Even as regards its function *it is nothing more than a bud*, which differs from the terminal bud of the stem merely in combining at the same time one character of the stem, *i. e.* the cortical layer. Hence the nucleus is nothing more than the perfect analogue of the central utricle or *of the metamorphosed stem itself*. *The sporal sac is the perfect analogue of the cortical layer of the stem*. *The contents of the nucleus agree perfectly with those of the internodial cells of Nitella*. The fruit of *Chara* differs from these buds only in its compound structure. Whilst the buds of the stem and branches were developed longitudinally, the buds destined to form the fruit remained at the grade of buds and concentrated their formative powers in themselves. *Finally, no impregnation takes place*. This deduction is evidently a consequence of the above; however it can do no harm to mention it again here in *italics*. Thus all artificial investigations on the so-called anthers are referred to a separate province, and their explanation becomes still more obscure.

The five terminal cells, like the other parts of the sporal sac, have to defend the young nucleus from injury; they therefore grow together over it and perfectly inclose it. *The sporal membrane has to fulfill the same office* as soon as the spores are deprived of their coating, the spore-sac, in order to prevent their development into new plants.

After the above remarks had been written, I found in Kützing's 'Phycologia,' p. 80, a similar comparison of the individual organs of the fruit. I add them here for comparison with my own: "The true fruit of the *Charæ* is nothing more than a branch, the evolution of which takes place in width instead of in length; the five cells which crown its apex are the verticil of branches*. The internal utricle has become transformed into the coats of the seed; the external tubes, which form the cortical layer in the stem, form the external coat of the seed †; the angular cell-contents ‡ be-

* From what has been stated this cannot be true, because branches are never formed from the cortical layer; we rather have a repetition and a confirmation of the development of new cortical cells in the older ones beautifully repeated in the cortical layer of the stem. Kützing regards this cortical layer as the elongation downwards of the cells of the branches. Hence the five terminal cells are new cortical cells.

† Older authors also believed this, as Meyen, Phys. 3 Bd. p. 395, where a similar morphological interpretation of the fruit of the *Charæ* is anticipated. I hope to have rendered the above extended interpretation useless by direct observations.

‡ From what has been stated this is incorrect.

come converted into pure amyllum, in which state they partly exist in the utricular cells of the stem, only here they are coloured green by chlorophylle."

§ 7. Systematic Position.

This paragraph is not for the purpose of deciding upon the systematic position of the *Charæ*, for that has been already spoken of; I merely wish to notice a few special points.

It is evident from the above, that the formation of the fruit of the *Charæ* cannot be considered as a high grade of development. To what other cryptogamic family is it best comparable? I do not hesitate to state, the *Algæ*. Kützing, in his 'Phycologia Generalis,' has unconditionally referred them to this position, placing them near *Lemania*. We must here bear in mind the structure of the fruit before all things, and although we are but little acquainted with the fruit of those *Algæ* which are nearest related to the *Charæ* in habit, in examining the latter I at the same time met with another of the *Algæ* in which the most remarkable analogies to the fruit of the *Charæ* existed. I allude to *Chatophora tuberculosa*. In the 'Flora,' 1842, no. 33, I have published a small treatise on it, which unfortunately still remains very imperfect. The main point is, that in it the analogues to the anthers of the *Charæ* may be positively found. They are red globules, formed in a much more simple manner than the anthers of *Chara*. They also lie close to the fruit, which is also nothing more than metamorphosed buds. Kützing, who quotes my paper in the essay above mentioned, p. 325, denies *any* analogue of the anthers either of Phanerogamia or Cryptogamia, and asserts that the above red globules are nothing more than the more highly developed fruit! Having lately carefully moistened and again examined my dried specimens, by which they were not found altered in the least, *I must most decidedly protest against this statement!* When I look at the two cells of the anthers and fruit of *Chara* represented in fig. 27, I find, as it appears to me, the lowermost red, the contents of the upper being green,—a similar formation to the two organs in *Chatophora*. Unfortunately not having enough specimens, I cannot make any more remarks upon them than what I have already stated in my history of the development of *Chatophora*. I therefore strongly recommend those fortunate persons, who should again meet with them, to examine them most accurately and to compare them with the organs of fructification of *Chara*. As far as I know, no one has noticed the above red globules. However, as long as this remains so, we must regard the *Charæ* as a *familia incertæ sedis*, but must place them near the *Algæ*.

EXPLANATION OF PLATES V., VI. AND VII.

- Fig. 1. Ripe fruit of *Chara vulgaris* cut through the axis, and exhibiting the internal structure.
- Fig. 2. The same, showing the exterior.
- Fig. 3. A portion of the spore-sac more highly magnified. The brown sporal membrane forms its internal border.
- Fig. 4. The nucleus from *Chara vulgaris*.
- Fig. 5. Starch-cells from the same nucleus. Fig. 20. A cell converted into cytoblastema, magnified 400 diameters.
- Fig. 6. The germinating spores of *Ch. vulgaris*.
- Fig. 7. The lowermost part of the germ, containing a distinct primordial utricle, cytoblasts, their fibres, and the cytoblastema deposited in the joints, after treatment with iodine.
- Fig. 8. The same, exhibiting the formation of intercalary cells, treated with iodine.
- Figs. 9, 10.—10. New plants of *Ch. vulgaris* formed by intercalary growth. 9. The earliest stage of the last figure, after treatment with iodine; magnified 300 diameters.
- Fig. 11. Terminal bud of the stem of *Ch. hispida*, 400 diameters. Fig. 14. The same seen from below.
- Fig. 12. A portion of the same bud with perfect branches. The cells of the shoots are deposited along with their septa, but have not yet assumed their vesicular form.
- Fig. 13. This has taken place here.
- Fig. 15. A branch of *Ch. hispida* transversely divided.
- Fig. 16. A branch with the cells of the shoots forming.
- Fig. 17. A branch of *Ch. hispida* with the commencement of the cortical formation.
- Fig. 18. The central cell of the internode, after treatment with nitric acid and iodine, 400 diameters.
- Fig. 19. A branch of *Ch. hispida* cut through longitudinally. The internodal cells are distinctly seen.
- Fig. 21. Apex of a branch of *Ch. crinita*, after treatment with iodine.
- Fig. 22. Apex of a branch of *Ch. hispida* cut through longitudinally.
- Fig. 23. Summit of a branch of *Ch. hispida* with a divided apex.
- Fig. 24. A part of the apex of a branch of *Ch. crinita*, after the addition of nitric acid and iodine. The secondary membrane is distinctly seen internally. One end of the primordial utricle is separated from the transverse wall of its cell.
- Fig. 25. The primordial utricle in the lowest articulations of the germ of *Ch. vulgaris*. Treated with nitric acid.
- Fig. 26. The same from the apex of a branch of *Ch. hispida*, also treated with nitric acid.
- Fig. 27. Apex of a branch of *Ch. crinita* with the cells of the fruit and anthers.
- Fig. 28. Early state of the fruit of *Ch. crinita*, 400 diameters.
- Fig. 29. The same, with the formation of the five terminal cells, 400 diam.
- Figs. 30 and 31. The same, perfectly formed, 400 diameters.
- Fig. 32. The same. New cells have become developed within the nucleus from cytoblasts: 400 diameters.
- Fig. 33. The same. The cells of the spore-sac are arranged spirally around the nucleus: 250 diameters.
- Fig. 34. The perfectly formed fruit of *Ch. crinita*, 250 diameters.
- Fig. 35. Its five terminal cells, seen from above, 400 diameters.
- Fig. 36. The same from the young fruit, 400 diameters.

XLIX.—*Observations on the Natural History of the Malayan Peninsula.* By Capt. P. J. BEGBIE, Madras Artillery. Communicated by H. E. STRICKLAND, Esq.

DURING a recent exploration of the richly-furnished shelves of the Radcliffe Library at Oxford, I met with a small volume entitled 'The Malayan Peninsula, embracing the History, Manners and Customs of the Inhabitants, Politics, Natural History, &c.,' by Capt. P. J. Begbie; printed at the Vepery Mission Press, 1834. As this volume is almost, if not entirely, unknown to British naturalists, and as the zoological observations appear to be made by a careful and original observer, they may perhaps be interesting to the readers of the 'Annals', notwithstanding occasional inaccuracies in the scientific nomenclature.—H. E. S.

Begbie's Malayan Peninsula, p. 497 et seq.

The first species of the Ape tribe which is to be found in the peninsula is the *Troglodytes niger* of M. Desmarest*, and the *Simia troglodytes* of Linnæus†, better known to English readers as the Chimpansé.

This animal presents a striking similarity in external conformation to the human figure. It stands about three feet high, and is covered profusely with long black hair, that on the hind head and shoulders being considerably longer than the rest. The head rounded and skin of the face dark. The facial angle, or that formed by a line drawn from the forehead to the muzzle, and another from the muzzle to the bottom of the ear, is 50°. The Chimpansé is destitute of a tail, cheek-pouches, and intermaxillary bones. The haunches are naked, but not callous. The arms reach nearly to the knees, so as to be nearly proportioned to the legs when the animal goes on all-fours. The hair on the fore-arm is reversed, pointing to the elbows instead of to the wrist. The hands and legs from the wrists and ankles are covered with light brown hair, the terminal line of the black hair being well-defined, so as to give an appearance of white gloves and stockings. The face is encircled with a white beard.

The Chimpansé is capable of receiving a considerable degree of education, and can make use of a stick to assist its steps. It is met with in troops of about 100 each, in various parts of the Malayan archipelago: those in the peninsula generally delight in the deep woods which clothe the sides of the various ranges of hills, and are extremely shy and difficult of access. It is very rarely that they are taken alive,—a circumstance perhaps to be

* Stark's Elements of Natural History, vol. i. p. 41.

† Turton's System of Nature, vol. i. p. 10.

attributed to the timidity of the natives, who prefer the certainty of the gun to the hazard of a struggle in which they might be overcome by strength and number.

P. Satyrus, Desm. (synonyms: *Simia satyrus*, Linn.; *Pongo Wurmbii*, Desm.), generally known as the great Orang-Outang*.

The canine teeth in this species project somewhat more than they do in mankind, and the tubercles on the molars are considerably more developed. The head is rounded, but more inclining to the oval than in the Chimpanseé; the facial angle is about 65° . Like the last, it has no tail, cheek-pouches, nor callosities on the buttocks. The ears, except in being destitute of the lower lobe, resemble those of man. The arms are disproportionably long; so much so, that when the animal is erect, it can touch the ground with its hands.

Mr. Stark†, in treating of this animal, has the following passage:—"The history of this animal, confounded with relations of other species, has hitherto been involved in much obscurity. The animal described by naturalists under the name of *S. satyrus*, specimens of which have occasionally been seen in Europe, and the Pongo of Wurmb, seem only, as Cuvier conjectured, to be the young of the gigantic animal described and partly figured by Dr. Clarke Abel. From the measurement of the shrivelled and dried skin, that gentleman makes its height to exceed seven feet and a half, though the youth of the animal was ascertained by the state of its teeth, and by the apophysis of the bones of its hands and feet being incompletely ossified."

After this opinion of two eminent naturalists, it may appear to savour somewhat of presumption to come to a different conclusion; but I offer with diffidence the following grounds on which I conceive the Pongo of Wurmb, or the third variety of the *Simia Satyrus* of Linnæus, to be, as there classed, distinct from the great Orang Utan.

The fur of the great Orang Utan is brownish red—that of the Pongo of the Malayan peninsula is a very pale nankeen. The beard of the former is chestnut—that of the latter nearly white. The hair of the head of the Orang Utan is reddish brown—that of the Pongo is of the same pale colour as the body. But the principal fact on which I rest is the height. It is supposed by these authors that the Pongo of three feet high is but the young Orang Utan. Now the Pongo in my possession was killed with a young one in her arms, which she was suckling,—a decisive proof of maturity, and yet she is barely three feet high. I have seen several others, some smaller, but none taller than this.

* Corrupted from the Malayese: *Orang*, a man, and *Utan*, wild, from the resemblance to a human being.

† Stark's Elements of Natural History, vol. i. p. 42.

Further, the Malays assert, although I am not prepared to state with what truth, that there is seldom more than one Pongo to be found amongst a troop of Chimpanzés, over whom it rules with despotic authority, and that consequently it is very difficult to get near enough to shoot one, as the alarm is generally given by some of its subjects on the approach of the sportsman. If this exercise of authority have any foundation in fact, it tends to confirm the opinion of the animal being in full vigour.

I would therefore subdivide this tribe into the two following, viz. :

1st. *Pithecus satyrus*, Desm. (synonym, *Simia satyrus*, 2. Linn.)
The great Orang Utan.

2nd. *Pongo Wurmbii*, Desm. (synonym, *Simia satyrus*, 3. Linn.)
The lesser Orang Utan or Pongo.

Pithecus lar, Desm. (syn. *Simia lar*, Linn.) The Gibbon, or Long-armed Ape. The fur of this species is black, and the face surrounded with a ruff of gray hairs, causing the countenance to assume the appearance of extreme age and decrepitude. When the animal is erect the arms nearly touch the ground. Height about sixteen inches. Callosities on the buttocks.

This animal is extremely common in the forests of the Malayan peninsula, which re-echo with their plaintive whooping, as the boughs bend under the successive springs of the retreating troops scared by the unwonted sound of the traveller's footsteps. In confinement it is mild and melancholy, deprecating ill-treatment in a most beseeching manner, but never attempting to revenge it.

A smaller variety of the Gibbon is also to be met with in Malacca, termed by Desmarest *Pithecus variegatus*, corresponding with the *Simia lar* var. of Linn. This is a third less than the one just described, and its fur is variegated with gray-brown and dark gray.

P. syndactylus, Desm. (syn. *Simia syndactyla*, Raffles. *Siamang*, Malayese). The Siamang. The fur is very woolly, and of a deep black colour. Throat naked. The thumb and forefinger of the posterior hand united at the second joint, whence its name.

This species of Gibbon is found in large troops, which are each governed by a chief. In the cool of the morning and evening they utter hideous outcries, but are perfectly silent during the heat of the day. They drink by immersing the hand in water, and then sucking the moisture from their fingers. They are easily tamed, but their timidity can never be wholly overcome, even by the most continued kind treatment.

P. agilis, Desm. (syn. *Hylobates agilis*, F. Cuvier). The Active Gibbon. Fur brown, back yellow, and forehead extremely low; face of the male bluish black, of the female brown.

These differ from the preceding in their habits, being found in couples instead of in troops. They are remarkably active in their movements, but not distinguished by much intelligence.

I pass over the three next *genera*, as, although I have no doubt that several species in these families, which are common in Sumatra and Java, are to be found in the peninsula, they have not passed under my own observation.

Macacus, properly so called. Tail more or less long.

M. Sinicus, Desm. (syn. *Simia Sinica*, Linn.) Chinese Monkey. Tailed, beardless. Fore-top horizontal, and diverging from the centre of the head to the circumference, giving it the appearance of a mandarin's cap.

This monkey is about the size of a cat, the tail considerably longer than the body. The fur reddish brown, mixed with pale yellow on the back. Is extremely active, and appears to delight in frequenting the banks of rivers.

M. nemestrinus (syn. *Simia nemestrina*, Linn.). The Brown Baboon. Beard thin, eyes hazel, haunches naked; tail short and slender, reaching only to the middle of the thigh.

The colour of the fur is gray, deepening into brown on the back; dorsal line and middle of the head black. The face naked and tawny; nose flat and lips thin. About two feet high. The brown baboon is extremely ugly, but intelligent, lively, and tractable, and susceptible of a considerable degree of instruction, easily learning to perform a variety of tricks. It is very abundant in the peninsula.

The Lemurs in their form approach to that of the quadrupeds, but the shape of the hands and head is somewhat similar to that of the preceding family of the *Quadrumania*, between whom and the quadrupeds nature appears to have designed them to be, as it were, a connecting link; most of them are nocturnal in their habits, from which circumstance and their disgusting appearance Linnæus designated them *Lemures*, or ghosts.

There are seven tribes of them, but only one that I am aware of is to be found in the Malayan peninsula, viz. the *Nycticebus*, Geoff. (syn. *Lemur*, Linn.; *Loris*, Cuv.)

N. Javanicus, Geoff., Desm. Javanese Lory. The animals of this *genus* have a long body with a very short tail; the eyes are very large, prominent, bright, and directed forward. The limbs appear weak, and the animal "drags its slow length along" as if it were pain to move. The species under description is about a foot long; the fur red, with a deeper-coloured dorsal line. It utters a low melancholy cry when teased, and has a mournful expression of countenance.

Galeopithecus, Geoff., Pall., Desm. (syn. *Lemur*, Gmelin).

The *Galeopithecii* belong to the *Cheiropterous* order, and are

distinguished in common with the other families by having their form adapted for flight, a strong expansile membrane running from the throat to the fore-feet, thence to the hind-feet, and from them to the tail.

Mr. Stark says*, that "the *Galeopithec*i are but imperfectly known;" and again, "that the largest species known is not bigger than a young cat." He enumerates but three species, viz. *G. rufus*, which he classes with the *Lemur volans*, or flying macaoco of Linnæus; the *G. variegatus*, supposed by some naturalists to be but a variety of the preceding; and the *G. ternatensis*. I am inclined to think that either the *Lemur volans* of Linnæus is a distinct species, or else that the specimen from the Pellew islands, which this author states to be about a foot long, must have been a young one, as the animals of this nature in the Malayan peninsula are fully three feet long, and thus agree with the Linnæan *Lemur volans*, and measure the same across when the membrane is expanded.

The *Galeopithecus rufus* is of a dusky red; but the fur of the species now under consideration consists chiefly of brown, interspersed with soft and hoary, or grayish-coloured hairs, which are also sprinkled on the upper surface of the membrane. The inside of the latter is fibrous and nearly naked. The tail long, slender, and hairy. Toes five on each foot, armed with acute, crooked, and slender claws. Head long, fox-shaped; mouth and teeth small; ears rounded, small and membranaceous; mammæ two, pectoral.

Nocturnal in its habits, it is seldom seen before sunset, when it springs from tree to tree in search of its food, which consists of insects and small birds. When the animal makes these leaps, it expands the membrane in order to support the body by the resistance of the air: it always alights however lower than the place it started from, owing to the insufficiency of this resistance to thoroughly buoy up the weight of its body; and it would, at the termination of a few successive leaps, find itself on the ground, were it not every now and then to run up the trunk on which it alights. The one which fell into my possession in 1832 had a young one clinging to the breast, and, owing to this incumbrance and the closeness of the pursuit, which deprived her of the opportunity of climbing, was speedily a prisoner. Both she and her young one however made a vigorous resistance, emitting sharp and unpleasant cries at the same time, and were not easily secured even with the assistance of two or three Europeans.

Pteropus Javanicus, Desm., Leschenault (syn. *Vespertilio vampyrus*, var. 3. Linn.). The Javanese Bat, *Kulowang* in Ma-

* Elements of Natural History, vol. i. p. 65.

layesc. This is the largest of the Bat *genus*, the body measuring from nine inches to a foot in length, and the spread of the wings being fully five feet. It is destitute of a tail. The upper part of the neck is of a dusky red hue, and the remainder of the fur black, intermingled with a few white hairs. It is gregarious, and may be seen hanging in clusters from the extremities of the boughs of a tree in most parts of the peninsula. They fly very high and evenly, quitting their retreats about an hour before sunset, and winging their way in an easterly direction, far above the tops of the loftiest trees. About an hour after sunrise they return in the same manner to their nocturnal retreat, and apparently accomplish at least four or five miles each trip without halting; a flock of them migrating thus regularly every evening from Sebang to Taboo, whence they returned the following morning. From the extreme height at which they soar, they are inaccessible by small shot; and the only one that I ever saw killed was shot at Bell's Stockade, in December 1832, by an officer of the 23rd Madras light infantry with a single ball. As it was shot through the heart, it fell perpendicularly; but the distance between the sportsman and the spot where it impinged was a hundred measured yards, so that, taking its extreme height into consideration, it could have been little less than double that range from the sportsman.

P. rostratus, Horsfield, Desm. The Dog-Bat of Java. Fur pale brown. Body three inches. Spread of the wings eleven inches.

Cephalotes Pallasii, Geoff., Desm. (syn. *Vespertilio cephalotes*, Linn.) The Malacca Bat. Three and a half inches long; spread of the wings fourteen inches. Fur above cinereous, beneath whitish.

Besides the foregoing, there are several species of bats; but as their habits present nothing peculiar, I pass on to the consideration of the *Erinaceus Malaccensis*, Linn., Desm. (syn. *Hystrix brachyura*, Linn.) The Malacca Hedgehog.

This animal is about eight inches long, and is armed with very long spines pointing parallel to each other. From it is procured the bezoar, known by the name of *Piedra del porco*.

Ursus malayanus, Raffles. The Malay Bear. This species is covered with smooth black fur, having a heart-shaped patch of yellowish white on the throat. It is very abundant amongst the low ranges of wooded hills in the peninsula, a great number of which have been called by the Malays *Bukit Bruan*, or Bears' Hill, in consequence of their resorting thither. It is singular that the *Bruan* of the Malays should so closely assimilate in sound with our term Bruin. They are savage and not to be trusted.

Mustela nudipes. The Java Ferret. This animal is about eleven inches long, and its fur is a brilliant golden yellow, with the exception of the forehead and tip of the tail, which are yellowish white. The soles of the feet are naked, whence its name.

Mephitis javanensis, Desm. (syn. *Telagon*, F. Cuv.) The Javan Mephitic Weasel. The whole of this tribe derive their defence from the power of ejecting an intolerably fœtid liquid from their body. Body about sixteen inches long. Fur deep brown; forehead with a white spot, extended into a dorsal line. Tail very short, and covered with long hair. The *Lutra leptonyx* of Dr. Horsfield is also an inhabitant of the peninsula, and appears to be either the *Viverra cafra* of Linnæus, or closely allied to it.

Viverra musanga, Raffles. The Musang. Fur variegated with ash-colour and black; faint black stripes on the back. Head, feet and tail black, point of the muzzle white. Stands about the height of a cat, but the body is considerably longer. Fierce and untameable. Emits a strong and sickening smell of musk, especially when irritated, and is very destructive to poultry.

Felis tigris. The Tiger. This animal is too well known to require any description. It is abundant in the peninsula, but appears to be somewhat less bold than it is in the more arid climate of India.

Felis melas, Peron and Lesueur (syn. *Melas*, Cuv.). Spotted Black Tiger. Fur dusky black, spotted with deeper black. Eyes silvery gray, nearly white. About two feet and a half high. This is one of the most ferocious of the species, and very much dreaded by the Malays. Providentially it is comparatively rare, only one, a cub, having been brought into Malacca in the course of three years. Although not much larger than a common cat, he was so exceedingly savage, that after having had him in my possession for a few days, I was obliged to have him strangled.

Felis javanensis, Cuv., Desm. Javan Tiger-Cat. Fur silvery gray, or gray-brown above, beneath white. Four rows of elongated spots along the sides. Head streaked longitudinally with brown and white; white lunule at the base of each ear. Tail and legs darker than the body. The former shortish, straight, obtuse. Size of the common cat, and resembles in most particulars the *Felis bengalensis*. Fierce.

Sciurus bicolor, Desm., Gmel. The Java Squirrel. Fur above deep brown or blackish; below clear fawn-colour, with a white longitudinal stripe dividing the two colours. Eyes encircled with black. Ears not pencilled. About a foot long. Tail the same, distichous. This is a beautiful species of squirrel, but the one which I had in my possession resisted every attempt to tame it.

Sciurus badjing, Gmel. (syn. *Sciurus flavus*, Penn.) The Plantain Squirrel. Colour throughout pale yellow. Size the same as the last; gentle and easy tamed. This species is considered by Mr. Stark not to be well established, and he therefore merely mentions the name without including it in his classification. As however I procured a live specimen in the interior of the peninsula, and kept it for some weeks, I have restored it to its proper place in the catalogue.

Besides the above, there are three or four varieties of flying squirrels, viz. the *Pteromys petaurista* of Desm., or *Sciurus petaurista* of Gmelin and Pallas, about seventeen inches long; the *P. nitidus* of Desm., which is a slight variety of the preceding; the *P. sagitta* of the same author, or *Sciurus sagitta* of Gmelin; the Javan flying squirrel, six inches long, &c.

Mus javanus, Desm. (syn. *Mus pilorides*, Linn.) The Musk Cavy. Body above tawny, beneath white. Tail long, scaly, truncate. Nine inches long, tail four inches. The cavy grunts something like a hog, and from the looseness and toughness of its skin, and the length of its fore-teeth, which are cuneiform, makes a vigorous resistance when attacked by even three or four dogs. These teeth are about an inch long, and fully as much is imbedded in the jaw. When removed from the socket, the shape of the tooth is about a third of a circle. They are harmless and inoffensive, living principally upon the bamboo, which they cut down with great rapidity, and are known to the Malays by a name signifying Bamboo Rat.

Manis crassicaudata, Geoff. (syn. *M. macroura*, Desm.; *M. pentadactyla*, Linn.) Short-tailed Manis. This animal is about two feet long, and has the body covered with imbricate triangular scales; those on the back form eleven longitudinal and parallel rows. The tail shorter than the body. The manis erects its scales when irritated, and defends itself when attacked by rolling up its body into the form of a ball, presenting a defence on every side by means of its pointed scales.

The *Manis javanicus* of Desm. differs principally from the foregoing in being only two-thirds of the size, and having seventeen rows of longitudinal scales on the back.

Elephas indicus (syn. *Elephas maximus*, Linn.). The Asiatic Elephant. This animal inhabits the forests of the Malayan peninsula in considerable numbers.

Sus babyrussia, Linn. The Wild Hog. The name of this species is derived from two Malay words, viz. *babi*, hog, and *rusa*, wild. It is very abundant throughout the peninsula; but its tusks are smaller, and its disposition less ferocious, than those of the wild hog of continental India. It can be shot on foot with

little or no danger, hunting being totally impracticable from the nature of the country, and its flesh is remarkably tender and delicious.

The *Rhinoceros sumatrensis*, or Sumatran Rhinoceros, is also an inhabitant of the peninsula.

Tapirus malayanus, Raffles. The Malayan Tapir is to be found in the interior, but it is a very scarce animal. The nose of this singular quadruped is elongated into a moveable proboscis, which, unlike that of the elephant, is unfurnished with a digital process. The fur is black, with a broad white patch on the posterior part. The tapir is gentle and easily tamed. Sleeps during the day, and feeds at night on water-melons, gourds, pasture, &c.

Neither the horse nor the ass are indigenous to the peninsula, and those of the former to be met with are either Java or Achin ponies imported annually for the use of the wealthier class of inhabitants.

Of the Deer species there is the *Moschus javanicus* of M. Desmarest, or the *Kantchil*, which is a beautiful little animal, not larger than a rabbit, and having legs about the thickness of a tobacco-pipe. The fur is a deep red-brown on the back and white on the belly; three white streaks under the throat. It is very abundant, and the flesh strongly resembles that of a rabbit.

The *Cervus muntjac* of M. Desmarest is also an inhabitant of the peninsula.

Neither goats nor sheep, although both have been introduced, can be said to be indigenous to the soil, nor do the latter thrive as well in this part of the world as they do in continental India.

Bos arnee, Shaw. The Buffalo, *Karbau* in Malayese. Great numbers of buffaloes are domesticated in the peninsula, but I have never met with any wild ones. They are not nearly so savage as those of the Burman empire.

This is the most useful animal possessed by the Malays, and is employed by them for every purpose of draught and agriculture. The young afford them a very good substitute for beef, and the flock is maintained at a very little expense. From the extreme harshness and dryness of the skin, the buffalo suffers much during the heat of the day, and is consequently hardly ever worked at that time, but allowed to luxuriate, immersed all but the head, in a stagnant pool. It is extremely sluggish, not moving much above a mile an hour.

The domestic ox is unknown as an original inhabitant of the Malayan peninsula. A few bullocks and cows have been introduced, but they do not thrive very well on the main. Those on the island of Pinang appear to fatten better. Having in the few foregoing pages given a summary of the mammalia of the Straits, as far as they have passed under my own observation, I

now come to the consideration of the ornithological department.

It would swell these pages to an extent greater than it is contemplated, were I to detail at length the whole of the varied ornithology of the peninsula; I shall therefore content myself with a simple enumeration of this department, dwelling only on the more remarkable specimens.

Amongst the Eagle tribe, we find the *Falco severus*, Horsfield, Javan Falcon. This bird is about twelve inches long. The body is ash-brown, spotted and waved with darker and black. Greater wing-coverts varied with black, brown and pale brown. Arrow-spot on the throat white, outer quill-feathers barred, and outer tail-feathers tipped with white. Middle claw serrate.

Falco malayensis, Tem. Malayan Eagle. Plumage sooty brown. Irregular whitish bands at the base of the wing-feathers, and white lunules on the inside of the tail-feathers.

The Hornbill tribe, to which we now come, is one of the most curious of nature's wonders, and no less than five species are procurable in the peninsula. The first of these is

The *Buceros rhinoceros* of Linn., or the Rhinoceros Hornbill. It is about the size of a hen turkey, but slenderer in the body, and the plumage is totally black, with the exception of the tail, which is tipped with white. The bill is ten inches long, surmounted with a hollow protuberance eight inches long, and curved backwards.

What the precise use of this appendage is I am unable to say, but I think it not improbable that a communication exists between it and the *larynx*, producing the shrill and grating cry uttered by the bird, which is heard when it is soaring even at a great height. The hornbills build on the tops of the loftiest trees and are extremely shy, seldom permitting the sportsman to approach within range. When taken alive, they make a strenuous resistance with their long and powerful wings. The other species are, the *Buceros monoceros*, Shaw (syn. *B. malabaricus*, Lath.), the unicorn hornbill; the *Buc. galeatus*, Lath., the galeated or helmeted hornbill; and the other two I conceive to be new species, and shall therefore describe them.

The first of these I shall term *Buceros rugosus*, or the Wrinkled Hornbill*. This species is two feet and a half long. Body, wings and tail black, with the exception of the cheeks, shoulders and throat, which are dirty white mixed with cinereous. One-third of the tail from the tip smoky white; helmet and pouch-like protuberance under the throat crimson, the former furrowed with three deep indentations. Upper mandible yellowish brown,

* This is evidently the *Buceros corrugatus* of Temminck, Pl. Col. 531.—H. E. S.

inclining to white at the tip, and chipped at the edges; the base half of the lower mandible ochraceous and transversely caniculate; remainder of the mandible dirty white.

The second new species which I have ventured to nomenclate is the *Buceros lugubris*, or Melancholy Hornbill. This species is two feet long, having the bill very much hooked, destitute of a helmet, and reddish yellow. Head, neck, throat, belly and vent white, slightly sprinkled with black. Body, wings and tail black, the latter tipped with white. This bird is melancholy in its disposition, but withal voracious in its habits. I had one in confinement for some time, feeding it principally on plantains, which it devoured greedily, and never attempted to escape from its perch. I destroyed it on account of the filth and stench which it generated*.

Amongst the Pheasant tribe, Malacca boasts of the *Argus giganticus* of Temm., or the *Phasianus argus* of Linn., the Argus pheasant, so justly celebrated for its superb plumage. Including the two long tail-feathers, the male measures five feet three inches in length. The secondary quill-feathers are brilliant with ocellate spots (whence the name of Argus is given to the bird), and are manufactured into fans by the Chinese. Like the rest of the pheasant tribe, it is a remarkably shy bird.

There are also the *Phasianus ignitus*, or fire-backed pheasant, which is a very handsome bird, about the size of a barn-door fowl, and the *Phasianus nyctemerus*, or pencilled pheasant. This last is however a very rare bird. The *Cryptonyx coronatus* of Temm., or the Malacca partridge, is a very handsome bird, having a chestnut crest on the occiput, the body being generally of a dark violet colour, and the back and rump of a dark shining green. Its flesh resembles that of the European partridge in flavour, and the bird can be kept in confinement. The *Coturnix textilis*, or common Indian quail; the Chinese quail, the *Charadrius pluvialis*, Linn., or golden plover; the *Charadrius hiaticula*, Linn., or ringed plover; the *Arenaria vulgaris*, or common sand-lark; *Gallinago media*, or common snipe; the *Gallinago media*, or *Scolopax gallinula*, Linn., the jack snipe; the *Scolopax sinensis*, or Chinese, or painted snipe; *Anas boschas*, the wild duck; the common, and the whistling teal; and a species of the *Phæopus*, or whimbrel, complete the game of the peninsula.

There are two species of Bittern to be met with, viz. the *Ardea stellaris*, or *Botaurus stellaris*, the common bittern, and the *Botaurus lentiginosus*, or freckled bittern†; they are however both

* I have not been able to identify this with any described species.—H. E. S.

† This must be an error, *B. lentiginosus* being an American species, occasionally straying into Britain, but unknown in Asia.—H. E. S.

rare birds. There is also the *Ardea flavicollis*, or yellow-necked heron.

A large and very elegantly-plumaged bird is the *Porphyrio viridis*, the *Ayam ayer** of the Malays, or the Malacca water-hen (syn. *Porphyrio hyacinthinus*, Temm.; *Gallinula porphyrio*, Lath.; *Fulica porphyrio*, Linn.). Body above green with a purple gloss, beneath violet. Bill, legs and front red †.

Rallus philippensis, the Philippine rail; the *Rallus phaenicurus*, or the red-tailed rail; the *Rallus striatus*, or streaked rail; and the *Plotus melanogaster*, or Javan darter, are also numbered amongst the birds of the peninsula. This last is to be met with in great numbers between Ching and Malim, five miles from Malacca, in the swampy ground, which for the greatest portion of the year is overflowed by the river. It is three feet three inches long, and obtains its name from the celerity with which it darts its long serpentine neck forward, in the act of seizing any of the finny tribe, on whom it preys. Its plumage is by no means destitute of elegance.

Mergus, the merganser, a plain and dusky-plumaged bird; *Coracias orientalis*, the oriental roller; the *Nectarinia longirostra*, or long-billed creeper; the *Certhia viridis*, or green creeper; the *Picus martius*, or greater black woodpecker; *Picus flavicans*, or yellow woodpecker; *Picus malaccensis*, or Malacca woodpecker; the *Picus galeatus*, or crested woodpecker; and *Picus minor*, or the lesser spotted woodpecker, may also be enumerated.

There are numerous varieties of Kingfishers: the *Alcedo collaris*, or collared kingfisher; the *Alcedo atricapilla*, or black-capped kingfisher; the *Alcedo smyrnensis*, var. 2, or Smyrna kingfisher; the *Alcedo tridactyla*, or three-toed kingfisher; a variety of the *Alcedo leucocephala*, or blue-headed kingfisher, differing in being blue, barred with black above; cheeks, nape, and orbits of the eyes chestnut; beneath pale rufous ‡; a variety of the *Alcedo maculata*, or spotted kingfisher, differing in being brown, barred with black above; and the *Alcedo cristata*, or crested kingfisher.

There are three splendid species of the Barbet tribe, viz. the *Bucco javensis* of Horsfield, or the Javan barbet; the *Bucco versicolor* of Temm., or many-coloured barbet; and the *Bucco gularis* of Reinwardt, or blue-throated barbet. They are all three remarkable for splendour and brilliancy of plumage.

The *Ploceus philippinus*, Temm. (*Loxia major*, Linn.), or the Philippine weaver; and the *Ploceus pensilis*, Temm. (*Loxia pra-*

* From *Ayama*, fowl, and *Ayer*, water.

† This appears to be identical, not with the *P. hyacinthus* of Europe, but with *P. indicus*, Horsf. (*P. smaragdinus*, Temm.), from Java.—H. E. S.

‡ The bird here described is the *Halcyon pulchellus* (*Dacelo pulchellus*, Horsf.).—H. E. S.

sina, Linn.), or pensile weaver, are both common in the peninsula, and the latter is remarkable for the elegance of its plumage. The nest of the former is composed of the fibres of leaves and grass, and is curiously constructed in the shape of a long cylinder, swelling out globosely in the centre, which portion forms the apartment wherein the eggs are laid. One end of the cylinder is attached to the end of a branch, which generally either impends over water, or is nearly inaccessible from some other cause; and the other, or lower extremity, is furnished with a small aperture, which forms the only entrance, and effectually secures the young from the depredations of the numerous snakes who would otherwise prey upon them.

There are several species of Flycatcher, amongst which may be enumerated the *Muscicapa atricapilla*, or pied flycatcher; the *Edolius malabaricus* of Temm., the *Lanius* of Shaw, or the Malabar shrike; and a new and beautiful species, as it appears to me, which I have ventured to term *Muscicapa cyanea*, or ultramarine flycatcher. Its body, head, wings and tail are velvet glossy black; front, crest, scapulars, back and tail-coverts are of a most beautiful and brilliant ultramarine blue. Tail shortish, cuneated. Legs and bill black. Length eight inches and a half. Female greenish ash; head, scapulars and tail-coverts sprinkled with ultramarine blue. Wings and tail brown, with a slight steel-blue gloss. These birds abound in the woods of Sebang, and the whole tribe enliven the solitude by their restless movements and noisy cries*.

A variety of the *Coccyzus nævius* of Temm., or the brown cuckoo, is a denizen of the woods. It differs only in the tail having a black bar near the extremity and being tipped with white.

Few countries boast such a variety of the Pigeon tribe; the following species may be enumerated:—*Columba indica*, or green-winged pigeon; *Columba viridis*, or green turtle; *Columba malaccensis*, or Malacca turtle; *Columba turtur*, or turtle dove; *Columba vernans*, or green pigeon; *Columba ænea*, or nutmeg pigeon; *Columba cristata*, or lesser-crowned pigeon; *Columba migratoria*, or passenger pigeon; *Columba lacernulata*; *Columba striata*, barred turtle; and *Columba jambu*, or Jambu pigeon, which is a remarkably handsome bird with a blossom-coloured head of the hue of the *jambu* fruit, whence its name.

There are several species of Parrots indigenous to the peninsula, but the most beautiful varieties of lorries and cockatoos are imported from Java and the Moluccas. The native ones are the *Psittacus galgulus*, or sapphire parrot, which suspends itself by

* This is the *Irena puella*, Horsf.—H. E. S.

one foot when it sleeps; the *Psittacus purpuratus*, or purple-tailed parrot; and the *Psittacus erythrocephalus*, or blossom-headed parroquet.

The *Rupicola viridis* of Temm., or the *Calypomena* of Raffles, is distinguished by the vivid and glossy green of its plumage, heightened as it is by the contrast of three broad black bands. The *Trogon fasciatus*, or fasciated curucui; the *Paradisea regia*, or king bird of paradise*; the *Nectarinia javanica*, or Javan humming-bird; and a very minute species, which I shall distinguish by the name of *Nectarinia ignita*, or fire-backed humming-bird. This beautiful little thing is only two inches long; cheeks black; chin and beneath white; crest, back and tail-coverts bright red; wings and tail black; lesser wing-coverts with a purplish gloss†. The *Oriolus galbula*, or golden oriole; the *Trogon sulphureus*, or sulphur curucui, differs only from the *Trogon sulphureus* of Spix in having the back glossy copper-coloured instead of glossy green‡; the *Lamprotornis gularis* of Temm., or *Paradisea gularis* of Lath., or golden-throated bird of paradise; the *Hirundo panayana*, or Panayan swallow; these, and several other species of the feathered creation, flash their splendid plumage in the sun, or make the deeply shaded woods re-echo with their song.

Of Chelonian reptiles, those found in the peninsula are the *Cistuda amboinensis*, or Amboina freshwater turtle; the *Chelonia mydas*, or green turtle, which is very abundant and esteemed a great delicacy; and the *Chelonia imbricata*, or hawk's-bill turtle, which is not so common.

Of the Saurian order, there is the *Alligator sclerops* of Cuvier; the *Alligator lacerta* of Linn., or the common alligator, which infests the rivers and sea-shores in great numbers, and may be seen occasionally swimming up and down the Straits at the distance of half a mile or more from the shore; the *Monitor elegans*, or elegant monitor lizard; the *Lacerta viridis*, or green lizard; the *Draco lineatus* (*D. volans*, Linn.), or flying dragon; the *Gecko guttatus*, or spotted gecko; and the *Gecko tuberculatus*, or the tokay, so called from the sound which it emits, and which must be familiar to the ears of every one who has sojourned in the Burman empire.

Of snakes, the following may be enumerated:—the *Coluber lebetinus*, which is exceedingly poisonous, and causes death by inducing an unconquerable sleep; the *Platurus laticaudatus* of Cuvier, or *Hydrus colubrinus*, a poisonous water-snake which is met with in the seas; these are the only poisonous ones which

* This is probably an error, the *Paradisea regia* being a native of New Guinea.—H. E. S.

† This seems to be *Dicæum cruentatum*.—H. E. S.

‡ Probably *Harpactes Reinwardti*, Temm.—H. E. S.

have passed under my observation. The *Coluber tigrinus*, or tiger-snake, is one of the most brilliant of the species, being striped like a tiger, as its name imports, and the head being beautifully variegated with yellow marks resembling Persian characters; and along the belly runs a chain of bright scarlet spots, every four being disposed in diamond squares; the *Coluber porphyriacus*; the *Coluber purpurascens*; the *Coluber madeirensis*; the *Coluber schokari*; the *Coluber ahetula*, or whip-snake; the *Pseudoboa lineata* of Cuvier, or *Boa lineata* of Shaw; and the following three, which I could not class by means of 'Gmelin's System,' and which, from my not having 'Stark's Elements' at hand at the time of examination, and not having the specimens by me now, I am equally at a loss to arrange; viz. *Coluber* —; this snake is six feet long; plates of the belly 161; scales under the tail 59; pale yellowish brown; sides marked with equilateral triangular white spots placed equidistant from each other; inhabits the jungles of the peninsula. *Coluber* —; plates of the belly 184; scales under the tail 34; length three feet eight inches; body thick; above bluish black, beneath white; scales of the back hexangular with paler edges. *Coluber* —; plates of the belly 172; scales under the tail 125; two feet long, slender; tail one-third of the whole length, tapering; above brown ash, with a black stripe leading from the eye to the shoulder, a few minute bluish green specks intermingled with the stripe; a white stripe along each side, growing yellowish towards the head; beneath white, terminated on each side by a black filiform line. The *Anguis hepaticus* is also found in the woods.

The *Zygæna vulgaris*, or hammer-headed shark, is caught in great abundance and exposed in the markets, constituting the food of a large proportion of the lower orders; the *Pristis cirratus*, or cirrated saw-fish; several species of the *Sclerodermi* family, which are eaten by the natives, although their flesh is not in great esteem; the *Clupea chinensis*, or Indian sprat, and a great variety of others: those however most in esteem for European tables are the *Pleuronectes bilineatus*, or Indian sole; the black and white pomfret; the *Polynemus paradiseus*, or *Ikan kuru*; the seer fish, &c.,—all of which are remarkably fine.

Of shell-fish there are but few varieties, and of those the only edible ones are oysters*, crabs, the common and the land, or violet, the cockle, and the muscle. The *Monoculus Cyclops*, which is a singular sea-insect, having a bivalve shell about a foot in diameter, is eaten by the lower orders. Prawns are in abundance.

The *Cancer Bernhardus*, or hermit-crab, is remarkable for its

* Crabs of course belong to the crustaceous class of invertebral animals, as oysters do to the conchiferous class; but I introduce them here by the term shell-fish, as they are designated in common parlance.

habits. This little animal takes up its abode in any empty uni-valve shell, which continues to form its habitation until its increasing size renders it necessary for it to abandon it for a larger. It often happens that it fixes upon one already tenanted by another of its species, and a desperate struggle ensues, which is rarely discontinued until either one or both be disabled.

The few shells that are to be found on the beach in the Straits are small and common, such as the *Solen truncatus*, or truncated razor-sheath; the *Mya nicobarica*, or Nicobar trough-shell, or gaper; the *Venus decussata*, or decussated Venus; the *Murex tribulus*, or thorny woodcock; the *Murex rana*, or frog Murex; the *Mytilus plicatus*, or plaited muscle; the *Trochus indicus*, or Indian top; and *Voluta auris Midæ*, Midas's ear volute.

The entomology of the Straits presents a wide field for the naturalist, but several circumstances prevented my turning my attention to it. The few specimens that I had an opportunity of noticing are as follows:—the Atlas moth; the *Papilio memnon*, or Memnon butterfly; the *Papilio pamnon*, or Pamnon butterfly; the *Locusta citrifolia*, or lemon-leaved locust; the *Phyllium sicifolia*, or walking-leaf; the *Scarabæus rhinoceros*, or rhinoceros beetle; the *Libellula clavata*, or club-shaped dragon-fly; and the *Libellula tricolor*, or tricoloured dragon-fly.

L.—Description of some new Genera and Species of British Entomostraca. By W. BAIRD, M.D. &c.

[With a Plate.]

Legion BRANCHIOPODA.

Order LOPHYROPODA.

Section I. *Cladocera*.

In the genus *Daphnia*, as elaborated by Milne Edwards in his 'History of the Crustacea,' there are two species which are so anomalous in their characters that it becomes necessary to separate them from the true *Daphnia*, and even to form a distinct genus for each. These are the *D. cornuta* and the *D. rosea*. The latter I have already in a previous paper (Ann. Mag. Nat. Hist. xi. 87) given my reasons for removing from the genus *Daphnia*, and constituting for it the genus *Macrothrix*, and the former I have shortly characterized as a new genus in the 'Transactions of the Berwickshire Naturalists' Club' for 1845, p. 149.

The genus *Daphnia* of Müller was revised by Straus in the 'Mém. du Mus. d'Hist. Nat.' iv., and split into three genera, the generic characters being taken from the number of joints in the

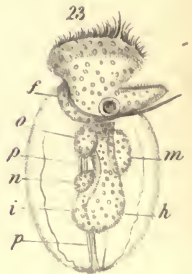
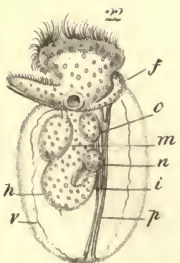
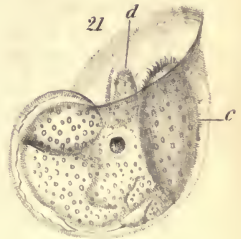
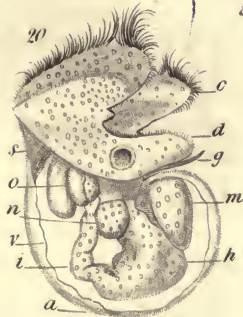
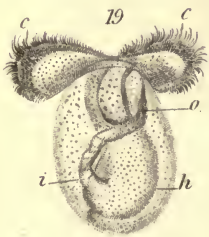
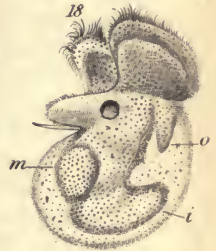
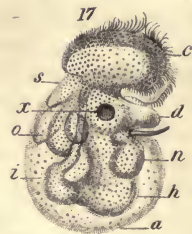
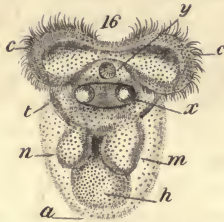
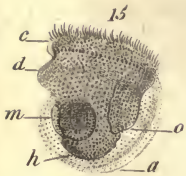
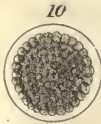
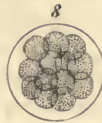
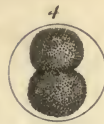
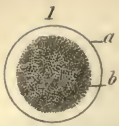


PLATE I. THE GREAT OYSTERS OF THE GREAT BRITAIN.



inferior or large antennæ, the *rami* of Straus. In these three genera, which have been all adopted by Milne Edwards, the superior antennæ (antennules of M. Edwards) in most of the species are exceedingly small compared with the inferior, so much so indeed, as almost to have escaped the notice of Müller altogether. They are also situated beneath the beak. In the two species however which I have mentioned above, they are very much larger than in the others, and instead of springing from the head under the beak, hang pendulous from or are articulated to the beak itself. In the *Daphnia rosea* (*Macrothrix roseus*) they are flat, one-jointed and distinctly pendulous from the beak, occupying such a position that they cannot be mistaken or overlooked.

In the *Daphnia cornuta* however, from the extremely minute size of the little animal, they have been hitherto constantly misunderstood by observers, and though much too large and prominent to be overlooked, they have been described as a totally different organ. Having last autumn met with this curious little creature in great abundance in the water from the Hampstead ponds, I have been enabled to place it under a microscope of high power, and have thus succeeded in ascertaining the real structure and position of these organs. In the notices of this species by Müller, Jurine and M. Edwards, the antennules are not mentioned at all, but the animal is described as possessing a long beak*; and certainly at first sight and with a low magnifying power these organs appear as being merely a prolongation of the anterior part of the head, similar to what we see in many of the *Lynceidæ*. This is not so however, and upon a careful investigation I have found this apparent beak to consist of two long, curved, cylindrical bodies, consisting each of about twenty small articulations, and united to the beak or anterior part of the head by a distinct joint. In structure these organs resemble very much the antennæ of the *Cyclopida*, but like the antennules of the other *Daphniæ* possess very little motion. Müller considered this animal to be a *Lynceus*, and led away by the above-mentioned resemblance to the beak of many of that genus, he has described it under the name of *L. longirostris*†. Jurine has described it under the division of *Monoculi* belonging to the group of the *Daphnidæ*, under the name of *Monoc. cornutus*, and has been followed by Desmarest and M. Edwards. In the 'Ann. Mag. Nat. Hist.' I have also described it under the name of *Daph. cornuta*, not having then distinctly seen the structure of the antennules. These are so peculiar however in their structure and position, and so distinct from those of the other *Daphnidæ*, that in the 'Trans.

* "Le bec est long et gros."—Edwards.

† Entomostraca, p. 76. t. 10. f. 7, 8.

Berw. Nat. Club' for 1845, I have proposed forming a distinct family for receiving all those species of the genera *Daphnia* and *Lynceus* of Müller that have the antennules pendulous from the beak. In the 'Ann. Mag. Nat. Hist.' xi. p. 87, I have arranged the genus *Macrothrix*, provisionally, under the fam. *Lynceidæ*, as it possesses only three articulations to each joint of the large antennæ, and has also the black point in front of the eye. I have now ascertained however that it has not the articulated abdomen nor the convoluted intestine that form such distinguishing marks in the *Lynceidæ*, being in these respects formed like the *Daphnidæ*. It cannot thus be received into that family, and as in its position of antennules it agrees with the *D. cornuta*, I now propose arranging it in the same family. The two families and genera will be thus characterized:—

Fam. I. DAPHNIDÆ.

Two pairs of antennæ; superior very small and situated under the beak, inferior large, two-branched, and used as organs of locomotion. Five pairs of feet. Head prolonged into a more or less obtuse beak. Eye single, large. Intestine straight.

This family contains two British genera, *Daphnia* and *Sida*. (Trans. Berw. Nat. Club, 1845, p. 148.)

Fam. II. BOSMINIDÆ.

Two pairs of antennæ; superior longer than in preceding family, and pendulous from or articulated to the extremity of the beak. In other respects as in *Daphnidæ*.

This family contains two British genera, *Bosmina* and *Macrothrix*.

Gen. 1. MACROTHRIX, Baird, *Ann. Mag. Nat. Hist.* xi. p. 87.

Superior antennæ flat, consisting of only one articulation. Inferior antennæ large, two-branched, each branch having three articulations. Second articulation of anterior branch provided with a very long seta. Eye accompanied with a black spot.

Gen. 2. BOSMINA, Baird, *Trans. Berw. Nat. Club*, 1845.

Superior antennæ long, curved, cylindrical, and consisting of many articulations. Inferior antennæ large, two-branched, one branch having four, the other three articulations.

Sp. 1. *Bosmina longirostris*. Pl. IX. B. f. 1.

Syn. *Lynceus longirostris*, Müller, *Entom.* 76. t. 10. f. 7, 8.—*Monoculus cornutus*, Jurine, *Hist. Nat. des Monoc. de Genève*, 142. t. 14. f. 8-10.—*Daphnia cornuta*, Desmarest, *Consid. gén. Crust.* 375; Baird, *Ann. Mag. Nat. Hist.* i. 257. t. 9. f. 15; M. Edwards, *Hist. Nat. Crust.* iii. 382.—*Bosmina cornuta*, Baird, *Trans. Berw. Nat. Club*, 1845.

This animal is very small. The shell is rounded on the posterior margin, bulging out anteriorly, and terminating at inferior angle in a sharp point or spine, which projects straight downwards. The superior antennæ consist of twenty articulations; the seven first are short and close to each other; at the seventh two or three setæ spring, projecting forwards and upwards; then follow thirteen articulations, each one longer than the preceding. It requires a strong magnifying power to make out this articulated structure distinctly. Like the antennules of the *Daphnidæ* and *Lynceidæ* they appear to be almost destitute of motion, and thus, when seen close to each other, they certainly bear a close resemblance to a prolongation of the beak. The inferior antennæ, though strong bodies, are much shorter than in most of the *Daphnidæ*. The anterior branch has four articulations, the posterior only three. They are furnished with long filaments, which are not plumose. The ova are few in number. The motion of this curious little creature through the water is caused by numerous and very rapid strokes of its inferior antennæ or rami, being in that respect very similar to the *Lynceidæ*. The males I have never yet met with.

Section 2. *Ostracoda*.

The genus *Cypris* as established by Müller has hitherto remained intact. As however a number of the species which have been described possess a set of organs which many others do not, and which exercise a decided influence upon their œconomy and habits, I think it becomes incumbent upon us to separate the two sets of species into distinct genera. In the one set the animals have a much greater degree of motion and agility than the others, swimming freely and rapidly through the water in all directions, and apparently possessing a higher degree of enjoyment in their existence. This arises from a bundle of long plumose setæ which spring from the second articulation of the pediform antennæ (the first pair of feet of Müller and others), and by means of which they can suspend themselves in the water or transport themselves through it with great facility. The other set are deficient in this apparatus, and instead of swimming gaily through the limpid element, crawl in the mud at the bottom of the pools in which they are found, or creep along the aquatic plants which grow there, and if dropped into a glass of water fall to the bottom without being able to suspend themselves for the shortest time. They thus form a connecting link between the genera *Cypris* and *Cythere*.

I propose characterizing them thus:—

Gen. 1. *CYPRIS*, Müller.

Two pairs of feet, one pair always contained within the shell.

Abdomen terminated by a long, slender, bifid tail. Posterior or pediform antennæ furnished with a bundle of long setæ, generally plumose. Animal swims freely in the water.

The *Cypris tristriata*, Baird, *Trans. Berw. Nat. Club*, i. p. 99. t. 3. f. 13, (the *C. pubera*, Baird, *Mag. of Zool. Bot.* i. p. 524. t. 16. f. 1—13,) will serve as the type of this genus.

Gen. 2. CANDONA, Baird, *Trans. Berw. Nat. Club*, 1845, vol. ii. p. 152.

Two pairs of feet, one pair contained within the shell. Abdomen terminated by a long, slender, bifid tail. Pediform antennæ not furnished with a bundle of long setæ. Animal creeps at the bottom or upon aquatic plants, &c.

The *Cypris reptans*, Baird, *Mag. Zool. Bot.* i. p. 135. t. 5. f. 5, will serve as the type.

Gen. 3. CYTHERE, Müller.

Three pairs of feet, all external to the shell. Abdomen short and blunt. Pediform antennæ not furnished with a bundle of long setæ, but possessing one stout articulated filament. Animal creeps at the bottom or upon submerged plants, &c.

Genus CYPRIS.

Sp. 1. *C. elliptica*, n. s. Pl. IX. f. 2.

Nearly elliptical in shape, of a light green colour clouded with darker patches of the same colour on the sides of the shell. Hairy round the edges, but otherwise glabrous. Pediform antennæ provided with five or six long setæ.

Hab. Pond at Highgate. British Museum.

Sp. 2. *C. sella*, n. s. Pl. IX. f. 3.

Shell somewhat elliptical in shape, and rather globose, about half the size of preceding, of a uniform light greenish colour, marked on the back and side with a patch of a dark colour. A dark streak runs along the upper edge of the shell, beginning from immediately behind the eye and terminating at about the same distance from posterior extremity. It there extends a short way down the side and then runs forward a little way in a somewhat lunated shape. At the anterior commencement of the dorsal mark a narrower streak of the same colour runs down the side, stopping only a short distance from anterior margin. The shell is densely set all round with hairs. Pediform antennæ provided with long setæ (f. 3 a). This species resembles a little the *C. vidua* in shape, but is smaller and differs very considerably in the markings, which are uniformly the same.

Hab. Pond on Clapham Common. Brit. Mus.

Genus CANDONA.

Sp. 1. *C. similis*, n. s. Pl. IX. f. 4.

Shell somewhat elliptical in figure, flattish, slightly sinuated in middle of anterior edge, white with two dark orange-coloured spots on the back. It is smooth, except round the edges, which are beset with some rather stiff hairs, more numerous at anterior extremity than posterior, transparent, rather larger at anterior extremity than posterior. The feet have one long curved claw and one short. Pediform antennæ (f. 4 a) have three strong curved claws at their extremities, but no bundle of long setæ. It creeps upon the plants, &c. at the bottom of the water, and when it walks it leisurely puts first one foot forward, then the other.

It approaches *Cypris detecta*, Müller; the posterior extremity however is narrower than the anterior, which is the reverse in the *detecta*.

Hab. Pond on Clapham Common.

Section 3. *Copepoda*.

The genus *Cyclops* of Müller, composed of very heterogeneous materials, required reform, and has accordingly been reviewed by M. Edwards, who, in his great work on the Crustacea, distinguishes three different genera. The characters of these he takes from the structure of the second or inferior pair of antennæ and the foot-jaws. In his genus *Cyclopsina* however he includes two species of *Cyclops* described by Müller, which are very different from each other and cannot be placed together. The chief character of the genus *Cyclopsina* is the branched nature of the second or inferior pair of antennæ, a character which agrees well with the structure of these organs in the *Cyclops cæruleus* of Müller, but not with his *C. minutus*, in which the inferior antennæ are simple and not branched. I propose dividing this family into the following genera:—

FAM. CYCLOPIDÆ.

Head distinct from body, not possessing a moveable beak; body consisting generally of four, abdomen of six segments; foot-jaws two pairs, sometimes small; legs about five pairs; one eye.

Genus 1. *CYCLOPS*, Müller.

Foot-jaws large and strong, branched; second or inferior pair of antennæ simple; external ovaries double.

The *C. quadricornis*, Müll., is the type of the genus.

Genus 2. *CYCLOPSINA*, M. Edwards.

Foot-jaws of considerable magnitude, simple; second or inferior pair of antennæ branched; external ovary single.

The *Cyc. cæruleus*, Müller (*Monoc. Castor*, Jurine), is the type of this genus.

GENUS 3. CANTHOCARPUS, *Westwood MSS.*

Foot-jaws small, simple; second or inferior pair of antennæ simple; ovary single.

The *Cyc. minutus*, Müll., is the type of the genus.

GENUS 4. ARPACTICUS, *M. Edwards.*

Foot-jaws possessing strong hooked claws at their extremity; second or inferior pair of antennæ simple; external ovary single.

The *Cyc. chelifera*, Müll., is the type of this genus.

GENUS 5. ALTEUTHA, *Baird.*

Foot-jaws small, simple; body flat; two strong falciform appendages from fifth segment of body.

The *Cyclops depressus*, Baird, is the type and only known species of this genus.

GENUS ARPACTICUS.

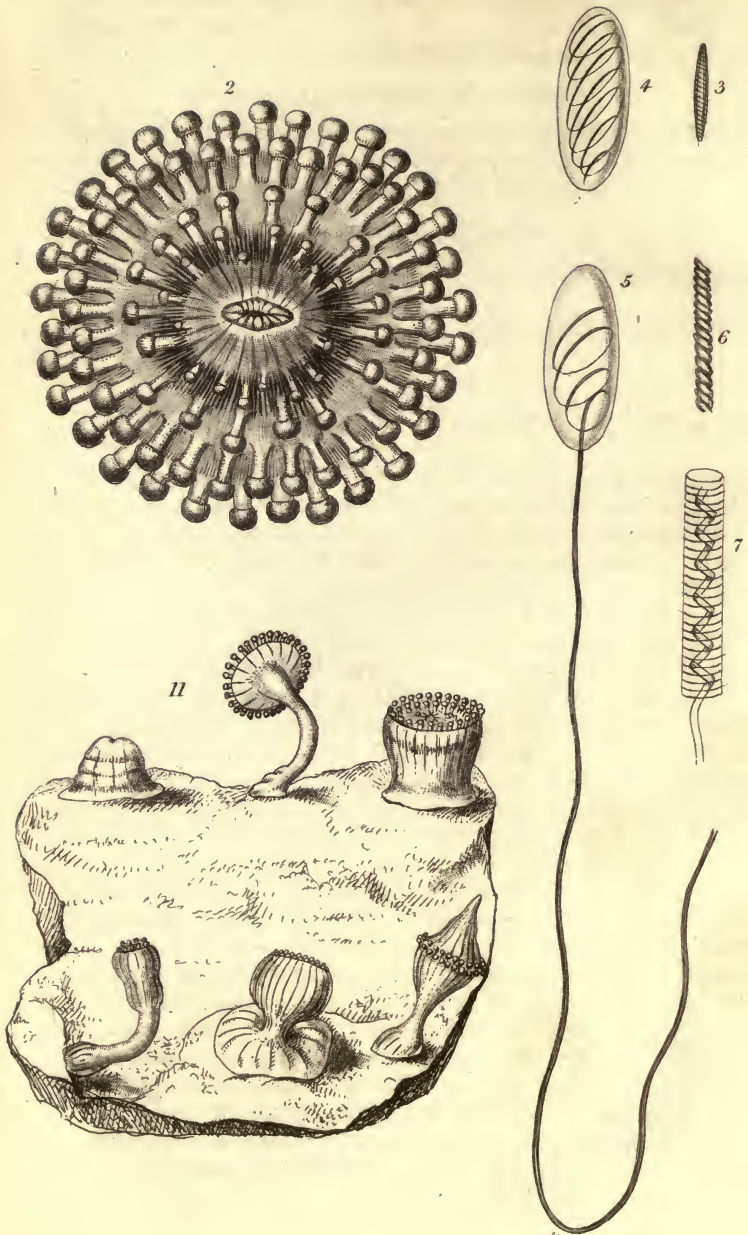
Spec. *A. nobilis*, Baird, Trans. Berw. Nat. Club, 1845.

Pl. IX. f. 5.

Thoracic and abdominal portions of body distinct from each other. The thorax is composed of four segments and is large and rounded. Abdomen consists of six slender segments, the last bilobed, and giving off two long and two short setæ. The whole insect is beautifully coloured with green, red and purple. Eye large, of a ruby colour. Antennæ (f. 5 *a*) short, of seven segments, all setiferous; the two first short and stout, the third much longer, toothed on upper edge and giving off at its extremity several long setæ; four last small and short. Antennules (f. 5 *b*) composed of two segments, the first giving off a shoot from about the middle of its length, the second terminating in several stout setæ. The mandibles and anterior or first pair of foot-jaws are strong, and resemble the same organs in *Cyclops quadricornis*. Posterior foot-jaws (f. 5 *c*) shorter and stouter than those of typical species, and consisting of two joints and a terminal hooked claw. Thoracic pair of feet (f. 5 *d*) differ from abdominal ones. They consist of two stalks rising from a common base; the anterior or upper stalk consisting of one long joint, and a very short one which terminates in a strong claw; the posterior or inferior stalk is very short, toothed on the edge and giving off several stout setæ. The abdominal feet resemble those of the typical species, the setæ with which they and the fulcra are provided being all plumose. The fulcra are the same also as in the other species. The setæ of the tail however are not plumose. This species is at least three times larger than the *chelifera*, and has the body more rounded and much stouter.

Hab. Berwick Bay.





Corynaectis viridis

LI.—*Biological Contributions*. By GEORGE J. ALLMAN, M.B., F.R.C.S.I., M.R.I.A., Professor of Botany in Trinity College, Dublin, late Demonstrator of Anatomy and Conservator of the Anatomical Museum, T.C.D.

[With a Plate.]

No. I. *Description of a new genus of Helianthoid Zoophytes.*

At the York Meeting of the British Association in September 1844, I read before the Natural History Section a description of a Helianthoid Zoophyte which I had just discovered on the Irish coast. The subject of the communication I believed to possess a form generically distinct from all hitherto described, but not having been able since its discovery to procure the works necessary to establish this point with certainty, I refrained at the time from naming it. Since then however I have convinced myself of its claims to a new generic rank, whose limits may be assigned by the following characters :—

CORYNACTIS.

GEN. CHAR. *Body* subcylindrical but very mutable in figure, adhering by an expanded base. *Tentacula* capitate, contractile, surrounding the mouth in one or more concentric series*.

Species unica, *C. viridis*. Pl. XI.

Hab. Near low water mark in the pools left by the retiring tide, Crook Haven, co. Cork ; coast of Cornwall, *Mr. Peach* †.

This beautiful little zoophyte measures about half an inch across the tentacular disc, which, as well as the body, is of a bright grass-green, with the exception of a circle of radiating brown striæ which surround the mouth at a short distance from its margin. The tentacula are short, the stems of a sienna colour, and the capitate extremities of a bright rose colour. Those tentacula which lie near the margin of the disc are arranged in two regular concentric circles, and are succeeded towards the mouth by others which are for the most part smaller and present a more scattered disposition.

There is a variety by no means uncommon, in which the green colour, except in a narrow ring at the upper margin of the body, is entirely replaced by a light flesh colour. In this variety the animal becomes so translucent, that the septa and vermiform filaments may often be distinguished through the integuments ; it is an evident example of albinism.

* From *κορύνη*, a club, and *ἄκτις*, a ray.

† At the Cambridge Meeting of the British Association in June 1845, Mr. Peach exhibited drawings of a Zoophyte found by him on the Cornish coast, and undoubtedly referable to the species here described.

So exceedingly mutable is *Corynactis viridis*, perpetually exhibiting some new and strange form, according to the state of contraction in which it may happen to present itself, that all attempts to limit its figure in description would be vain. At one time it will assume the appearance of a narrow cylindrical stem fixed by one extremity, and bearing upon the opposite a flattened circular disc attached to the stem like the blade of a peltate leaf to its petiole. Sometimes a contraction will occur in the centre of the body so as to cause the animal to present somewhat the appearance of an hour-glass. Again, the central part of the tentacular disc will be forced forwards into an elongated conical projection bearing the two outer circles of tentacula around the margin of its base, and with the mouth elevated upon its apex; this occurs without any eversion of the stomach. In short, the strange shapes assumed by this protean polype are innumerable and altogether beyond the domain of description (fig. 1).

With the exception of the tentacula, whose structure is peculiar, the anatomy of *Corynactis* would appear to differ in no essential point from that of *Actinia*; the structure of the tentacula however is such as to demand here a moment's attention. The tentacula of *Corynactis*, like those of *Actinia*, are tubular, and communicate freely with the interseptal spaces; they are however imperforate at the free extremities, terminating there in little spherical capitula, into which the tube of the stem penetrates for some distance. Imbedded in the substance of these capitula are certain highly curious organs; they are of two kinds: one consists of elongated ellipsoidal or fusiform bodies which are copiously scattered through the entire substance of the capitulum, and which appear to be formed of a filament rolled into a close helix and enveloped in a delicate transparent capsule (fig. 3).

The other set of bodies contained in the capitulum are larger and not so numerous. They are transparent elliptical capsules with a very long filament coiled up within them (fig. 4). Many project beyond the capitulum, causing this organ to present under a high power of the microscope a somewhat hispid surface. When liberated from the tentacula in the recent zoophyte, a very remarkable phenomenon is presented; the capsule opening at one extremity gives exit to the contained filament, which uncoiling itself as it escapes is rapidly shot across the field of the microscope (fig. 5). A spiral groove with approximated coils may then be traced along the entire length of the exposed filament (fig. 6).

On a subsequent examination of specimens which had been preserved for more than a year in spirits, a new feature in the filament of the capsule was detected. The spirits had so acted on it as to develop its real nature, and render manifest a much

more complex structure than had at first been suspected. The body which had been projected from the capsule, and which had appeared in the recent zoophyte a simple filament with a spiral groove, was now seen to be composed of a delicate transparent tube marked with circular or spiral striæ, and having within it a spiral filament which with rather distant coils wound through its entire length (fig. 7).

Both sets of bodies now described are slowly but effectually dissolved by nitric acid without effervescence, appearing to be neither siliceous nor calcareous, but of a truly animal composition. That they are analogous to the lancet-bearing capsules discovered by Corda in *Hydra*, and whose existence I have myself been enabled to verify, there can I think be no doubt. Bodies strictly analogous, though differing somewhat in detail, I have detected in three other genera of Helianthoid Zoophytes, namely *Actinia*, *Anthea* and *Lucernaria*, while Ehrenberg, Wagner, Erdl, Quatrefages, Bailey and others have described similar organs in this and other families of Invertebrata.

In attempting to assign a use to the bodies in question some difficulty is encountered; perhaps the most tenable opinion is that generally held, namely, that they are in some way connected with the predaceous habits of the animal, and are most likely gifted with the power of inflicting envenomed wounds on the creatures which constitute its prey.

Corynactis viridis is a charming little animal, and by no means rare in the locality where I discovered it; the brilliancy of its colours and the great elegance of its tentacular crown when fully expanded render it eminently attractive; hundreds may often be seen in a single pool, and few sights will be retained with greater pleasure by the naturalist than that presented by these little zoophytes as they spread abroad their green and rosy crowns among the many-tinted sea-weeds and plummy corals, cotenants of their rocky vases.

LII.—*Notes on the Botany of Scinde.* By J. E. STOCKS, M.D., Assistant-Surgeon Bombay Fusileers. Extract from a Letter to ARTHUR HENFREY, F.L.S. &c.

Sukkur, Upper Scinde, March 14th, 1846.

THE country about Kurrachee is very desolate, the immediate neighbourhood of the sea low and flat, the sandy soil bound together by the *Ipomæa Pes Capivæ*, and on the muddy shores of the creek grow *Rhizophora candelaria* and *Salicornia indica*. The *Rhizophora* grows within water-mark, is like a tree in appearance and habit, but not above two feet high, and a bank of it looks like a miniature forest. The soil beyond the immediate limits of the beach is bare, and the

rocky soil comes up from the adjoining mountains which bound Scinde on the north. All is bare, no trees and no surface vegetation, but great abundance of the *Euphorbia nereifolia*, which, like a *Cactus*, fleshy and leafless, spreads its whitened stems and withered stumps in patches as large as a small haystack. There are a few gardens in which grow tamarinds, mangoes, bheres (*Zizyphus vulgaris*), and the date-palm (*Phoenix sylvestris*) springs up wild in every compound. However, Sir Charles Napier is doing great things; has planted rows of young trees over all the avenues and streets; and has formed a capital Government garden, which is a depôt for garden shrubs, and supplies the troops with fresh European vegetables. The favourite garden shrubs in Kurrachee are *Ricinus communis*, *Æschynomyne Sestan*, *Parkinsonia aculeata*, and, for hedges, the milk-bush (*Euphorbia Tirucalli*), with its leafless, rush-like, flexible branches. The peepul and banyan (*Ficus religiosa* and *F. indica*), and the bheres (*Zizyphus vulgaris* and *Z. Jujuba*), are the trees planted in the avenues. On our first march from Kurrachee, about eight miles out, the Indus soil and vegetation commenced; dry creeks, dry water-furrows and a loose sandy soil, characterized by tamarisk jungle (*Tamarix gallica* and *T. dioica*) and *Salvadora persica*; low bushes of *Acacia (arabica, Catechu)*, and *Mimosa (rubicaulis, &c.)*, also abundance of the camel-thorn (*Alhagi Maurorum*). Among herbaceous plants I occasionally found a *Polygonum*, a *Gnaphalium*, a *Solanum*, &c., and above all these grows everywhere the *Capparis aphylla*, which I have told you before is also very common in Guzerat.

We passed to Tattah on the Indus, and went up the right bank as far as Hyderabad, where we crossed over to the left bank and proceeded to Rorea, which is on the side opposite to Sukkur. Before coming to Hyderabad we crossed rocky ground for some marches, where the Hala mountains come down to the river bank. Here we met with the *Euph. nereifolia* again, and two apparently new Zygo-phyllaceous plants, at least I do not find them in Indian floras. On the banks of the Indus from Torrock to Sukkur grow *Ranunculus indicus*, Roxb., a *Potentilla*, and *Rumex acutus*! About Sukkur the river runs through an isolated tract of limestone hills, and the date-palm is very luxuriant, covering acres of low ground by the river; it is now in flower.

LIII.—Botanical Notices from Spain.

By MORITZ WILLKOMM*.

[Continued from p. 347.]

No. XIII. SEVILLE, October 25, 1845.

AFTER a hasty visit to the unimportant Sierra de Elvira, which rises out of the middle of the plain of Granada, and is distinguished by the unusually frequent occurrence of *Chrysocome verticalis*, Lag., I

* Translated from the Botanische Zeitung, Jan. 23, 1846.

finally took leave of Granada, and on the 20th of August set out on my journey to the kingdom of Jaen and the Sierra Morena. From the advanced season, the vegetation, especially in the lowlands, was for the most part already dried up, and the harvest was consequently much less than in the previous months. But I scarcely think, if at least I can judge from the remains of the spring flora, that this portion of Andalusia presents any very rich or rare vegetation. Only a small part of the province of Jaen belongs to Upper Andalusia; the larger portion consists of a lowland watered by the Guadalquivir, and bears throughout the character of Lower Andalusia. The most southern part of the province of Jaen is covered with a limestone range, whose loftiest chain forms a concave half-circle to the north, which stretches out from Jaen in an eastward direction as far as the frontiers of the kingdom of Murcia, and is intersected by the deep valley of the Guadiana Menor, which is formed by the rivers of Huescar, Guadix and Baza, and is the first important tributary stream which the Guadalquivir receives, as well as by the Rio de Jaen which issues from the most northern part of the Montes de Granada. By these two rivers the above-described circle of mountain-chains is divided into three parts; the central one of which appears to be the highest, and is called the Sierra de Huelma; the western one on the contrary forms the Sierra de Jaen, and the eastern one the Sierra de Cazorla. This district of steep mountains, whose greatest height can scarcely exceed 6000 feet, forms the southern limit of the immense, broad, and flat valley of the Guadalquivir, which runs from east to west through the centre of the province of Jaen. On the north this wide valley is bounded by the Sierra Morena.

As soon as the Rio Cubillas has been crossed, the traveller quits the charming road to Granada, and passing through a copse-wood of *Quercus Ilex*, soon comes to the valley of the Rio de Benalúa, which divides the Sierra del Annar, where it rises from the Sierra del Morrón,—two mountains of inconsiderable height, for the most part covered with *Lavandula Spica*, which lie between the mountain-chains of Jaen and the Montes de Granada. On grassy spots of the above-mentioned oak-wood flowered *Stellera Passerina*, L., in profusion, and also *Achillea Ageratum*, L., *Cleonia lusitanica*, L., *Echium pustulatum*, Sibth., and in the valley of the Rio de Benalúa the gigantic *Echium Lagasca*, Boiss., which I had already met with in the neighbourhood of Granada at the foot of the Sierra de Alfacar, and which occurs in all the watered valleys of the kingdom of Jaen, as well as in the plains of the Guadalquivir and the lowest valleys of the Sierra Morena in tolerable abundance. Between the villages of Calomera and Benalúa I remarked *Cynara alba*, Boiss., and *Mentha Pulegium*, L., which is extremely common on moist spots of the mountain-region throughout the whole kingdom, and especially in the Sierra Morena. Soon after passing the village of Benalúa you enter the kingdom of Jaen, and after crossing a mountain-ridge arrive at the village of Campillos de Arenas, which lies at the foot of the irregular Sierra de Arenas, which is partly wooded with pines, and is a branch of the above-described mountain-chain of Jaen. On

the rocks of this range grew luxuriantly *Sarcocapnos enneaphyllos*, DC., *Teucrium pyrenaicum*, L., var. *granatense*, Boiss., *T. Polium*, L., *T. capitatum*, L., *Silene velutina*, Pourr., *Chrysocome verticalis*, Lag., *Inula montana*, L., *Galium verticillatum*, Danth., *Scabiosa tomentosa*, Cav., *Bupleurum gibraltarium*, L., *Biscutella saxatilis*, Boiss., and on the acclivities *Plumbago europæa*, L., *Ballota hirsuta*, DC., and *Thymus tenuiflorus*, Boiss. The Sierra de Arenas is intersected by the Rio de Campillos, which further on joins the river of Jaen. The left rocky wall of this river consists of debris of laminar gypsum, and is therefore covered with a salt vegetation, among which especially occurs *Ononis crassifolia*, Duf., in abundance. Further down *Balsamita multifida*, Clem., is very plentiful.

From Jaen, where I stayed three days, I ascended the Cerro Jabalcón, one of the highest summits of the Sierra, and convinced myself in this excursion of the great sterility of this mountain-chain. The lower portion of it is covered with *Lavandula Spica*, *Phlomis purpurea*, *Ph. Lychnitis*, *Thymus tenuiflorus*, *Th. Mastichina*, *Teucrium Polium*, *T. capitatum*, *Quercus coccifera*, *Cistineæ*, &c., among which occur *Leuzea conifera*, *Chamaepeuce hispanica*, DC., *Chrysocome verticalis*, *Ruta montana*, *Inula montana*, *Crambe filiformis*, *Scabiosa tomentosa*, *Santolina rosmarinifolia*, Mill., and *Helichrysum serotinum*, Boiss. On the rocks of the mountain-region grew luxuriantly *Linaria origanifolia*, DC., *Silene velutina*, *Digitalis obscura*, L., *Teucrium pyrenaicum*, *Helianthemum marifolium* and *Cerastium repens*, L., which is common on the northern acclivity of the Cerro Jabalcón up to the summit. In the upper part of the mountain-chain a narrow-leaved *Iris* was still flowering on grassy slopes, and I also found here off flower, *Serratula flavescens*, Poir., *Arenaria Armeriastrum*, Boiss., *Centaurea granatensis*, Boiss., *Pæonia lobata*, Desf., *Scorzonera hispanica*, L., *Cirsium echinatum*; and on the upper face of the range *Xeranthemum erectum*, Presl, *Muscari comosum* and *racemosum*, *Silene conica*, L., *Pistorinia hispanica*, DC., and various grasses. On rocks of the summit were seen *Saxifraga spathulata*, and on the northern acclivity *Anthyllis erinacea*, *Ptilotrichum spinosum*, *Salvia officinalis*, and *Odontites longiflora*, Webb. On my way back I found by a spring *Lysimachia Ephemerum*, L., and *Hypericum Caprifolium*, Boiss., and finally on perpendicular and inaccessible walls of rocks in the neighbourhood of Jaen some shrubs of *Rhus Coriaria*, L., in fruit.

On the 25th of August I quitted Jaen, and went seven leagues eastward to the town of Ubeda, which lies on the other side of the Guadalquivir below the mouth of the Guadiana Menor. The way thither leads over a hilly gypsum formation, completely destitute of trees and water, which fills up the space between the river of Jaen, the Guadalquivir, and the Sierra de Huelma, and whose vegetation, now almost wholly dried up, is similar to that of the gypsum basin of Baza. Among other plants, *Lygicum Spartum*, *Helianthemum squamatum*, *Stellera Passerina*, *Ammi Visnaga*, *Centaurea granatensis*, *C. Calcitrapa*, *Catananche lutea*, *Cleonia lusitanica*, *Momordica Elaterium*, *Crozophora tinctoria*, *Capparis spinosa*, *Atractylis cancellata*, and a number of thistles, for instance *Scolymus hispanicus*, *Sc. maculatus*,

Silybum Marianum, *Notobasis syriaca*, *Cynara horrida*, *Onopordon illyricum*, *Echinops strigosus* grow here luxuriantly. With this gypsum formation is connected a hilly land consisting of limestone, which possesses a rich flora and extends to the mouth of the Guadiana Menor. Here I observed *Aristolochia longa*, *Anthyllis cytisoides*, *Genista ramosissima*, *Teucrium pseudochamæpitys*, *Scabiosa stellata*, *Crucianella angustifolia*, *Leuzea conifera*, *Atractylis humilis*, *Linum suffruticosum*, *Coris monspeliensis*, *Campanula Erinus*, *Minuartia montana* and *Elæoselinum Lagascæ*, Boiss., in fruit. The banks of the Guadalquivir are for the most part bordered by oleander, pistachio, and tamarisk bushes, beneath which *Cynanchum monspeliacum*, L., occurs in tolerable plenty. The right bank of the Guadalquivir consists of alluvial soil, which in the country around the towns of Baëza and Ubeda is partly planted with vines and olives. In the environs of both places occur *Ammi Visnaga*, L., in immense quantities, and on dry spots between Ubeda and the river the pretty *Heliotropium supinum*, L., in company with *Crozophora tinctoria* and *Momordica Elaterium*.

I now turn to the vegetation of the Sierra Morena, whither I journeyed from Ubeda, and which I have traversed in its full extent from the limits of Murcia as far as the frontiers of Portugal and to the mouth of the Guadiana, a distance of sixty-two German miles. I know no mountain-chain in Spain, which, in such a length and breadth (the average breadth may be taken at least at eight German miles), possesses such an immense uniform vegetation, but which differs in the different formations. I therefore consider it necessary to give first of all a brief geognostical survey, before proceeding to the general characteristics of the vegetation in the Sierra Morena. The Sierra Morena is of no great height, its highest point scarcely reaching 5000 feet, and that of its broad and greater portion only 2-3000 feet. It is distinguished by its peculiar character, as well as by its thick forests, from all the other mountain-chains of Andalusia, whose northern limits it forms, while it covers a large portion of the provinces of Jaen, Cordoba, Seville, and Huelva. Before I pass to the geognostical description of this mountain-chain, it may be well to give briefly my route over it.

From Ubeda I went in a north-easterly direction to the village of San Esteban del Puerto, which lies near the frontiers of Murcia, and from hence north-east to the Venta de Cardenas on the road to Madrid, close to the limits of the Mancha, upon which I went southwards through the Puerto de Despeñaperros to Carolina. After a stay of several days in this city I journeyed on, following the road to Andujar, and then went down the valley of the Guadalquivir to Montoro, where this river intersects the lowest part of the Sierra Morena, and enters the lowlands of the province of Cordoba. From Montoro I again turned northwards into the mountain-chain as far as Villanueva de Cordoba, from whence I travelled in a north-easterly direction towards the baths of Fuencaliente in the Mancha. From thence I went westwards to the little town of Pozo-Blanco, and then through the whole of the Sierra in a south-westerly direction

to Villaharta and Cordoba. After a residence of a fortnight in this town, I again crossed the whole mountain-chain and went northwards to Almada in the Mancha, then turned back again into the province of Cordoba, and journeyed south-west through Hinojosa to the little mountain-town of Fuente Ovejuna, and from hence westwards to Estremadura, which however I very soon quitted to enter the province of Seville. From the mountain-town of Guadalcanal, I turned westwards, and journeyed through the most mountainous portion of the Sierra Morena to the little town of Aracena, only five leagues from the frontiers of Portugal, where the Sierra Morena divides into two principal branches, one of which follows the chief direction, and stretches away far into Portugal, and the other goes off in an almost southerly direction as far as the Atlantic, covers the greatest portion of the province of Huelva, and forms the left wall of the valley watered by the Guadiana. Through this southern and very broad branch, I journeyed from Aracena through Cerro and Villanueva de los Castillejos to the mouth of the Guadiana.

The chief portion of the whole of the Sierra Morena consists of graywacke, which crops out in part as a compact rock, partly as graywacke schist, which takes an endless variety of forms according to its consistence and colour. In isolated spots this stone alternates with clay-schist, as at Almada, where it forms the matrix of the celebrated quicksilver ores, and between Villaharta and Fuente Ovejuna, where recently very rich coal-mines have been discovered. This graywacke formation stretches from Murcia as far as Portugal and up to the Guadiana, is from four to six German miles in extent, and forms uniform, undulating, gently rounded mountains and ridges, which in a great portion of the chain scarcely attain the height of 3000 feet. Only in the most western portion, in the province of Huelva, in the environs of Aracena, this formation consists of rugged and loftier mountains, which may perhaps be from 3-4000 feet high. Here the graywacke is in many places interrupted by a gneiss formation, which probably also constitutes the most northern chains of the western portion of the Sierra Morena, lying in Lower Estremadura, for this part is much more watered than the central and eastern part of the mountain-chain. Along the southern foot of the Sierra Morena various other formations overlies the graywacke, namely in the east of Murcia, as far as the country of Carolina, a red, very soft and clayey sandstone, which forms long, horizontal, but steep ridges. To this is joined a large formation of red, very hard and fine *Schleifstein*, which covers the whole southern margin of the mountain-chain of Baylen as far as beyond Montoro, forms somewhat steep, cup-formed or pyramidal, but neither rocky nor lofty, mountains, and passes into a white sandstone, which extends from Cordoba westward to the foot of the Sierra Morena. In the central part of the Sierra Morena, that is to say in the province of Cordoba, an immense granite formation breaks through the graywacke, which however forms no isolated summits, but an immense undulating table-land sloping gently towards the north, and lying between the northern margin of the graywacke formation and the lofty mountain-

chains which divide the province of Cordoba from Estremadura and the Mancha, but still belong to the Sierra Morena. In this somewhat barren granite plain lie the towns of Pozo-Blanco and Hinojosa, as well as a number of smaller places, for this part of the mountain-chain is the most populated of all. At the baths of Fuencaliente, much frequented on account of their hot mineral springs, begins a mountain-chain consisting of several parallel chains, which is distinguishable from a distance by its rugged, very rocky summits, and stretches out in a north-western direction to beyond Almadea, where it is divided by the valley of the Rio Zuja, a tributary of the Guadiana, from another similarly formed mountain-chain which goes in a south-westerly direction from the Zuja into the country of La Granja in Estremadura, where it joins the graywacke chains of Fuente Ovejuna. Both chains bound the above-mentioned granite plain on the north-west and east, and consist of a peculiar white stone, very hard and rich in quartz, which the Spaniards call Arenisca Carzosa (quartzose sandstone, but it is no true sandstone). This formation constitutes the highest mountains of the entire Sierra Morena.

The vegetation of all these formations consists indeed, in their principal features, of the same plants, but their distribution varies remarkably in the different formations. Moreover almost every formation possesses a number of plants peculiar to itself. To speak generally, the flora of these formations is throughout the whole mountain-range the same; only in the western part a decided tendency to the western flora of the peninsula of the Pyrenees is observable, as here a number of plants occur which are peculiar to Portugal and Western Andalusia. The chief part of the vegetation of the Sierra Morena is formed of trees and shrubs; the herbaceous vegetation is limited to a spring flora, as on account of the slight elevation of this mountain-chain, the greatest part of these plants are parched up from the month of July. Not until the autumn does the herbaceous vegetation spring up anew, and then brings forth a number of bulbous plants, very uniformly distributed over the whole range, as *Squilla maritima*, Steinh., *Scilla autumnalis*, L., *Leucojum autumnale*, L., *Merendera Bulbocodium*, Ker., and *Narcissus serotinus*, L., which last however only occurs in the southern part of the above-mentioned chain, which stretches from Aracena southwards as far as the sea. In the spring the whole of this range must present a very variegated appearance, from the numerous flowering *Cistineæ*, *Leguminosæ*, *Labiata* and *Compositæ*, and in this season some new discoveries may also perhaps be made in the families of the *Liliaceæ* and *Orchideæ*, for the other herbaceous plants are, to judge from the remains of the parched-up vegetation, common plants in the south of Spain. I now proceed to a description of the vegetation in the various formations.

1. *Graywacke formation*.—This is entirely covered with a very thick 'monte bajo,' which, especially on the northern and eastern acclivities of the river-valley, is extremely luxuriant. The principal part of this shrub-vegetation is formed of the noble *Cistus ladaniferus*, L., which overspreads the Sierra Morena for a length of some fifty

German miles, and covers frequently whole square miles *exclusively*. Next to this *Cistus* occurs most plentifully *Phillyrea angustifolia*, L., *Rosmarinus officinalis*, L., and *Helianthemum glutinosum*?, less frequent *Adenocarpus Telonensis*, Gay, *Cistus crispus*, *C. albidus*, *C. monspeliensis*, *Erica arborea*, *Genista ramosissima*, *Daphne Gnidium*, *Pistacia Terebinthus* and others. On the northern and eastern slopes of the valleys occurs especially *Arbutus Unedo*, L., and on the banks of the rivulets and rivers *Nerium Oleander*, *Pistacia Lentiscus*, *Salix cinerea*, L., *Rosa canina* and *Rubi*, interlaced with wild vines. Of trees, there grow luxuriantly on this formation and very plentifully, *Quercus Ilex*, *Qu. Ballota*, the first most frequently of shrubby growth, and in the eastern part of the mountain-chain *Qu. Suber*. The following are to be regarded as trees peculiar to this formation: *Frazinus excelsior*, L., *Acer monspessulanum*, L., and *Alnus glutinosa*, L., which however occur only in the deep river-valleys, as for example in the valley of the Rio Magaña which runs through the Puerto de Despeñaperros, in the valleys of the Rio Cuzua and Guadabarbo in the province of Cordoba, and in the valleys of the Cala Ribera, Huelva Ribera and Rio Tinto in the province of Huelva:—in addition, *Phillyrea media*, L., which I have met with only in two places in the valley of the Guadalea, between S. Estaban del Puerto and Aldea Quemada, and in the valley of the Huelva Ribera. Of shrubby plants, *Cistus laurifolius*, L., and *Helianthemum atriplicifolium*, W., which occur between the two river-valleys of the Cuzua and Guadabarbo, alone appear to be peculiar to this formation. Finally the graywacke formation possesses a portion of herbaceous plants, mostly rock-plants, as for example *Digitalis Mariana*, Boiss., clearly distinguished by its white woolly leaves and other characters from *D. purpurea*, and *Brassica longirostris*, Boiss., which grow luxuriantly on almost all the rocks of this formation, but most frequently and abundantly on the colossal rocks of the celebrated Puerto de Despeñaperros. Here occur moreover *Jasione foliosa*, Cav., forming thick beds, *J. montana*, L., *Umbilicus hispidus*, DC., *U. pendulinus*, DC., *Sedum amplexicaule*, DC., *Trixago Apula*, *Erysimum canescens*, Roth., *Lychnis dioica*, L., two pinks, one with capitate flowers, *Phagnalon Lagasca*, DC., *Rumex pulcher*, L., *Poterium mauritanicum*, Boiss., *Campanula Rapunculus*, L., *Ruscus aculeatus*, L., *Geranium lucidum*, L., &c. In addition throughout the eastern and central graywacke chain occurs very frequent the pretty *Eryngium tenue*, Lam., which was apparently already off flower, as most of the above-named rock-plants had long been. On the margins of streams I observed frequent *Hypericum baticum*, Boiss., and *H. perforatum*, L.

2. *Granite formation*.—This is characterized by its extraordinary sterility, and is covered partly with extensive forests of *Quercus Ilex* and *Qu. Ballota*, partly with a very poor and sparing underwood, for the most part of shrubby *Qu. Ilex*, mingled with *Cistus ladaniferus*, *Phillyrea angustifolia* and *Arbutus Unedo*. Characteristic of this formation are *Retama sphaerocarpa*, Boiss., and a *Pyrus* (*P. eriopleura*? Rchb.). In the environs of the numerous villages lying in this barren and dry high table-land I observed *Verbena supina*, Clus.,

and *Xanthium spinosum*, L., in plenty, less frequent *Heliotropium supinum*, L., and in vineyards about the hamlet El Viso de los Pedroches, the pretty *Cleome violacea*, L., still in flower.

3. *Sand and Schleifstein formation*.—This is characterized by an unusually luxuriant and variously composed shrubby vegetation, which is however in the *Schleifstein* and white sandstone formation richer in trees than in the eastern red sandstone formation, and, especially in the country of Cordoba, frequently alternating with copses of *Pinus Pinea*, L. Here occurs also *Quercus Suber* plentifully, and also *Qu. Ilex* and *Qu. Ballota*. The underwood consists especially of *Qu. pseudococcifera*, Desf., *Qu. lusitanica a. faginea*, *Olea europæa* var. *sylvestris*, *Viburnum Tinus* and *Myrtus communis*, and also almost all the shrubs of the graywacke formation, especially *C. ladaniferus*, but variously intermixed.

4. *Arenisca quartzosa*.—The above-described most northern mountain-chains of the Sierra Morena are also for the most part covered with shrubs, which are very varied and characterized by the occurrence of *Cistus populifolius*, L., and a shrubby *Helianthemum*, which resembles the *H. halimifolium*, L., but is clearly distinguished from it by numerous smaller and channeled leaves. In this formation is also found *Cratægus monogyna* in great profusion. I have not observed any trees in this part of the mountain-chain, with the exception of *Qu. Ilex* and *Qu. Ballota*. On the rocks a *Jasione* is plentiful, forming beds; it seems to be different from *J. foliosa*, Cav., but unfortunately was already quite dried up.

5. *Most Western part of the Sierra Morena*.—Although this for the most part consists of graywacke, its vegetation is very different from that of the rest of the graywacke range, and its underwood extremely varied, on which account I must speak here particularly of this division of the mountain-chain. *C. ladaniferus* still continues to form the chief portion of the shrubby vegetation, which occupies large tracts as far as the sea; but besides this occur *C. populifolius*, L., and almost all the shrubs of the above-described formations in abundance, as well as all the trees, especially *Qu. Suber*, which forms large woods with *Qu. Ballota* and *Pinus Pinea*, L. Of shrubs, which I had not before observed in the other parts of the mountain-chain, I found *Helianthemum halimifolium*, L., (the *Helianthemum* mentioned in the preceding formation also occurs here and there,) *Teucrium fruticans*, L., *Erica umbellata*, L., and lastly two shrubs peculiar to the south-west of Andalusia and Portugal in great plenty, namely *Genista tridentata*, L., and *Ulex genistoides*, Brot. At Villanueva de los Castillejos our common *Calluna vulgaris* is plentiful, and was just in full flower.

In moist lowlands, throughout the whole range, but especially in the eastern and central part, occurs a thorny shrub with virgate branches and small elliptical coriaceous leaves, in very great abundance, which appears to belong to the *Rhamnaceæ* (I have found neither flowers nor fruit), as well as *Mentha Pulegium*, *M. rotundifolia*, a *Senecio*, and a *Pulicaria* with very small heads of flowers. On clayey soil, especially of the granite formation, *Tanacetum annuum*,

L., was now in flower in great plenty, wholly covering large tracts of land, and in the oak-woods grew luxuriantly *Cynara horrida*, and *C. humilis*, DC., very frequent. The last occur quite as numerous in the plains of the Guadalquivir, of which I will now say a few words. The banks of the Guadalquivir, from Andujar to Seville and further down, are for the most part lined with *Tamarix gallica*, L., *Ricinus communis*, L., *Xanthium spinosum*, L., *X. Strumarium*, L., and various *Chenopodiaceæ*. At Montoro and Cordoba, *Salsola rosacea* occurs plentifully; and at Montoro and Seville, here and there, *Vitex Agnus-castus*, L. The following plants are common in this flat land: *Ammi Visnaga*, L., *Scolymus maculatus*, *Sc. hispanicus*, *Notobasis syriaca*, *Silybum Marianum*, *Centaurea Calcitrapa*, *Datura Stramonium*, *Atractylis gummifera*, L., and rare *Verbena supina* and *Heliotropium supinum*. In the environs of Cordoba, at the foot of the Sierra Morena, grow luxuriantly and in tolerable abundance *Paliurus australis*, L., *Asparagus horridus*, L., and, on the contrary, rare, *Anagallis verticillata*, All.

The graywacke formation of the Sierra Morena approaches within four miles of the coast in the south-western part of the province of Huelva, where a very intersected low hilly land, consisting of limestone debris, breccia and gravel overlies it, covering the coast from the mouth of the Guadiana as far as the mouth of the Rio Piédra at the little town of Cartaya, and is tolerably thickly wooded with pines (*Pinus Pinea*). In its underwood occurs *Cistus ladaniferus*, still very frequent, and also great quantities of *Ulex genistoides*, Brot., *Calluna vulgaris*, and a leafless prickly *Genista*. Pine-forests border this hilly land, which include the sandy coast of Cartaya up to the mouth of the Guadalquivir, and, as I before observed, descend far toward the coast of the province of Cadiz eastwards. The banks of the Guadiana, both Spanish and Portuguese, and the coast of the mouth of this noble stream as far as Huelva, are bordered with immense marismas or morasses, which have the same vegetation as the before-described morasses of the Isla de Leon and of Chiclana, and whose plants were now partly in flower. The chief portion of this saline marshy vegetation consists of a number of *Salsolaceæ*, as *Salsola Kali*, L., *S. sativa*, L., *Salicornia fruticosa*, L., and others; moreover, *Obione portulacoides*, Moq., *Frankenia thymifolia*, and especially a large shrubby *Statice* with fleshy lanceolate leaves and red flowers, and a *Senecio* with fleshy cylindrical leaves. Everywhere on the hedges and walls around Agamonte and Huelva blossomed *Atriplex Halimus*, L., with other *Chenopodiaceæ*. Huelva, the chief town of the province, lies on a tongue of land between two arms of the sea, stretching inland for several miles, at the foot of a height consisting of mere loam and sand, on which *Salsola microphylla*, Cav., occurs very plentifully. The banks of these two arms of the sea are also occupied by immense morasses, which present the same vegetation as the before-described marismas.

On the 10th of October I left Huelva and the next day reached Seville, whither the road leads through an uninterrupted lowland, which in part is extremely well cultivated, especially from Palma.

The road frequently leads through copses of cork-trees and pines, and large barren tracts are seen covered with *Chamærops humilis*, *Narcissus serotinus*, L., *Scilla autumnalis*, L., *Leucjum autumnale*, *Squilla maritima*, *Ranunculus bullatus* and *Melissa Calamintha* flowered everywhere in this lowland; more rarely *Merendera Bulbocodium* and *Mandragora officinarum*. The most interesting plant which presented itself on this road was the *Pancreatium humile*, Cav., or *Carenoa lutea*, Boiss., still so seldom found in herbariums, which hitherto was only known in one locality at Seville, where it occurs rarely, and in another at the Puerto de St. Maria. This lovely and sweet-smelling plant grows luxuriantly and very frequent in the plains of the province of Huelva, where I have observed it from Cartaya to within a few leagues of Seville, and is on some spots, as for example in the environs of the village of Niebla, extremely common.

The environs of Seville present at this season scarcely anything beside the common autumnal flora of the plains of Lower Andalusia.

BIBLIOGRAPHICAL NOTICES.

Phycologia Britannica: or a History of British Sea-weeds, containing Coloured Figures, Generic and Specific Characters, Synonymes, and Descriptions of all the species of Algæ inhabiting the Shores of the British Islands. By WILLIAM HENRY HARVEY, M.D., M.R.I.A., Keeper of the Herbarium of the University of Dublin.

As great admirers of that beautiful portion of our flora, the subjects of which, even more than those of the land, are "born to blush unseen," we hail with extreme pleasure an illustrated 'History of British Sea-weeds.' And above all—on account of the accuracy it insures—one, in which every species inhabiting the shores of the British Islands will be drawn, lithographed and described by the same hand. The importance of this combination in the one individual is well known to all naturalists who have had any experience; the species being generally described by one party, drawn by a second, and engraved by a third:—and truly may we say, that "small by degrees and *beautifully* less" in accuracy is sure to be their fate the more hands they pass through.

This work is published in royal octavo, to admit of as many species as possible being figured of full natural size; when this cannot be done, a double plate will occasionally appear; and of the giants of the deep, a portion will be given of natural size; when the species are minute, two will be represented on the same plate, as we already see done in the *Elachistææ*, seven species being thus figured in the one number instead of six, as announced in the prospectus. In every instance microscopical representations of the structure, fructification, &c. will appear, and all will be coloured.

The descriptive portion will be much more full than in any previous work in which our native plants have been treated of, for the 'Phycologia Britannica' will as a whole occupy a place by itself. We have ample descriptions of the species; their geographical dis-

tribution; their distribution on our own coasts; and their general history. To use the author's words:—"The plan which I have adopted is, to select the species illustrated in each number from several different genera, taken from as many families, so that there shall always be a variety of subjects in the monthly number; and, as early in the work as possible, to figure one species at least of every genus, so that by the end of the twentieth number, which will complete the first volume, illustrations of all the genera may be placed before the student. This, with the aid of the descriptions of species and sketch of a general arrangement afforded by the 'Manual' * (which may serve as a synopsis of the principal contents of the 'Phycologia'), will afford him very great facilities for determining his plants during the progress of this work, even though the particular species which he has under examination may not be among those then figured in it. Were the plants to be published systematically, it is obvious that not till the completion of the entire work would the student have as much assistance toward understanding the genera, as he will now have at the end of the first volume. This arrangement is therefore decidedly the best for those who have purchased the 'Manual,' and as it appears to me, for those also, who, now commencing the study of *Algology*, wish to obtain speedily a general view of the principal varieties of marine plants."

Sixty numbers will complete the work, five of which are now before us, and we question whether a more beautiful botanical work, plates and typography combined, has ever issued from the press,—at so low a price we feel certain that none has. In these five numbers appear species altogether new (*Griffithsia devoniensis*, *Elachistea attenuata*); some before known in other seas, but now for the first time added to our flora (*Chordaria divaricata*); and several species figured for the first time.

So favourably is Mr. Harvey known to the botanical world as an algologist, that to speak of his excellent treatment of the subject in all its bearings, as known to the present time, seems to us superfluous. We say advisedly as known to the present time, for sufficient attention has not hitherto been paid to the general œconomy of the Algæ. A knowledge of the peculiar rocks, soils, &c. affected by the various species; the ranges of depth, influence of currents and tides, not only on their presence, but on their growth, rendering them dwarfed or luxuriant according to circumstances, have not, at least in our own country, been properly studied. These causes have a much more important bearing on Algæ than a mere difference of latitude. We trust therefore that the author will throughout his work afford us all the information he can obtain on these interesting points—in natural history every positive observation is of value. We have ourselves attended to some extent to what is here suggested, and have been much interested to find upon coasts of similar mineralogical and geological character, though separated by several degrees of latitude, the same broad botanical features; indeed, the mere appearance of a particular

* Manual of British Algæ, by the same author, published a few years ago.

character of coast at any part of the British Islands suggests to us its productions. Yet are there some species so far influenced by latitude, as not to be found further south than our more northern shores, and others again not further north than our more southern coasts : in such cases our shores are the extreme limits of the species in the respective directions. Further we need not here enter into this subject, but instead, call upon our author to give us all the information in his power.

The 'History of British Sea-weeds' we can most faithfully recommend for its scientific, its pictorial, and its popular value. The professed botanist will find it a work of the highest character. Persons who have not commenced the study, or who desire merely to know the names and history of the lovely plants which they gather on the margin of the sea, will find in it when complete the faithful portraiture of every one of them. Those who have not that happy privilege, but in "close cities pent," or confined to the inland country, will have before them pictorial representations only less fresh and glowing than the beautiful originals; and those who merely desire what the French call a work of luxury for the drawing-room table, will, owing to the extreme variety and delicacy of form of the objects, combined with the most glowing colours, find that no work at the same cost is more attractive, or should be preferred before it.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

November 25, 1845.—William Horton Lloyd, Esq., in the Chair.

A paper was read containing "Descriptions of fourteen new species of *Helix*, belonging to the collection of H. Cuming, Esq.," by Dr. L. Pfeiffer :—

1. *HELIX ALBOCINCTA*, Pfr. *Hel. testâ umbilicatâ, orbiculato-convexâ, tenuiusculâ, supernè regulariter et confertim striatâ, sericinâ, fulvo-corned, carinatâ; spirâ depresso-conicâ, apice obtuso; anfractibus 5½ convexis, carinâ albâ cinctis, ultimo basi sublevigato, lineis subtilibus, concentricis notato; umbilico mediocri, pervio; aperturâ obliquâ, angulato-lunari; peristomate simplice, acuto.*

Diam. 11, alt. 5 mill.

Collected by Mr. Cuming at Himamaylan, island of Negros.

2. *HELIX BOHOLENSIS*, Pfr. *Hel. testâ imperforatâ, depressâ, lenticulari, acutè carinatâ, tenui, corneo-albidâ; spirâ convexiusculâ; anfractibus 7 planulatis, regulariter confertim striatis, juxta carinam lineis 2 acutè elevatis approximatis cinctis, ultimo basi convexiusculo, striatulo, medio vix impresso, anticè non descendente; aperturâ verticali, depressissimâ, latè angulato-lunari; peristomate simplice, acuto, margine supero brevissimo.*

Diam. 14, alt. 6 mill.

Var. *minor*, *anfractibus 6½*. Diam. 10, alt. 4 mill.

Collected by Mr. Cuming at Loboc, island of Bohol.

3. *HELIX CYATHUS*, Pfr. *Hel. testâ umbilicatâ, orbiculato-conicâ, supernè arcuatim costulato-striatâ, unicolore fuscâ; spirâ elevatâ, obtusè conicâ; suturâ distinctâ, crenulato-marginatâ; anfractibus 6½ convexiusculis, ultimo carinato, basi sublævigato, planiusculo; umbilico magno, profundo, cyathiformi; aperturâ subverticali, angulato-lunari; peristomate simplice, margine supero recto, basali arcuato, reflexiusculo, columellari breviter descendente.*

Diam. 8, alt. $4\frac{1}{2}$ mill.

Collected by Mr. Cuming at S. Jaun, province of Cagayan, island of Luzon, on the leaves of trees.

4. *HELIX DUBIOSA*, Pfr. *Hel. testâ imperforatâ, depresso-globosâ, tenui, obsoletè malleatâ, fulvâ, fasciâ suturali et areâ columellari nigro-rufis, fasciis plurimis angustis epidermidis hydrophanæ albidæ ornatâ; spirâ subsemiglobosâ; anfractibus 4 convexiusculis, celeriter accrescentibus; columellâ intrante, planulatâ, declivi; aperturâ lunato-rotundatâ, intus margaritacèd; peristomate tenui, albo, latè expanso, vix reflexiusculo, margine basali cum columellâ angulum obsoletum formante.*

Diam. 35, alt. 26 mill.

β. *Fasciis 2 nigricantibus ad peripheriam.*

Collected by Mr. Cuming on the island of Samar. This is the shell figured by Mr. Reeve under the name of *H. decipiens*, Sowerby (Conchologia Systematica, vol. ii. pl. 145. fig. 16); it is nearer allied to *H. mirabilis*, Fér., but may be distinguished as a good species.

5. *HELIX FILOCINCTA*, Pfr. *Hel. testâ perforatâ, depressâ, tenui, pellucidâ, corned, striatulâ, nitidâ; spirâ parùm elevatâ, obtusâ; anfractibus 5½ convexiusculis, carinatis, ultimo basi convexo; carinâ filiformi, in anfractibus superioribus conspicuâ, sed non exsertâ; aperturâ verticali, lunato-subauriformi; peristomate simplice, recto, margine columellari perobliquo, elongato, descendente, ad dextram subitò ascendente.*

Diam. 11, alt. $5\frac{1}{2}$ mill.

Collected by Mr. Cuming at Cagayan, province of Misamis, island of Mindanao.

6. *HELIX GOULDI*, Pfr. *Hel. testâ umbilicatâ, orbiculato-conicâ, tenuiusculâ, subtiliter striatulâ, vix nitidulâ, unicolore fuscâ; spirâ elevatâ, conoidèd; anfractibus 6 convexiusculis, ultimo carinato, anticè subrotundato, basi planiore; umbilico mediocri, pervio; aperturâ lunato-orbiculari; peristomate simplice, marginibus subconniventibus, dextro recto, columellari subdilato, patente, basali reflexiusculo.*

Diam. $9\frac{1}{2}$, alt. 6 mill.

Collected by Mr. Cuming in the province of Laguna, island of Luzon, and on the island of Negros.

7. *HELIX ORTHOSTOMA*, Pfr. *Hel. testâ umbilicatâ, depressâ, supernè confertim subarcuato-striatâ, tenui, pellucidâ, pallidè corned; spirâ vix elevatâ, obtusâ; anfractibus 6 angustis, convexiusculis, ultimo basi sublævigato; umbilico majusculo, cylindraceo; aperturâ*

verticali, obliquè lunari; peristomate simplice, acuto, margine supero brevi, basali valdè arcuato, columellari dilatato, sinuato.

Diam. 10, alt. 5 mill.

Collected by Mr. Cuming at Dingle, island of Panay, under decayed leaves.

8. *HELIX STRIGILIS*, Pfr. *Hel. testá umbilicatá, depressá, lenticulari, tenui, pellucidá, pallidè corned, acutè carinatá; anfractibus 6 angustis, vix convexiusculis, supernè confertim costulato-striatis, lineis elevatis concentricis reticulatis, ultimo basi convexiore, lævigato, nitido; umbilico mediocri, cylindrico; aperturá subverticali, angulato-lunari; peristomate simplice, acuto, margine supero brevi, strictiusculo, basali valdè arcuato.*

Diam. 12, alt. $5\frac{1}{2}$ mill.

Collected by Mr. Cuming at Himamaylan, island of Negros.

9. *HELIX CONSPERSULA*, Pfr. *Hel. testá imperforatá, turbinatá, striatuld, opacá, tenuiusculá, stramineá vel cinnamomeá, punctis albis confertissimè conspersá; spirá conoided, apice obtusiusculo, nigricante; suturá mediocri, castaneo-marginatá; anfractibus 6 convexiusculis, ultimo subangulato, basi planiusculo; columellá obliquá, subarcuatá, subexcavatá, albá, castaneo-marginatá; aperturá amplá, lunato-ovali; peristomate simplice, breviter expanso.*

Diam. $23\frac{1}{2}$, alt. 15 mill.

Hab. — ?

10. *HELIX HARTMANNI*, Pfr. *Hel. testá umbilicatá, depressá, subdiscoideá, acutè carinatá, arcuatim distinctè striatá, unicolore fuscá; spirá vix elatá; suturá lineari; anfractibus 6 planulatis, ultimo non descendente, basi convexiusculo; umbilico magno, perspectivo; aperturá depressá, securiformi; peristomate recto, margine supero simplice, antrorsum arcuato, basali subincrassato.*

Diam. 26, alt. 8 mill.

Hab. — ?

11. *HELIX HELICOPHANTOIDES*, Pfr. *Hel. testá perforatá, depressá, tenui, obliquè et confertim costulato-striatá, stramineá, rufo tessellatá et strigatá; spirá planiusculá; anfractibus $3\frac{1}{2}$ vix convexiusculis, rapidè crescentibus, ultimo depresso; aperturá perobliquá, amplá, subovali; peristomate simplice, acuto, marginibus approximatis, callo tenuissimo junctis.*

Diam. maj. $4\frac{2}{3}$, alt. 2 mill. (Spec. max. coll. Cuming.)

Hab. Island of Juan Fernandez.

The shape of this shell is very like that of *Helicophanta rufa*. Perhaps it may belong to the same genus.

12. *HELIX MARMORELLA*, Pfr. *Hel. testá perforatá, depressá, tenuissimá, distanter costulatá, pellucidá, stramineá, strigis obliquis et maculis rufis marmoratá; spirá planá; anfractibus 3 vix convexiusculis, rapidè accrescentibus, ultimo basi pauld convexiore; aperturá perobliquá, amplá, lunato-ovali; peristomate simplice, acuto, marginibus callo tenui junctis, supero antrorsum arcuato.*

Diam. 7, alt. 3 mill.

Hab. Island of Juan Fernandez.

13. *HELIX KINGI*, Pfr. *Hel. testâ umbilicatâ, depressâ, sub lente confertissimè striatâ, tenui, diaphanâ, stramineâ, rufo-flammulatâ et 1-2-fasciatâ; spirâ depressâ; anfractibus 5½ convexiusculis, celeriter accrescentibus; umbilico majusculo, perspectivo; aperturâ lunato-ovali; peristomate simplice, acuto, marginibus conniventibus, columellari subdilatato, patente.*

Diam. 7, alt. 3 mill. (Spec. max. coll. Cuming.)

Hab. Island of Juan Fernandez.—An *H. pusio*, King?

14. *HELIX RADIELLA*, Pfr. *Hel. testâ umbilicatâ, depressâ, sub-lenticulari, tenui, utrinque confertim costulatâ, corned, strigis crebris undatis, castaneis, ad peripheriam latioribus radiatâ; spirâ vix elevatâ; anfractibus 5½ convexiusculis, ultimo subangulato, basi planiusculo; umbilico mediocri, pervio; aperturâ subverticali, latè lunari; peristomate simplice, tenui.*

Diam. $4\frac{3}{4}$, alt. $2\frac{1}{2}$ mill.

Collected by Mr. Cuming on the island of Opara.

A paper was also read containing "Descriptions of thirty-six new species of *Helix*, belonging to the collection of H. Cuming, Esq.," by Dr. L. Pfeiffer:—

1. *HELIX INCEI*, Pfr. *Hel. testâ umbilicatâ, depresso-globosâ, solidulâ, striatâ, sub epidermide pallidè fulvâ albâ, fasciis angustis castaneis cingulatâ; spirâ elevatâ, acutiusculâ; anfractibus 7 vix convexiusculis, ultimo circa umbilicum mediocrem, pervium subcompresso; columellâ arcuatâ; aperturâ perobliquâ, lunato-ovali; peristomate albo, tenui, intus sublabiato, margine dextro vix expanso, basali reflexo, columellari in laminam triangularem dilatâ, umbilicum semitegente.*

Diam. 38, alt. 28 mill.

β. *Minor, epidermide castanea, fasciis indistinctis, anfractu ultimo basi flavo.*

Diam. 32, alt. 21 mill.

From North Australia, collected by Lieut. Ince, R.N.

2. *HELIX JONASI*, Pfr. *Hel. testâ imperforatâ, globoso-conoided, solidiusculâ, lævigatâ, non nitens, pallidè virescens; spirâ obtusè conicâ; anfractibus 5 convexiusculis, ultimo basi subplanato; columellâ albâ, obliquâ; aperturâ lunari; peristomate breviter incrassato, margine columellari subdilatato, adpresso.*

Diam. 28, alt. 24 mill.

β. *Tenuior, apice rubicundo, anfractu ultimo basi nigricante, fascia angusta, nigra ad suturam: H. dimera; Jonas.*

From the Philippine Islands, Mindoro.

3. *HELIX BUSCHI*, Pfr. *Hel. testâ imperforatâ, conico-globosâ, solidiusculâ, tenuiter striatâ, parùm nitidulâ, citrinâ; spirâ conoided, obtusiusculâ; anfractibus 5½ convexiusculis, ultimo rotundato; columellâ subobliquâ, strictâ, dilatatâ, albo-callosâ; aperturâ rotundato-lunari, intus nitidâ, concolore; peristomate tenui, albo, breviter expanso, margine basali cum columellari angulum formante.*

Diam. 23, alt. 23 mill.

From the island of Mindoro.

4. *HELIX PELODES*, Pfr. *Hel. testâ umbilicatâ, subglobosâ, tenuiusculâ, striatâ et minutè granulatâ, rubello-fuscâ; spirâ brevi, obtusiusculâ; anfractibus 6 convexiusculis, ultimo inflato, anticè breviter descendente; umbilico mediocri, pervio; aperturâ lunato-orbiculari, intus margaritacè; peristomate expanso, saturatè carneo, margine columellari per dilatato, fornicatim reflexo.*

Diam. 31, alt. 20 mill.

From the north coast of Australia: found under decayed leaves (Lieut. Ince, R.N.).

5. *HELIX HARTWEGI*, Pfr. *Hel. testâ umbilicatâ, depressâ, carinatâ, solidulâ, striatulâ, fuscâ; spirâ vix elevatâ; anfractibus 5 planulatis, ultimo basi pauld convexiore, anticè non descendente; umbilico angusto, pervio; aperturâ perobliquâ, irregulariter subquadratâ; peristomate albo, incrassato, breviter reflexo, marginibus callo junctis, dextro sinuoso, basali subrecto, dilatato, introrsum calloso, dente unico interposito.*

Diam. 23, alt. 12 mill.

From El Catamajja, near Loxa, republic of the Equator (Hartweg).

6. *HELIX LEPTOGRAMMA*, Pfr. *Hel. testâ umbilicatâ, globosâ, tenui striatâ, lineis impressis, concentricis, confertis, sculptâ, carneo-albidâ, supernè fasciis 3-4 angustis, rufis ornatâ; anfractibus 4½ convexiusculis, ultimo inflato, anticè breviter descendente; aperturâ vix obliquâ, rotundato-lunari, intus concolore; peristomate albo, simplice, breviter expanso, marginibus callo tenuissimo diffuso junctis, columellari valdè dilatato, albo, nitido, reflexo, umbilicum angustum semioccurrente.*

Diam. 17, alt. 13 mill.

From Cygnet Bay, North Australia (Lieut. Ince, R.N.).

7. *HELIX GILBERTI*, Pfr. *Hel. testâ umbilicatâ, depressâ, distinctè striatâ, minutissimè granulatâ, tenui, pallidè corned, lined rufâ ad suturam cinctâ; anfractibus 4½ convexiusculis, ultimo basi convexo; umbilico mediocri, pervio; aperturâ rotundato-lunari; peristomate simplice, recto, margine columellari parùm dilatato, reflexo.*

Diam. 16, alt. 9 mill.

From Darling Downs, East Australia (Gilbert).

8. *HELIX ZONITES*, Pfr. *Hel. testâ umbilicatâ, depressâ, tenui, diaphand, confertim costulato-striatâ, lutescenti-corned; spirâ vix elatâ; anfractibus 6 convexiusculis, regulariter accrescentibus, ultimo supra medium lined rufâ, ad apicem usque conspicuâ ornato, basi levio-re, subplanulato; umbilico mediocri, pervio; aperturâ depressâ, obliquè lunato-ovali; intus margaritacè; peristomate simplice, recto, margine columellari breviter patente.*

Diam. 25, alt. 12½ mill.

Hab. Unknown.

9. *HELIX GRIFFITHI*, Pfr. *Hel. testâ umbilicatâ, globoso-depressâ, solidiusculâ, levigatâ, supernè leviter striatulâ, corneo-lutescente; spirâ breviter elevatâ, conoidè; anfractibus 6 convexiusculis, ul-*

timo ad suturam castaneo-marginato, ventroso; umbilico mediocri, pervio; aperturá vix obliquá, amplá, rotundato-lunari, intus margaritacéa; peristomate simplice, acuto, marginibus callo tenuissimo junctis, columellari breviter patente.

Diam. 26, alt. 14 mill.

Locality unknown.

10. *HELIX KOCHI*, Pfr. *Hel. testá umbilicatá, globoso-depressá, solidulá, obliquè distinctè striatá, albídá, fasciis pluribus rufis ad peripheriam ornatá; spirá parùm elevatá, obtusiusculá; anfractibus 6 convexis, sensim accrescentibus, ultimo subcylindrico; umbilico magno, pervio; aperturá lunato-orbiculari, intus concolore, nitídá; peristomate simplice, acuto, marginibus conniventibus, dextro antrorsum arcuato, columellari dilatato, patente.*

Diam. 30, alt. 16 mill.

Locality unknown.

11. *HELIX VARIOLOSA*, Pfr. *Hel. testá perforatá, depressá, acuté carinatá, solidulá, opacá, lutescente, supernè confertissimè plicatá, lineisque concentricis irregulariter decussatá, pustulis albis subfasciatim obsitá; spirá planiusculá; anfractibus $3\frac{1}{2}$ vix convexiusculis, rapidè crescentibus, ultimo basi convexo, infra carinam compresso; columellá brevi, verticali; aperturá latè securiformi; peristomate simplice, acuto, margine columellari breviter reflexo.*

Diam. 23, alt. 10 mill.

Locality unknown.

12. *HELIX INDUTA*, Pfr. *Hel. testá perforatá, lenticulari, acuté carinatá, solidá, supernè confertim plicato-striatá, lineis confertis concentricis decussatá, subtùs striatá, spadicedá, basi pallescente, circa perforationem castaneo-areolatá, epidermide tenuissimá corneo-grisédá undique indutá; anfractibus 5 planis, sensim accrescentibus; aperturá subrhombédá; peristomate simplice, margine columellari vix reflexiusculo.*

Diam. 21, alt. 11 mill.

Locality unknown.

13. *HELIX BILINEATA*, Pfr. *Hel. testá umbilicatá, depressá, tenui, nitídá, pellucidá, lævigatá, lutescenti-corneá; spirá planiusculá; suturá striolatá; anfractibus 5 vix convexiusculis, regulariter crescentibus, ultimo subdepresso, lineis 2 castaneis, alterá supra peripheriam, alterá suturali ad apicem usque conspicuá ornato; umbilico angusto; aperturá obliquè lunari; peristomate simplice, acuto, margine columellari brevissimè reflexo.*

Diam. 15, alt. 7 mill.

Locality unknown.

14. *HELIX BELCHERI*, Pfr. *Hel. testá latè umbilicatá, depressá, tenui, diaphaná, supernè confertim costulato-striatá, subtùs sublævigatá, nitídá, concolore corneo-ceréá; spirá vix convexá; anfractibus 5 vix convexiusculis, ultimo basi subplanulato; aperturá obliquá, lunato-ovali; peristomate simplice.*

Diam. $8\frac{1}{3}$, alt. 4 mill.

Locality unknown. Brought by the 'Sulphur,' Capt. Belcher.

15. *HELIX CERATODES*, Pfr. *Hel. testá subperforatá, globoso-depressá, tenui, minutè striatá, nitiduld, pellucidá, corned; spirá parùm elevatá; anfractibus 5 subplanulatis, celeriter crescentibus, ultimo subdepresso; aperturá amplá, obliquè lunari; peristomate simplice, acuto, margine columellari breviter reflexiusculo, perforationem ferè occultante.*

Diam. $16\frac{1}{2}$, alt. 9 mill.

Collected on the islands of Luzon and Mindoro, by H. Cuming, Esq.

16. *HELIX SPLENDIDULA*, Pfr. *Hel. testá latè umbilicatá, depressissimá, pallidè olivaceo-corned, nitidá, striatulá, lineis concentricis, magis minusve distinctis obsoletè reticulatá; spirá planá; suturá profundá; anfractibus $3\frac{1}{2}$ subplanulatis, celeriter crescentibus, ultimo lato; umbilico lato, perspectivo; aperturá obliquá, lunato-ovali; peristomate simplice, acuto, marginibus conniventibus, dextro obliquè descendente, antrorsum subarcuato.*

Diam. $8\frac{1}{2}$, alt. $3\frac{1}{3}$ mill.

Hab. East Australia, near Torres Strait (Lieut. Ince, R.N.).

17. *HELIX PAPILLATA*, Pfr. *Hel. testá umbilicatá, depressá, subdiscoideá, solidiusculá, irregulariter striatá, opacá, albidá, spadiceonebulosá, saturatiusque strigatá et maculatá; spirá planá, apice papillatim prominente; anfractibus 5 planiusculis, ultimo descendente, depresso-rotundato; umbilico angusto, pervio; aperturá obliquá, lunato-orbiculari; peristomate simplice, acuto, margine columellari vix dilatato.*

Diam. 23, alt. 11 mill.

Locality unknown.

18. *HELIX SPIRULATA*, Pfr. *Hel. testá imperforatá, depressá, lenticulari, subtilissimè striatá, lineis elevatis concentricis utrinque notatá, tenui, fulvâ, carinatá; carinâ compressá, subexsertá; spirá parùm elevatá; anfractibus 5 lentè crescentibus, supra carinam convexiusculis, ultimo basi vix convexo, medio impresso; aperturá depressá, subrhomboided; peristomate simplice, acuto.*

Diam. 9, alt. 4 mill.

Hab. Real Llejos, Central America; found on trunks of trees (Cuming).

19. *HELIX INSCULPTA*, Pfr. *Hel. testá imperforatá, depressá, utrinque convexiusculá, acutè carinatá, soliduld, castaned, supernè costulis confertis et lineá spirali, carinæ parallelá, insculptá; anfractibus 5 planulatis, ultimo basi levigato, juxta carinam lineá impressá notato; columellá dente unico brevi, acuto, albo munitá; aperturá depressá, securiformi; peristomate simplice.*

Diam. 8, alt. 4 mill.

Locality unknown.

20. *HELIX SINAITENSIS*, Pfr. *Hel. testá umbilicatá, orbiculatoconvexá, tenui, confertim striatá, corned; spirá convexá, obtusá; anfractibus 7 angustis, vix convexiusculis, carinâ filiformi cinctis, ultimo basi convexiore; umbilico lato, perspectivo; aperturá rotun-*

dato-lunari; peristomate simplice, margine supero brevi, recto, basali valdè arcuato, breviter reflexo.

Diam. 10, alt. 4 mill.

From Sinai, province of North Ilocos, isle of Luzon (Cuming).

21. *HELIX ANDICOLA*, Pfr. *Hel. testâ umbilicatâ, depressâ, tenui, undique granulatâ, opacâ, corneo-albidâ, fasciis pluribus rufis interruptis, denticulatis vel maculoso-tessellatis tæniatâ, interstitiis rufo-flammulatis; spirâ planâ; anfractibus 4 convexis, ultimo dilatato, rotundato; aperturâ rotundato-lunari; peristomate tenui, marginibus callo tenui junctis, supero breviter expanso, basali reflexiusculo, columellari dilatato, reflexo, umbilicum angustum semitegente.*

Diam. 20, alt. 11 mill.

From the Eastern Cordilleras.

22. *HELIX HIANs*, Pfr. *Hel. testâ subobtectè perforatâ, depressâ, tenui, pellucidâ, nitidiusculâ, undique regulariter et confertim granulatâ, pallidè corned, strigis angustis, rufis, approximatis, undulatis, interdum ramosis, et ad suturam fasciâ pallidâ, maculis irregularibus rufis tessellatâ ornatâ; spirâ planâ; anfractibus 4½ convexis, ultimo inflato, subcompresso, anticè vix descendente; aperturâ subobliquâ, amplâ, lunato-rotundatâ, intus concolore; peristomate tenui, expanso, marginibus distantibus, supero expanso, basali breviter reflexo, columellari membranaceo-dilatato, fornicatim reflexo, perforationem tegente.*

Diam. 25, alt. 12 mill.

Locality unknown.

23. *HELIX RECTANGULA*, Pfr. *Hel. testâ imperforatâ, orbiculato-conicâ, solidâ, striatulâ, griseo-stramineâ, areâ basali, lined suturali et fasciis latis castaneis ornatâ; spirâ elevatâ, obtusâ; anfractibus 6-6½ convexiusculis, ultimo subrectangulè carinato, basi planiusculo, medio subexcavato; aperturâ depressâ, subtrapezid, margine columellari incrassato, calloso-subunidentato.*

Diam. 13, alt. 10 mill.

From the Marquesas islands (M. Rohr).

24. *HELIX NYSTIANA*, Pfr. *Hel. testâ latè umbilicatâ, depressâ, subdiscoïdè, tenui, sub lente minutissimè granulato-striatâ, haud nitente, pallidè corned, fasciis angustis, rufis 3-4 circumdatâ; spirâ vix elevatâ; anfractibus 4 convexis, ultimo anticè subdeflexo, basi vix latiore; umbilico latissimo; aperturâ perobliquâ, suborbiculari; peristomate simplice, marginibus ferè contiguïs, supero recto, basali breviter reflexo.*

Diam. 11, alt. 4 mill.

From Real Llejos, Central America (Cuming).

25. *HELIX NILAGIRICA*, Pfr. *Hel. testâ latè umbilicatâ, depressâ, discoïdè, striatâ, corneo-albidâ, lined unicâ rufâ supra peripheriam cinctâ; spirâ planiusculâ; anfractibus 5 convexiusculis, lentè accrescentibus, ultimo anticè abruptè deflexo; umbilico latissimo, anfractum penultimum latè monstrante, medio angusto, per-*

vio; aperturá parvá, horizontali, rotundato-ovali; peristomate albo, sublabiato, reflexo, marginibus contiguís.

Diam. $14\frac{1}{2}$, alt. $5\frac{1}{2}$ mill.

From the Neelgherries, East Indies.

26. HELIX TUMIDA, Pfr. *Hel. testá imperforatá, globosá, solidá, rugoso-striatá, nitidiusculá, sub epidermide sordidè viridi, saturatius radiatá albá; spirá parvulá, elevatá; anfractibus 5 tumidis, ultimo permagno; columellá subverticali, elongatá, basi subtortá, albo-callosá; aperturá amplá, lunato-rotundatá, intus cærulescente; peristomate simplice, recto, margine dextro arcuato, basali cum columellá angulum formante.*

Diam. 27, alt. 21 mill.

Locality unknown.

27. HELIX CAUCASICA, Pfr. *Hel. testá umbilicatá, globoso-depressá, tenui, subtiliter rugoso-striatá, sub lente granulatá, corneo-albidá, pellucidá, fasciá latá, subopacá ad suturam, angustiore albá ad peripheriam ornatá; anfractibus 6 convexiusculis, ultimo anticè subdeflexo; aperturá lunato-rotundatá; peristomate acuto, expanso, intus callo albo, acuto labiato, margine columellari dilatato, umbilicum angustum, pervium semitegente.*

Diam. 16, alt. 10 mill.

From the Caucasus.

28. HELIX KNYSNAENSIS, Pfr. *Hel. testá umbilicatá, globosá, solidiusculá, costulato-striatá, sericiná, corneo-olivacéá; spirá brevi, obtusá; anfractibus 4 convexiusculis, ultimo inflato, basi sublevigato, nitidissimo; umbilico angusto, pervio; aperturá rotundato-lunari, intus margaritacéá; peristomate simplice, acuto, margine columellari supernè dilatato, patente.*

Diam. 24, alt. 16 mill.

From Knysna, Cape of Good Hope.

29. HELIX JENYNSI, Pfr. *Hel. testá subperforatá, turbiniformi, striatulá, tenui, nitidá, carinatá, lacted, supra carinam fusco-unifasciatá; spirá brevi, conicá, acutá; anfractibus $5\frac{1}{2}$ vix convexiusculis, ultimo basi convexiore; aperturá angulato-lunari; peristomate simplice, acuto, margine columellari supernè reflexiusculo, perforationem ferè claudente.*

Diam. 12, alt. $7\frac{1}{2}$ mill.

Locality unknown.

30. HELIX BRONNI, Pfr. *Hel. testá imperforatá, semiglobosá, striatulá, sub lente punctatá, nitidulá, castaned, apice obtuso pallidá; anfractibus 5 convexiusculis, ultimo obsolete carinato, basi planiusculo, granulato, cærulescenti-albido, infra carinam fasciá 1 castaned ornato, anticè deflexo, profundè scrobiculato; aperturá subhorizontali, elliptico-oblongá; peristomate latè incrassato, marginibus callo tenui junctis, basali dilatato, reflexo, fusco-maculato, intus 4 dentato; dentibus 2 anticis majoribus, compressis, à margine remotis.*

Diam. 25, alt. 15 mill.

From Jamaica; sent by Mr. Adams with *H. sinuata*, Born, to which it is nearly allied.

31. *HELIX VENTROSULA*, Pfr. *Hel. testá rimato-perforatá, depresso-globosá, tenui, subtiliter striatá, pellucidá, corneo-albidá; spirá vix elevatá; anfractibus 5½ vix convexiusculis, ultimo subitò deflexo, supernè subangulato, basi inflato, anticè gibbo et valdè constricto; aperturá perobliquá, ringente; peristomate acuto, latè reflexo, marginibus vix conniventibus, laminas elevatas, in ventre anfractús penultimi angulatim junctas emittentibus, dextro lamina subperpendiculari dilatatá, basali dentibus 2 acutis munito.*

Diam. 13, alt. $7\frac{1}{2}$ mill.

From Mexico (Hinds), and Texas (Sowerby).

32. *HELIX HINDSI*, Pfr. *Hel. testá umbilicatá, depressá, subtiliter striatá, corneo-lutescente, diaphaná, nitidá; spirá parùm elevatá; anfractibus 5 planiusculis, ultimo basi convexiore, anticè supernè deflexo, subtùs constricto; umbilico angusto, pervio; aperturá perobliquá, lunari, ringente; peristomate breviter reflexo, marginibus conniventibus, callo triangulari, dentiformi, bicurvè junctis, dextro lamellá subverticali, basali dentibus 2 acutis munito.*

Diam. 8, alt. $4\frac{1}{2}$ mill.

From Mexico (Hinds), and Texas (Sowerby).

33. *HELIX HEDENBORGI*, Pfr. *Hel. testá subperforatá, depressissimá, subdiscoideá, acutè carinatá, tenuiusculá, confertim rugosostriatá, supernè albido et fusco-variegatá, basi subunicolore fuscescente; spirá vix elevatá; anfractibus 5½ planis, non exsertis, ultimo basi vix ventrosiore, anticè non descendente; aperturá depressá, angulato-lunari; peristomate tenui, marginibus subparallelis, supero recto, basali breviter reflexo, columellari vix dilatato, reflexo, adpresso.*

Diam. 18, alt. 6 mill.

On cliffs at the river Baher el Killo, at the Road of Marc Aurel, Egypt (Dr. Hedenborg).

34. *HELIX PLATYODON*, Pfr. *Hel. testá imperforatá, depresso-turbinatá, minutissimè granulato-striatá, albá, fasciis fuscis, alboguttatis ornatá; spirá elevatá, obtusiusculá; anfractibus 6 vix convexiusculis, ultimo basi subplanulato, anticè deflexo; aperturá perobliquá, lunato-ovali, intus albá; peristomate latè expanso, reflexo, marginibus callo albo junctis, columellari per dilatato, adpresso, dente lato compresso munito.*

Diam. 30, alt. 19 mill.

Locality unknown.

35. *HELIX RETUSA*, Pfr. *Hel. testá imperforatá, subglobosá, apice retuso, tenui, levigato, basi concentricè striolatá, castaneo-fulvá, albo latè strigatá et flammulatá, epidermide hydrophaná, albidá, deciduá partim indutá, sursùm pallescente, castaneo-fasciatá; spirá brevi; anfractibus 4 convexiusculis, ultimo subangulato, vix descendente; columellá intrante, albá, supernè dentato-dilatatá; aperturá rotundato-lunari, intus margaritaceá; peristomate latè expanso.*

Diam. 28, alt. 20 mill.

From the island of Samar; found on leaves of trees (H. Cuming).

36. *HELIX PRATENSIS*, Pfr. *Hel. testá umbilicatá, orbiculato-convevát, ruguloso-striatá, albidá, fasciis 2 castaneis cinctá vel sub-unicolore; spirá subelevatá; anfractibus 6 convexiusculis, ultimo anticè vix descendente; umbilico mediocri, pervio; aperturá rotundato-lunari; peristomate expanso, intus remotè albo-labiato, marginibus conniventibus, columellari subdilatato, patente.*

Diam. 17 alt., $9\frac{1}{2}$ mill.

From the banks of the river Tortoom (As. Russ.); found in damp meadows.

December 9.—William Yarrell, Esq., Vice-President, in the Chair.

A paper was read containing "Descriptions, by Dr. L. Pfeiffer, of new species of Land-Shells from Jamaica, collected by Mr. Gosse."

1. *HELIX PTYCHODES*, Pfr. *Hel. testá umbilicatá, depressissimá, discoided, tenuissimá, arcuato-plicatá, sub epidermide tenui, fuscá, deciduá hyalind; spirá planiusculá; anfractibus $4\frac{1}{2}$ —5 planulatis, ultimo basi vix convexiore; umbilico mediocri; aperturá perobliquá, amplá, angulato-lunari; peristomate simplice, acuto.*

Diam. $10\frac{1}{3}$, alt. $3\frac{1}{3}$ mill.

2. *BULIMUS GOSSEI*, Pfr. *Bul. testá rimatá, turrítico-cylindracedá, obliquè costulatá, albidá, opacá, strigis semilunaribus, punctisque pellucidis corneis ornatá; spirá cylindracedá, apice attenuato, acuto; suturá crenulatá; anfractibus 11 convexis, ultimo $\frac{1}{4}$ longitudinis vix superante, rotundato, basi subangulato; aperturá suborbiculari; peristomate breviter expanso, marginibus approximatis, columellari reflexo, patente.*

Long. 11, diam. $3\frac{2}{3}$ mill.

Nearly allied to *Bul. unicarinatus* and *Bul. turricula*.

3. *CYLINDRELLA GOSSEI*, Pfr. *Cyl. testá subcylindracedá, sursum attenuatá, non truncatá, tenui, diaphaná, obliquè et arcuatim leviter costulatá, pallidè corned vel albidá; anfractibus 16 vix convexiusculis, ultimo basi acutè carinato, non protracto; aperturá oblongá, basi subangulatá; peristomate simplice, tenui, breviter expanso, marginibus vix junctis.*

Long. 21, diam. 4 mill.

4. *GLANDINA JAMAICENSIS*, Pfr. *Gland. testá fusiformi-turrítá, confertim et verticaliter costatá, nitidá, albidá, strigis raris rufis ornatá; spirá turrítá, acutiusculá; suturá crenulatá, submarginatá; anfractibus 10 planiusculis, ultimo $\frac{1}{3}$ longitudinis subæquante, plurivaricoso, infra médium sublævigato, attenuato; columellá subrectá, basi obliquè truncatá; aperturá angustá, semiovali.*

Long. 22, diam. 7 mill.

5. *GLANDINA CURVILABRIS*, Pfr. *Gland. testá oblongo-turrítá, solidiusculá, confertissimè costulatá, diaphaná, nitidá, luteo-corned, remotè albido-strigatá; spirá turrítá; suturá marginatá; anfract-*
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tibus 8 planiusculis, ultimo $\frac{3}{4}$ longitudinis subæquante, anticè medio impresso; columellâ verticali, ad basin aperturæ abruptè truncatâ; aperturâ angustâ, oblongâ; peristomate albido-imbato, margine dextro antrorsum curvato.

Long. 16, diam. 5 mill.

6. GLANDINA ARCUATA, Pfr. *Gland. testâ fusiformi-turritâ, tenuiusculâ, nitidâ, subarcuatim et confertim costulatâ, succineo-flavidâ, strigis angustis, remotis, arcuatis, rufis, pallidè marginatis ornatâ; spirâ subulatâ, acutâ; suturâ crenulatâ; anfractibus 9 planis, ultimo $\frac{1}{3}$ longitudinis subæquante; columellâ strictiusculâ, breviter truncatâ; aperturâ oblongâ; peristomate simplice.*

Long. 13, diam. $3\frac{1}{2}$ mill.

7. ACHATINA ADAMSII, Pfr. (*Bul. costulatus*, Adams). *Ach. testâ fusiformi-turritâ, longitudinaliter distinctè costatâ, inter costas basi anfractûs ultimi evanescentes subtilissimè striatâ, corned, strigis rufis irregulariter ornatâ; spirâ turritâ, apice acuto; anfractibus 8 convexis, ultimo $\frac{1}{3}$ longitudinis subæquante; columellâ subrectâ, basi obliquè truncatâ; aperturâ subrhombed.*

Long. 7, diam. $2\frac{1}{2}$ mill.

8. ACHATINA GOSSEI, Pfr. *Ach. testâ subulatâ, tenui, diaphanâ, cered, remotè costatâ, inter costas in anfractibus ultimis deorsum obsolescentes subtilissimè striatâ; anfractibus 9—10 convexiusculis, ultimo $\frac{1}{4}$ longitudinis vix superante; columellâ obliquâ, basin aperturæ attingente, breviter truncatâ; aperturâ angustâ, oblongâ; peristomate simplice, margine dextro deorsum dilatato.*

Long. 12, diam. $2\frac{2}{3}$ mill.

9. ACHATINA ABERRANS, Pfr. *Ach. testâ subulatâ, tenui, nitidâ, lineis impressis longitudinalibus, regulariter distantibus notatâ, pallidè succined, strigis rufulis, angustis, obliquis, sparsis ornatâ; spirâ subulatâ, apice acutiusculo; suturâ leviter crenulatâ; anfractibus 7 planiusculis, ultimo $\frac{1}{3}$ longitudinis æquante; columellâ callosâ, torto-subtruncatâ; aperturâ oblongâ; peristomate simplice.*

Long. 7, diam. 2 mill.

This species belongs to a peculiar aberrant group of the genus *Achatina*, of which the type seems to be *Ach. columnaris*. The columella is not exactly truncated, but rather contorted, and forms a prominent angle, which appears similar to the truncated columella of the true *Achatinas*. To this same group may be referred another very distinct and beautiful species, collected by Mr. Lattre in Central America, and making, like all formerly described species, part of the rich collection of Mr. Cuming.

10. ACHATINA LATTREI, Pfr. *Ach. testâ glandiformi, lævissimâ, nitidâ, fulvâ, strigis castaneis leviter arcuatis irregulariter ornatâ; spirâ brevi, conoided, acutiusculâ; anfractibus 7 planis, ultimo $\frac{3}{4}$ longitudinis ferè æquante; columellâ callosâ, contortâ, extus subtruncatâ; aperturâ angustissimâ, basi dilatata; peristomate simplice, obtuso, margine dextro antrorsum leviter arcuato.*

Long. 38, diam. 14 mill.

A paper by Dr. Philippi was then read, containing "Descriptions of a new species of *Trochus*, and of eighteen new species of *Littorina*, in the collection of H. Cuming, Esq."—

TROCHUS CUMINGII. *Tr. testâ latè conicâ, umbilicatâ, acutâ, carneo-cinereâ; anfractibus convexiusculis, transversè striatis, et serie triplici spinularum ornatis; spinis supremis solidis compressis, medianis fornicatis majoribus, infimis fornicatis confertissimis; aperturâ suborbiculari, violacescente; margine umbilici acuto, prominente.*

Altit. 8, diam. 8, altit. aperturæ $4\frac{3}{4}$ lin.

Hab. Guimaras, insula Philippinarum.

This very interesting species was found on rocks at high water-mark; its operculum is orbicular, horny, and consists of 5–6 volutions.

1. **LITTORINA LEMNISCATA.** *Lit. testâ parvâ, ovato-oblongâ, nigrâ, striis transversis et lined triplici, elevatâ, moniliformi sculptâ; anfractibus planiusculis; basi nodulosâ; aperturâ spiram non æquante, nigrâ, basi albo-fasciatâ; columellâ depressâ, basi subeffusâ.*

Altit. $4\frac{1}{2}$, diam. 3, altit. aperturæ $2\frac{1}{2}$ lin.

Hab. Cuba?

2. **LITTORINA ASPERA.** *Lit. testâ oblongâ, acutâ, crassâ, fuscescente, lineis nigricantibus longitudinalibus obliquis pictâ, ad basin subangulatâ; anfractibus parùm convexis, liris elevatis transversis sculptis; aperturâ ovatâ, fuscâ, fasciis duabus albidis; labro intus albido, fusco-punctato.*

Altit. 8, diam. $5\frac{1}{2}$, altit. aperturæ $4\frac{1}{2}$ lin.

Hab. Ad oram occidentalem Americæ borealis (from Sitka, New Albion, found on rocks at low water by Mr. Barclay; from Mexico, found by Hegewisch; from Conchagua, province of San Salvador, Central America, Cuming). By the character of its aperture, this species belongs to the group of *L. ziczac*, *L. zebra* (*Phasianella peruviana*, Lamarck), and is easily distinguished from all allied species by its sculpture.

3. **LITTORINA PICTA.** *Lit. testâ parvâ, ovatâ, acutâ, basi obscure angulatâ, transversim striatâ; fasciâ ad partem superiorem anfractuum, aliâque ad basin albis, lineis fuscis longitudinalibus pictis; aperturâ semiorbiculari, fuscâ, basi albo-fasciatâ; columellâ satis compressâ ferè rectilineâ.*

Altit. 4, diam. 3, altit. aperturæ $2\frac{1}{2}$ lin.

Hab. ad insulas Sandwich.

Var. β . *Anfractibus supernè angulatis, parte medianâ anfractûs ultimi albido-marmoratâ.*

This species has nearly the shape and size of *L. Basteroti* (*Turbo petraeus*, *Turbo carulescens*, etc.), which I believe the true *Turbo neritoides* of Linnæus, and the colouring of the interrupted variety of *L. ziczac*.

4. **LITTORINA PORCATA.** *Lit. testâ parvâ, ovatâ, obtusiusculâ, umbilicatâ, è carulescente-albidâ, lineis elevatis distantibus porcatâ;*

aperturá magná, ovatá, semiorbiculatá; faucibus fuscis, albo-bifasciatis; limbo labri albo.

Altit. 3, diam. $2\frac{1}{2}$, altit. aperturæ 2 lin.

Hab. ad insulas Gallapagos (on high exposed rocks); Cuming.

5. LITTORINA SITKANA. *Lit. testá transversim ovatá, obtusiusculá, castaneá, transversim grossè sulcatá; anfractibus rotundatis, ultimo dilatato; aperturá ovatá, patulá; columellá albá, vix dilatá, sulco umbilicari exarátá.*

Altit. 6, diam. 6, altit. aperturæ $4\frac{1}{2}$.

Hab. ad Sitka, Nova Albion (on rocks, half-tide); collected by Mr. Barclay.

Very nearly allied to *L. groenlandica*, but more depressed, blunt, the aperture more dilated. The elevated transverse lines are three in number on the upper volutions, about twelve on the last.

6. LITTORINA GLABRATA. *Lit. testá ovato-oblongá, acutá, albidocarnéá, strigis pallidè fuscis obliquis pictá; anfractibus parùm convexis, lævibus, supremis sub lente lineis impressis 6-8 exaratis, ultimo basi angulato; aperturá ovatá, rufá; columellá depressá, violacéá.*

Altit. $8\frac{1}{2}$, diam. 6, altit. aperturæ $4\frac{1}{2}$ -5 lin.

Hab. ad Payta Peru (on rocks, half-tide); Cuming. Ad Caput Natale (Wahlberg).

Perhaps only a variety of *L. obesa*, Sow., though easily distinguished by the pale oblique longitudinal lines: very like *L. ziczac*, D'Orb. (non Chemn.)

7. LITTORINA LÆVIS. *Lit. testá ovato-oblongá, acutá, albidd, cinereo-marmoratá; anfractibus parùm convexis, lævissimis (sub lente fortiori vix tenuissimè striatis); ultimo basi obscurè angulato; aperturá ovatá, fusco-violacéá, basi albido-fasciatá; columellá depressá, violacéá.*

Altit. $8\frac{1}{2}$, diam. 6, altit. aperturæ 5 lin.

Hab. Unknown.

This species scarcely differs, except in colouring, from *L. obesa*.

8. LITTORINA DEBILIS. *Lit. testá parvá, ovato-oblongá, acutá, tenui, cærulescente-albidd, interdum lineis obliquis pallidissimè fuscis pictá, apice obscuro; anfractibus læviusculis (sub lente lineis confertis impressis sculptis), ultimo basi angulato; aperturá ovato-oblongá, rufá, basi productá et subangulatá; columellá parùm depressá, fuscéscente.*

Altit. $4\frac{1}{2}$, diam. 3, altit. aperturæ $2\frac{1}{2}$ lin.

Hab. Unknown.

A *L. glabrata* in miniature; it differs however essentially from that species by its aperture, which is produced into a distinct angle at the base.

9. LITTORINA SAYI. *Lit. testá ovato-oblongá, acutá, solidiusculá, transversim multisulcatá, albá, punctis pallidè rufis ornatá; spirá violacéscente; anfractibus convexiusculis, suturá profundá divisis; aperturá ovato-orbiculari; columellá rufá; labro intus albo.*

Altit. 9, diam. $6\frac{1}{2}$, altit. aperturæ 5 lin.

Hab. ad Floridam (communicated by Say).

Very nearly allied to *L. irrorata*, but thinner, more slender, the aperture not narrowed, nor the outer lip mottled within.

10. LITTORINA MODESTA. *Lit. testâ ovato-oblongâ, acutâ, tenuiusculâ, albidd, aut obsolete rufo-punctatâ, profundè transversim sulcatâ; anfractibus convexiusculis, suturâ profundâ divisâ, ultimo haud carinato; aperturâ semiorbiculari, luted vel fusco infuscatâ; columellâ ferè rectilined, dilatâtâ, depressâ, infuscatâ; anfractu ultimo ad columellam eroso.*

Altit. 8, diam. 6, altit. aperturæ 5 lin.

Hab. ad Sitka, Nova Albion (on rocks, half-tide), Mr. Barclay; ad insulam Mauritiî, Capt. Caldwell.

This species has the sculpture of *L. aspera*, the shape and colour of *L. Sayi*.

11. LITTORINA INTERMEDIA. *Lit. testâ oblongo-conicâ, basi ventricosâ, tenui, varii coloris, lineis impressis circa 8 in anfractu penultimo exaratâ, lævi; anfractibus convexis, ultimo rotundato haud carinato; aperturâ ovatâ; columellâ albâ vel violacèd, foveâ exaratâ.*

Altit. 10, diam. $7\frac{1}{2}$, altit. aperturæ $5\frac{1}{2}$ lin. et minor.

Hab. Mare Rubrum, ad oram Natal; Swan Point, in Novâ Hollandiâ boreali; Jimamailan, in insula Negrorum; Tahiti; insula Elisabeth in Oceano Pacifico (Cuming).

This species is intermediate between *L. scabra* (*Helix scabra*, L. not auct.) and *L. angulifera*, Lamk., not Quoy and Gaim.; it has the shape and colouring of the latter, which is easily known by its very numerous impressed spiral lines. With *L. scabra* it agrees in the number of the impressed lines, but differs by its smoothness to feeling and by the absence of the basal keel. This latter character distinguishes it from *L. luteola*, Q. et G., a species which, however, I have not seen in nature. It is very variable in colouring, and we may distinguish principally the following varieties:—

1. punctata, *testâ lutescente aut rufescente, lineis transversis fuscis irregulariter interruptis punctatâ.*
2. articulata, *testâ interstitiis sulcorum regulariter albido et fusco articulatis.* (From Swan Point; only 6 lin. high.)
3. strigata, *testâ in fundo flavescente strigis latis, irregularibus nigris ornatâ.* (From Jimamailan; only 6 lin. high.)

12. LITTORINA CONICA. *Lit. testâ tenuissimâ, oblongâ, exactè conicâ, basi carinatâ, confertim et obsolete transversim striatâ, albidd, unicolore vel fusco pictâ; aperturâ ovatâ, perobliquâ; columellâ basi rectâ, excavatâ.*

Altit. 10, diam. $7\frac{1}{2}$, altit. aperturæ 6 lin.

Hab. Insula Java.

13. LITTORINA TENUIS. *Lit. testâ ovato-oblongâ, acutâ, tenuissimâ, tenuissimè transversim striatâ, carneo-albidâ, lineis angulatis rufis*

pallidissimis pictâ; suturâ sæpius infuscatâ; anfractibus planiusculis, ultimo basi rotundato, minimè angulato; aperturâ ovatâ, concolore; columellâ arcuatâ, vix compressâ.

Altit. 7, diam. $4\frac{2}{3}$, altit. aperturæ $3\frac{2}{3}$.

Hab. Insula Ticao, Philippinarum (on rocks, high water; Cuming).

14. *LITTORINA PALLESCENS.* *Lit. testâ oblongâ, subturritâ, solidâ, albidâ; anfractibus convexiusculis, superioribus lineis impressis novem, ultimis lineis elevatis obtusis (circa quatuor in anfractu penultimo) sculptis; aperturâ patulâ, semiorbiculari; columellâ brevi, compressâ.*

Altit. 10, diam. 7, altit. aperturæ $5\frac{1}{2}$ lin.

Hab. Insula Mindanao (Cagayan, province of Misamis, found on mangrove-trees; Cuming).

This species differs from *L. filosa*, Sow., in being much more solid, in its broader and blunter elevated transverse lines and broad compressed columella.

15. *LITTORINA SIEBOLDII.* *Lit. testâ oblongâ, subturritâ, tenuiusculâ, flavescente, subunicolore; anfractibus convexiusculis, supremis lineis impressis, inferioribus lineis elevatis confertis, acutiusculis (circa 9 in anfractu penultimo) sculptis; aperturâ patulâ, semiorbiculari; columellâ compressâ, subcanaliculatâ, albâ.*

Altit. 13, diam. 8, altit. aperturæ 7 lin.

Hab. Japonia, Siebold.

Perhaps only a variety of *L. scabra*, from which it differs almost only in its high raised transverse ridges and very obscurely angulated base.

16. *LITTORINA CINGULATA.* *Lit. testâ oblongâ, acutâ, tenui, pallidè griseâ, apice obscuro; anfractibus convexiusculis, suturâ profundâ divisâ, sulcatis; ultimis cingulis elevatis croceis ornatis; basi haud carinatâ; aperturâ ovatâ, patulâ; columellâ arcuatâ, albâ, haud compressâ; faucibus albis, rufo-lineatis.*

Altit. 9, diam. $6\frac{1}{2}$, altit. aperturæ $4\frac{1}{2}$ lin.

Hab. Ad oram borealem Novæ Hollandiæ (found on the mangrove-trees by I. E. Dring, Esq.).

17. *LITTORINA SULCULOSA.* *Lit. testâ oblongâ, acutâ, tenui, flavescente, fasciis transversis pallidè fuscis pictâ; anfractibus convexiusculis, suturâ profundâ divisâ et sulcis 3-4 exaratis; ultimo subangulato; aperturâ semiorbiculari, albâ; faucibus fusco-fasciatis; columellâ parùm arcuatâ, compressiusculâ.*

Altit. $8\frac{1}{2}$, diam. $5\frac{1}{4}$, altit. aperturæ $4\frac{1}{2}$ lin.

Hab. in orâ boreali Novæ Hollandiæ (found on the mangrove-trees by I. E. Dring, Esq.).

The sculpture of this species is exactly like that of *Trochus rostratus*, Gm.

18. *LITTORINA? ABERRANS.* *Lit. testâ elongatâ, subturritâ, subperforatâ, tenui, obsolete striatâ, albidâ; anfractibus rotundatis, suturâ profundâ divisâ, ultimo ventricoso; aperturâ patulâ, orbi-*

culari-ovatâ, intus nigro-marginatâ; columellâ brevi, tereti, extus reflexâ.

Altit. 8, diam. 5, altit. aperturæ $3\frac{3}{4}$ lin.

Hab. Panama (found on the rocks, half-tide, Cuming).

This species differs by its aperture so much from the other species of *Littorina*, and so nearly resembles a *Bulimus*, that I am very doubtful whether it be placed in its right genus.

ROYAL SOCIETY.

January 22, 1846.—“On the Supra-renal, Thymus and Thyroid Bodies.” By John Goodsir, Esq. Communicated by Richard Owen, Esq., F.R.S. &c.

In this paper, the author enters on the development of the theory he advanced two years ago with regard to the origin and nature of the supra-renal, thymus and thyroid bodies, and the correctness of which, with certain modifications, he has been enabled to confirm by subsequent observation and reflection. His hypothesis was that the three organs in question are the remains of the blastoderma; the thyroid being the developement of a portion of the original cellular substance of the germinal membrane grouped around the two branches of the omphalo-mesenteric vein; the supra-renal capsules, the developements of other portions grouped around the omphalo-mesenteric arteries; and the thymus, the developement of the intermediate portion of the membrane arranged along the sides of the embryonic visceral cavity. He has since ascertained, however, that the thyroid body derives its origin in a portion of the included *membrana intermedia* remaining in connexion with anastomosing vessels between the first and second aortic arches, or carotid and subclavian vessels. He considers these organs as essentially similar in their structure, as well as in their origin in continuous portions of the blastoderma situated along each side of the spine, and extending from the Wolfian bodies to the base of the cranium: the development of the supra-renal capsules having relation to the omphalo-mesenteric vessels; the thymus, to the jugular and cardinal veins and ductus Cuvieri; and the thyroid gland, to the anastomosing branches of the first and second aortic arches. The functions of these organs he regards as being analogous to those of the blastoderma; with this difference, however, that as the blastoderma not only elaborates nourishment for the embryo, but absorbs it also from without, that is, from the yolk, the developed organs only elaborate the matter which has already been absorbed by the other parts, and is now circulating in the vessels of the more perfect individual.

Feb. 5.—“On the Secretary Apparatus and Function of the Liver.” By C. Handfield Jones, M.D. Communicated by Sir Benjamin C. Brodie, Bart., F.R.S.

The author is led by his researches into the minute structure of the liver, to results which confirm the view of Mr. Bowman, in opposition to those of Mr. Kiernan on this subject; and particularly with regard to the absence of real tubercular ducts from the interior of the lobules. He concludes that the secreting process commences

in the rows of epithelial cells surrounding the central axis of the lobule, and that the fluid there secreted is transmitted to the cells forming the margin of the lobule, where it is further elaborated, and, by the bursting of these cells, is conveyed into the cavity of the surrounding duct. A few diagrams are annexed, illustrative of the descriptions of microscopic structure given in the paper.

Feb. 19.—“On the Mechanism of Respiration.” By Francis Sibson. Communicated by Thomas Bell, Esq., F.R.S.

This paper is almost entirely occupied with anatomical details, collected from an extensive series of dissections of the muscles and bones concerned in the act of respiration in man and the lower animals, for the purpose of elucidating the mechanism of their action both in inspiration and in expiration; accompanied by a great number of illustrative diagrams and drawings. The author commences with the serpent tribes, which present the simplest form of ribs, being attached only at their vertebral ends, while their anterior ends are free. When these ribs are brought forwards by the action of the levatores costarum and external intercostal muscles, the chest is expanded; and when drawn backwards by the long depressors, internal intercostals and transversales, expiration is effected. In birds there are added to the former apparatus a sternum, and a series of sternal ribs, the respiratory movements of which are performed in directions the reverse of those of the vertebral ribs. During inspiration, the angles between the vertebral and sternal ribs become more open; the sternum moves forwards, and the spinal column slightly backwards, by the combined action of the scaleni and sterno-costal muscles on the first vertebral and first sternal ribs respectively; of the levatores costarum and external intercostal on all the lower vertebral ribs, and of the sternal intercostals on all the lower sternal ribs. On expiration these movements are reversed by the action of the internal intercostals, the external and internal oblique, recti, transversales and other muscles. The mechanism in the Mammalia is further assisted and modified by the addition of a large and powerful diaphragm. The thoracic ribs are articulated with the sternum by the medium of cartilages corresponding to the sternal ribs of birds: those ribs which are connected with the inferior curve of the dorsal arch have floating cartilages, and may be considered as a diaphragmatic set of ribs. When raised, the former approach each other, and the latter recede from each other anteriorly. Intermediate to these are the longer ribs connected with the dorsal arch, having their cartilages united, and articulated with the lower end of the sternum. The scaleni muscles invariably act during the whole time of inspiration. The external intercostals between the thoracic ribs are also throughout inspiratory; but those portions which are situated between their cartilages are expiratory; and those between the diaphragmatic ribs are inspiratory behind, expiratory to the side, and in front, and inspiratory between their cartilages. Between the intermediate ribs, they are for the most part slightly inspiratory between the ribs, and expiratory in front, between the cartilages. The external intercostals of the thoracic ribs are expiratory behind, and inspiratory in front, if the ribs approach

these, and are inspiratory between their costal cartilages. Between the diaphragmatic and intermediate sets of ribs, and between their cartilages they are throughout expiratory. The levatores costarum draw the posterior portion of the lower ribs backwards. In the ass and the dog, the upper fasciculi of the serratus magnus are expiratory, the lower inspiratory, and the intermediate neutral. In man, the greater part of the fasciculi of this muscle is expiratory. In the ass, the lower fibres of the serratus posticus inferior are inspiratory, and the upper fibres expiratory. In the dog and in man, all are throughout expiratory.

MISCELLANEOUS.

Notice of a Black Lizard taken in Cheshire. By W. WELLS, Esq.
To Sir W. Jardine.

Rimrose House, Bootle, Liverpool, April 12th, 1846.

SIR,—When botanizing at Bidston, Cheshire, a few days ago, I met with a lizard a description of which I send you, hoping you will excuse the liberty which I have taken and the imperfections of my remarks, as I am but a tyro in this department of science.

The head, back and throat are a shining black; scales of the belly and tail black, tipped with dark brown. The scales of the head are less numerous than in *Zootoca vivipara*, which it resembles in size and shape except that it is more slender, the tail is longer and more tapering, the head is more bulky, the eyes are perfectly circular and surrounded by a beautiful ring of minute scales, the scales forming the eyebrows do not project over the eye, and those of the back are much smaller than in the common species, which was abundant in the same locality.

DIMENSIONS.

Length of head	$\frac{5}{16}$ inch.
Body	$1\frac{3}{4}$
Tail	$3\frac{1}{4}$
Total	$5\frac{9}{16}$
Greatest breadth of head	$\frac{1}{2}$
Circumference of body	$1\frac{3}{8}$
Length of longest toe	$\frac{5}{8}$
Shortest	$\frac{1}{10}$
Scales of the head	20
Joints [scales?] of the tail	62

I am aware that in the 'Mag. Nat. Hist.' vol. i. p. 189, New Series, mention is made of a black lizard by G. W. in a note to his paper on Vipers, but I conceive that the difference between that and the one I have attempted to describe entitles me to consider them different. I have kept a considerable number both of the viviparous and the sand lizard, but none of them evinced the very irritable, untameable disposition of this one; they are in general easily tamed, but the black one seizes everything that is put near it, and never

lets go until forced to do so. I placed a sand lizard within its reach, which it instantly seized, and retained its hold for upwards of two hours, although for more than half that time it was suspended from it.

Before concluding, permit me to mention that the following reptiles have been found by me near Liverpool since August last: *Zootoca vivipara*, *Lacerta agilis*, *Natrix torquata*, *Vipera communis*, *Triton palustris*, *T. aquaticus*, *T. vulgaris*, *Rana temporaria*, *Bufo vulgaris*.

I remain, yours very respectfully,

W. WELLS.

New species of Fossil Bats. By M. H. DE MEYER.

Cheiroptera have but rarely been found fossil in the tertiary formations. Of this family, in the deposits anterior to the diluvian epoch, only the *Vespertilio parisiensis* of the schists of Montmartre was known, a single individual of which is preserved in the Museum of Paris; and two small teeth found in the eocene sand of Kyson, and referred with doubt by Prof. Owen to the genus *Vespertilio*. The species indicated by Karg, at Æningen, appears to be very uncertain, and the original specimen has not been discovered again. Hermann de Meyer has detected at Weisenau, amongst a considerable mass of fragments of bones, some belonging to two *Cheiroptera*. They consist of one half of the right lower jaw, in which, although the teeth are wanting, the alveoli are sufficiently well preserved to give an idea of the dental system; of three humeri, of which two are left and one right, which show the existence of two species, and prove even probably a generic difference between them; lastly, of one half of a radius which likewise can only belong to a *Cheiroptera*. These two species differ from that of Montmartre, and H. de Meyer has designated them under the name of *Vespertilio præcox* and *V. insignis*, until their generic affinities are definitely fixed.—*Leonhard und Bronn's Jahrbuch*, 1845, p. 798.

Does Magnetism influence the Circulation in Chara?

By M. DUTROCHET.

In some experiments made in the year 1837, M. Dutrochet proved that electric currents only affect the circulation of *Chara* by their action as *exciting* causes. The movement of the fluid is only arrested for a few minutes and then recommences, often with greater rapidity than before, as the equilibrium between the electric and vital forces is restored. This action is exactly analogous to that of hot water or solution of common salt.

M. Dutrochet has recently submitted *Chara* to the influence of a large electro-magnet, capable of supporting a weight of about 4000 pounds. The stem of *Chara* was placed a little in front of a plane passing vertically through the poles of the horse-shoe magnet, but quite within the magnetic influence. Careful observation at the moment of establishing the electric current in the coil, proved that the speed of the circulation was unaltered. Left thus for ten minutes, all remained as before—no influence was manifested. The

electric current was then suddenly reversed: the circulation exhibited no alteration. The stem was then exposed to the influence of each of the poles separately, from the base of the stem to the apex; still no change in the circulation was visible. After each experiment all magnetic influence was suppressed, but no change in the rate of the motion became evident.

It was thus shown that the magnetic force, even when prodigious, exerts no influence on the circulation of *Chara*. Therefore there is no relation between the magnetic force and the vital force producing this circulation.

These experiments, with those of 1837, prove that the circulation is caused by a vital force, which is not electrical, since electricity merely acts like any other *exciting* cause, and which has no relation to the magnetic force, since the latter has not the slightest influence upon it.

It must be admitted therefore that the vital force is a force *sui generis*, of the nature, relations and mechanism of which we are totally ignorant.

These observations must necessarily change the opinion of those who consider the *vital force* as *something imaginary*.

At the same time it must be understood, that all the causes called *exciting* are *debilitating* or *sedative* in their *primitive* or *direct* effect, and only *strengthening*, *stimulant* or *tonic* in their *secondary* or *indirect* effect, by reason of the *vital reaction* which they occasion either instantaneously or after a short interval.—*Comptes Rendus*, April 15th, 1846.—A. H.

New species of Fossil Frogs.

M. Dunker has found some small bones of frogs in shell and coralline deposits of Hellern, not far from Osnabrück, which belong to the tertiary epoch. H. de Meyer, who has examined them, has found in them at least three new species, which may be distinguished particularly by the forms of the humerus. This same bone had already served that able palæontologist to establish twenty-four species of frogs found at Weisenau. Not one of the humeri discovered at Hellern is similar to those of these twenty-four species. The other bones, such as those of the sacrum, of the fore-arm and of the pelvis, appear to indicate more analogy between the species of these two localities.—*Leonhard und Bronn's Neues Jahrbuch*, 1845, p. 798.

Description of Fossil Foot-Prints. By ALFRED T. KING, M.D.

It is now more than a year since fossil foot-prints were discovered in the sandstone of the coal-measures in Westmoreland county, Pennsylvania. Since then, numerous localities have been observed, which contain well-characterized impressions. Some of these are similar to, and a few identical with, those which I first described, but by far the greatest number are totally different from any which have heretofore been observed.

About three miles from this town, near the summit of the first anticlinal roll, west of Chesnut ridge, one of the principal axes of

elevation belonging to the Alleghany range, in a coarse-grained sandstone, are eight remarkable impressions, all having the same dimensions, the same distance apart, and forming a continuous series in a slightly bent line. Each is of an ovoidal form, 13 inches long, 9 broad, and from 3 to 6 deep. The impression is deep and ovoidal before, but superficial behind, as though made by an animal with a long and flexible pastern.

Twenty-seven miles from Greensburgh, on the summit of Chesnut ridge, in a coarse-grained sandstone, are numerous imprints, as perfect as they are anomalous and remarkable. These imprints are of different kinds: the greatest number seem to have been made by *ruminant mammals*, as the feet were cleft so as to resemble those of the ox and deer, but much larger. They are of various sizes, and differ from most living types in having two hind hoofs, which made deep and vivid impressions from one to two inches behind the main track.

The length of the largest, including the posterior imprints, is 9 inches, breadth $5\frac{1}{2}$ inches.

The smaller vary from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches in length, by $2\frac{1}{2}$ to $4\frac{1}{2}$ in breadth. The general form of these foot-marks is ovoidal, the largest portion being behind as well as the widest part of the cleft. The posterior impressions are each about the size of a walnut. The interval between each foot-mark is about $2\frac{1}{2}$ feet in the larger, and 18 inches in the smaller.

Besides these, and a few others which are identical or nearly so with some which I have already described on a former occasion, there are four or five huge imprints of a still more remarkable character than any that have heretofore met my eye. They are in a continuous line: each imprint is 13 inches long and 9 wide. The toes, which are five in number, are thick and very perfect. Four of these imprints are quite perfect, others are less so, and many are nearly obliterated. The average distance between each impression is 3 feet 7 inches, with the exception of the last two, which are 7 feet apart. This seems to indicate that there was once a track between these two, which has been defaced by the erosive action of the elements upon the rock during a series of ages.—*Proceedings of the Acad. Nat. Scienc. of Philadelphia.*

Description of a new species of Parus from the Upper Missouri.

By EDWARD HARRIS.

Parus septentrionalis. Young, in summer plumage.

Bill brownish black, short and stout. Iris dark brown. Feet grayish blue. Upper part of the head, chin and fore-neck dull black; the black of the head scarcely descending to the hind-neck, and that on the fore-neck hardly reaching to the breast. Cheeks and sides of the neck, a line running from the base of the bill under the eye and almost meeting on the hind-neck, white. Back grayish, slightly tinged with yellow. Quills and tail-feathers dark grayish brown, margined with pure white; secondaries conspicuously so. Lower parts gray-

ish white with an almost imperceptible tinge of yellowish under the wings.

Length $5\frac{7}{8}$; wing $2\frac{1\frac{5}{8}}{16}$; tail $3\frac{3}{2}$ inches.

A single specimen of this bird was procured on the 26th of July on the Yellow Stone River, about thirty miles above its junction with the Missouri. It is evidently a bird of the season, with immature plumage, to which may be attributed the dullness of the black on the head and throat. On comparison of this bird with *P. carolinensis* and *P. atricapillus*, it will be perceived that, beginning with the smallest bird, the parts which are black decrease, and the white parts increase in size and intensity in ascending. In *septentrionalis* the outer web of the lateral tail-feather is entirely white, except a small portion near the base, where there is a slight tinge of gray next the shaft, and the quills, secondaries and all the tail-feathers are margined more broadly and with a purer white than in the other species.

I have given a table showing the comparative measurements of the three American species of this division of the genus *Parus* having black heads, which so closely resemble each other in voice, habits and markings; and have also added some measurements from a paper in the Archives of the Academy by M. de Selys-Longchamps, Corresponding Member of the Royal Academy of Brussels, extracted from their 'Bulletin,' vol. x. no. 7. I have reduced his measurements to English inches and decimals, and have given my own also in decimals for more ready comparison. It will be seen that his specimen from Iceland (*frigoris*) corresponds so nearly with our *atricapillus* as to render it probable that it is identical, while his *atricapillus* from Brisson is so near to Audubon's *carolinensis* as to render it almost certain that the description of *P. atricapillus* by the old authors was from our small southern bird. If this opinion be correct, our *carolinensis* should resume the name of *atricapillus*, and the larger bird be called *frigoris*, as suggested by M. de Selys-Longchamps.

The note of this bird is similar to *atricapillus*, but its voice more liquid, and less harsh and querulous in the utterance. Bill longer and stouter.

	Length.	Wing.	Tail.	Length.	Wing.	Tail.
Parus Carolinensis	$4\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{8}$ or	4.250	2.500	2.375
— atricapillus	$5\frac{1}{8}$	$2\frac{1\frac{1}{8}}{16}$	$2\frac{9}{16}$	5.125	2.687	2.562
— septentrionalis (Nob.) ...	$5\frac{7}{8}$	$2\frac{1\frac{3}{8}}{8}$	$3\frac{3}{2}$	5.875	2.812	3.093
— atricapillus (Briss.) } from the paper of M.				4.794		2.397
— frigoris				5.149		2.663

It will be seen by the above table, that while in each of the old American species the wing is .125, or $\frac{1}{8}$ th of an inch longer than the tail, in the new bird the tail is .281, or nearly $\frac{5}{10}$ ths of an inch longer than the wing: compared with *atricapillus*, the total length is greater by $\frac{5}{4}$ ths of an inch, the wing by $\frac{1}{8}$ th, and tail by $\frac{1}{3}\frac{7}{2}$ or more than half an inch.

The colours in this immature specimen are only to be depended upon as showing the much greater development of the white and smaller extent of the black markings than in the other species. For the sake of more easy reference, the description has been made par-

allel with those of Audubon in his 'Synopsis.' I would propose as an appropriate English name for this bird, the "Long-tailed Black-cap Titmouse."—*Ibid.*

Red Colour of the Blood in Planorbis imbricatus.

By M. DE QUATREFAGES.

In examining by transmitted light *Planorbis imbricatus*, M. de Quatrefages has perceived that this little mollusk, very common in the soft water of the environs of Paris, has red-coloured blood. With a weak magnifying power the liquid is seen to fill the cavities of the pericardium and of the ventricle, and at moments to colour the general cavity of the whole body on its lower surface. M. de Quatrefages has not seen any distinct globules in this liquid. Other specimens, of a very small size, have colourless blood. M. de Quatrefages presumes that these are the young of the *P. imbricatus*, the blood of which acquires its characteristic tint only with age; and he remarks that if this conjecture is verified by observations which he intends to continue, it would be exactly the same with these mollusks as with the *Annelides*.—*Institut*, Jan. 7, 1846.

INDIAN SPECIES OF PAPILIO.

To the Editors of the Annals of Natural History.

Brixton, May 18th, 1846.

GENTLEMEN,—Having been informed by Mr. Westwood that he had written to Dr. Erichson on the subject of my comments upon his Report on Entomology for 1842, and having been led to expect that an early answer would be received, I delayed replying to Mr. Westwood's communication in your January number.

From what I have lately heard from Mr. Westwood, it does not appear that he has now much expectation of a speedy reply, in fact that it may be deferred to the Greek calends, or may perchance have fallen on the road,

Lassaque facta viâ, lassaque facta mari;

and there lies waiting strength to continue its journey.

This being the case, I must decline to delay any longer a re-assertion of my belief that *Dr. Erichson is in nowise blameable for the errors I have pointed out in his Report, but was misled by erroneous information from England*; at the same time asserting the correctness of the Ray Society's version of the passages in question, the word Mr. Westwood would translate differently being commonly used by German entomologists to signify absolute specific identity,—a fact which I am surprised Mr. Westwood could overlook,

It is equally surprising to me that Mr. Westwood can assert that so acute an entomologist as Dr. Erichson could imagine, from my description of *P. Xenocles*, that it was identical with *P. Pollux*. I think it quite as probable for him to suppose that a minute description of a kittiwake compared with the short Linnæan description of the jackdaw proved their specific identity.

I must also beg leave to deny Mr. Westwood's right to assume, from the conversation he refers to, that my remarks were intended

to apply to him. My own language then ought to have made him hesitate to do so. At the same time I must say, that had he not denied the supposed imputation, I should have thought that such extreme sensitiveness, like M. de Pourceaugnac's—"ce n'est pas moi, je vous assure,"—indicated some internal uneasiness. His denial, of course, entirely removes this suspicion.

To any other entomologist who may chance to wince under my remarks, I might be tempted to reply, "Voilà un discours qui marque quelque chose;" but I have no intention to occupy more of your space with this trivial matter, unless Dr. Erichson's missive, having taken breath, finds strength to continue its journey. Should this prove me to be in error, no one will be more happy or ready to confess it than

Your most obedient servant,

EDWARD DOUBLEDAY.

METEOROLOGICAL OBSERVATIONS FOR APRIL 1846.

Chiswick.—April 1. Fine. 2. Cloudy: showery. 3. Clear and windy: cloud and fine. 4. Hazy: heavy rain. 5. Heavy rain: clear. 6. Heavy rain: cloudy. 7. Slight rain: densely overcast. 8—10. Fine. 11. Dry haze. 12, 13. Cloudy and fine. 14. Clear: dry haze: overcast. 15. Densely clouded: dry haze: densely overcast. 16. Slight dry haze. 17. Foggy. 18. Rain. 19. Cloudy and cold: clear. 20. Showery: frosty at night. 21. Foggy: cloudy and fine. 22. Foggy. 23. Heavy clouds: rain. 24. Rain: dark haze: cloudy. 25. Hazy and damp: showery: hazy: foggy. 26. Extraordinary fall of rain early A.M.: dense clouds: overcast at night. 27. Clear and fine. 28. Very fine. 29, 30. Clear: very fine: overcast.

Mean temperature of the month 47°·36

Mean temperature of April 1845 48°·41

Average mean temperature of April for the last twenty years 47°·19

Average amount of rain in April 1·47 inch.

Boston.—April 1. Fine. 2. Rain. 3. Windy: rain P.M. 4. Cloudy: rain P.M. 5. Cloudy: rain A.M. and P.M. 6. Cloudy. 7. Rain. 8. Cloudy: rain early A.M. 9, 10. Fine. 11. Cloudy: rain P.M. 12. Fine. 13. Fine: rain early A.M. 14. Fine: rain P.M. 15. Cloudy: rain early A.M. 16—18. Cloudy. 19. Cloudy: rain A.M. 20—22. Fine. 23. Fine: rain A.M. 24, 25. Fine. 26. Cloudy: rain A.M. 27. Fine: rain A.M. 28. Cloudy. 29. Fine: ice this morning. 30. Cloudy.

Sandwich Manse, Orkney.—April 1. Snow: clear. 2. Showers: clear. 3. Snow-showers. 4. Snow-showers: frost: snow-showers. 5. Showers. 6. Showers: clear: aurora. 7. Clear: drops. 8. Cloudy: clear. 9. Bright: cloudy. 10. Bright: showers. 11. Bright: rain. 12. Fog: damp. 13. Damp: drizzle. 14. Clear. 15. Fog: cloudy. 16. Cloudy. 17. Cloudy: damp: fog. 18. Rain: clear. 19—21. Fine: clear. 22. Clear: cloudy. 23, 24. Clear. 25. Cloudy. 26. Sleet-showers: hail-showers. 27. Bright: cloudy. 28. Hail-showers: cloudy. 29. Snow-showers: clear. 30. Cloudy: clear.

Applegarth Manse, Dumfriesshire.—April 1. Wet. 2. Wet A.M.: cleared and fine. 3. Wet A.M.: cleared. 4. Slight showers: frost A.M. 5. Fair, but chilly. 6. Fair, but very bleak. 7. Fair. 8. Fair: frost A.M. 9. Fair: frost: fine. 10. Fine. 11. Rain all day. 12. Rain P.M.: thunder. 13. Frequent heavy showers. 14. Frequent heavy showers: hail: fine P.M. 15. Frequent heavy showers: rain all day. 16. Very fine spring day. 17, 18. Dropping day. 19. Fair, though chilly. 20. Frost, slight: fine. 21. Hoar-frost: rain P.M. 22. Slight showers. 23, 24. One slight shower. 25. Heavy shower: fair P.M. 26. Slight shower: fine. 27. Slight shower: frost A.M. 28. Frost A.M.: fine. 29. Frost A.M.: a slight shower. 30. A dropping day.

Mean temperature of the month 45°·6

Mean temperature of April 1845 48°·2

Mean temperature of April for twenty-three years 44°·2

Mean rain in April for eighteen years..... 1·69 inch,

Meteorological Observations made by Mr. Thompson at the Garden of the Horticultural Society at CHISWICK, near London; by Mr. Veall, at Boston; by the Rev. W. Dunbar, at Applegarth Manse, DUMFRIES-SHIRE; and by the Rev. C. Clouston, at Sandwick Manse, ORKNEY.

Days or Month.	Barometer.						Thermometer.						Wind.				Rain.													
	Chiswick.		Dumfries-shire.		Orkney Sandwick.		Chiswick.		Dumfries-shire.		Orkney Sandwick.		Boston.		Dumfries.		Orkney Sandwick.		Boston.		Dumfries.		Orkney Sandwick.							
	Max.	Min.	9 a.m.	9 p.m.	8 a.m.	8 p.m.	Max.	Min.	8 a.m.	8 p.m.	Max.	Min.	9 a.m.	9 p.m.	Chiswick.	Dumfries.	Orkney Sandwick.	Chiswick.	Dumfries.	Orkney Sandwick.	Chiswick.	Dumfries.	Orkney Sandwick.							
1846.																														
April.																														
1.	29.591	29.445	29.10	29.19	29.10	29.30	62	45	52	48	41	38	36	35	sw.	calm	ne.	.03	.....	.....	.....	.....	.....	.09		
2.	29.284	29.122	28.80	29.08	28.93	29.30	59	40	49	58	49	43	39	38	sw.	calm	ne.	.06	.....	.....	.....	.....	.....	.....	.12	
3.	29.725	29.486	28.80	29.00	29.37	29.35	55	39	48	49	41	40	36	35	w.	calm	ne.	.06	.38	.....	.....	.....	.....	.....	.06	
4.	29.916	29.250	29.24	29.43	29.24	29.51	53	40	44	44	31	38	35	35	se.	calm	ene.	.46	.08	.....	.....	.....	.....	.....	.15	
5.	29.222	29.142	28.90	29.21	29.17	29.43	55	40	43	44	35	42	41	41	sw.	calm	ne.	.45	.06	.....	.....	.....	.....	.....	.31	
6.	29.058	28.984	28.69	29.14	29.20	29.46	51	34	47	47	36	43	36	36	sw.	calm	ne.	.30	.12	.....	.....	.....	.....	.....	.08	
7.	29.156	29.060	28.75	29.22	29.22	29.38	48	40	43	47	32	42	35	41	w.	n.	nne.	.12	.76	.....	.....	.....	.....	.....	.12	
8.	29.411	29.198	28.89	29.20	29.37	29.50	56	31	46.5	52	39	44	40	40	w.	calm	nne.	.....	.13	0.57	.....	.....	.....	.....	.18	
9.	29.799	29.645	29.26	29.51	29.57	29.62	57	29	44	54	32	44	41	41	w.	calm	calm	.....	.....	.....	.....	.....	.....	.....	.....
10.	29.835	29.736	29.40	29.60	29.57	29.63	60	39	50	54	36	43	42	42	sw.	calm	wsw.	.....	.....	.....	.....	.....	.....	.....	.....
O 11.	29.542	29.337	29.22	29.36	29.16	29.54	61	36	49	52	37	46	44	44	s.	e.	e.	.06	.....	.....	.....	.....	.....	.....	.....	.02
12.	29.507	29.370	28.96	29.16	29.28	29.36	65	45	55	59	47	46	45	45	sw.	calm	e.	.09	.13	.....	.....	.....	.....	.....	.....	.18
13.	29.758	29.509	29.05	29.25	29.44	29.46	61	34	57	57	47	50	46	46	sw.	calm	e.	.02	.14	.....	.....	.....	.....	.....	.....	.....
14.	29.715	29.565	29.32	29.60	29.63	29.65	61	42	55	60	46	51	45	45	ne.	calm	se.	.10	.....	.....	.....	.....	.....	.....	.....	.14
15.	29.786	29.590	29.21	29.68	29.86	29.95	57	49	53	53	46	46	46	46	e.	calm	se.	.05	.52	0.72	.....	.....	.....	.....	.....	.....
16.	30.027	29.939	29.57	29.95	29.89	30.05	62	44	50.5	60	46	46	46	46	e.	calm	se.	.....	.....	.....	.....	.....	.....	.....	.....	.....
17.	29.952	29.883	29.50	29.83	29.84	29.94	57	44	53	53	47	46	45	45	sw.	calm	nne.	.09	.....	.....	.....	.....	.....	.....	.....	.....
18.	30.003	29.893	29.55	29.91	29.98	30.09	53	43	48	52	44	46	42	42	n.	calm	n.	.02	.....	.....	.....	.....	.....	.....	.....	.25
19.	30.127	30.019	29.74	30.12	30.15	30.25	54	27	47	55	33	46	41	41	ne.	calm	ne.	.03	.11	.....	.....	.....	.....	.....	.....	.....
20.	30.108	30.072	29.74	30.13	30.01	30.15	54	27	47	55	35	46	41	41	ne.	calm	e.	.....	.....	.....	.....	.....	.....	.....	.....	.....
21.	30.049	29.955	29.61	29.95	29.87	30.07	57	30	47	55	35	46	41	41	e.	calm	e.	.....	.....	.....	.....	.....	.....	.....	.....	.....
22.	29.873	29.840	29.52	29.87	29.90	30.17	57	37	51.5	52	40	47	45	45	e.	calm	e.	.....	.....	.....	.....	.....	.....	.....	.....	.....
23.	29.815	29.773	29.46	29.90	29.81	30.16	53	42	49	52	37	47	42	42	ne.	calm	e.	.27	.....	.....	.....	.....	.....	.....	.....	0.57
24.	29.865	29.746	29.40	29.82	29.80	30.19	57	54	53	50	40	50	43	43	ne.	calm	ne.	.05	.07	.....	.....	.....	.....	.....	.....	.....
25.	29.901	29.784	29.53	29.88	29.85	30.15	60	42	51	56	38	47	40	40	e.	calm	ese.	1.40	.....	.....	.....	.....	.....	.....	.....	.....
26.	29.818	29.762	29.40	29.82	29.80	30.19	53	40	47	51	40	42	38	38	n.	nw.	nne.	.04	.....	.....	.....	.....	.....	.....	.....	.....
27.	29.909	29.885	29.47	29.81	29.76	29.82	54	36	43	49	32	42	38	38	n.	nw.	w.	.03	.04	.....	.....	.....	.....	.....	.....	.....
28.	29.986	29.867	29.50	29.79	29.94	29.85	61	27	48	54	32	40	39	39	e.	calm	nw.	.....	.09	.....	.....	.....	.....	.....	.....	.....
29.	30.232	30.193	29.78	30.04	30.07	30.01	60	33	47	54	32	38	35	35	e.	calm	w.	.....	.....	.....	.....	.....	.....	.....	.....	.....
30.	30.298	30.283	29.87	30.15	30.10	30.20	61	44	49	53	39	42	36	36	w.	calm	sw.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean.	29.775	29.644	29.31	29.620	29.630	29.782	57.10	37.63	48.7	52.5	39.0	44.21	40.95	40.95													3.73	3.23	1.94	1.95

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

SUPPLEMENT TO VOL. XVII. JUNE 1846.

LIV.—*Botanical Excursion in Lower Styria in 1842.*

By R. C. ALEXANDER, M.D.*

IN the spring of 1842 I was persuaded by my friend Dr. Maly to take a tour through Lower Styria, as a country that had been hitherto very little explored by botanists, though from its situation seeming to claim their especial notice. Situated in a degree of latitude about the same as that of the middle of France, at the base of the great central Alpine group of Europe, three branches of which terminate in this province; and on the other, the eastern side, exposed to the influence of the great plain of Hungary, where the winter is as cold as in the steppes of Russia, and the summer as hot as in the warmest parts of Italy or Spain, it might be expected to evince in its vegetation the effects of a climate so modified. Though it was impossible in an excursion of eight weeks to obtain anything approaching to a perfect knowledge of its flora, the few plants collected are of interest in connexion with the circumstances under which they present themselves.

During the first four months of the year I remained at Gratz. The thaw set in on the 2nd of March, but the weather continued very cold till the end of April, and the vegetation was unusually backward. During this time I collected *Daphne Mezereon*, which was in blossom on the 14th March upon the Schöckel, a month earlier than in the plain below, *Crocus vernus*, and its var. *albiflorus*, *Helleborus viridis*, *Carex clandestina*, *ornithopoda*, *digitata*, *montana* and *præcox*; *Erythronium Dens-canis*, which is abundant in all the woods from Gratz southward, *Anemone pratensis*, *Halleri*, *hepatica*, *ranunculoides*, *Hierochloa australis*, *Sesleria cærulea*, *Petasites albus*, *Potentilla cinerea* and *alba*, *Erica carnea*, *Gagea lutea*, *Isopyrum thalictroides*, *Corydalis solida*, *Cornus Inas*, *Potentilla micrantha*, Ram., *Primula Auricula*, *Valeriana tripteris*, *Gentiana acaulis* and *verna*, *Viola arenaria*, *Pulmonaria mollis* and *officinalis*, *Daphne Cneorum*, *Mercurialis ovata*, and *Veronica triphyllos*.

The Society will find specimens of them with their habitats among the plants sent. The *Anemone Halleri* is the same as the Bohemian *Hacquetii*, and the plant of Piedmont described by

* Read before the Botanical Society of Edinburgh, March 12th, 1846.
Ann. & Mag. N. Hist. Vol. xvii. Suppl. 2 I

Allioni, specimens of which from its station there are in Mr. Rainer's herbarium in Gratz. The Vienna *An. Pulsatilla* is not very different. Indeed botanists are inclined to consider it a transition form. The flower is nodding, like *Pulsatilla*, and the leaves are those of the *A. Halleri*, to which I have myself no doubt that it properly belongs. The *Potentilla cinerea* is another questionable plant. Many maintain that there is no difference between it, the *P. opaca* and *P. verna*, more than arises from situation. The *cinerea* inclosed with this was gathered in a wood on a limestone soil, where the forest was burnt some years ago, and consisting chiefly of charcoal and ashes. It was with the *A. Halleri*. Foreign botanists who see only the extreme forms may find it very easy to distinguish these *Potentillas* and *Anemones*, when collected in their herbaria from distant countries. Here on the spot where they grow I find that I cannot. The *Primula veris*, L., appears here as a pure *P. officinalis*, *elatiorensis*, and *acaulis*, but between them are transition forms, *elatiorensis* with radical peduncles all round the scape, and on sloping meadows the *officinalis* is seen to pass gradually into the *elatiorensis* in descending from above to the moister ground below. Trattinick was quite in the right to make one species of it in reference to the Austrian flora.

The *Potentilla* sent as *micrantha* is the *breviscapa*, Vest. The *P. Fragariastrum* with *caudiculi repentes* is not found here; but this form, the *micrantha*, far from being confined to the Donati, grows on several hills near Gratz, and becoming more abundant towards the south, is found in all the woods on the north side of the hills in Lower Styria, and I have seen specimens of it in herbaria from Agram, and from the Banat in Hungary, sent as the *Fragariastrum*. It appears to me that there is in all genera in these countries less tendency to spread by caudiculi than in England. Bohemian botanists, Tausch and Co., who live in a country where there is very little variety of climate and situation, seem incapable of conceiving the versatility of plants in accommodating themselves to circumstances. A more remarkable instance of this quality is seen in the *Moehringia*, which on hot dry limestone rocks is *M. Ponaë*, and in the crevices and under the shadow of bushes *M. muscosa*. In ravines which are constantly damp and shady I have remarked the same transition of *M. trinervia* into *M. heterophylla*. A very careful and excellent botanist, Mr. Zehentner, has collected transition forms with as much care as others throw them away, and among *Arenarias*, *Campanulas*, *Primulas* and other genera, shown that a great number of so-called species are only varieties.

On the 2nd of May I set out on my journey through Lower Styria. The unceasing wet weather during the whole of this

month rendered it much less agreeable and remunerating than, from the richness of the flora and the hospitality I met with everywhere, it would otherwise have been. Many plants turned mouldy from the impossibility of drying my paper in the sun. There was only one fine day from the 3rd to the end of the month.

At Marburg I found *Lamium Orvala* and *Anemone trifolia*, which comes with the Drave from Carinthia, and is abundant on its banks and the hills near it, but appears nowhere else I believe in Styria. At Wurmberg I collected several with blue flowers, but the colour is nearly lost in drying. The forests on the Bacher were just beginning to revive from the unusually long winter. This mountain forms a marked boundary in the vegetation. It is about 5000 feet high, twenty English miles long, and five or six broad, and covered with forests left from time immemorial to a state of nature, and only inhabited by wolves and other wild beasts. On the first view of the country to the south of it, the greater number and beauty of many trees, which to the north of it occur as isolated individuals, and the scarcity of others, such as the *Coniferae* and birches, which form the forests of Upper Styria, make an impression on the traveller that he has entered a different climate. The aspect of Lower Styria has nothing of the savage dismal character of the northern part of the province, but its magnificent streams the Save and Drave amply compensate for the precipices and waterfalls; and one who can feel the beauty of a quiet and unobtrusive majestic scenery without requiring the harsher features of a landscape to awaken their attention, will feel as deep and lasting an interest in the valley of the Save, and at Wisell, Wurmberg, Cilli and other spots in that district, as in the Alps.

From Marburg I went to Stattenberg, a castle at the foot of the Wotsch, ten English miles west of Pettau, and remained there a fortnight with Mr. Peterstein, a botanist well acquainted with the localities. Among many other plants which being common about Gratz I did not collect, were *Scrophularia vernalis*, *Lapsana fœtida*, abundant in every wood, *Potentilla micrantha*, *Veronica acinifolia*, *Lunaria rediviva*, *Arabis turrata*, *Dentaria enneaphyllos*, *bulbifera*, and the rare *trifolia*, *Glechoma hirsuta*, *Scopolina atropoides*, *Loranthus europæus*, *Astrantia Epipactis*, and *Aremonia agrimonioides*, a plant that had been singularly overlooked, though very abundant in shady moist woods in all parts of Lower Styria south of the Bacher. These on the north side of the Wotsch, in warm dry situations: *Aronia rotundifolia*, *Helianthemum alandicum foliis incanis*, *Cytisus prostratus*, Scop.? *Thlaspi montanum*, *Orchis pallens* and *sambucina*, usually in the woods, *Genista scariosa*, Viv. (*triquetra*, W. K.), *Homogyne sylvestris*, *Carpinus*

Ostrya, *Ophrys aranifera*; and in narrow dells in the mountain; *Cardamine trifolia*, *Chrysosplenium alternifolium*, *Carex pilosa* and *pendula*, *Corydalis cava*, *Cineraria longifolia* and *Arum maculatum*, the latter not being found in Upper Styria.

From Stattenberg I went to Pettau and stayed a week there, visiting Ankenstein, Wurmberg and Dornau castles, to which I had introductions. The town stands on a large plain of alluvial soil and in summer is very much hotter than Gratz, being open towards Hungary, and the flora essentially different; I found *Ornithogalum umbellatum* in the corn-fields very abundant, often one foot and a half high; on dry meadows *Saxifraga bulbifera* and *Ophrys aranifera*, usually together in countless number. Most of the specimens were however spoilt by the wet and the impossibility of getting dry paper enough. *Poa bulbosa* var. *vivipara*, *Orchis militaris*, *globosa* and *variegata*; in damper situations *Scrophularia Scopoli*, *Vicia grandiflora*, *Acorus Calamus*, *Menyanthes trifoliata*. On the heath *Galanthus nivalis* in fruit, *Vicia lathyroides*, *Arenaria rubra*, *Ajugu genevensis*, *Poa compressa*.

Wurmberg and Ankenstein lie on hills a few miles from the town in opposite directions, but the plants being nearly the same I take them together, omitting what I also found on the Wotsch. *Moenchia mantica*, Koch, *Campanula sibirica*, and *Silene rubella*, Wulfen, all now discovered for the first time in Styria: that is, nobody had announced their discovery before, and in these matters "Paulum sepultæ distat inertæ celata virtus." The *Moenchia* I have since found in a friend's herbarium unnamed, and the *Silene* is probably that given in Dr. Maly's book as *Silene inaperta* on Dr. Hayne's authority. Koch, on receiving a specimen from me, wrote in answer, "Diess ist die lang gesuchte *Silene rubella*, Wulf." I found it again at Wisell, and a gentleman at Töplitz in Croatia has lately sent it as *S. linicola* to Dr. Haffner. The *Campanula sibirica*, as well as *Cytisus prostratus*, Scop., and *Helianthemum canum*, I have not seen in any other herbarium, as found in Styria. Other plants were, *Euphorbia dulcis*, of the form *ambigua*, W. Kit., *epithymoides* and *verrucosa*, *Potentilla rupestris*, *alba*, *Allium ursinum*, for the first and last time in Styria; *Ophioglossum vulgatum*, another plant that had been overlooked, though as common in Lower Styria as in England; *Asperula arvensis*, *Iris graminea*, *Carex Davalliana*, common in wet meadows, *Staphylea pinnata*, *Fraxinus Ornus*, *Orobus Clusii*, *Lithospermum purp. carul.*, *Convallaria majalis*, *multiflora*, *polygonatum*, *Maianthemum bifolium*, and on the castle hill at Pettau, *Muscari racemosum*. Had not the Lady Verwalterin of the castle at Wurmberg taken upon herself the charge of drying my plants, I could not have rescued half of

them. Leaving about 300 specimens with her, I pursued my excursions, and unfortunately for the Society, the lady acquitted herself so well of the task, that there are very few of those plants left me to send, the rest adorning the herbaria of other friends. Throughout the journey I was indebted to the kindness of Dr. Maly, to whom I directed the half-dried plants, and who laid them immediately into fresh paper and pressed them; notwithstanding which, many Orchises and other monocotyledons which it had been necessary to dip into boiling water were spoilt.

Proceeding from Pettau round the western side of the Wotsch to Rohitsch, I found *Daphne Cneorum*, *Globularia vulgaris* and *cordifolia*, *Leontodon incanus*, *Carex alba* and *Michelii*, *Muscari comosum*, and *Helleborus niger* in fruit. These were at the foot of the mountain on the south-west side. At the top as well as on most other Lower Styrian hills was *Ostrya vulgaris*.

At Windisch Landsberg, my next station, I found *Lepidium Draba* and the beautiful *Orchis speciosa*, Host. Whether this is a good species I will not undertake to say. The *mascula* appears here only on mountain meadows in May and June, and not as in England in woods in April, and is still more unlike the *speciosa* than the English one is. This plant I found in a clay bank under the castle and only one specimen of it, for the first time in this province. I could not at the time it was fresh find any specimen of *mascula* to compare it with. On the Rudenza, at the base of which the castle stands, I saw nothing new to me except *Helleborus atrorubens* in fruit. The *Arenonia* was very abundant, as well as *Euphorbia dulcis*. On the Croat side of the frontier my only prizes were *Euphorbia virgata* and *Lathyrus Nissolia* and *Aphaca*.

From Windisch Landsberg, where I staid three days and was most kindly entertained, but where there was less for the botanist than anywhere on my whole journey, I went to Wisell. On crossing a range of limestone hills to this castle the whole scene is changed. Plants that I had seen here and there as solitary stragglers were in abundance, and a multitude of new ones beside. On the other hand, many old friends disappeared. *Coniferae* cannot be made to grow there. M. Hirschhofer, the proprietor, has made many attempts to rear them, but they die away in two or three years. In their place are oaks, but of what species I do not know, as they were eaten up with caterpillars, and did not present a green leaf except of the parasite *Loranthus*, which was abundant enough; chestnuts, *Pyrus torminalis*, *Aria*, *Amelanchier*, *communis* and *Malus*, *Staphylea pinnata*, *Fraxinus Ornus*, *Ostrya* and beech. *Cratægus monogyne* in the woods about Pischätz assumes almost the character of the weeping willow, and is one of the greatest ornaments of the forest.

Maples, especially a form of *Acer campestre* with blood-red twigs and *Samara*, and the delicate *Spiraea ulmifolia*, which I was also the first to discover in Styria. Among herbaceous plants, *Veronica austriaca* v. *multifida*, *Centaurea axillaris*, *Moehringia Pona* and *muscosa*, *Clematis erecta*, *Orchis fusca*, *Vicia tenuifolia*, Roth., *Lactuca perennis*, *Epipogium aphyllum*, *Corallorrhiza innata*, and many already mentioned as occurring on the Wotsch and about Pettau. A mere catalogue gives a very inadequate idea of the vegetation: it was the proportion in which these plants occurred that struck me at every step. *Genista scariosa* covering large banks, *Helleborus atrorubens* so thick that one could not walk free of it in the woods; *Inula hirta*, *Hypochaeris maculata*, and other plants that occur about Gratz only locally, were here frequent and abundant; different birds and insects; altogether it appeared not so much a part of Styria as an outlier of a more southern district. One might perhaps say more correctly that it is not, like Upper Styria, hindered by the vicinity of high mountains from developing the climate proper to its degree of latitude. During my visit the ladies accompanied me over the frontier to Klanyecz, where I spent the day and a night in a Franciscan monastery, and made an excursion with one of the good monks up the Kaiserberg, but found the same things as at Wisell: *Cynosurus echinatus*, *Scandix Pecten*, *Lathyrus Nissolia* and *Aphaca* in the corn-fields; *Physalis Alkekengi* and *Aristolochia Clematitis* in most of the vineyards. My visit at Wisell was at the end of May, just as the weather began at last to clear up; and what with the beautiful scenery, delightful family, rich flora, and different dress and look of the people, who are here pure Croats, I was amply recompensed for almost daily soakings that I had got hitherto on my excursions. The drawback in this district is the language. The peasantry speak nothing but that of the country, and a different dialect of it in every village. It is even difficult in some places to get a guide who understands German. On the other hand, a Slavonian guide is worth two German ones for hunting out plants and digging them up. They have the character of being sly and tricky, but I suspect the fault lies oftener with the rascally Beamten, the employés of absentee noblemen, using the name of their master to oppress and cheat them. The gentlemen who reside on their estates universally spoke handsomely of them, and as far as I have had the opportunity of judging, they are naturally a much more intelligent people and more capable of attachment than the Upper Styrians. It may seem out of place to speak of the people here, but botanists may be deterred from visiting the most interesting part of the Austrian dominions by the ridiculous prejudices that are entertained against all kinds of Windisch, Croats,

Carniolans, Lower Styrians, Dalmatians or Slovacks. 'Sauvolk,' 'mistrausch,' 'Spitzbuben,' are the terms commonly applied to them. They are charged with every kind of sensuality. The country gentlemen and the clergy speak better of them than those of Upper Styria do of their neighbours, and I recommend any of the Society who take a botanical trip into the Austrian dominions to visit one of these long-neglected provinces. Carniola would perhaps be the most interesting.

To resume the journey—I went next to Rann, which, like Pettau and Gratz, lies on a flat tract of alluvial land. This plain being just at the mouth of the gorge through which the Save discharges itself, is subject to dreadful devastations by floods, and a great part lies uncultivated, being too insecure. Here I found *Scrophularia canina*, *Ajuga Chamæpitys*, and *Leucojum æstivum*, and upon the neighbouring hills *Epimedium alpinum*, *Hesperis matronalis*, *Orobus niger* and *Medicago carstiensis*.

From Rann I made a short trip to Agram, and found on the road *Adonis æstivalis*, and on rubbish-heaps in the town *Pyrethrum macrophyllum*. The unceasing rain, alternating with intolerable heat, rendered all attempts at botanizing futile, and I returned to Rann, where M. Josepatz, a very zealous young botanist, had meanwhile dried my Wisell plants for me. Taking Reichenburg in my way to Lichtenwald, I found *Potentilla inclinata*, Vill., and *Orchis hircina*, with other plants seen at Wisell.

From Lichtenwald I ascended the Laisberg and found the long-lost *Ranunculus Thora*, L. (*scutatus*, W. K.), which, though abundant enough in Italian Tyrol, occurs nowhere else in the German provinces of Austria. Another hill near Cilli is called Leisberg: this one, on which the *R. Thora* grows, is printed Lisza on all the maps, though it really is pronounced and usually written Leis. There was a tradition that the plant grew on the Leisberg, and the Prefect Dorfman in Cilli had been tormented by all his friends to get them specimens, and had this year hunted for it high and low on the Leis. I brought down only ten specimens, not knowing that it was so prized. Other plants found were *Orobus luteus*, *Laserpitium Siler*, *Ophrys myodes*, *Orchis mascula* (on the 6th of June), *Cytisus purpureus*, and *Linum viscosum* and *flavum*. The outward habit of the *O. mascula* is very different, and so is the time of flowering, from that of the British plant, but it certainly agrees with Lindley's description of *O. mascula*. *Gymnadenia conopsea* and *Platanthera bifolia* usually accompany it on mountain meadows; and these too have a slenderer and more delicate form. *Habenaria viridis* grows in meadows as large and coarse as *Orchis latifolia*. Nearer the castle I found *Ophrys arachnites* and a very hirsute variety of *Triticum* (*Brachypodium*, Beau.) *pinnatum*. In the meadows, *Gentiana utriculosa*,

Omphalodes verna and *Spiraea ulmifolia*. Here, as almost everywhere in Lower Styria, the *Struthiopteris germanica* is abundant among the alders and underwood along the brooks. A very bad name is *germanica* for a plant that is only found in Bohemia and other Slavonian provinces. *Clematis erecta* and other plants that I have mentioned before occurred here in abundance: the same range of hills coming across from Klanyecz, Wisell and Reichenburg presents at Lichtenwald nearly the same flora. On the Carniolan side of the Save I found *Saxifraga cuneifolia*, *Quercus Cerris*, *Veronica urticifolia*, *Silene gallica* and *Euonymus verrucosus*.

From Lichtenwald I went to Montpreis. The first excursion was on the Wach Berg in a drenching rain and nothing found. Next day taking a different direction I met with *Lilium chalcedonicum*, *Coronilla montana*, *Viola mirabilis*, and a great number of other interesting plants already mentioned. Had Montpreis been the first station visited, I should have almost as much to say in its praise as about Wisell.

On the road thence to Cilli I found *Ononis hircina* and *Asplenium septentrionale*; but though travelling through a valley in the most shameful state of neglect that I have ever yet seen, the meadows covered with sedge and rush, I did not meet with any water-plants of the least interest. *Carex ampullacea* and *C. hirta* var. *sublavis* are not uncommon.

From Cilli, in company of the Prefect Dorfman, I made several most delightful excursions. On one down the beautiful and famous Sann Thal which I took alone and on foot, I found *Lolium speciosum* and *Hemerocallis flava*, both new to the flora, *Rhus Cotinus*, *Dorycnium herbaceum*, *Erysimum strictum* or *E. odoratum*; I do not know positively which it is; there is great dispute about it, and "adhuc sub judice lis est." *Dianthus sylvestris*, *Biscutella lævigata* and *Aristolochia pallida*.

With this excursion I took leave of the Save and its brilliant scenery. Through the whole length in which it forms the boundary of Styria to the south, it is confined by rocky shores covered nearly to the water's edge with forests of deciduous trees, broken here and there with villages of white houses. The profusion of white blossoms on the *Fraxinus Ornus* and *Spiraea Aruncus* and other trees and shrubs, and the beautiful clear green water, and above all, the custom in Lower Styria and Croatia of building their churches on eminences, give the Save valley an hilarity that I never saw equalled on any other river.

With regard to the *Erysimum*, I may say as I did of the *Potentillas* and *Primulas*, that there is no drawing an exact line between the different forms in the genus. *E. carniolicum*, *odoratum*, *strictum*, *repandum*, *crepidifolium* change their names with every

herbarium one looks into. I have two specimens of *carniolicum* from Noé, named by Reichenbach, as stated on the label; and I have two others from Freyer, who is publishing the 'Flora Carniolica,' and ought certainly to know which is his country's plant; as *forms* they are as distinct as possible, Freyer's plants being the same identical variety as mine from Tüfer in the Sann Thal, and which has been given in Dr. Maly's 'Flora' by Mr. Zehentner as *strictum*. Of all my acquaintance I know no two men on whom I would rely with more confidence than these, Dr. Maly and Zehentner, and yet, as I said above, M. Freyer must know his own Carniolan plants. The fact is, that all five are one and the same species. Books are usually written by chamber botanists, who receive only the extreme forms, characteristic specimens, and hence arises this multiplicity of species.

In the Teufel's Graben near Cilli I found *Daphne Laureola*, a very scarce plant in these parts, and *Dentaria pinnata* in fruit. *Ruscus hypoglossum* grows there, but is so greedily seized by the peasantry to adorn the images in the churches that the botanist can seldom get a bit.

From Cilli I made an excursion with Prefect Dorfman to Schönstein and up the Eselberg, through the romantic Hudi Lukna, Devil's Ravine. We found *Sedum hispanicum* and *dasyphyllum*, *Saxifraga crustata*, Vest., *Aizoon, rotundifolia, cuneifolia*, *Erysimum pallens* most deliciously fragrant, *Veronica saxatilis*, *Atragene alpina*, *Convallaria verticillata*, and a new discovery for the flora, *Cytisus alpinus*.

I fear it may be out of place to describe how excursions go on in this part of the world when one has a good introduction, but it may induce some member to try a trip in the Windisch provinces of Austria. The Prefect is an elderly clergyman, educated at Admont, and a very well-informed man,—the very opposite of what some people figure to themselves of a Catholic priest from a convent,—liberal in his sentiments, a good Greek scholar and a botanist, one of the most delightful men I have met with. We started one afternoon and drove over to Schönstein castle, saw *Stachys alpina* and two or three other unimportant plants on the way, and took up our quarters at Mr. M . . . 's, a very good John-Bull-kind of country gentleman, not a man of science at all. He determined to accompany us next day, and sent to the village surgeon to be ready to go with us, and so we sallied out early in the morning and arrived at a parsonage on the mountain about eleven o'clock. The good clergyman, though taken by surprise, put a really superb dinner on table with the best of wine. No welcome in an Arabian desert could be more kind and cordial than he gave us. After dinner he accompanied us up to the top of the mountain, gave us a very interesting account of the country, and

conducted us over the Carinthian frontier to St. Veith. There, by good luck, we met with another clergyman who invited us to sup with him on the way back, and treated us as handsomely as the gentleman with whom we dined; and so we reached Schönstein somewhere about two in the morning. One evil of the warm hospitality in the Slavonian provinces is, that the inns are neglected by respectable people and are consequently dirty and bad. To a person travelling through the country for the first time it is very pleasant, and he acquires a knowledge of people's feelings and mode of thinking better than in other countries at inns and coffee-houses; but what is gained by the traveller is lost by the botanist, and I often regretted, in the magnificent castles where I was staying, that I could not be out at five in the morning and return at seven in the evening, without waiting for breakfast or dinner with the family.

From Cilli I went to Gonowitz and thence ascended the Bacher, but found nothing of interest! *Pyrola uniflora*, *Doronicum austriacum*, which is pretty common, and plants that are here on all alps, *Veratrum album*, *Arnica montana*, *Cacalia alpina*, &c. A Tyrolese botanist ascended it in this month, November, and found *Botrychium matricarioides*, the first good plant that was ever brought from it. It has been explored by many botanists from all sides, but has been universally condemned as the most thankless mountain in all Styria, though from its great breadth and perfect wildness much might be expected from it. Mineralogists give it a better character.

Returning to Stattenberg I ascended the Donati, the most striking feature in Lower Styria from its abrupt precipitous face towards the north. Though not higher than the Wotsch it presents a great many alpine plants, none of which are found on the latter: *Athamanta cretensis*, *Draba aizoides*, *Atragene*, *Primula Auricula*, *Hieracium flexuosum*, W. Kit., *Rosa alpina* and *Saxifraga Aizoon*. Lower down were *Prunella alba*, *Dianthus plumarius*, *Medicago carstiensis*, *Quercus Cerris* and other things often seen elsewhere. The bathing-place, Ashitsch, has rendered the Donati so famous that I expected more from it. Possibly the visitors have extirpated some of the plants, to take home as keepsakes. Making another ascent up the Wotsch I found the vegetation quite changed, but nothing that I had not already collected elsewhere. On my way from Stattenberg to Marburg I saw *Lathyrus tuberosus* and *Galega officinalis* very abundant, and in an excursion from Marburg found *Orobanche Picridis*, with which the excursion closed; and I returned on the 28th of July to Gratz, having enriched the Flora Stiriaca with about fifteen new species, in addition to the 1900 it already contained.

LV.—On the real nature of the Minute Bodies in Flints, supposed to be Sponge Spiculæ. By WILLIAM C. WILLIAMSON.

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

GENTLEMEN,

Manchester, May 14th, 1846.

AN exceedingly interesting example of friable chalk, found at Charing in Kent, having been placed in my hands by Dr. Mantell, I have been enabled by an examination of it under the microscope to correct an error into which I had fallen along with other observers, as to the real nature of those minute fusiform bodies, so common in chalk and chalk flints, and which have long been regarded as spiculæ of sponges.

On examining a section of flint, even when it does not contain the usual forms of *Xanthidia* and *Foraminifera*, there will generally be observed a number of small dark-coloured fusiform bodies, which have been regarded by geologists as sponge-spiculæ. The same things are frequent in the soft chalk of Cambridge and Kent, as well as at other localities.

A slight inspection of the Charing chalk, where the organisms are distinct and unmixed with amorphous matter, convinced me that the half of the small atoms of which the pulverulent mass was composed, consisted of bodies identical with those found in flint. Observing them to be calcareous and not siliceous, as I had expected, I was induced to make a more minute examination of them, and soon became convinced that they were *not* the calcareous spiculæ of sponges, but the separated prisms of disintegrated shell-structures, belonging to some genus of the group of *Margaritaceæ*, as defined by Dr. Carpenter in his valuable Report on the Microscopic Structure of Shells, published in the 'Report of the British Association' for 1844.

The first thing that struck me in the Charing specimens was their transverse lineation, a characteristic feature of shell-prisms, but one which I have never seen in sponge-spiculæ. Another point of difference was, that instead of being *round*, as is usually if not invariably the case with sponge-spiculæ, they were angular, having from four to six sides, which is also characteristic of shell-structures. The correctness of the view I had taken was soon settled by the discovery of a few specimens in which from two to half a dozen prisms remained in their original contact, exhibiting at one end the hexagonal reticulation so common in shell tissues, and at the other the pointed contour, which characterized the detached specimens. Even the latter portion presented a different appearance from what we see in sponge-spiculæ; instead of being thickest in the centre and gradually tapering away to each extremity, these organisms are nearly of equal thickness throughout a considerable portion of their length, and then taper off

somewhat suddenly, having frequently what engravers call a "diamond point" given to them by the introduction of a fresh plane at the apex. This peculiarity of contour had previously attracted my notice in the flint specimens. When the length of each prism has been less than the thickness of the lamina of shell of which it constituted a part, it is pointed at each extremity; but when this has not been the case, one end is truncate.

These facts lead to some interesting conclusions as to the part played by the larger mollusks in the accumulation of calcareous strata. In some recent deposits I have found, that in addition to calcareous *Foraminifera*, disintegrated shell-structures constituted an important part of the mass, by the decomposition of their animal textures and the separation of their prismatic portions. Dr. Carpenter has shown us in the case of the shell furnished to him by Mr. Stutchbury (see Report, *ut supra*, p. 5), that exposure to the action of water during a lengthened period is capable of decomposing the animal membrane and causing the calcareous prisms to separate. When we remember the small size of these prisms in many shells, as in some species of *Vulsella*, where Dr. Carpenter says they are only the $\frac{1}{2800}$ th of an inch in diameter, we can readily conceive how, under favourable circumstances, they may add to the *organic* elements of limestone rocks, and yet be liable, from their small size and crystalline appearance, to be mistaken for inorganic atoms.

As this interesting subject is one to which I hope shortly to be able to recur, I will content myself for the present with directing the attention of microscopic geologists to it. Whether or not any real traces of sponge-spiculæ are to be found in the chalk, is a question about which I am as yet doubtful. I have not hitherto succeeded in meeting with one which I could without hesitation refer to that class of organisms. I may remark as an additional argument, that whilst I have observed these prisms to be abundant in some of the Cambridge chalk, where sponges are *comparatively* rare, I have not as yet seen them in those portions of the Yorkshire chalk, where shells are seldom met with, but where sponges (*Alcyonia* and *Ventriculites*) abound.

I remain, Sir, yours truly,

WILLIAM C. WILLIAMSON.

78 Bloomsbury, Manchester.

P.S. Since writing the above, Dr. Mantell has kindly supplied me with an interesting specimen of chalk, taken from the interior of a hollow flint, abounding with *Rotalia* and *Textilaria*, and also in the calcareous prisms. Along with these I succeeded in finding a very few well-marked calcareous triradiate sponge-spiculæ, as well as some small siliceous muricated forms. These however are entirely different from the prisms so common in ordinary flint.

LVI.—*Journey through Java, descriptive of its Topography and Natural History.* By Dr. FR. JUNGHUHN*.

[Continued from p. 48.]

THIS same species of tree (*Thibaudia varingiaefolia*), but decreasing more and more in size, accompanied us to the highest summit, which we reached by climbing along a rocky wall, descending perpendicularly in a westerly direction, and extending for about 500 feet at a height of not more than thirty to forty feet; but a cleft overgrown with shrubs extends at its base far lower down the mountain. On this journey the author also saw, amongst other gigantic fig-trees, one of fifty feet in circumference. They have not however the imposing appearance of other gigantic trees, as their short trunks are soon lost in thick branches, not of compact masses, but made up of a thousand single stems and air roots, forming a kind of trellis-work, or an agglomeration of columns. The author likewise saw, upon the Ungarang, another gigantic tree, apparently also belonging to the genus *Ficus*, with a trunk of about forty feet in height, and thirty to thirty-five feet in circumference, with immense polyp-like branches. The author observes, with respect to the richness of the flora of this mountain, that it would require at least two months to examine a space of 300 square feet; whereas he could only remain two days. A single tree, with its hundreds of parasitic plants, of the most varied families, would alone require a longer time.

Upon the Lawu were Casuarina forests at a height of 4200 Paris feet. They consisted of *Casuarina equisetifolia*, and formed, in isolated groups, small woods with sharply defined limits, which scattered here and there rise upon the grassy slopes, and alternate with more shady, dark green woods. From the extremities of their boughs hang down, yards long, the articulated sheathed branches, floating in the wind. They thus give to the locality a peculiarly lovely and beautiful physiognomy, such as the author had not before seen in Java, and which reminded him of the pine-forests of the north†. The ground in these forests is only occasionally barren, and covered with the fallen dry branches, just as in a larch-wood. It is also covered with species of *Rubus*, *Viburnum*, *Gnaphalium*, and masses of lofty Allang.

At the same time the author found a Casuarina-tree, built in so as to form a kind of temple in the ruins of Budentjeddo. The building-stones consisted of trachytic lava, and inclosed the tree closely. The trunk was three feet in diameter and about ninety feet in height. The author reckoned that these ruins must have existed before A.D. 1400, as Mohamedanism was introduced into Java shortly after that period, and he conjectures that the tree must now be above 600 years old. Upon another spot were Casuarina-trees, surrounded by the darkest and most shady oak-forests, whose fresh

* Translated from the 'Botanische Zeitung' for Sept. 29, Oct. 3, 10, 17 and 24, 1845.

† M. Junghuhn is a German, and comes from the Hartz.

colour exactly resembled those of the north, and imparted an indescribable beauty to the country. Pre-eminent in these woods was *Quercus pruinosa*, Bl., in the underwood of which the *Areca glandiformis*, Willd., with its red racemes formed a principal ornament. Blackberry-bushes with red berries, tree-ferns and rotangs were plentiful. Later appeared *Laurineæ* and *Thibaudia*.

Upon the Wilis a number of Javanese gathered coffee-berries upon the ground, and in a heap of fæces, consisting entirely of the beans caked together, which lay scattered about in numerous heaps and in some measure resembling the excrement of the dog. These heaps are deposited by a species of *Arctomys* (called by the Japanese La(w)ak), a kind of otter, which greedily devours the ripe coffee, and passes the berries undigested! The Japanese assured our traveller that these berries were the best of all!

We must refer to the author's second excursion through the mountain-forests of Panggerango, Manellawangie, and Gedé, in the year 1839, as the most complete description of the vegetation of Java. We shall let the author speak. "I proceeded up hill and down, on horseback along the road which crosses the back of the high tableland, sloping down in a westerly direction, and arrived on the 30th of March, 1839, at ten o'clock, at the spot where I am at present, that is to say, on the N.N.W. declivity of the Panggerango, where, at a height of 3212 feet, a Passanggrahan (the highest spot in the residence Buitenzorg) is built of planks and bamboos.

"Next, below the cottage (Bodjong-Keton) the ridge is formed of grass plains, on which are seen grazing numerous horses and cattle, while here and there lie scattered groups of miserable huts. Above this spot is only a dark forest, the limits of which appear to begin here close to the house, although it is next to coffee-plantations, which, shadowed by *Erythrina indica*, extend for several paals further, whilst the virgin forests only descend thus far on the side declivities of the ridge and in the unpassable clefts.

"But throughout, where the coffee cultivation leaves only a small open plot, these ridges are ornamented by a splendid vegetation of tree-ferns (*Chnoophora glauca*, Bl.), whose stems rising from out of the tall grass and bushes, from eighteen to twenty-four feet, form with their leafy covering lovely groups, and are only overtopped here and there by an isolated specimen of a Rasamala (*Liquidambar Althingiana*, Bl.), 150 feet and more. On moist places are seen the large pinnate leaves of species of *Amomum* and *Elettaria*, which, from the size and the light freshness of their green, stand next to the Pisang, with which they form luxuriant thickets, rising fifteen to twenty feet and above.

"As I could not expect the bearers of my luggage to arrive before the afternoon, and it was moreover prudent to send out a number of men to erect a hut on the top of the mountain, I determined not to set out before the 1st of April, but in the interim to visit the woods around Bodjong-Keton, up to a height of about 4500 feet, in which excursions generally five Japanese armed with hatchets accompanied me.

“ In these months only a very few of the large forest-trees are found in blossom, although the species, as a superficial observation of their foliage shows, is infinitely numerous. I now only found in blossom *Podocarpus latifolia*, Bl., *Vernonia javanica*, DC., *Pterospermum javanicum* (Jgh.), and two species of *Fagraea*.

“ The *Podocarpus* is in its leaves deceptively like the *Agathis loranthifolia*, Salisb., which I had not yet met with in this country, but which is cultivated in many splendid specimens at Pontokgedé, on the steep acclivities of the mountain. Its pyramidal growth, stretching up aloft and being at the same time very narrow, readily distinguishes it from all the other trees.

“ Of the *Fagraea* I should consider one, which is recognised from a distance by its large golden blossoms glittering through the leafy crowns, as *F. obovata* (*obovata-javana*), Bl., and the other as *F. lanceolata*, Bl., were they not both sixty to seventy feet high, large-stemmed forest-trees, whereas in the works of M. Blume they are described as parasitical and shrubby.

“ An interesting sight to the northern stranger is the occurrence of a syngenesious plant, as a forest-tree fifty to sixty feet high and large-stemmed, with flowers resembling our *Eupatoriæ*; it is the *Vernonia javanica*, DC., which occurs scattered in the woods at a height of from 3000 to 5000 feet, but by no means rare.

“ The Javanese give the name of Pohon-payor to a species of *Pterospermum* (*Pt. javanicum*, Jgh.), a very pretty tree, whose leaves are covered on the under surface with a rust-coloured silver-gray felt. The growth of these trees is more expanded than slender; but they are discernible above all others by the whitish brown tint of their foliage, which glitters afar off; they however by no means impart a physiognomy to the wood, as they are isolated among the *Rasamalaæ*, which are pre-eminent from their number, and also exceed all others in size and mass, so that these woods may rightly be called *Rasamala*-forests. And they were so now, being in full blossom. Their green foliage was clothed with a reddish tint, for the circumference of their rounded crowns was covered all over with blossoms, the small spherical male catkins, which gave to the whole surface of the forest, especially seen from a certain distance, a red enamel, and distinguished above all others a *Rasamala*-tree, even when its stem was hidden in the bosom of the forest. According to the observations which I made several times on this and other mountains, the region of the *Rasamalas* lies, where they are the most numerous and grow highest, at between 2000 and 4000 feet. At 4000 feet they are already very isolated; at a greater height than 4500 feet I never saw them; but at 1500 feet they are still met with; from which it may be observed, that their lower limits cannot be ascertained with the same certainty as their upper, and that it is to be feared that these noble trees, whose occurrence is limited to a few mountains in the west of Java (on the Salak, Gedé, on some mountains between Tjanjor and the Bay of Palabuan-Ratu, and some others), will one day completely disappear: for their region is also of very small vertical extent, and is precisely at the same height at which coffee-

plantations are advantageously laid out. In order to obtain the sweet-smelling wood Randai, in which small bee-like but stingless insects (*Melipona vidua*, V.*) live high up in the crevices of the trunk, and also to measure the height of the trees, I had some Rasamalas cut down, and found the same results as in 1837 at Tjanjor; that is to say, fifteen feet for the circumference of the trunk at about twenty feet from the ground, ninety to 100 feet for the length of the stem, up to the height at which it is undivided and columnar, and at which height it generally, but often not at all, slightly decreases in thickness, and fifty to eighty feet from the first bifurcation up to the top of the crown of foliage—therefore 140 to 180, or a mean of 160 feet, or most frequently 150 feet for the whole tree. When a space of the wood is felled, and the primitive forest, as is the case on the edge of the new coffee-plantations, is cut off in sharply defined lines from the cleared spot, on which the observer stands, there is nothing similar to the majestic appearance of such a forest, which is seen at one view in its entire height. The trunks rise straight up, and from their whitish colour, stand off in sharp lines from the dark background of the wood, in regular rows, as if they were columns which giants had turned and set up here. How small would a cocoa-palm appear by the side of such a giant, like a little switch, reaching scarcely to the first division of the trunk of a Rasamala! Although the trunks of the Rasamalas are less overgrown with *Lianæ* than the other trees, yet I found occasionally the foliage interlaced by a *Cissus*, the stalk of which, like a tightly drawn perpendicular rope, ascended for a hundred feet upon the stems (*Cissus macrophylla*, Jgh.).

“ At length, on the 1st of April, the morning sun, which was just rising above the forests of the Megamendong, illumined our path as we began to ascend from Bodjong-Keton through the coffee-plantations. Dr. E. A. Forsten (who during his residence here was engaged in entomological and ornithological pursuits) joined me, and we went onwards with good heart and spirit. Our attendants, the twenty Japanese, who with our travelling baggage were loaded with some sacks full of rice and other provisions, welcomed gladly the warm rays of the sun; for the temperature of 65° F. (14·5 R.)—the thermometer sank even lower in the shade—was sensibly felt by the naked bodies of the natives, accustomed as they are to warmth. The sky was clear and blue, and only a few light fleecy clouds were visible on it. But the high mountain regions and the wide plains in the north, which may otherwise be followed with the eye as far as the Roadstead of Batavia, were covered with a bluish; semi-transparent mist, in which isolated white vapour-clouds floated. The whole mountain-forest lay brightly illumined before us, and only a streaky covering of clouds rested upon the high tops of the Manellawangie. Inspired by this fine weather, we ascended the coffee-plantations: Forsten’s gun was heard afar through the wood, like a *feu de joie*; but it often cost some poor bird or an *Arctitis albifrons*, Cuv., its life. On the trunks of the Rasamalas, of which

* Lepelletier de Saint Fargeau, Hist. Nat. des Hymenopt. vol. i. p. 429.

some isolated specimens are still met with here and there, we saw a quantity of ant-paths, formed of a brownish earth. They lead up to the nests, which are seen hanging in shapeless brown clumps at a great height on the stems. On the limit of the coffee-plantations, which we soon reached, grows in freshly turned-up soil a small *Balsamina*; but frequent above all *Ageratum conyzoides*, which was here not higher than two to six inches, and so dense that the whole district appeared coloured bluish by its heads of flowers.

We now entered the dark shade of the primitive forests, and hung our barometers on the next tree (Dr. Forsten his Engelfield's barometer, and I my Fortin's), which gave for the forest-limit a height of 4590 feet, consequently a vertical space for the coffee-plantations from Bodjong-Keton to this spot of 1376 feet. As we proceeded we found the moist soil of the wood, which was covered with mosses and lycopodiums, ornamented with a beautiful little plant, which grows here in plenty, and discovers itself readily by its azure-blue flowers and the purple under surface of its leaves as *Scutellaria indica*, L.

Rasamalas had disappeared on the limits of the coffee-plantations, and with them the tree-ferns (*Chnoophora glauca*). In their place numerous trees, belonging to the family of the Laurels (*Laurinæ*), now occurred, but above all chestnuts, oaks, and *Schima Noronhæ*, among which *Fagrææ* were also still seen. Their trunks were indeed less gigantic than those of the Rasamalas, but they are more thickly overgrown with *Orchideæ* and ferns, more luxuriantly entwined with species of *Freycinetiæ* and *Calamus*, more frequently coated with numerous nest-ferns, and thus form a very shady and dark wood. In this wood grows solitarily, differing in this respect from the allied *Acaciæ*, *Acacia Saltuum*, Jgh., a slender little tree with almost pyramidal crowns and branches, which originate at different heights one above another, at the upper end of the trunk, and extend in an almost horizontal direction. A peculiar disease and protuberance of their leaf-petioles, which change into brownish excrescences, called to mind the beautiful *Inga montana*, Jgh.

Between the stems of the trees, overtopping the lower shrubs, which are composed of hundreds of different species, and fill up all the intervening space, is seen the *Areca glandiformis*, Willd., the little stems of which, hung with scarlet berries, notwithstanding their smallness, still exhibit the slender majesty of their family.

But, besides isolated *Orchideæ*, the ground in the woods is adorned by a small white-blossomed *Solanum* (*S. Rhinozerotis*, Bl. ?), *Begonia repanda*, Bl. En. 1. p. 97; *Polygonum corymbosum*, Willd., the form of whose leaf varies remarkably; several species of *Strobilanthes*, with knotty-jointed upright stems, and above all *Ardisia coccinea*, Jgh., whose little stem, scarcely three feet high, but woody and straight, bears round berries, of the most glowing scarlet. All the stalks of these plants rise out of dense beds of mosses, among which two tree-shaped ones, similar to our *Leskea dendroides*, several inches tall, especially catch the eye (*Bryum ferrugineum*, Jgh.), and a sterile undetermined species with a little stalk four inches

high, and alternate with numerous species of ferns, from two to ten feet high. Amongst the last, *Aspidium neriiforme*, Sw., is especially striking, with beautiful lanceolate foliage, which is elongated in a very peculiar manner, and winds about the trees almost like a cord. Here and there from the tops of the trees hangs down a string of *Cissus* 100 feet long, which is imbedded in young *Jungermannia* and mosses, and the enormous circumference of which (sometimes as thick as a man's thigh) excites astonishment.

This was the character of the forest vegetation which surrounded us, as we ascended on the N.N.W. acclivity of the Panggerango. From the great cleft which lay on our right proceeded the hollow rushing noise of the rivulet, and from the tops of the trees came the lovely song of a bird, whose well-known notes we listened to with delight, for it was the mountain-songster of Java, the *Muscicapa cantatrix*, which here welcomed us in its native habitat.

As we ascended, some of the little plants with which we had become acquainted since our entrance from the coffee-plantations into the woods disappeared; *Scutellaria indica*, which does not grow at a height exceeding 5000 feet, disappeared the first; *Ardisia coccinea*, *Begonia repanda* and *robusta* also soon vanished, and these were gradually followed by the species of *Calamus*, *Areca glanduliformis* and *Aspidium neriiforme*. But in their places we observed *Polypodium Dipteris* (which we had before met with at Tapos, and previously on the lake of Telaga-Bodas), but above all *Freycinetia* (*Fr. insignis*, Bl. and others), which, reaching their maximum at a height of between 5000 and 6000 feet, principally determine the physiognomy of the interior of the woods in this region; for on almost all the trees they climb in spiral windings, concealing the stems as it were under the weight of their fasciculate leaves, which resemble the leafy crowns of the *Pandana* or *Ananassa*. Not less characteristic of the interior of the woods of this region is an arborescent Araliaceous plant, namely *Hedera aromatica*, DC., whose wide-spreading branches, extending thirty feet in length, which unite below in a very short stem, and are crowned with leaves and panicles of flowers only at their extremities, attract the wanderer's eye. Isolated, occurs a very peculiar species of *Pandanus**, whose dark green tufts of leaves rise directly at the ends of a slender stem thirty feet high and quite perpendicular, as if trying to imitate a palm-tree, or emulating the tree-ferns (*Cyathea polycarpa* and *oligocarpa*, Jgh.) which rise not less slender and palm-like in its vicinity. At times the circular *Asplenium Nidus-avis* is seen adhering to such a *Pandanus* stem, which perforates it in the centre, so that twofold and threefold crowns rise one above another on the stem, the uppermost of which however are easily recognised as the leaves of the *Pandanus*, and the lower ones by their light pisang-green as the whorl of leaves of the *Asplenium*.

Beneath the loftier trees (*Fagraea*, *Acacia Saltuum*, &c. have disappeared) which compose the forest in this region, that is to say,

* It was barren, and could not therefore be more closely determined.

form its uppermost leafy vault, species of *Podocarpus* predominate, especially *Podocarpus imbricata*, Bl., which has a pyramidal growth only while it is young, but in its old age recalls the picture of the Rasamala-forests in this region by its gigantic height and its immense and straight stem. But here the boughs were already hung with species of *Usnea*, through which the cloudy mists pass.

We halted close to such a *Podocarpus*; for, besides the characteristic forms previously noticed, *Freycinetia*, species of *Calamus*, and *Areca glandiformis* had wholly disappeared, and *Asplenium Nidus-avis* became more rare, although the aspect of the forest (from the lower limits upwards) had not strikingly altered, excepting a greater covering of moss upon the stems and their diminution in the diameter of the stems. *Balsamina* and *Solanum Rhinocerotis* alone still accompanied us. To determine this region, we took an observation, according to which the elevation attained was 6510 feet. Therefore in a vertical space of about 2000 feet, from the termination of the coffee-plantations upwards, we had passed by those different vegetable forms. It was now ten o'clock and gray mists enveloped us.

We had screwed our perforators for suspending the instruments to the stem of a fern which was met with somewhat lower down, and was distinguished from afar as distinct from *Chnoophora glauca*. Its growth is less vigorous, less in circumference than that of *Chnoophora glauca*; its fans are much smaller and shorter, fewer in number, and of a less fresh green than in that species; its stem is more slender; but its height is the more imposing, being on an average twenty-five feet, in some which I measured thirty-five, and in one even forty feet, rising perpendicularly just like species of palms. The perfectly horizontal direction of the fans, which are united to the ends of the stem only in (single) rows and very few in number, generally only five, six or seven, and, like the spokes of a wheel, lie almost entirely in a plane, so that the form of the whole is shield-like, is very remarkable. This tree-fern is distinguished therefore at the first glance by its different habitus from *Chnoophora glauca*, whose fans are inserted at different heights one above another in several series from the apex of the stem, and do not grow upwards till they form an angle of 45° , before they bend over in a curve. The fans of the *Chnoophora lanuginosa* (for so we call our tree-fern) only rise upwards as long as they are young and undeveloped. This *Chnoophora* is also worthy of notice for the region to which it belongs, for we have never seen it lower than 5500 feet, whilst it rises to the highest summits, 9200 feet; and even then its stems, thickly clothed with layers of moss, scarcely decrease from fifteen to twenty feet in height.

After finishing our barometrical observations, and filling our bamboo-canes in a little brook which runs down just below our halting-place in a trachytic channel, we set out again.

The woods now assumed another aspect, and their acclivities became more and more steep. All other species of trees disappeared, and soon the forest consisted almost solely of some species of the families of *Laurineæ* and *Araliaceæ*, but especially species of *Thibaudia*. The stems of the trees became shorter, slenderer, rose less

perpendicularly, in a more oblique direction from the soil, and turned away from the slope, as if they strove to rest on the steep surface of the rock at a right angle; they became more and more bent, stood thicker and more compact, and were at the same time covered over with thick layers of mosses from the very roots up to the extremities of their stems. Such a ragged moss-covered forest presents indeed a very peculiar aspect.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Jan. 13, 1846.—William Yarrell, Esq., Vice-President, in the Chair.

Mr. Gould described a new species of *Nyctibius*, which he proposed to name

NYCTIBIUS BRACTEATUS. *Nyct. castaneo-fuscus*; *scapularum apicibus, et abdomine, maculis albis, quasi bracteis, ornatis*.

The general plumage rich chestnut-brown; the feathers of the head, back and breast freckled with black, and with an irregular-shaped blotch of black at the extremity of each feather; near the tip of each of the scapularies a spot of white encircled with black; on the lower part of the abdomen are two lunar-shaped marks of white, formed by a square spot of silvery white, bounded above and below with a narrow line of black, occupying the extremities of the feathers; wings dark brown, with the exception of the outer margins of the primaries, which are cinnamon-brown; tail chestnut, crossed with numerous bars, composed of two irregular narrow lines of black, and with a small spot of white at the tip; under tail-coverts buff, with a square spot of white at the tip.

Total length, $9\frac{1}{2}$ inches; bill, $1\frac{1}{4}$; wing, 6; tail, $5\frac{1}{2}$; tarsi, $\frac{1}{2}$.

Hab. Santa Fé de Bogota.

Remark.—This species is the least of the genus that has come under my notice; the description is taken from a fine specimen in the collection of the Royal Institution of Liverpool.

January 27.—William Yarrell, Esq., Vice-President, in the Chair.

A paper by Professor Owen was read, containing the following notes on the dissection of the Chimpanzee (*Troglodytes niger*) which died in the menagerie of the Society Dec. 29, 1845:—

Chimpanzee (female):—Weight $42\frac{1}{2}$ lbs.

	MEASUREMENTS.	ft.	in.
From vertex to under-side of heel		3	6
From vertex to coccyx		2	0
From trochanter major femoris to external condyle of femur		0	$9\frac{1}{2}$
From external condyle of femur to external malleolus ..		0	$9\frac{1}{4}$
From heel to end of middle toe		0	$8\frac{3}{4}$
From distal end of first metatarsal to distal end of phalanges of first toe		0	$2\frac{1}{2}$

	ft.	in.
From acromion to external condyle of humerus	0	9½
From external condyle of humerus to distal end of radius	0	10
From distal end of radius to extremity of middle finger ..	0	10
Circumference of proximal part of arm	0	8
Circumference of proximal part of fore-arm	0	8½
Circumference of distal part of fore-arm	0	6½
Circumference of wrist	0	6
Circumference of proximal part of thigh	0	11
Circumference of distal part of thigh	0	9¼
Circumference of proximal part of leg	0	7
Circumference of distal part of leg	0	6¼
Circumference of metatarsus	0	7

Weight of brain (covered by arachnoid and pia mater), 13 oz. 4 dr.

Weight of liver, 2 lbs.

Weight of spleen, 2½ oz.

Weight of kidneys, 3 oz. each.

All the deciduous teeth were shed, and all the permanent teeth (on the right or healthy side of the mouth) were in place, except the canines and last molars; these latter teeth were more advanced in their development than the canines. This stage of dentition corresponds with that of the human subject at about the twelfth year; but allowance must be made for the later period of development of the canines in the Chimpanzee. Both upper and lower jaws on the left side were enlarged by disease; the gums inflamed and sloughy; the bicuspides or premolars and the first and second true molars had been pushed out, and their fangs more or less absorbed. The left outer permanent incisor of the upper jaw was half an inch distant from the inner or median incisor, owing to intervening swelling of the jaw. A section of the diseased left ramus of the lower jaw showed the matrices of the canine and last molar in a healthy state in the closed alveolar cavities.

The irritation had extended to the left submaxillary and sublingual glands, which were much enlarged. Both tonsils were ulcerated. Both pleuræ, but particularly the left, were partly closed by old adhesions, which had obliterated the divisions of the lobes of the lungs. Only one small portion of the pulmonary tissue was consolidated by inflammation; it was about the size of a walnut, and situated in the lower lobe of the right lung, close to an adhesion of the pleura, but there were no tubercles developed in any part of the lungs.

A few old adhesions bound the spleen and omentum to the walls of the abdomen; all the other viscera of the abdominal cavity were healthy. The most remarkable morbid appearance was found upon the upper surface of the posterior lobe of the right hemisphere of the brain, where a circumscribed depression of two convolutions was formed, to which the dura mater strongly adhered, by the medium of a yellowish firm lymph; but there was no superficial ulceration of the cerebral substance.

With regard to the normal anatomy, I may at present add to the full descriptions that have been published of the dissections of

younger Chimpanzees, that in this nearly adult individual the laryngeal pouch extended over the front of the neck, beneath the platysma myoides, as far down as the left axilla, passing there beneath the upper border of the great pectoral muscle.

The continuation of Mr. Lovell Reeve's paper on new species of *Pleurotoma* was then read:—

PLEUROTOMA DELICATA. *Pleur. testá subulatá, tenui, hyaliná, transversim minutè et creberrimè elevato-striatá, aperturá brevi; pellucido-albá, aurantio pallidissimè maculatá.*

Hab. Lord Hood's Island, Pacific Ocean; Cuming.

PLEUROTOMA AXIS. *Pleur. testá recto-acuminatá, infernè contractá, anfractibus supernè bicarinatis, infra transversim exiliter liratis, aperturá oblongá, sinu profundo, albidá, aurantio-fusco subindistinctè tinctá.*

Hab. Philippine Islands; Cuming.

PLEUROTOMA CREBRIPPLICATA. *Pleur. testá ovatá, infernè ventricoso-sinuatá, anfractibus concentricè crebruplicatis, transversim crebriliratis, aperturá patulá; albidá, aurantio-fusco profusè variegatá.*

Hab. Bolinao, Island of Luzon, Philippines (found under stones at low water); Cuming.

PLEUROTOMA ROSARIA. *Pleur. testá abbreviato-subulatá, basi truncatá, anfractibus concentricè plicatis, lævibus, aperturá brevi, vividè coccineo-rosed, anfractuum parte supremá albizonatá.*

Hab. — ?

PLEUROTOMA DYSONI. *Pleur. testá ovatá, spirá subturritá, anfractibus supernè concavis et obtusè carinatis, infra rotundatis, longitudinaliter costatis, liris transversis decussatis, aperturá brevi, sinu amplo; castaneo-fuscá, anfractuum parte superiori hic illic interruptè albifasciatá.*

Hab. Honduras; Dyson.

I have much pleasure in naming this shell, at the request of Mr. Cuming, after Mr. Dyson, whose adventurous researches after objects of natural history in a country not the most healthy for European travellers are certainly worthy of being recorded.

PLEUROTOMA HONDURASENSIS. *Pleur. testá oblongo-ovatá, spirá acutá, anfractibus rotundatis, nodoso-costatis; cinereo luteoque alternatim fasciatá; labro incrassato.*

Hab. Honduras; Dyson.

PLEUROTOMA FENESTRATA. *Pleur. testá fusiformi-ovatá, subinflatá, tenui, pellucidá, anfractibus rotundis, liris superficiariis subdistantibus undique clathratis, labro simplici, sinu latiusculo; pellucido-albá, aurantio pallidè tinctá.*

Hab. Island of Mindoro, Philippines (found among coral).

PLEUROTOMA GRANICOSTATA. *Pleur. testá abbreviato-ovatá, basi truncatá, spirá brevi, anfractibus pulcherrimè granoso-costatis,*

liris transversis clathratis; albidd, roseo-fuscescente tinctd, granis saturatioribus.

Hab. — ?

PLEUROTOMA REGULARIS. *Pleur. testd subpyramidali-ovatd, anfractibus supernè concavis, medio obliquè regulariter costatis, aperturâ parvd, sinu lato; albidd.*

Hab. — ?

PLEUROTOMA ANGICOSTATA. *Pleur. testd oblongo-ovatd, spirâ turrâ, lævigatâ, anfractibus longitudinaliter costatis, costis subdistantibus, angustis, supernè angulatis, submucronatis; nived.*

Hab. — ?

PLEUROTOMA MUCRONATA. *Pleur. testd acuminato-pyramidali, anfractibus longitudinaliter subobscure plicato-costatis, costis nodulosis, aperturâ brevi; fuscâ, nodorum serie medianâ albicante.*

Hab. — ?

PLEUROTOMA CAGAYANENSIS. *Pleur. testâ fusiformi-ovatd, spirâ acuminatd, anfractibus supernè unicarinatis, infra tuberculato-plicatis, transversim conspicuè liratis; sinu amplo; albâ.*

Hab. Cagayan, province of Misamis, island of Mindanao, Philippines (found in sandy mud at the depth of seven fathoms); Cuming.

PLEUROTOMA TESSELLATA. *Pleur. testâ pyramidali, anfractibus supernè concavis, medio confertim tuberculato-plicatis, aperturâ parvd; albâ, maculis grandibus conspicuis rufo-fuscis tessellatd.*

Hab. Isle of Capul, Philippines (on the reefs); Cuming.

PLEUROTOMA SEMEN. *Pleur. testâ oblongâ, spirâ mucronatd, anfractibus lævibus, medio obliquè plicatis, aperturâ parvd, sinu profundo; castaneo-fuscâ, plicis albidis.*

Hab. San Nicolas, island of Zebu, Philippines (under stones at low water); Cuming.

PLEUROTOMA PARIâ. *Pleur. testâ oblongâ, spirâ acuminato-turrâ, anfractibus supernè concavis, infra plicato-costatis, costis angustis, subflexuosis; albâ, fasciâ pallidè aurantid indistinctâ cingulatd.*

Hab. — ?

PLEUROTOMA SCALPTA. *Pleur. testâ pyramidali-ovatd, lævigatâ aut minutissimè reticulatâ, aperturâ brevi, sinu distincto; albâ, lineis fuscis brevibus tessellatim pictd.*

Hab. — ?

PLEUROTOMA FORBESII. *Pleur. testâ turrâ, anfractibus rotundatis, longitudinaliter obtusè costatis, transversim liratis, aperturâ parvd; rufescente-fuscâ, liris saturatioribus.*

Hab. Paros, Grecian Archipelago; Forbes.

I have much pleasure in dedicating this little species to Professor Edward Forbes, whose submarine researches among the islands of the Grecian Archipelago have afforded matter of so much interest and novelty.

PLEUROTOMA SYMMETRICA. *Pleur. testâ ovatâ, spirâ breviusculd, anfractibus supernè depressis, longitudinaliter costatis, costarum*

interstitiis subtilissimè elevato-striatis; lutescente, anfractuum parte superiori albd.

Hab. — ?

PLEUROTOMA CORNEA. *Pleur. testâ ovatâ, spirâ acuminatâ, corned, subpellucidâ, concentricè tenuicostatâ; fuscescente, zonâ angustâ pallidâ cingulatâ.*

Hab. — ?

PLEUROTOMA FOVEOLATA. *Pleur. testâ ovatâ, liris fortibus elevatis undique reticulatis, liris ad decussationem granosis; albd.*

Hab. — ?

PLEUROTOMA PAGODA. *Pleur. testâ pyramidalî-acuminatâ, anfractibus longitudinaliter crassicostatis, transversim subtilissimè liratis, aperturâ brevi; olivaceo-fuscâ.*

Hab. — ?

PLEUROTOMA SEMIGRANOSA. *Pleur. testâ acuminato-turritâ, anfractibus supernè concavis, medio nodoso-costatis, infra granosis, aperturâ parvâ; albâ, fasciâ aurantiâ infernè cingulatâ.*

Hab. — ?

PLEUROTOMA TINCTA. *Pleur. testâ oblongo-ovatâ, anfractibus rotundis, longitudinaliter crassicostatis, liris transversis fortiter clathratis, interstitiis profundis, labro incrassato, sinu lato, canali subrecurvo; albâ, anfractibus supra et infra aurantio-fusco fasciatim maculatis.*

Hab. — ?

PLEUROTOMA CANALICULATA. *Pleur. testâ ovato-turritâ, spirâ suturâ canaliculatâ, anfractibus striis elevatis, subtiliter clathratis, sinu amplo; albicante.*

Hab. — ?

PLEUROTOMA FUSOIDES. *Pleur. testâ fusiformi, spirâ acuminatâ, anfractibus supernè angulatis, striis elevatis creberrimè reticulatis, labro subincrassato, sinu lato; albicante, intus fuscescente.*

Hab. Island of Mindanao, Philippines (found in sandy mud at the depth of twenty-five fathoms); Cuming.

PLEUROTOMA ALBIFUNICULATA. *Pleur. testâ oblongâ, anfractibus rotundatis, longitudinaliter crebricostatis, liris subtilibus transversis funiculatis, canali subrecurvo, sinu lato; albicante, aurantio hic illic tinctâ, liris opalo-albis, apice rosaceo.*

Hab. South Pacific.

PLEUROTOMA ALBINODATA. *Pleur. testâ ovato-turritâ, medio gibbosâ, anfractibus superne angulatis, ad angulum tuberculatis, transversim granoso-liratis; nigricante-fuscâ, tuberculis albis.*

Hab. — ?

PLEUROTOMA SCARABÆUS. *Pleur. testâ obeso-ovatâ, spirâ brevi, apice elevato; lævigatâ, spirâ apicem versus obsolete hexagonali; castaneo-fuscâ, anfractu ultimo zonâ subobscurâ lutescente cingulatâ, apice albo.*

Hab. Honduras; Dyson.

PLEUROTOMA DÆDALA. *Pleur. testd subfusiformi, anfractibus longitudinaliter tenuicostatis, interstitiis transversim creberrimè elevato-striatis, labro incrassato; albidd, fuscescente pallidissime tinctd.*

Hab. — ?

PLEUROTOMA OBTUSA. *Pleur. testd oblongd, spirâ breviusculd, obtusd, anfractibus rotundis, obtuso-costatis, transversim tenuiliratis, labro incrassato, sinu lato; lutescente.*

Hab. — ?

February 10.—R. C. Griffith, Esq., in the Chair.

The following letter was read, addressed to G. R. Waterhouse, Esq., by the Society's Corresponding Member Thomas Bridges, Esq. :—

“ I am much delighted to learn that several of the little Rodents I sent from Chile previous to my departure proved new, and I thank you sincerely for the honour you have done me by affixing my name to the new Octodon. I now with pleasure give you its habitat. Many years ago I found this species inhabiting holes in sandy banks and hillocks near the borders of the river Jenó, in the province of Colchagua, nor do I remember having found it in any other locality in Chile. It is much less abundant than *O. Cumingii*, but, like that species, it feeds on herbs and dried grass. In the winter months I have observed it eats the bark of *Mimosa Cavenia*, which abounds in that part of Chile. Of this species, on my return to Chile, I shall endeavour to procure other specimens; also a skeleton and cranium for your inspection. Like *O. Cumingii*, it makes its appearance and feeds during the day, especially when the weather is cloudy.

“ The *Lagotis Cuvieri* of Bennett, of which I sent beautiful specimens, were captured on the western side of the Andes, in the province of Colchagua. This animal I have also found in great abundance in Bolivia; you would be delighted to see it in its native country. It abounds in bold, rocky and steep precipices, and sometimes on the slopes amongst large stones tumbled one on the other, amongst the crevices of which it takes shelter. I have never yet seen it make caves or burrows. It is highly amusing to see it bound from one huge block to another, taking leaps equal almost to those of the squirrel; this it accomplishes from the structure of its hind legs and the assistance of its tail. On examining several females lately, I find that they only produce one or two at a birth. Their food is coarse grass. It appears that this animal has an immense mountainous range from lat. 33° to 18°, and probably is found much further north and south. I have found it often from 10,000 to 12,000 feet of elevation in Bolivia. If not mistaken, I have discovered in my rambles from Cobija to this place, a distance of 900 miles, another species of *Lagotis**. It is somewhat less in size, more compact, with a shorter tail, and the fur is of a rusty colour, especially that of the flanks and abdomen; nor is the dark line over the vertebra so well-marked as in *L. Cuvieri*. When you possess the skins you will be better able to discover if it is a distinct species.

* I did not perceive any other species of *Lagotis* beyond the *L. Cuvieri* in Mr Bridges' collection.—G. R. W.

“The Chinchilla I have never been able to capture, although I spent a day or two in Cobija for that purpose. It is entirely a nocturnal animal, never making its appearance during the day, therefore it cannot be taken with the gun: its habits and abode are similar to the Viscacha.

“The native hunters of this little animal domesticate the Quique of Molina, which they term here Huron, the Spanish for ferret*; the Huron enters the crevices and holes made by the Chinchilla, and drives them out, when they are either killed with sticks by the hunters or taken by the dogs trained for that purpose.

“I find near the coast of Bolivia, where scarcely any vegetation exists, the Chinchilla lives on the seed-vessel of a tall long-spined species of *Cereus*, which it collects in small piles, and eats during the night. These seed-vessels contain a great deal of pulpy substance surrounding the seeds, and the exterior is covered with long hair. They are shaped like a pear, and are called by the natives *Pasas canas* (hairy figs). The *Canis fulvipes* I am persuaded does not exist in the northern provinces of Chile; had this been the case I should have taken it. Molina describes the Culpeo and the Chilla, and as I have not his work here I cannot give you his specific names; why not adopt them, as I consider them prior to those of other authors? On my return to Chile I will consult his work and send you them.

“During my journey in Bolivia I have paid every attention to the Mammalia, and only a few days ago I forwarded a box of skins to Valparaiso, requesting my friend there to forward three species which are highly interesting, and at the same time to me quite new. They are—

“1. *Kerodon*.—This animal I consider different from *K. Kingii*; it is found in the vicinity of Chuquisaca and Cochabamba in rocky places, and not uncommon in fields surrounded by stone walls, in which it takes shelter and lives. It is more solitary than *K. Kingii*, as that species I found near Mendoza in what may be termed large communities. This animal feeds during the day on grass and herbage, but, I have observed, after the dew is evaporated from the ground. The hair of this animal appears, from what I remember, to be more coarse and bristly; however, comparison will decide; I may perhaps be mistaken. Native name, ‘Conejito †.’

“2. A large Rat, with short tail and strong claws ‡. This curious and astonishing animal I first found a few leagues south of Potosi, at an elevation of 12,000 feet, in sandy slopes and valleys, at no great distance from water. Large patches of land are completely undermined by its workings, which are similar to those of *Schizodon fuscus*. I at first concluded that it burrowed for amusement, or the change of residence, but on deeper consideration I consider it does so in pursuit of bulbs and the roots of grass for food, like *Poëphagomys ater*. It may be seen working in the morning, throwing out the

* This is the *Galictis vittata* of Bell.—G. R. W.

† The species referred to is the *Cavia cobaia* of authors.—G. R. W.

‡ *Ctenomys braziliensis* of De Blainville.—G. R. W.

sand, and now and then turns round and protrudes its head out of the new-made burrow. It was then our only chance to shoot them, and if not killed on the spot, there is no hope of obtaining them. Only in one or two instances do I remember seeing them leave their holes to feed on the grass. I think you will find this animal distinct from all the other South American Rodents, and perhaps it will form the type of a new genus. Its native name is 'Tufo' and 'Tojo,' pronounced 'Tu-fo' and 'To-ko.'

"3. A large Mouse, with soft fur and large ears*. This charming little animal we found in the same locality as the above, inhabiting the abandoned caves of the former species. It makes its appearance in the afternoon, when the sun is nearly on the horizon, to feed on grass, and is often seen sitting on its hind legs; and it then presents its pretty white abdomen and erect ears. In this position it has the appearance of a rabbit in miniature. The natives call it 'Achohalla,' pronounced 'Ha-cho-ha-ya.'

"I have taken the *Didelphis Azaræ* with a litter of eight young ones. I have not forwarded this animal with the others; it will remain till my return to Chile; also several species of Mice and Bats.

"In ornithology I have been very successful, having obtained about 100 species differing from the birds of Chile. I have found a considerable portion of the birds figured in D'Orbigny's splendid work, and before I leave Bolivia I hope to obtain the greater part, especially as in a few days I intend leaving Cochabamba and travelling down the river Mamoré towards the frontiers of Brazil, traversing the country of the Yaraques Indians, where D'Orbigny found an immense number of novelties.

"Amongst the *Perdicaræ* I have found a beautiful species of *Endromia*, differing from *E. elegans* of D'Orbigny; also a third species of *Tinachorus*, much larger than *T. D'Orbignyanus*; and in the valley of Cochabamba and mountains in the vicinity I have of late had the good fortune to take three distinct species of *Nocthura*, all of beautifully marked plumage, and different from *N. Perdicaria* of Chile. These have given me excellent sport. Amongst many other interesting birds which I have lately taken, I have found *Serrirostrum carbonarium* and *sittoides*. My intention is, before I leave Cochabamba, to write a communication to the Zoological Society, having now the honour to be a Corresponding Member, giving them a brief idea of what I have accomplished since I arrived in this country. I have no doubt that the Earl of Derby and the Messrs. Gray will have much pleasure at the sight of the Bolivian birds when they arrive in England. I have many interesting insects, amongst which there are three species of *Nyctelia* and two or three of the genus *Phanæus*, with others which I am sure will afford you pleasure and amusement."

HESPEROMYS BOLIVIENSIS. *Hesp. pallidè ochraceus, corpore suprâ fusco-penicillato, subtùs albo; pedibus albis flavo-lavatis; caudâ quoad longitudinem corpus ferè æquante, albâ, suprâ flavâ: auribus permagnis, extùs rufescenti-flavis.*

* *Hesperomys boliviensis*, a new species hereafter described.—G. R. W.

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin.	5	3
———— caudæ	3	5
———— tarsi digitorumque	1	1½
———— auris	0	9½

Hab. Bolivia, near Potosi.

The most striking features of this species are the large size of its ears, combined with its delicate ochre-yellow colouring. It is apparently a stout-bodied animal, and has long and soft fur, which on all parts of the body is of a deep slate-grey colour next the skin; on the under parts each hair has the outer half white; on the sides of the body the visible portions of the hairs are ochreous, obscurely tinted with rufous on the rump: the hairs on the back are similarly coloured, but they are brown at the point, and many of them are blackish. The feet are white, but slightly suffused with yellowish; the tail is well-clothed for a mouse, white beneath, and of a pale yellow colour above; the eyes are margined with brown; the ears are clothed with small pale yellow hairs internally, and the hairs on the outer surface, which are much longer, are of a rusty yellow hue. The hairs of the moustaches are numerous and very long, some of them white and some black. The incisor teeth, which are narrow in proportion to the animal, are of a very pale orange colour. The fore-feet are small; the tarsi moderate.

The *Hesperomys boliviensis*, in the large size of its ears, must approach the *Mus auritus* of Desmarest; but judging from the description of that animal, it should differ in being of a larger size, in having the tarsi shorter in proportion, and its colouring must be very dissimilar, the *M. auritus* being described as of a grey hue.—G. W.

February 24.—George Gulliver, Esq., F.R.S., in the Chair.

A paper by Edward Fry was read:—

“On the Osteology of the Active Gibbon (*Hylobates agilis*).”

I have never met with any detailed account of the osteology of any species of the genus *Hylobates*. Professor Owen’s memoir on that of the Orang Utan and Chimpanzee seems to make one desirable, for the sake of comparison, as the Gibbons are the next group of *Simiadæ* to the Orangs. Their skeleton too is highly interesting, as exhibiting a striking adaptation to progression amongst the branches of trees, well-fitting the animal to be a walker amongst woods, a *Hylobates*.

The individual, whose skeleton I am about to describe, was a female, which lived for some years in the Zoological Gardens at Bristol, having been brought thither from Macao, where she had been kept in confinement. Of two young ones which were taken with their mother in the forests of Malacca, she alone attained maturity. She was probably nine or ten years of age at the time of her death. Of her agility and her cry I shall say nothing; much has already been written on these subjects, and no account of mine could give any adequate impression of her wonderful manners.

This individual is the one which was exhibited in London in 1840,

and of which mention is made in Martin's 'Natural History of Quadrupeds,' Part 8.

Section I.—OF THE SKULL.

The cranium of the *Hylobates agilis* is elongate and ovate in form, much-contracted behind the orbits, which are very projecting and deep and surmounted by very elevated supraciliary ridges. The muzzle is rounded and broad, so that the face, although considerably prominent, has not attained the lengthened shape of the Baboons or of the adult Orang Utan. The forehead, which is narrow, is but slightly arched above the orbits, so that the whole of the cranium is behind the face.

A slightly elevated ridge of bone, arising from the supraorbital ridges, which becomes contracted during its passage over the coronal aspect of the skull, and again expands towards the occiput, marks the boundary on either side of the temporal muscles. This elevated medial portion is smooth, whilst the lateral portions of the skull are roughened by muscular attachments. This development is similar to that of the Chimpanzee, whilst in the Orang Utan the sagittal and temporal crests are elevated to an extraordinary extent.

The supraorbital ridges, we have before remarked, are much-developed. Such is the case in the Chimpanzee, where however they form a junction across the face, which does not take place in the Active Gibbon. The orbits have a very prominent margin, are very large and deep, and are much swelled out externally, so that their outer portion "projects very boldly from the cranium." Sir Thomas Stamford Raffles says of the Siamang, "The orbits of the eyes are circular and remarkably prominent," Linn. Trans. vol. xiii. p. 242. Such too is the character of the skull of the adult Hoolock figured by Dr. Harlan in the Transactions of the American Philosophical Society, vol. iv. New Series, p. 52.

The nasal bones make a slight elevation, thus resembling Man more than the Orang Utan or even the Chimpanzee. The osseous opening of the nose is wide and rather large. The figure of the face viewed in front, from between the orbits to the dental edge, resembles a wedge whose point is directed downwards. This form is contrary to that of the Baboons, where the wedge is inverted. The infraorbital canal opens by a single hole, as in Man and the Chimpanzee. This foramen is smaller in the Gibbon than in those animals.

The outward curvature of the zygomatic arch is not great; it is placed far more posteriorly than in Man, in consequence of the lengthening of the facial portion of the skull.

The skull of this Gibbon is ankylosed, externally at least, into one piece. Prof. Owen tells us that the cranial sutures are obliterated in the adult Orang Utan, Syndactylous Ape, and frequently in the Baboons and other Quadrumana. I have observed it in *Pithecia Satanus*, an American species. It sometimes occurs in the adult human cranium.

The lower jaw is rather lengthened in figure, decidedly more so than in Man, in consequence of the production of the muzzle. It is shallowest just below the termination of the molar series, deepening towards the symphysis, which is not very retreating, so that the

Gibbon has a pretty good chin for a monkey. In this respect it appears to approach Man more nearly than the higher Orangs. The lower jaw of Man is more uniform in its depth than that of this Gibbon: its angle too is not quite so much rounded; the external edges of the ascending and horizontal branches do not form quite so obtuse an angle at their meeting.

The question may be asked, What are the effects of age in altering the form of the skull in the Gibbons? In answer I will remark, first, that the muzzle is elongated and the cranium thrown in a more backward position, in consequence of the necessity for lengthening the dental edge to receive the second or permanent series of teeth. This will be evident by a comparison of the skulls of the young White-cheeked and Hoolock Gibbons, figured in Martin's Nat. Hist. Quad., Part 8, with that of the adult Agile Gibbon in the Bristol Institution (the subject of this paper) and with Dr. Harlan's plate of that of the adult Hoolock, Trans. Amer. Phil. Soc., *ubi supra*. The latter comparison is very satisfactory on this point, as the specimens compared are of the same species. A corresponding elongation of the facial parts takes place in the Orangs, as demonstrated by Prof. Owen, Zool. Trans. vol. i. or Zool. Proc. 1835, p. 30. A similar change is also observable in the human species; the facial angle of the infant decreases with age until the second teeth are cut. Secondly, with increasing age another change takes place in the greater prominence of the supraciliary ridges and the margin of the orbit. I appeal again to the illustrations of Martin and Harlan, and to the original sketch of the Agile Gibbon. A similar development of the cranial ridges takes place in the Orang Utan and Chimpanzee with age; in the former, in the temporal and sagittal crests; in the latter, in the orbital margin. Thirdly, in the anchylosis of the bones of the cranium and the face. This would appear to have taken place in the skull of the Hoolock figured by the late Dr. Richard Harlan (*ubi supra*), whilst in the immature one figured by Martin (*ubi supra*) the sutures are represented. This change is observed to take place in the adult Orang, but not in the Chimpanzee. Fourthly, it appears probable, from a comparison of the before-mentioned materials, that the infra-orbital foramen, and the foramen which gives exit to the dental blood-vessel and nerve in the lower jaw, become smaller by age.

From these observations it will be apparent that the skull of the Gibbons, like that of the Orangs, is far more anthropoid in youth than in mature age. The prolongation of the muzzle, the retrogression of the cranium, the smallness of the facial angle, the development of the orbital ridges, the anchylosis of the bones, and the smallness of the foramina, all distance the aged more than the immature Gibbon from the human race.

Compared with the human skull, the head of this Gibbon is distinguished by its lengthened ovate figure; its narrowness, especially behind the orbits; by the large size and inflated parietes of the orbits; by the want of vertical elevation of the forehead, and the consequent position of the brain behind, not above the face; by the great elevation of the supraorbital ridges; by the development of the muzzle, necessitating the backward position of the zygomatic arches and the

elongation of the palate; by the small proportional size of the infra-orbital foramen; by the obliquity of the occipital plane, and by the large size of the canine teeth; by the elongation of the lower jaws, in consequence of the length of the muzzle and palate; by the increased depth of the symphysis, and by the small size of the foramen which gives exit to the blood-vessel nourishing the teeth and the accompanying nerve.

This skull agrees with that of the Chimpanzee in its smallness proportionally to the body, in its generally elongated form, in its anterior contraction, in the marks of the attachments of the temporal muscles, in the large supraorbital ridges, in the obliquity of the plane of the foramen magnum, and in the slight arch of the nasal bones.

It differs from that of the Chimpanzee in the supraorbital ridges not uniting, in the obliteration of the sutures, in the smaller size of the infraorbital foramen and of the foramen of the dental blood-vessel. The lower jaw is proportionally shallower. The cranium of the young Chimpanzee is far broader, more arched and less anteriorly compressed, and therefore far more anthropoid. These characters however degenerate with age.

It differs yet more from the form of skull exhibited by the adult Orang Utan, where the strongly developed cranial ridges and widely expanded zygomatic arches give the skull a carnivorous aspect. These peculiarities we have seen to be absent in the Gibbon. The flatness of the bones of the nose of this Ape is an additional distinction. On the other hand, it agrees with the Orang in the obliteration of the cranial sutures of the adult.

In the large development of the supraciliary ridges this skull reminds us of the Baboons, which present however a more degraded form, and may be distinguished by the greater narrowness of the cranium, by the less circular form of the orbits, by the greater prolongation of the muzzle and the greater space between the zygomatic arch and the skull.

The dentition of the Gibbon claims no especial notice; the incisors and molars are moderate in size, whilst the canines are large, their roots apparently reaching nearly to the internal corner of the orbits.

Section II.—OF THE TRUNK.

The vertebral formula of the Agile Gibbon is—cervical, 7; dorsal, 13; lumbar, 5; sacral, 4; coccygeal, 4. The comparison of these numbers with those of some of its congeners and near allies will be exhibited by the following table:—

Name of Animal.	Cervical.	Dorsal.	Lumbar.	Sacral.	Coccygeal.	Total.
Man	7	12	5	5	4	33
Chimpanzee	7	13	4	5	4	33
Orang Utan	7	12	4	5	3	31
<i>Hylobates concolor</i>	7	14	5	5	5	36
<i>Hylobates lar</i>	7	12	6	3	3	31
<i>Hylobates agilis</i> ...	7	13	5	4	4	33

Of the cervical vertebræ I need only remark, that the transverse

processes of the atlas are produced long and narrow, more so than in Man. The first dorsal vertebra is the smallest, after which they gradually increase in size. The transverse processes of the lumbar vertebræ are less developed than in Man, and are more uniform in size. It will be noticed that whilst the lumbar vertebræ of the Chimpanzee and Orang Utan are four, two of the Gibbons have five and one has six; in the extent of this region therefore they approach Man. The sacral vertebræ are perfectly ankylosed together, but not to the coccygeal, and form about their middle an angle, the lower part being curved backwards. The upper portion thus remains in a line with the vertebral column, and part only is thrown backwards instead of the whole, as in Man. The first pair of foramina are almost obliterated, and are therefore not so large as in Man and the Chimpanzee; the three following are persistent. As in the Orangs, the sacrum is narrower than in the human skeleton. The weakness of these parts indicates the less amount of capability of assuming the erect posture than is granted to Man. The Gibbons are especially fitted for arboreal progression; and although by the assistance of their lengthened fore extremities, touching the ground on either side, and as it were acting as crutches, they are perhaps more at home in the erect posture on level surfaces than either the Chimpanzee or Orang Utan, yet their movements are awkward and constrained. The Gibbons are the only Mammals which can assume the erect posture whilst they walk on all four extremities.

The thorax, which is formed by seven true and six false ribs, is larger and more conical in form than in Man. The great activity of the Gibbons requires large respiratory organs; hence we find the thorax proportionally large (see Prof. Owen on Orangs, *ubi supra*); at the same time it affords increased attachments to the strong pectoral muscles required by the lengthened arms. One contrivance thus answers two ends.

The last three ribs are unattached by cartilage to the sternum, which consists of five pieces, whereof the last is free. In the number of its component pieces the sternum of the Active Gibbon agrees with Man and the Chimpanzee, and differs from the Orang Utan, where it is formed of seven or eight small pieces arranged in a double row. The manubrium differs slightly from the human in being proportionally broader.

Compared with the ribs of the Chimpanzee, those of the Active Gibbon are slight in form; compared with those of a Baboon, they are strong.

A reference to the dorsal column of the table of vertebræ given above will show that the number of ribs varies considerably in the genus *Hylobates*.

Section III.—OF THE FORE EXTREMITIES.

The clavicles, which from their great length throw the scapulæ far backwards, and give great breadth to the shoulders, are flattened horizontally, have but little marks of tendinous attachment, and present neither the double curvature of Man nor the straightness of the Orang Utan, but a simple gentle curvature outwards.

The scapulæ are of a more lengthened shape than in the human subject, from which they also differ in having the aspect of the glenoid cavity far less laterally and more upwardly directed, in the upper edge of the bone rather descending than ascending from this cavity, in the convexity instead of concavity of the humeral edge, and the far greater acuteness of the inferior angle.

The peculiarities to be remarked in the humerus are its extraordinary length, reaching to just above the head of the femur, its slightness of form, and the general weakness of its elevations. The tubercles at the superior head are very small. Its twist occurs about one-third from the upper extremity of the bone, as in Man. The external apophysis can scarcely be said to exist; the internal is present.

The fore-arm is remarkable for its length (which is yet more extraordinary than that of the arm), for the slenderness of its form, and for the extent of the interosseous space formed by the great outward curvature of the radius: by this last character the Gibbon is distanced from Man, but approximated to the Orangs. The greatest distance of the radius from the ulna occurs about one-third of the length of the fore-arm from the superior articulation; not near the inferior head, as in the human skeleton. The olecranon of the ulna appears neither so broad nor so strong as in Man.

In this specimen the fore-arm is two inches longer than the arm. In the adult Hoolock the difference is about $1\frac{1}{2}$ inch; in the *Hylobates concolor* about $2\frac{1}{2}$ inches. These proportions correspond with those of the Orangs, but are at variance with the human, where the arm is about two inches longer than the fore-arm. Now it is remarkable that in the immature Gibbons the proportion of these parts has been found to resemble the human (see Dr. Harlan, *ubi supra*). Not only then are the skulls of these monkeys more anthropoid in youth than maturity, but likewise the proportions of the anterior extremities. Retrogression with advancing age from a superior to an inferior type of organization is not so common in nature as the converse.

The carpus of the Agile Gibbon appears to contain the same eight bones as in Man; not eleven, as Daubenton states that the *Hylobates lar* possesses (Martin, *ubi supra*). The whole hand is remarkable for its slenderness and length, by which it is beautifully adapted for grasping the boughs of trees or any such objects: the fingers maintain similar proportions, one to another, to those of Man. The thumb, longer than in the Chimpanzee, where it does not quite equal in length the metacarpal bone of the first finger, is slender in form.

So extraordinary is the length of the fore extremity, that the humerus reaches to nearly the same part of the trunk as the wrist in Man, and that the fingers really rest on the ground when the animal assumes the erect posture. The length of the fore-arm of this skeleton, whose total height is only about two feet, positively exceeds in length that of the adult human subject, being eleven inches long.

Never have I seen a skeleton which better illustrates the law of animal mechanics, that rapidity of movement depends on the elongation.

gation of the short arm of the lever (which every bone represents) in proportion to the long arm of the same; or (otherwise expressed) on the extent of the distance between the fulcrum and weight in proportion to the distance between the fulcrum and the power.

As respects the proportions of the fore-limbs, the Orang Utan approaches the Gibbons, and retrogresses from Man more than the Chimpanzee, since in the former the arms reach to the heel, in the latter to about the knee-joint.

Section IV.—OF THE HIND EXTREMITIES.

The pelvis presents us with a type far degraded from the Bimanous. The hips are narrow; the iliac bones long and flat, and their superior margins do not present an arc of a circle, as in Man, and indeed to a certain extent in the Chimpanzee. The ischiatic bones, instead of retreating far backward from the symphysis of the pubes, are nearly on a plane with the iliac wings; their inferior margins are not circular, as in Man, but present three sides of a lengthened parallelogram. The symphysis of the pubic bones resembles that of Man more than does that of the young Chimpanzee.

The bones of the lower extremities are characterized, as those of the pectoral limbs, by the slenderness of their form and the slightness of their elevations.

The trochanters of the femur are small; the *linea aspera* absent. The ligamentum teres appears to have been present, thus agreeing with Man and all the *Simiadae*, excepting the Orang Utan.

The tibia and fibula have rather a larger interosseous space than in Man, consequent on the bowing of the fibula. This space is large in the Orang Utan (Owen, *ubi supra*).

The relative proportions of the leg and fore-leg are similar to the human.

Let me here introduce a remark made on this animal by Yarrell, viz. that both the upper and lower extremities are incapable of the same extension as in Man, owing to the strong facial expansion of the flexor tendons passing before the elbows and behind the knee-joints to be attached to the upper halves of their respective bones below these parts (Notes on Dissection of Active Gibbon, Zoological Journal, vol. v. p. 14).

The foot is remarkable for the smallness of the os calcis, a character common to the Orangs and the lower Monkeys, and which, giving less basal surface to the foot, indicates less power of supporting the frame in the erect posture. The hind-foot is formed for grasping the branches of trees and not for walking on the ground. The metatarsal bones decrease in strength (as in the hand) from the first towards the little finger. The thumb is strongly formed, especially its metatarsal bone. The ungueal phalanges are wanting in the second and third finger, and the ungueal and penultimate in the little finger of the only hind extremity mounted on the skeleton. These defects in the hind-foot arise from the animal having been affected some time previous to her death with a morbid state of constitution (supposed to arise from confinement), which caused her to gnaw off

the ends of some of her fingers. The foot is thrown less on the external edge than in the lower *Quadrumana*.

I am fully conscious of the imperfection of this account of the osteology of the Active Gibbon, yet trust that I have called attention to some points in which the organization of the skeleton is beautifully adapted to the habits of the creature. No part of the studies of a naturalist is more interesting or instructive than thus to trace, however imperfectly, the hand of an all-wise Creator in the works of nature.

EDW. FRY.

The next paper contained "Descriptions of eleven new species of Australian Birds," by John Gould, Esq. :—

ATHENE MARMORATA. *Ath. omni superiore corpore, alis, caudaque, saturatè fuscis, nuchâ autem, alarum tectricibus, et scapularibus, obscurè albo maculatis; pogoniis internis primariorum ad basin et rectricum lateralium fasciis stramineis, ad extremam pogoniam albicantibus, ornatis; facie et mento albidis; corpore inferiore saturatè fusco, albo et arenaceo colore maculato.*

All the upper surface, wings and tail dark brown, obscurely spotted with white round the back of the neck, on the wing-coverts and scapularies; inner webs of the primaries at their base, and the inner webs of the lateral tail-feathers crossed by bands, which are buff next the shaft and white towards the extremity of the webs; face and chin whitish; under surface dark brown, blotched with white and sandy brown; legs and thighs fawn-colour; bill horn-colour; feet yellow.

Total length, 14 inches; bill, $1\frac{1}{8}$; wing, $9\frac{1}{2}$; tail, 6; tarsi, 2.

Hab. South Australia.

Remark.—Nearly allied to *Athene maculata*, but much exceeding that species in size.

ATHENE RUFÆ. *Ath. disco faciali saturatè fusco; omni corpore, suprâ saturatè fusco, infrâ arenaceo-rufo, multis autem lineis rufo-fuscis transversim fasciato.*

Facial disc dark brown; all the upper surface dark brown, crossed by numerous narrow bars of reddish brown, the tints becoming paler and the barrings larger and more distinct on the lower part of the body, wings and tail; all the under surface sandy red, crossed by numerous bars of reddish brown; the feathers of the throat with a line of brown down the centre; vent, legs and thighs of a paler tint, with the bars more numerous, but not so decided; bill horn-colour; toes yellowish, slightly clothed with feathers.

Total length, 20 inches; bill, $1\frac{3}{4}$; wing, $13\frac{1}{2}$; tail, $9\frac{1}{2}$; tarsi, $2\frac{1}{4}$.

Hab. Port Essington.

Remark.—A very powerful species, nearly allied to *Athene strenua*.

ALCYONE PULCHRA. *Alc. omni corpore superiore splendide purpurascente-cyaneo; alis fusco-nigris; loris, cristulâ post aurem, et guld, stramineis; lateribus pectoris purpurascente-cyaneis, in vini colorem ad latera mergentibus.*

All the upper surface shining purplish blue; wings brownish black; lores, tuft behind the ear and throat buff; under surface deep fer-

ruginous orange; sides of the chest fine purplish blue, passing into a rich vinous tint on the flanks; irides and bill black; feet orange.

Total length, 6 inches; bill, 2; wing, $2\frac{7}{8}$; tail, $1\frac{1}{2}$; tarsi, $\frac{3}{8}$.

Hab. Port Essington.

Remark.—This is by far the finest of the Australian Alcyones, and is at once distinguished by the rich blue of the upper surface and the beautiful vinous colouring of the flanks.

ALCYONE DIEMENENSIS. *Alc. omni superiore corpore intensè cyaneo, ad uropygium et tectrices caudæ superiores splendidius; alis nigris cyaneo lavatis; guld stramineâ; vertice nigro indistinctè fasciato.*

All the upper surface deep blue, becoming more vivid on the rump and upper tail-coverts; wings black, washed with blue; throat buff; under surface of the body and wings ferruginous orange; on each side of the chest a patch of bluish black; lores and a small patch behind the ears buff; crown of the head indistinctly barred with black; irides and bill black; feet orange.

Total length, $6\frac{1}{2}$ inches; bill, 2; wing, $3\frac{1}{8}$; tail, $1\frac{3}{4}$; tarsi, $\frac{1}{2}$.

Hab. Van Diemen's Land.

Remark.—Rather more robust than *Alcyone azurea* or *A. pulchra*, and differing from both in the blue of the upper surface, which is less brilliant and of a slight greenish tinge.

EÖPSALTRIA LEUCOGASTER. *Eöps. parvo maculo triangulari ante oculum nigro; vertice, corpore superiore, alis caudæque, saturatè griseis; corpore inferiore albo.*

Immediately before the eye a small triangular-shaped spot of black; above the eye a faint line of greyish white; crown of the head, all the upper surface, wings and tail dark slate-grey; the lateral tail-feathers largely tipped with white on their inner webs; all the under surface white; irides dark brown; bill and feet black.

Total length, $5\frac{3}{4}$ inches; bill, $\frac{1}{16}$; wing, 3; tail, $2\frac{3}{4}$; tarsi, $\frac{7}{8}$.

Hab. Western Australia.

The sexes are alike in plumage.

STREPERA ARGUTA. *Strep. toto corpore nigro; remigum apicibus fuscis; crisso, et pogoniis internis primariorum secundariorumque ad basin et tertiæ partis apicalis rectricum albis.*

All the plumage black, becoming browner on the tips of the wing-feathers; base of the inner webs of the primaries and secondaries, the under tail-coverts and the apical third of the inner webs of the tail-feathers white; irides yellow; bill and feet black.

Total length, 21 inches; bill, 2; wing, $11\frac{3}{4}$; tail, 10; tarsi, $2\frac{3}{4}$.

Hab. Van Diemen's Land.

Remark.—This is the largest species of the genus I have yet seen.

STREPERA PLUMBEA. *Strep. corpore superiore plumbeo-griseo, ad frontem loresque multo saturatius; alis nigris; secundariorum marginibus griseis, apicibus, et crisso, albis.*

All the upper surface leaden-grey, becoming much darker on the forehead and lores; wings black; secondaries margined with grey and tipped with white; basal half of the inner webs of the primaries white, of the outer webs grey; the remainder of their length

black, slightly tipped with white; tail black, margined with grey and largely tipped with white; all the under surface greyish-brown; under tail-coverts white; irides, bill and feet black.

Total length, 18 inches; bill, $2\frac{3}{4}$; wing, $11\frac{1}{2}$; tail, 9; tarsi, $2\frac{1}{2}$.

Hab. Western Australia.

STREPERA MELANOPTERA. *Strep. corpore superiore caudaque nigris; corpore inferiore fusco-nigro, abdomine griseo tincto; crisso rectoribusque, duabus intermediis exceptis, albis.*

All the upper surface, wings and tail black; under surface brownish-black, tinged with grey on the abdomen; under tail-coverts and tips of all but the two centre tail-feathers white; irides yellow; bill and feet black.

Total length, 19 inches; bill, 2; wing, 11; tail, 9; tarsi, $2\frac{5}{8}$.

Hab. South Australia.

Remark.—Distinguished from all other species by the total absence of any white mark on the wings.

GALLINULA TENEBROSA. *Gal. griseo-nigra; dorso scapularibusque nigris; crisso medio nigro ad latera albo.*

General plumage greyish-black, with the exception of the back and scapularies, which are deep brown, and the primaries and tail, which are nearly pure black; under tail-coverts black in the centre and pure white on the sides; frontal plate orange; base of the bill blood-red; tip greenish yellow; above the knee a garter of yellow and scarlet; joints of the legs and feet green; under surface of the legs and feet olive; the sides of the tarsi and frontal plates of the toes yellow; frontal plates of the tarsi yellow; those nearest the knee stained with scarlet; irides olive.

Total length, 15 inches; bill, $1\frac{1}{4}$; wing, 8; tail, 3; tarsi, $2\frac{1}{2}$.

Hab. South Australia.

Remark.—The above is the description of a female; the male is supposed to be larger in size, and to differ in being of a paler hue beneath, and in having the whole of the upper surface brown.

SYLOCHELIDON STRENUUS. *Syl. fronte vertice et nuchâ nitidè nigris; dorso alis caudaque pallidè cinereo-griseis; reliquis plumis albis.*

Forehead, crown and nape deep glossy black; back, wings and tail pale ashy grey, becoming lighter on the tail and deepening into dark grey on the primaries, the shafts of which are white; remainder of the plumage pure white; irides black; bill scarlet, stained with yellow on the sides and tip, and with greenish yellow near the extremity.

Total length, $20\frac{1}{2}$ inches; bill, 4; wing, $16\frac{1}{2}$; tail, $6\frac{1}{2}$; tarsi, 2.

Hab. Southern coasts of Australia.

Remark.—The above is the description of the plumage of the breeding season; at other times the head instead of being wholly black is mottled with black and white.

SULA PERSONATA. *Sul. alba; tectricibus alarum majoribus, secundariis, tertialibus, rectoribus lateralibus, et rectoricum intermediarum apicibus, intensè fuscis.*

The whole of the plumage pure white, with the exception of the

greater wing-coverts, primaries, secondaries, tertiaries, the tips of the two central and the whole of the lateral tail-feathers, which are of a rich chocolate-brown; irides yellow; naked skin of the face and chin in dead specimen dull bluish black; legs greenish blue.

Total length, 29 inches; bill, 5; wing, $16\frac{1}{2}$; tail, $8\frac{1}{2}$; tarsi, $2\frac{1}{2}$.

Hab. North and north-east coasts of Australia.

Remark.—A very robust and powerful species.

The following Note on the Spermatozoa of the Polar Bear, by George Gulliver, Esq., F.R.S., was read:—

The question of the true nature of these curious bodies is as interesting as it is obscure. Whether they be independent animalcules or merely free and floating cilia has never been clearly proved.

Professor Valentin*, indeed, described an amount of organization in the spermatozoa of a Bear, quite sufficient, if confirmed, to prove that they are really distinct beings. Therefore I took an opportunity of obtaining them for examination from the Polar Bear which died this morning in the Society's menagerie. The animal was a very large adult, in good condition; his testes well-developed, containing in the seminal tubes plenty of cells and immature spermatozoa, and an abundance of them perfectly formed in the vas deferens. These were carefully examined. They presented none of the marks of mouth, anus and internal vesicles depicted by Professor Valentin. In short, the spermatozoa of the Polar Bear were similar in all respects to those of numerous other Mammalia, as may be seen by comparing my drawings, now exhibited to the Society, of the spermatozoa of the following animals, viz. the Polar Bear (*Ursus maritimus*, Linn.), the Stoat (*Mustela Erminea*, Linn.), the Indian Badger (*Arctonyx collaris*, F. Cuv.), the Dromedary (*Camelus Dromedarius*, Linn.), and the Camel (*Camelus Bactrianus*, Auct.). I gave a notice of the spermatozoa of the two last animals in the Proc. of this Society, July 26, 1842, p. 101, and April 11, 1843, p. 50.

ENTOMOLOGICAL SOCIETY.

January 6th, 1845.—G. Newport, Esq., President, in the Chair.

Mr. F. Bond exhibited a specimen of *Damophila Trifolii*, together with the portable case formed by its larva, thus proving its affinity to the genus *Porrectaria*.

February 3rd.—G. Newport, Esq., President, in the Chair.

Mr. A. White exhibited specimens of the Chinese *Rhomborhina resplendens* from Mr. Harrington's collection, *Goliathus (Compscephalus) Horsfieldianus* from Abyssinia, and drawings of some species of *Coccinella* brought from Asia Minor by Professor Forbes.

Mr. E. Doubleday exhibited a drawing of an aberrant species of *Diadema* resembling the genus *Acræa* in its colouring, especially *A. Zidora*, &c., and which he proposed to name *Diadema Boisduvalii*.

* Wagner's Physiology, tr. by Dr. Willis, p. 228; 8vo, Lond. 1844.

March 3rd.—The Rev. F. W. Hope, F.R.S. (who had been elected President at the adjourned Anniversary Meeting), in the Chair.

The President nominated W. Spence, Thomas Marshall and W. W. Saunders, Esqrs., and Captain Parry, to act as Vice-Presidents.

Mr. Ingpen exhibited a remarkably fine specimen of amber, or gum anime, inclosing a small butterfly and numerous other insects.

The following papers were read:—

Extracts from a letter addressed by Captain Boyes to Mr. Westwood, containing notices of the habits of the *Termites* and other insects of India.

On carefully examining the nests of the white ants, the hissing noise described by some author (Smeathman?) was very distinctly heard by Captain Boyes, who ascertained that it was caused by the fluttering of the wings when the *Termes* is in its perfect state. At the commencement of the rainy season he several times prevented the exit of the perfect insects from their nest, which was in one of his room-walls, by pouring spirits of turpentine down the orifices into the nest, which kept them prisoners for several days; afterwards he plastered up the orifice with mortar, and after a month's confinement he allowed them to swarm, when however they all appeared to be of one sex (males), running over the tables in myriads, not a single specimen being observed to shed its wings, which is an operation voluntarily performed by the females when (as he supposes) they have paired, after which also the male sheds his wings.

Details, accompanied with coloured drawings, were also given of the transformations of a species of *Anthrenus*, and of several previously described species of *Sphinx*, *Bombyx*, and butterflies.

Extracts from a letter addressed to Mr. Westwood by R. Templeton, Esq., on the Bite of the *Scolopendra* in Ceylon.

Since his previous communication the author had seen two instances which show that the bites of *Scolopendræ* are not so innocent as he therein stated them to be. Lieut. M——, of strumous habit, was bitten by *Scolopendra pallipes* of his catalogue, on the forehead just above the root of the nose. He states that the pain was pungent for at least half an hour or longer; the forehead swelled very much, and his upper eyelids so much as to close the eyes completely. Cold lotion was applied and soon reduced the swelling, the two punctures only remaining. A gunner a few days afterwards was bitten by another of the same species on the dorsum of the foot, and he states that he was awakened by the pain; the *Scolopendra* was killed in his bed; two small punctures appeared, his foot near the marks swelled a little, but it disappeared totally in a few hours by poulticing. He states the pain also to have been as if chillie was rubbed into it, but it soon disappeared. His stomach and bowels were much out of order at the time—rather bilious or so.

Mr. Newport, in reference to the poisonous properties of the *Scolopendræ*, stated that *Lithobius* was also poisonous, at least to its own tribe, as observed by DeGeer; and that *Scolopendra* possesses a distinct secretory apparatus, provided with a poison-gland ending in

the mandibles, which are pierced for the purpose of emission of the poisonous fluid, which he had not however detected in *Lithobius*.

“A memoir on the Sectional Characters in the genus *Lucanus*.”

By J. O. Westwood, F.L.S.

After alluding to the prevalence of certain characters apparently of *immaterial* importance in the economy of insects, such as the number of joints in the antennæ, the number and position of the veins in the wings, &c., which nevertheless from their constancy afford excellent *artificial* points of distinction, the author alludes to the difficulties he had experienced in adopting sectional characters in the genus *Lucanus* of modern authors, now consisting of nearly 150 species; and to the employment of the number of spines on the outer edge of the middle and posterior tibiæ in the different sexes, which in many species he had observed to differ in this respect: whence the species form three primary groups:—

1. Those with two or three spines on the outside of the four hind tibiæ.

2. Those with only one spine in the middle of the four posterior tibiæ in both sexes.

3. Those in which the four posterior tibiæ are either destitute of spines, or have them furnished in the middle with one minute spine in the females alone.

The commencement of a memoir on the Life and Writings of Fabricius, translated (with additions) from the Danish. By the Rev. F. W. Hope.

Mr. A. White stated that an extended memoir on Fabricius has been published by the Baron Walckenaer in the ‘Biographie Universelle.’

It was announced that the Address delivered by Mr. G. Newport at the adjourned Anniversary Meeting had been printed, and was ready for delivery to the Members.

Mr. E. Doubleday, in allusion to the noise made by the genus *Termes*, as stated in Captain Boyes’s letter, mentioned that he had recently examined *Peridromia Feronia*, the butterfly described by Mr. C. Darwin, in his ‘Tour,’ as making a noise during flight like the rustling of parchment, and that he had detected a small membranous sac at the base of the fore-wings, with a structure along the subcostal nervure like an Archimedean screw or diaphragm in the tracheæ, especially at the dilated base of the wing.

April 7th.—The Rev. F. W. Hope, F.R.S., President, in the Chair.

Mr. Louis Fraser exhibited, on behalf of Mr. Balfour, a large case of Brazilian insects.

Mr. Westwood exhibited specimens of the singular chrysalis of the genus *Simulium*, which is found attached to the underside of the leaves of the watercress. Also a box containing a considerable number of specimens (belonging to more than twenty species) of *Pausida*, several of which (being new) had been forwarded to him by Captain Boyes. He also exhibited and opened at the meeting one of the large balls of earth formed by the Indian *Copris Molossus*, also

forwarded by Captain Boyes, the interior of which was found to contain a mass of dried dung, partially eaten, and a dead larva.

Mr. A. White exhibited drawings of various remarkable species of Crustacea, and read the description of a new genus of *Brachyura* somewhat allied in appearance to *Plagusia* of Latreille.

“The two divisions of *Plagusia* and *Grapsus* were formed by Latreille and Lamarck for the reception of certain Crabs, to which, from their square carapace and frequently perpendicular sides, Latreille gave the name of *Quadrilatères*. By De Haan the former of these genera has been divided into two, his *Philyra depressa* being founded on the *Cancer depressus* figured by Herbst, while he retains the name of *Plagusia* for those species of which the *Cancer squamosus* of Herbst (i. 260. t. 20. f. 113) is the type: of this last group he is acquainted with four species, two of which he describes. Professor Edwards only sectionally divides the genus *Plagusia*, and describes a new species from the Cape under the name of *Pl. tomentosa*. A careful perusal and comparison of the description given by Linnæus of his *Cancer Chabrus* (M. L. U. Reg. 438) has made me consider the *Plagusia tomentosa* synonymous with the Linnæan species; in which case *P. Chabrus* must stand in the list for *P. tomentosa*. Were there any just ground for separating the *Plagusia depressa* and *tomentosa*, the name *Philyra*, De Haan, ought to be changed, because already used for one of the genera of the Leucosiadous family of Crustacea.

“Without referring to the divisions of the marked group called *Grapsus*, I may here exhibit a sketch of a most remarkably formed genus from one of the Government voyages, somewhat allied to *Plagusia*, but differing much from it in appearance and even in family.

“*TELMESSUS*, White. Carapace depressed, somewhat pentagonal, the latero-anterior sides being the longest; the latero-posterior sides have two teeth in the middle, the latero-anterior sides have two broad dentated teeth between the external angle of orbit and the strongly developed, wide dentated division, the end of which forms one of the prominent angles of the carapace; the beak is very wide, and is formed of three broad teeth, the lateral forming the internal angle of orbit; the central is the widest, and by three notches at the end is divided into four small teeth; the inner antennæ are small, and not contained within a groove of front; the outer antennæ are very large, two basal joints thick and strong, and project beyond notch of front. The external pedipalps have the 3rd joint pointed at the end; it is oblong-ovate. Legs very long, compressed; tarsi longer than the joint before them, somewhat compressed.

“*Telmessus serratus*. Surface covered with small warts arranged in some places in lines, with hairs proceeding from the front of them.

“The specimen is a male.”

The following papers were also read:—

“Description of a new genus of Lamellicorn Beetles apparently belonging to the family *Aphodiidæ*, from India.” By J. O. Westwood, F.L.S.

CHÆTOPISTHES, Westw. *Corpus oblongum, glabrum, dorso valde*

sulcato. Caput antice deflexum, fronte semicirculari marginato. Mandibula membranacea? Maxilla cornea, lobo apicali in unguiculum curvatum acutissimum producto. Antennae 9-articulatae. Prothorax fere rotundatus, antice truncatus, medio profunde sulcatus. Elytra apicibus setosis, singulo 4-sulcato. Pedes lati, compressi, tibiarius apicibus angulatis.

Chætopisthes fulvus, Westw. *Fulvus, nitidus, capite et prothorace parum castaneis, hoc angulis posticis basique transverse impresso, impressionibus setulosis.* Long. corp. lin. $1\frac{3}{4}$.—Hab. in India Centrali. D. Boys.

A memoir on the characters and geographical distribution of those groups in nature which are considered as typical of families, by G. R. Waterhouse, Esq., was also read, which led to an extended discussion on the geography of insects.

MISCELLANEOUS.

Apparatus of Hearing in Mollusks. By Dr. FREY.

THE observations of Dr. Frey have been especially directed to the embryo of *Limnæus stagnalis*. The auricular vesicle is not perceptible in this mollusk until the singular rotatory movements of the embryo have ceased, and when the animal already crawls on the internal side of its shell. It is easy then to observe, on the anterior part of the body, the rudiments of the tentacles, the eyes with their pigment, and the tongue with its characteristic epithelium. On each side of the base of the tongue are found the auditory vesicles. They are spherical, their contour is simple, and their diameter from $\frac{1}{60}$ to $\frac{1}{56}$ of a line. At first they appear to contain in their interior only a transparent liquid, and are then, like the eye, unconnected with the central parts of the nervous system. There are soon developed in the liquid one or two small corpuscles, the form, the size, and the oscillatory movements of which are quite similar to those of the otolithes of the perfect animal; the vesicle which contains them presents on its margin a double contour, resulting probably from the thickness which the sides acquire. The size of the otolithes is from $\frac{1}{450}$ to $\frac{1}{300}$ of a line; their number slowly increases, and reaches to 20 when the *Limnæus* quits its shell; the diameter of the vesicle is, at this period, $\frac{1}{40}$ of a line. By the side of the otolithes occur other smaller corpuscles, which often do not attain the size of $\frac{1}{1000}$ of a line. The number of the otolithes and the size of the auditory vesicle continue afterwards to increase, at the same time that the animal increases; in the adult state, from 100 to 200 otolithes may be counted, and the diameter of the vesicle varies from $\frac{1}{16}$ to $\frac{1}{10}$ of a line.

The development of the auditory apparatus presents the same phenomena in *Physa*, *Paludina* and the terrestrial Gasteropods in general (*Helix*, *Limax*, &c.); the only differences are in the size of the parts.

In the bivalves, the apparatus of hearing only contains a single otolithe of large dimensions, which fills the cavity of the vesicle.

This same arrangement occurs again in the embryo of these mollusks before they issue from the egg; the otolithe, smaller than in the adult, presents, like it, very active oscillatory movements.—*Wiegmann's Archiv*, 1845, p. 217.

Comparative Anatomy of the Vocal Organs of Birds. By Prof. MÜLLER.

The merit of the first examination of the vocal apparatus of birds belongs to Cuvier, to whom is also due the greatest part of the facts relative to its organization. More recently, M. Nitzsch has sought to derive advantage from the examination of the inferior larynx for the classification of birds, which has always been, as is well-known, one of the most embarrassing problems of the natural methods. M. Müller has recently made a long series of observations on the vocal organ of the *Passerinæ*; the results of his labours are as yet only partly known; a detailed description will soon be published in the *Mémoires de l'Académie* of Berlin. Meanwhile we shall here point out some general conclusions of this investigation, which is impatiently looked for, as is everything from the pen of the illustrious Berlin professor.

M. Müller concludes from the facts which he has observed, that the singing *Passerinæ* cannot form a natural division, and, in opposition to the opinion of M. Nitzsch, he affirms that the *Picidæ* cannot be separated from them. The most natural groups of the order of *Passerinæ* contain types which differ in the organization of their larynx, and the variabilities of that apparatus render it little suitable to serve for classification. It is the less so, as the song may be produced by apparatus of very different structure. The order *Passerinæ* must probably be preserved in its most extended limits, comprising even the *Syndactyles* and the *Climbers*, and it must include, both those birds which have the most perfect vocal apparatus, and others in which it seems to be reduced to its greatest simplicity.

The two most common forms of vocal organ among birds are:—1st, the muscular vocalizing apparatus, formed on the type of that of our European singing-birds; 2nd, the form with a single muscle, thick or thin. It is to be remarked, that the first form prevails in Europe and in Africa, and that the second is more common in America. In consequence, the forests of the old world contain more real singing-birds; those of the new world chiefly abound in birds with a loud but little-varied voice, and resound much oftener with shrieks than with songs. Beside these two widely distributed forms, there are many other more special laryngian organizations: the most complicated is that of the *Parrots*.

M. Müller's memoir will contain numerous facts in detail, and engravings of all the forms described.—*Proc. Berlin Academy*, June 1845.

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PRINTED BY RICHARD AND JOHN E. TAYLOR,
 RED LION COURT, FLEET STREET.

