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

SIR W. JARDINE, BART.—P. J. SELBY, ESQ.,
DR. JOHNSTON,
DAVID DON, ESQ., PROF. BOT. KING'S COLL. LOND.,
AND
RICHARD TAYLOR, F.L.S.

VOL. VII.

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.
1841.

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

CONTENTS OF VOL. VII.

NUMBER XLI.

NUMBER XLIV.

NUMBER XLV.

Page

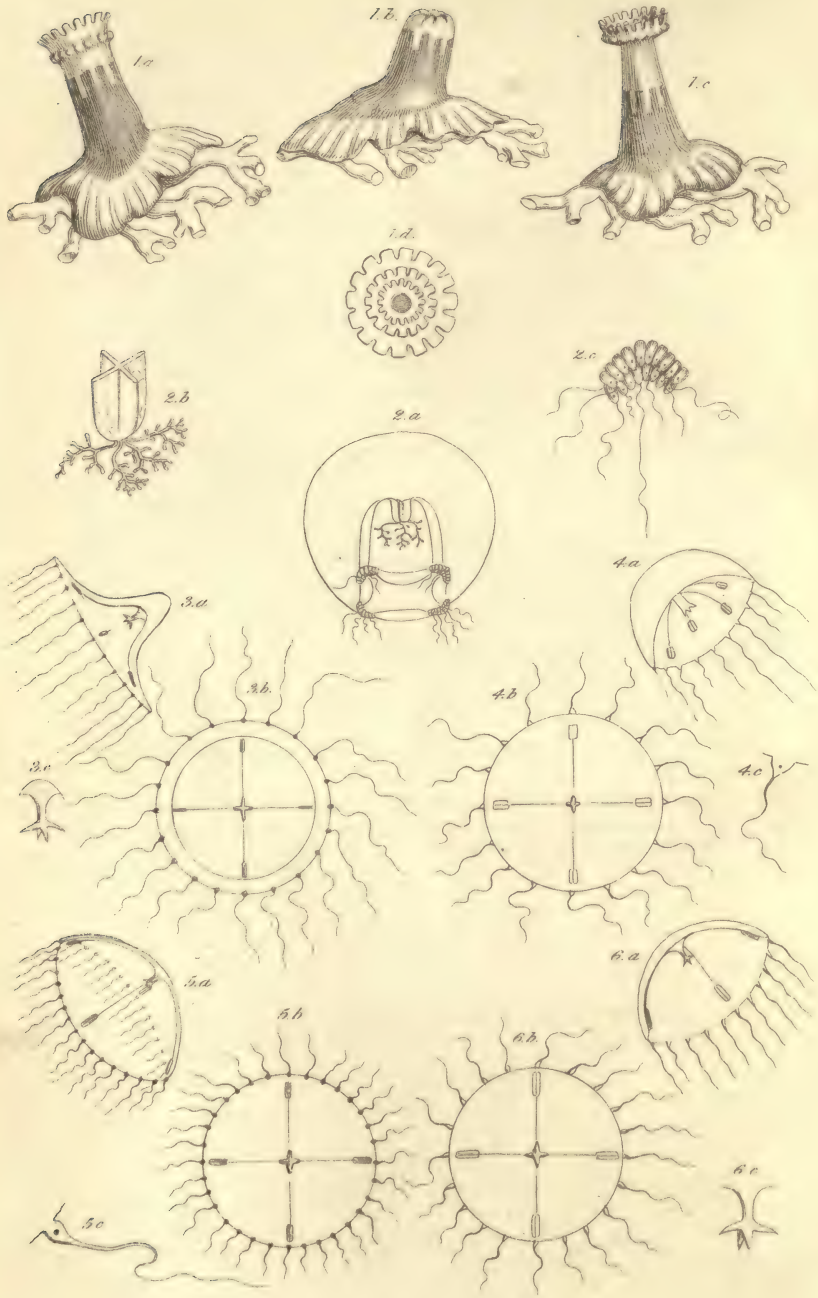
NUMBER XLVI.

NUMBER XLVII. SUPPLEMENT.

PLATES IN VOL. VII.

* In Plate VI. this figure is by mistake given as *Coryne squamata*. It is, in reality, a representation of *Flustra carnosa*, Johnston (see p. 369), of which it is a correct figure, with the exception of the number of the tentacula, which should have been 30.

Erratum, p. 373, line 33, for *Coryne squamata* read *Flustra carnosa*.



British Actiniadæ.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 41. MARCH 1841.

I.—*Considerations respecting Spur-shaped Nectaries, and those of the* Aquilegia vulgaris *in particular.* By M. Ch. Morren, Professor in ordinary at the University of Liége, Member of the Royal Academy of Brussels, &c.*

[With a Plate.]

THE Columbine, that pretty ranunculaceous flower of our woods, deserves attention, as well on account of its structure, curious as it is, and, we venture to add, but little known, as from the historical recollections which it brings to mind. To say nothing here of the medicinal virtues which Dioscorides attributed to his *Isopyron* or to his *Phasiolon*,—a plant which Fabius Columna, Clusius, Dodonæus and many other learned botanists suppose to be no other than the Columbine itself; and not to mention Adrian Junius, who also quotes it as a medical plant; or Francois Rapard, a celebrated physician of Bruges, who addressed to Clusius a letter upon its uses in difficult labours; ought we not to remark that its singular nectaries, compared by some to the beak and talons of an eagle, by others to the graceful neck of the pigeon, by some to rams'-horns, and by others to capuchins' hoods, had so gained the attention of the painters of the middle ages, that it became one of the favourite flowers, placed in great profusion in the illuminations of missals and manuscripts of the time? The '*ancoiles*' or the '*ancolyes*' were there intermixed with the leaves, flowers, or fruit of the strawberry or of the campanula; and Memling was most particularly attached to it. When Dodoens wrote his "Cruydt-Boek," the name *Aquileia* or *Aquilina* was still a novelty *just introduced*, he says, by the latest phytographers of his own time. The name *Aquilegia*

* Translated from the original communicated by the Author.

which he gives it calls to mind the comparison already mentioned, of the beak and talons of an eagle; but since that time that of *Columbine* prevailed in England and in Holland, where they were fonder of likening the spurred petal of this flower to the stately neck of a pigeon. When one of these flowers is turned upside-down, says an English author *, we might fancy we saw a group of young eagles, or, if we like better, a nest of pigeons. It is evident that these spur-shaped nectaries had considerable influence on the mind of Dodoens, since on their account he places his *Akeleyen* (*'ancolies,'* columbines,) between the *Cypripedium Calceolus*, a monocotyledonous plant, and his *Orant* or *Antirrhinum majus*,—an alliance which would not at all square with our present ideas of classification by families. By a singular chance, the *Cypripedium*, which in our mythological language we call the *Venus's foot*, was at that period of religious struggles called *Our Lady's shoe* (*Calceolus Mariæ*), and the *Columbine* was named in its turn *the Virgin's glove*: thus we see that shoes and gloves shook hands in our Lady's toilet.

Chief ornament of the gardens of the middle ages, and even of those of the sixteenth century, the *Aquilegia*, carefully and almost universally cultivated, produced those varieties which modern botanists have pointed out in this species. Joost van Ravelingen, the commentator of Dodoens, and L'Obel †, mention the varieties in colour and those of form to be met with in their time: blue, red, flesh-coloured, blue and white, white and variegated. The garden of a gentleman of Leyden, Jean van Hogelande, produced an *Aquilegia pleno flore roseo*, which Clusius described and illustrated. The same botanist had also recorded a variety truly monstrous (*Aquilegia degener*), in that the petals, being reduced to their primitive type of leaves, had remained green; only Van Ravelingen did not think that such monstrosities were worth the pains of describing. Now-a-days we should be eager to do it, and not without reason; for the organography of such a flower is very interesting to know, in relation to the subject which will occupy us further on.

The varieties of structure known under the name of *Aquilegia vulgaris corniculata*, in which Biria ‡ and DeCandolle § discovered that the cornets are deviations of the anther,

* Burnett's Outlines of Botany, p. 840.

† Generally written Lobel; but the true name of the author of the *Stirpium Historia* was Matthias De L'Obel, as appears from his letters and the portrait engraved during his life-time.

‡ Biria. Monographie des Rénonculacées. Montpellier, 1811.

§ DeCandolle. Organographie, tom. i. p. 496.

and those which bear the name of *Aquilegia vulgaris ecalcarata* or *stellata*, in which, according to these authors, the petals proceed from modified staminal filaments without anthers—these varieties had been already described by Clusius, Dodoens and L'Obel*. Moreover, these authors, besides the simple, semi-double and double varieties of these two principal forms (true sub-varieties which we still possess), also mention Columbines with inverted flowers (*Aquileia floro inverso variegato*). We might suppose, from the Dodonæan context, that it was hereby understood that the flowers, instead of being pendent, were upright ..... "die niet en verschillen van de ander dan dat de bloemen averechts staen." But we know that in this variety, the bases of the spurs being twisted, the spur itself has an upward direction.

We cannot but take an interest in observing the pleasures of the horticulturists of those times. Now-a-days these Columbines are treated with disregard, and dismissed as fit only for the garden of the cottager or village Curé, or, at most, are only permitted to grow in the shade of some forgotten nook of our villas; but let us not say too much: fashion, which revives all antiquated things, may some day assert its claim upon these Columbines of the Castels. Already in the Botanic Garden at Brussels, we have seen pretty borders entirely filled with this plant of the middle ages.

The Columbine is really a very interesting flower, on account of its nectaries; and their genesis not being known, at least so far as we are aware, we have taken them as the principal subject of our researches: our object has been to study them comparatively in the different varieties of the common species, and in some other species which we had at hand; secondly, to observe the monstrous structures; thirdly, to take them at their different degrees of evolution, in order to establish their true genesis; and, lastly, to examine their histology, so as to ascertain how in their forms so varied the interior tissues were affected.

So long as the laws of metamorphoses had not acquired the right of citizenship in the domains of science, calcariform nectaries had to be considered as special pieces, born *ad hoc*, and being such by their proper nature, without an anterior nature, without a type from which they were derived. Although Linnæus had said, "*Si nectarium a petalis distinctum, communiter ludit*;" he also said, "*distincta esse nectaria a corolla constat exemplis: Aconitum, Aquilegia*," &c.†.—They were, then, the floral pieces whose secretion of honey determined

* Dodoens. Cruydt-Boek, 1644, p. 274.

† Linnæi Philosophia Botanica: Fructificatio i. 110.

their character, and that character raised them to the rank of organs *sui generis*, not proceeding from any other:—they were, because they were.

They were, however, not nectaries, because by their nature they were stamens: here is that truth which science had not then become possessed of.

But when, at the end of the last century, Gœthe, following the example of Wolff, established his celebrated theory of the metamorphosis of plants, the nectaries at once lost their autochthonous nature; they were no longer aboriginal organs. On the contrary, in this new theory the nectaries became essentially organs of transition, mere forms of anterior organs; they were, in short, *intermediary organs of passage between the petals and the stamens**. In the spirit of this philosophic method, it was necessary to understand, that in order for the petal to become a stamen, in an ascending metamorphosis, it must previously pass through the form of a nectary. Moreover, Gœthe, who took precisely the Columbine as the example of one of the most remarkable and most striking transformations, considered, as he says, the cuculliform nectaries of this flower as a derivation from the petals†. We shall see, on the contrary, that the progress of nature is a descending metamorphosis; that is to say, that the nectary is, in its genesis, a stamen, and subsidiarily, that a stamen being developed as such, it may afterwards *turn into a nectary*.

The theory of Gœthe had made too little impression in France to admit of the supposition, that in 1815 Mirbel set out from it when he regarded the nectaries of the Columbine, as well as all organs of the same kind, as anomalous forms of the parts of the perianthium. The spur-shaped cornets of the *Aquilegia* were also, in his eyes, forms of petals; but the anomaly attacking all the petals at once, the flower remained *regular* ‡. It was one of the *successive alterations of types*, and in the Columbine particularly this alteration was created in order to become an organ of secretion. A glandular lamina existed for this purpose at the bottom of the cornet-shaped petals §. The petal was the type.

This lamina we have never found; and in the *Aquilegia glandulosa*, the *Aquilegia atrata*, &c., we have seen that there only exist one, or two, or three cornets without the regularity of the flower being perverted, as is the case in the *Nasturtium*,

* Gœthe. Œuvres d'Histoire Naturelle. Edition de Martius et Turpin. Paris, 1837, p. 226.

† Ibid, p. 228, chap. 56.

‡ Mirbel. Elémens de Physiologie, vol. i. p. 269.

§ Gœthe. Œuvres d'Histoire Naturelle. Edition de Martius.

Tropæolum, or the Lark's-spur. The great German poet's notions had not indeed at first all possible success in this country. Willdenow always asserted that the spur (*calcar*) was more an organ intended to preserve the nectar than to prepare it, and that it was furthermore a sacciform elongation of the corolline corona*. The first of these facts is evidently erroneous. The second was also admitted by Jacquin.

Sprengel, when opposing Vaillant, who had also himself declared that the nectary was always a production of the corolla, placed the spurs of the Columbine in his class of *Nectarothecæ*, and characterized by the presence of the secreting gland at the bottom of the cornet. Moreover, it never occurred to his mind to investigate the anterior nature of this apparatus in the *Passifloreæ*, in the Aconites, and a multitude of other plants; he sees only peculiar *little machines*, more or less ornamented: *machinulæ peculiares . . . . . eleganter coloratæ*†.

DeCandolle, in 1819, adopts this view of the subject; but the spur, according to him, is of a very different nature,—an elongation, one while of the calyx, one while of the corolla, one while of the perigonium; but the stamens are still excluded from the floral organs which may produce this nectary‡. However, a year before, the celebrated botanist of Geneva had positively declared that, in the *Aquilegiæ corniculatæ*, without regard to species, the supplementary spurs arose from a modification of the anthers which lengthened downwards; moreover, he recognises the origin of the *stellated* varieties from the abortion of the anthers, and from the hypertrophy of the filaments; and lastly, that the scales which are situated between the carpels and the stamens are stamens without anthers, and with dilated and membranous filaments§. Biria had made known the former facts‖. In 1827 these ideas were again brought forward in the *Organographie végétale*¶. They are, undeniably, the most accordant to the real state of things.

Among the most recent authors we may mention Kurr, who places the spurs of the Columbine with his *nectarostigmata*. A very curious remark of this accurate writer is, that the greenish glands which secrete the nectar at the bottom of

* Willdenow. Grundriss der Krauterkunde, cap. 86–88. (Terminologie.)

† Linnæi Phil. Bot. edit. Sprengel (notes). Fructificatio 110.

‡ DeCandolle. Théorie élémentaire, p. 406, § 395.

§ DeCandolle. Systema Regni Vegetabilis, vol. i. p. 333.

‖ Biria. Histoire naturelle et médicale des Rénoncules, 1 fasc. Montpellier, 1811.

¶ DeCandolle. Organographie, vol. i. pp. 484—496.

the spurred cornet, do not begin to afford this sugared liquid until precisely when the first anther blows. The secretion lasts only as long as the stamens are capable of performing their functions, and at the end of three or four days the flower leaves off this ejection of fluid and of pollen, and drops the organs which produced both the one and the other*. This curious remark is quite correct; we have verified it. From this we might be led to suppose that the secretion of the nectar, which is here so intimately connected with the functions of the stamens, becomes necessary to the action of the sexes; but from ten unblown flowers, where there had been neither dehiscence of the anthers, nor secretion of nectar by the spurs, Kurr cut away those organs: the further development took place without any difference, and these flowers bore as many and as large fruits as they ordinarily do; the seeds germinated as usual†. This experiment gives great support to those who consider the nectar as being only a true excretion, comparable to our urine, and which is of no use, at least in the great majority of cases, in the process of fecundation, as was generally supposed. Kurr, however, does not give his opinion as to the proper nature of the spurs.

Lindley, in his new edition of the 'Introduction to Botany,' (1839) no longer gives (to the great regret of the friends of deep scientific research) the interesting and useful part on morphology; but this judicious author, in his edition of 1832‡, had published some very curious details upon the *Aquilegia vulgaris*. "The petals of this plant," says he, "consist of a long, sessile, purple horn or bag, with a spreading margin, while the stamens consist of a slender filament, bearing a small, oblong, 2-celled, yellow anther. In single and regularly-formed flowers, nothing can be more unlike than the petals and stamens; but in double flowers the transition is complete. The petals which first begin to change, provide themselves with slender ungues: the next contract their margin, and acquire a still longer unguis: in the next the purple margin disappears entirely; two yellow lobes like the cells of the anther take its place, and the horn, diminished in size, no longer proceeds from the base, as in the genuine petal, but from the apex of the now filiform unguis: in the last transition the lobes of the anther are more fully formed, and the horn is almost contracted within the dimensions of the connective, retaining, however, its purple colour: the next stage

* Kurr. Untersuchungen über die Bedeutung, &c. Stutgard, 1833.

† Ibid, p. 128.

‡ Lindley. Introduction to Botany (1832), p. 515.—[Ed. 1835, p. 536.]

is the perfect stamen. No further evidence," says our author, "can, I think, be required of the formation of stamens out of petals."

We see that Lindley had here followed the impulse given by Gœthe, and that he looked upon the cuculliform petals (Richard) as proceeding towards the formation of the stamina by an ascending metamorphosis. At present the spur is no longer in his view anything but a modified petal*. A discovery which we cannot dispute with him, since the germ of it appears in his words, is that the horn of the Columbine is really a lengthened connective,—a thing which we shall also establish by direct proofs hereafter.

Although G. W. Bischoff, Professor of Botany at Heidelberg, does not give this morphological genesis of the spur in the *Aquilegia*, still this author helps to lead us to believe that this is really the means which nature employs, in what he has remarked respecting the metamorphosis of the nectar-bearing horns of the *Helleborus fœtidus* into normal stamens†. Link sees nothing in the spur but a continuation of the petal, characterized by the presence, at the end of its cavity, of a cellular gland, but of which the cellules have walls thicker than ordinary,—a thing which we take the liberty of not admitting‡. After M. Vogel of Bonn had sent me his elegant memoir on the development of the parts of the flower in the Leguminosæ§, the study of the formation of calcariform or cuculliform nectaries, according to the glossology of Richard||, became still more interesting. Indeed, Schleiden and Vogel having proved, by their labours, that it is not merely in idea, as a mental abstraction, that we are to see in the floral organs nothing but the axis of the plant and its leaves, but that this axis and its green leaves are really and substantially found, placed regularly in the very small buds, we thought that the investigation of the genesis of the nectaries in the Columbine could not be without scientific interest. DeCandolle came to consider these horn-shaped nectaries as anthers, by comparison; Lindley came to the same conclusion by the observation of teratological cases; it was become therefore curious to test these views *à priori* and *à posteriori* by organogenic proofs: and this is what we have proposed to ourselves.

* Lindley. Introduction to Botany (1839), p. 169.

† Gottlob Wilhelm Bischoff. Lehrbuch der Botanik, vol. i. p. 404. (1833.)

‡ Link. Elementa Philosophiæ Botanicæ, vol. ii. p. 130.

§ Schleiden und Vogel. Beitrage zur Entwickelungsgeschichte der Blumentheile bei den Leguminosen. (Act. Nat. Curios. vol. xix. p. 1.)

|| Richard. Nouv. Elémens de Botanique, 1838, p. 333.

Let us see, first, what takes place in a flower of *Aquilegia vulgaris calcarata.*

1. *Metamorphosis of the stamen into a spur-shaped nectary.*

The stamen of the Columbine has a thread-shaped filament slender, flexible and yellow, and a two-celled anther with parallel cells, slightly swelled, opening with a slit and united by a narrow connective, the whole yellow. The connective is even hardly visible (Plate XI. fig. 1).

In many flowers, we find along the spire which leads insensibly from the andrœceum to the corolla, stamens which turn into nectaries. To bring this about, the filament enlarges at its base; the connective is, at the opposite pole, the other organ which becomes modified, and it is even the most active of all in this transformation. It enlarges above, by separating the two loculi of the anther, and it grows to a point. This is not slow in becoming bifurcate, so that the connective is soon bilobate. (Figs. 2 and 7.)

To this modification, which up to this period does not attack the regularity of the organ, two ways of transformation succeed. In the one, one of the loculi of the anther disappears, in the other it remains visible with its fellow. The first of these modifications might induce a belief that *the spur is a sac formed by one half of an anther or by a loculus,* but this genesis is but a deceitful appearance. The second way of transformation proves *that the spur is a sac-shaped connective, and that the two lobes of its limb represent the two loculi of the anther originally united by this same connective.*

If such a spur-shaped nectary can be obtained, as from its nectar-secreting gland is truly a nectary, and that in it the two lobes of its limb exist as an elongation of the two anther-cells, still visible enough to attest their presence, it is clear that this second way of transformation should be admitted. Now this is precisely what experience confirms. In the Columbine we find this form, not so frequently as the first, it is true; but it is found, and that is all that is necessary. This case we have delineated (Plate VII. fig. 6). On a stamen thus modified, besides a well-formed filament (*c h*), we find the two loculi of the anther, still bearing pollen, but which open more widely (*a b*), separated by a small connectival eminence (*c*). Each of the swellings which represent the anther-cells produces an elongation in form of a thick margin (*e*), which, reaching from the inside to the outside, goes to form the circumference of the two lobes of the cornet (*d g*), separated by a slit (*f*). Each lobe corresponds to a cell, and originates from it; it is only indeed that same cell length-

ened. Lastly, *i* represents the belly of the cornet, and at *k* we find the gland which, for its part, secretes whilst the pollen no longer issues from the loculi, and little by little its structure is annihilated.

This case of metamorphosis not only proves, as we said above, that the two lobes of the cornet of the Columbine are derivations from the cells of the anther, but it puts out of doubt that the tube of the cornet is the lengthened connective. A circumstance which we must not lose sight of in this philosophic study of a metamorphosed flower, is that the nectar-bearing gland, an organ of emission, and which rids the flower of its excess of carbon, is found at the opposite pole to the pollen-bearing loculi, other organs of emission which also excrete from the individual, but in this case for the preservation of the species, a substance eminently charged with carbon. At the two poles then the same function exists, but the one does not begin till the other ceases; that is to say, the nectarial gland does not exist or become developed until the pollen apparatus wastes away and becomes obsolete. This subject certainly merits a reflection; even should I be accused of seeing, in Botany, more than my own eyes *can* see, and especially should I be accused of allowing to myself, in a science of observation, some stretch of imagination. For my part, I could never comprehend how inquiry into the truths of nature should put aside the understanding, and reduce it to a state of inaction which would render it useless. Behind and above facts I always conceive something superior and anterior; for facts are *effects*, and it is to the knowledge of *causes* that we ought to endeavour to come. Now here, in the particular problem which occupies us, I see a verification of the law of *organic compensation* and a realization of the *unity of composition*. Thus, the *nectaries* are ONE with the *stamens*, the *stamens* ONE with the *leaves*, the leaves ONE with themselves, as autochthonous organs. So much for the law of *unity*. Moreover, the *gland* is at the *end* of the nectary, because, by its nature a stamen, the *pollen* is at the other *end*; there is a change in the product, but not a change of nature, and by the side of this law of *polarity* there is that of *compensation*; for, in proportion as the anther-cell closes to render the pollen *abortive*, there is a development of the gland which begins to secrete the nectar; the evolution of the gland brings on the *atrophy* of the cell, but, fundamentally, there always remains an apparatus of *emission*.

Let us return to the Columbine: we have said that one way of transformation, and it is the most common one, would lead to a belief that the nectar-bearing sac may be in some instances the representative of a loculus of the anther. From

a slight examination we should in fact conclude so. As a proof of this, see the states delineated figures 3, 4, 5 and 6. We often see a stamen, with a filament dilated at its base, take two horns above (*c d*), whilst one loculus of the anther, inflated, no longer yields pollen; and the other, being atrophized to such a degree as no longer to appear except as a yellow gland (*b*), seems to have produced a rounded sac (*e*). This sac, the commencement of the cornet, should we not suppose it to be a modified anther-cell? and yet we have just seen that the tendency of the cells is to produce the lobes of the limb of the cornet, and not its tube. There is a mistake, indeed, as to the true signification of this enlargement, which is nothing but the middle of the connective itself. The connective extends itself outwards, and its hypertrophy brings with it the atrophy of the cells or of one cell of the anther; it signifies little whence substance comes to it, so that it only come. This is why the production of the spur does not always cause the whole anther to be metamorphosed all at once.

The better-formed cornets, and which even possess all the essential parts,—expanded limb, apex with two lobes and a slit, dilated faux, lengthened tube and terminal gland; these cornets, I say, sometimes still exhibit a trace of their old and primitive nature in the anther-cell, hardly visible, but distinguished by its yellow colour, whilst all the rest is white and blue, and, above all, distinguished by the grains of pollen that it still encloses in its bosom (fig. 4).

The conditions (figs. 5 and 6) are tendencies towards a regularized form of well-constituted nectaries. The condition (fig. 6) is that found in the common *Aquilegiæ*. Nothing here would lead to the supposition of an antherine nature, had not this strange metamorphosis been followed step by step.

It is evident, that all these cornets being hollow, and developed one above the other in several spirals (fig. 16), all likewise enter one into another (fig. 8), but it is inexact to say that then the glands no longer secrete. This is a mistake: the secretion continues, and, indeed, the tubes never completely close those into which they have entered.

Let us now examine in what manner the cornets are generated in a flower of *Aquilegia* taken at its first periods of development.

2. *Organogeny of the spur-shaped nectaries.*

To ascertain this organogeny, we have followed the method employed by Schleiden and Vogel. Taking a very young bud, which had hardly attained the length of a millimeter and

a half (fig. 10), we took off its calyx in water and with very fine needles. The central part then showed itself as a little sphere, whereon the stamina, having just quitted their form of green foliary gibbosities, now assumed that of two parallel protuberances (figs. 11 and 12). Upon these the connective is proportionally more developed than at a later period (fig. 12); the filament is dilated and very small; the anther is proportionally much larger, but it is still discoid, so that it is easier to discover in it the form of the blade of a leaf.

We were very curious to ascertain what the petals then were. The specimen which we dissected was one which would have had two rows of cornets. Now one of these rows (the exterior one) was formed by small circular laminæ, barely provided with a support, but these laminæ exhibited the same constitution as the anthers of the stamens described above (fig. 14): in fact, two gibbosities, representing the anther-cells (*a*, *c*); a very broad connective (*b*); and around all this a disc (*d*), of which, moreover, the trace also exists on the anther of a stamen proceeding in its development as such.

Here it is impossible to mistake the primitive staminal nature of the organ which at a later period is to become a hood-shaped petal, that is to say, a cornet-shaped nectary. It is evident that, after the first condition of the flower,—that in which all the parts were still cellular tubercles, similar to the primitive condition of a leaf,—the nectarial petal, before becoming such, was similar to a stamen. This is what caused us to say above, that the *spur-shaped nectaries of the Columbine did not produce stamens by ascending metamorphosis, but that they were, on the contrary, stamens modified by a descending metamorphosis.* In short, before being petals, they are rather stamens, or at least anthers, than anything else.

The row of small scales, which also become hood-shaped petals, but placed higher, exhibits at this age of the flower a more complete disappearance of the anther-like form. The anther betrays itself there only by the dilatation of the blade and its attenuated border (fig. 13 *b*), but there is but one common gibbosity in the place of the two parts which represented the loculi.

We took a bud three millimeters long (fig. 15), and stripped it of its calycinal envelopes. The stamens in this were better constituted, the filaments lengthened, the connective proportionally more contracted, and the loculi very distinct (fig. 17). The petaloid blades, on the contrary, were very broad, hardly pedicelled; but in the middle there is still the trace of the connective (*b*, fig. 19), and on the sides two protuberances, not so large, but prominent enough to discover in them the anther-

cells (fig. 19, *a*); traces or waves which incline us to suppose that there is a lateral extension of these cells to produce the petaloid lamina (fig. 19, *c*). It is evident that this is the anther flattening and dilating itself in order to become the petaloid lamina; and hardly does a bud attain the length of five millimeters before the laminæ are hollowed into tubes; and the spur-shaped nectaries, already making a projection outwards between the sepals of the calyx, are all formed (figs. 20 and 21).

This examination proves that, *in the genesis of the spur-shaped nectaries, Nature first forms a leaf, then a stamen, and that she converts the anther of this into a petal, at first flat and then hood-shaped.*

The nectary is then always a derivation from the stamen —*a descending metamorphosis of the stamen.*

This is precisely one of the facts which we have stated above. If it be to the detriment of the anthers that these singular spurs are produced in the Columbine, it was also a matter of interest for us to inquire if the laminæ noticed by DeCandolle between the carpels and the stamens are in reality abortive stamens. It is known that this author was in doubt concerning the nature of these organs. "One might say," he writes, in his 'Organography *,' "that they are either abortive stamens or interior petals." The latter opinion would be contrary to all the laws of Morphology previously established, for the corolline apparatus is exterior to the andrœceum. However, to ascertain the true nature of these lamellæ, we have had recourse to an organogenic examination.

In a bud three millimeters long, we found these lamellæ composed (fig. 18) of a distinct base and summit. The summit is formed of two lateral swellings (*a b*, fig. 18), between which is a projecting lamella (*c*, fig. 18). The base is lamelloid and winged, with a nervure in the middle (*d*, fig. 18). There is here evidently a staminal structure: the swellings are the loculi of the anther, the projecting lamella the connective, and the lamelloid base the filament.

Now, in a well-developed flower, nothing remains of this summit, which becomes a true continuation of the lamella of the base. Thus the filament suffers hypertrophy, especially in breadth, and the anther, on the contrary, suffers atrophy. The base carries away the summit; the one pole as it dilates diminishes the other.

The *lamellæ* of the Columbine *are* then really *stamens modified by the annihilation of the pollen-bearing apparatus, and by the super-development of the filament.*

* Vol. i. p. 484.

It now became interesting, after these researches, to study what takes place in the tissues when the anther becomes a nectary. Our observations upon this we comprise in the following third chapter.

3. *Histology of the nectary.*

The anther is, as appears from the observations of Purkinje, Mirbel, &c., an apparatus characterized by a peculiar form of tissue. The endotheca, formed by fibro-cellular cells (inenchyme), hence affords a valuable means of distinguishing the part which the tissulary elements perform in metamorphoses. We were, for our part, greatly desirous of ascertaining this, after observation had convinced us that one stamen will change its nature and become a petal, and notwithstanding, will show in its interior tissue its first destination; whilst another stamen will modify its tissues along with its exterior form. We shall instance here, for the first of these cases, what we have seen in the *Reseda odorata, mediterranea, lutea, luteola,* &c. Our readers no doubt remember the interesting discussion on the nature of this flower between Dr. Lindley on one side, Mr. Robert Brown and Mr. Henslow on the other. Now in these flowers it is evident that the white filaments, which we have discovered to be the only organs of odour in this fragrant flower, are but modified stamens*. Indeed, we find in their interior, and especially at the upper end, an inenchymatous tissue, formed of fibre-bearing cells similar to those of the endotheca of an anther of the same plant,—indeed, identical with them. Now we do not think that a petal, properly so called, contains a similar tissue, excepting in some genera of *Orchideæ,* as the *Catasetum.* The staminal nature becomes quite evident by means of this entirely endothecal anatomy. In other plants, as for example in the *Pæonia officinalis,* where the stamen becomes a petal, nothing similar takes place. The tissue of the modified part is decidedly either altogether staminal (inenchymatous), or altogether corolline (cellular).

Purkinje had already made known the form of the inenchymatous cells of the endotheca of the *Aquilegia Gleberi*†. The fibres are radiated, oblique, and unite at the centre in a plate. The endothecal cells of the *Aquilegia vulgaris* (Plate XI. fig. 22)

* There is often a monstrosity in the *Reseda* which causes atrophy in the white filaments or the fringes of the petals. Then the flower is without any scent. No sooner are these fringes developed than the perfume begins to be perceptible. White colour in plants is often the indication of an agreeable scent. Here it is the stamens that grow white, in order to send forth a perfume.

† De Cellulis Antherarum fibrosis, p. 55. tab. xv. fig. 15.

are the same. They are stars, with diverging rays, to the number of eight or ten, which, seen from above, resemble the actinenchyme of Hayne. The junction of the radiating fibres takes place on a large plate (fig. 22, *b*).

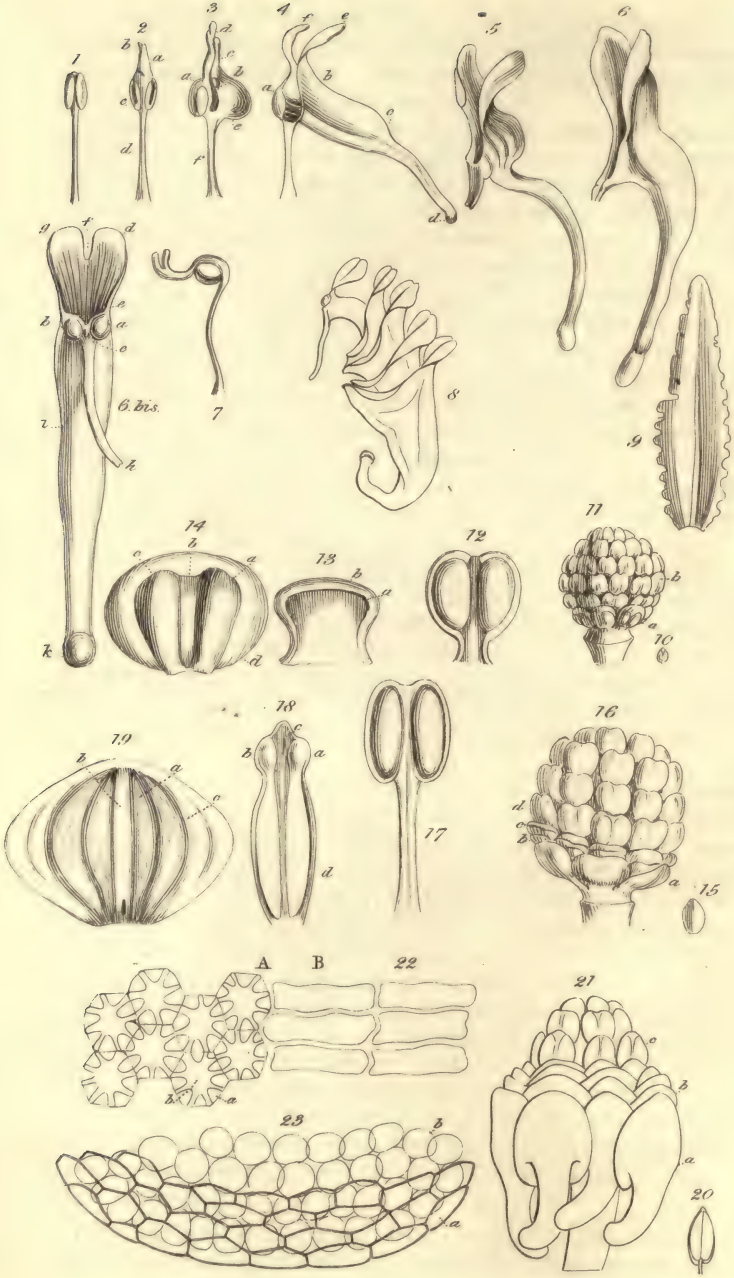
What becomes of this inenchymatous tissue in the metamorphosis of the anther into a spur? Does it continue with its form, as in the *Reseda*, or does it disappear, as in the *Pæonia*? With respect to this, observation shows, that the fibriferous cells lose their fibres at the same time that they change their form: from having been sphærenchyme this tissue becomes pinenchyme (fig. 22, A and B); and whilst the cell, from being spherical as it had been, becomes tubuliform, the fibre is resolved and disappears; its colour changes from yellow to blue, and instead of a star, only a blue liquid is seen there, without granules. I did not observe that the cytoblast, although my attention was especially fixed upon it, acted the least part in this histological metamorphosis.

When the spur is formed, the nectar-bearing gland appears like a mass of rounded cells (fig. 23 *b*), smaller and rounder than those of the derm (fig. 23 *a*).

The vascular system of the connective, on the contrary, performs an important part in this succession of changes of form, structure and function. Restricted at first, constituted by few fibres, in which we see fine tracheæ, hard to be unrolled, and pleurenchyme, this system soon divaricates its anastomoses, and fibres may be perceived in various directions, which, united, form an apparatus much larger than the primitive state.

It is evident from these researches, that the metamorphosis of the anther into a spur, that the change of the pollen-bearing apparatus into the nectar-bearing apparatus, attack the deepest tissues, and that if a morphological metamorphosis takes place, an histological metamorphosis takes place also. If the functions change, there is, as we see, a phænomenal translation of this change by that which exists most intimately in the organization—the tissular constitution. Cases of metamorphosis, indeed, only become interesting to the physiologist, when he comes to know what at the same time is passing in the tissues. We may therefore say here, that *if, in the Columbine, the connective forms the nectar-bearing spur, this change leads to the metamorphosis of the inenchyme of the anther-cells into parenchyme*, and that *the metamorphosis attacks in as great a degree the entire organism as the tissues which compose it.*

We have now to add a few words relative to the varieties of *Aquilegiæ* called *stellated.* DeCandolle attributes the peta-



Aquilegia vulgaris.

Ch. Morren del. J.D.C. Sowerby sculp.

loid form of the petals of these varieties to their being formed only by the filaments of modified stamens in which the anthers are abortive. This would be an hypertrophy of the staminal filaments. We would not venture to say that this is exact: on the contrary, we think that the petaloid and not cuculliform laminæ of the *stellated* Columbines are also in reality only modified connectives, and we rest this opinion on the fact that the genesis of these laminæ presents in the young flowers the same primary forms as the cornets: these are at first stamens without filaments, but with enlarged anthers. This point alone is decisive; but upon the *Aquilegia atrata* we have often found flowers where the laminæ form their spur by slow degrees. This spur, at first a cavity, afterwards a canal, then a tube, then at last a cornet, originates at the base of the laminæ, so that the greater part of these represent the two lobes of the cornets of the *Aquilegia vulgaris calcarata*, which lobes we have shown to be nothing but the extensions of the two anther-cells. We think, therefore, that it is to the anther also that the petaloid lamina is owing. On a flower of the *Aquilegia atrata* we have seen a well-formed lamina without a trace of spur; the following one had a simple protuberance, the third a tube, the fourth a half-spur, and the fifth an entire spur. All this was the result of a simple elongation of the base of the lamina: now, if this were not an anther in its nature, it would be difficult to admit that the filament could produce the same organs as the anther, and the more so as the facts previously established prove that the gland represents, as to function, the pollen-bearing loculus, and the nectar the pollen, whilst the cornet is really the connective. The filament, when it suffers hypertrophy, as is the case in the white lamellæ near the carpels, gives birth to no product; whilst, on the contrary, the petaloid laminæ produce a nectary, and subsequently nectar. Organogeny, morphology, and the metamorphoses, unite then in leading us to think, that *in the stellated Columbine the spurless petals are modified anthers and not filaments, and capable, as such, of elongating themselves directly into spur-shaped nectaries under many circumstances.*

EXPLANATION OF PLATE XI.

Fig. 1—8. Metamorphoses of the stamen into a spur-shaped nectary. *Fig.* 8 only is of the natural size; the others are magnified three times in diameter.

Fig. 2. Stamen at its first period of metamorphosis.
a. Lengthened connective. *c.* Anther-cells.
b. Bifid point of the connective. *d.* Filament.

Fig. 3. Stamen still more metamorphosed.
a. A very distinct anther-cell.
b. Rudiment of the second. *d.* Lamina of the connective.
c. Connective. *e.* Sac or beginning of the spur.

Fig. 4. Stamen almost entirely modified.
a. Loculus of the anther. *c.* Its belly.
b. Spur-shaped sac. *d.* Nectarial gland.
e. Lobe, and *f.* the other lobe of the limb.

Figs. 5. and 6. Ulterior modifications of the stamen, where the nature of the spur is well determined.

Fig. 6. *bis.* Spur-shaped nectary, where the staminal nature has left all its traces.
a. and *b.* Loculi of the anther.
c. Intermediary part of the connective between the two loculi.
d. Lobe of the limb of the nectary.
e. Marginal extension of the anther-cell.
f. Fissure of the limb. *g.* Another lobe of the limb.
h Filament or support of the nectary.
i. Spur. *k.* Nectarial gland.

Fig. 7. Stamen where the connectival elongation is the most evident.

Fig. 8. Insertion one within another of the spur-shaped nectaries.

Fig. 9. One of the lamellæ situated between the stamens and the carpels of the common Columbine.

Fig. 10. Bud of the natural size, in which the formation of the stamens was observed.

Fig. 11. Andrœceum of this bud, considerably magnified.
a. and *b.* Very young stamens ; their anther alone is visible.

Fig. 12. Stamen of this andrœceum separated, greatly magnified.

Figs. 13. and 14. Young petals of this bud (fig. 10).
a. Disc. *b.* Margin.
c. Prominence indicating the anther-cells.

Fig. 15. A rather larger bud.

Fig. 16. Andrœceum and flower of this bud deprived of its calyx.
a, b, c. Petaloid laminæ. *d.* Stamens.

Fig. 17. One of these stamens considerably magnified.

Fig. 18. One of the laminæ situated between the stamens and the carpels.
a, b. Traces of the anther-cells.
c. Connective. *d.* Filament.

Fig. 19. Young petals of this bud (fig. 15).
a. Traces of the anther-cells.
b. Connective. *c.* Lamellary margin magnified.

Fig. 20. A much larger bud of the natural size.

Fig. 21. The same stript of its calyx, considerably magnified.
a. Nectaries. *b.* Their fitting into each other. *c.* Stamens.

Fig. 22. Portion of the anther-cell dissected for the purpose of seeing its tissues.
A. Endotheca. B. Exotheca.
a. Endothecal cell. *b.* Its fibre.

Fig. 23. Tissues of the nectarial gland.
a. Exterior cellular tissue. *b.* Interior cellular tissue.

II.—*On the Fungi of the Neighbourhood of Bristol.* By Mr. H. O. Stephens.

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

Gentlemen,

Since the publication of my paper on the Mycology of the neighbourhood of Bristol in the Number of the Annals of Natural History for December, 1839, vol. iv. p. 246, I have gathered the following species, a few of which have not been, I believe, as yet mentioned as British:

Agaricus Clypeolarius, Bull. Flax; Bourton Coomb, Somerset.

Ag. olivaceo-albus, Fries. Leigh Wood.

Ag. pachyphyllus, Berk. Under oak trees, Leigh Wood.

Ag. imbricatus, Fries. Fir plantations, Bourton Coomb.

Ag. blandus, Berk. About way-sides, and in ditches among leaves, Stapleton, &c.; not an uncommon species.

Ag. inamœnus, Fries. Bourton Coomb.

Ag. murinaceus, Bull. Leigh Wood.

Ag. butyraceus, Bull. Bourton Coomb.

Ag. confluens, Pers. Woods, common.

Ag. undatus, Berk., *Ag. insititius*, Fries, Epicrisis Syst. Mycolog. vol. i. p. 386, No. 48. Leigh Wood, on the ground in mossy places.

Ag. ulmarius, Bull. Rather general on elms in the autumn of 1840. Brunswick Square, Bristol. Redland.

Ag. palmatus, Bull. On a decaying tree, Leigh Wood, growing in great numbers, tiled one above another, on the upper branches of the tree. Agreeing with Withering's description of *Agaricus fœtidus*.

Ag. validus, Berk. Stapleton Wood.

Ag. cinnamomeus, Linn. Leigh Wood, not abundant.

Ag. cinnamomeus, Bolton, tab. 22. This Agaric, though known to Purton and Withering, seems to be quite a puzzle to our best modern mycologists. Greville and Berkeley consider it to be a state of *Ag. fastibilis*. Having found a few plants under oak trees in Leigh Wood this autumn, I am enabled to say positively it is not a state of the last-mentioned plant. I do not draw up a character at present, because the plants were old. Bolton says it abounds about Halifax, but I suppose it must be a local species, or it would be better discriminated. It must bear the name of *Ag. pseudo-cinnamomeus*, given by Nees ab Esenbeck in his Commentary on Bolton's Fungusses appended to Willdenow's translation of that work.

Ag. bombycinus, Schæff. On an old hawthorn tree, Ashley.

Ag. stipatus, Pers. Ditches, Stapleton, Leigh Wood, not uncommon.

Ag. Candollianus, Fries. In dense clusters where trees had been felled, Stapleton.

Ag. papilionaceus, Bull. On dung, Stapleton, &c., not uncommon.

Ag. Boltoni. On cow-dung, Stapleton Wood.

Ag. radicatus, Bolt. On flower-pots in green-houses.

Polyporus armeniacus, Schæff. On decaying branches, Leigh Wood.

Boletus viscidus, Linn. Pileus pulvinate, scrobiculate, dirty yellowish white, copiously covered with slime. Stem scrobiculate below the ring, above the ring reticulated, the reticulations formed by imperfect tubes covered with slime, and of the same colour as the pileus. Flesh dingy white, with a tinge of dirty yellow; when bruised turning verdigris-green, hence *B. ærugi-nascens*, Secretan fide Fries. Pores large, adnate, angular, compound, clay-coloured. The veil is permanent, as in *Boletus Grevillei*; but a portion frequently remains round the edge of the pileus, forming a shiny web as in the division *Limaceum* of Agarics. A species not before detected in Britain.

Hydnum membranaceum, Bull. On sticks, Leigh Wood. *Hyd. fimbriatum*, Pers. Ditto.

Hydnum fusco-atrum, Fries, Epicris. Syst. Mycolog. vol. i. p. 515, No. 66. On decaying wood, Leigh Wood.

Clavaria fusiformis, Sow. Leigh Wood, &c. Not very rare.

Leotia lubrica, Scop. Stapleton Grove. Abundant last autumn.

Peziza granulosa, Schum. Pers. Mycolog. Europ. vol. i. p. 225, No. 14. On the naked earth in a beech wood, Stapleton, summer. Not before detected in England.

Pez. echinophila, Bull. Pers. Synop. p. 661, No. 97. On decaying pericarps of the *Castanea vesca*. Cunnegar, near Dunster, Somerset. I have likewise received it from Mr. Berkeley.

Pez. claro-flava, Grev. On a stick, Stapleton Wood.

Pez. furfuracea, Roth. On hazel stumps, Leigh Wood.

Phallus caninus, Hudson. My plants were not inodorous, as stated by Withering, but detestably fœtid. The uteri are frequently found empty. Leigh Wood.

Nidularia crucibulum and *striata*. Leigh Wood.

Sphæria lateritia, Fries. On the gills of *Ag. Necator*, Leigh Wood, this autumn. At first glueing the gills of the Agaric together with a white substance, in which state it is with difficulty discriminated. The contents of the perithecia, which are white, ooze out as in its congener *Sph. aurantia*, giving the plant the frosted appearance mentioned by Fries. The juiciness and decomposition of the parent plant depends upon the original nature of the matrix, for in my specimens the Agaric is dry and shrivelled.

Sph. fibrosa. On blackthorn, common. *Sph. Trifolii*, Pers. Ditto. *Sph. aquila*, Fries. On rotten sticks, Stapleton. *Sph. ovina*, Pers. On decaying stumps, Leigh Wood.

Sph. pulveracea, Ehr. On dry wood, Leigh Wood. Doubtful.

Sph. vagans, var. *Rumicis*. Everywhere. *Sph.* (*Depazea*) *Antirrhini*. Kingsdown.

Phoma circinans, Berk. Species nova, on *Yucca gloriosa*. Abundant in gardens. This plant was determined by Mr. Berkeley,

to whom I sent it with an erroneous name. An analogous species occurred on *Dracæna fragrans.*

Phacidium Patellæ, Tode. On stems of *Conium maculatum*. Unexpanded.

Cenococcum geophilum, Fr. Underground, amongst the roots of *Bryum hornum*, Stapleton. I have received it from Mr. Berkeley.

Stilbum tomentosum, Schrad. On *Trichia clavata*, Leigh Wood.

Puccinia Glechomatis, DeCand. On ground-ivy, Durdham Down. *Puc. variabilis*, Grev. On *Leontodon Taraxacum*, Minehead. *Puc. Lychnidearum*, Link. On *Lychnis diurna*, Stapleton. *Uredo caricina*, Schleich. Epidermis ruptured on *Luzula sylvatica*, Stapleton. *Uredo Caryophyllacearum*, Johnst. On *Stellaria graminea*, Minehead, accompanied by a dark brown *Puccinia.*

Omitted.—*Thelephora arida*, Fries. On the bark of oak trees, Leigh Wood ; it is not confined to the bark, but spreads over the interior of hollow trunks in wide patches.

Since my first catalogue was published, I have been indebted to the politeness of Mr. J. E. Gray, of the British Museum, for the use of the System of Fries, and Sowerby's Figures, and to Mr. Berkeley for some corrections. I therefore take this opportunity to rectify some errors in the former Catalogue:—*Cantharellus confluens* is a small, densely crowded variety of *Canth. sinuosus*, Fries, *Helvella floriformis*, Sowerby. *Thelephora amorpha* is doubtful. *Sphæria incana*, mihi, is *Sph. coprophila*, Fries, Syst. Mycolog. vol. ii. p. 340, No. 37. It had not previously been detected in England, and therefore was not described by any British author.

HENRY OXLEY STEPHENS.

Terrell Street, Bristol, Oct. 15, 1841.

III.—*Description of Four Bats taken in Cuba.* By DR. GRUNDLACH*.

VESPERTILIO *barbatus*, Grundlach. Pale, chestnut-brown, tips of hair on the upper side darker. Near the muzzle provided with very short hairs, and defined by a curve of longer hairs extending from one angle of the mouth to the other, and which at the mouth angle form a kind of beard. Between the nose and this curve of hairs there is still a smaller interrupted one on the nasal bridge. Ears somewhat prolonged to an obtuse point. Tragus at the base narrow, then expanding, its inner angle curving in a point.

Entire length 2″ 3‴. Length from the tip of the nose to the commencement of the tail 1″ 3‴, consequently, length of tail 1″. Spur 3‴. Breadth 6‴. Thumbs 1‴ long.

Found in buildings of the Cafetal St. Antonio el Fundador.

* Communicated and translated by Mr. W. Francis, A.L.S., from Wiegmann's Archiv. 1840. Part IV.

Nos. 2 and 3 form a new genus*, which I propose to call

LOBOSTOMA. *Lobed-mouthed.* The characters are:

Above and below 4 incisors, the upper ones are of unequal size; viz. in the centre are two large double, and at the sides a small simple tooth; and molars not yet examined, as I did not wish to destroy the only specimen I have as yet taken. Upper margin of the muzzle very prominent, and forms, with two membranaceous folds at the side of the nose, a surface directed obliquely downwards, in which the nostrils are likewise situated. Inferior lip, besides the true lip, has two membranaceous folds one behind the other: the anterior one furnished with warts, and the posterior one consisting partly of one piece, partly divided in the middle. Ears separated. Tail for the greatest part hidden in the interfemoral membrane, the apex free beyond the produced membrane.

LOBOSTOMA *cinnamomeum*, Grundlach. Above dark, beneath a light cinnamon-brown. The base of the hairs everywhere fainter. Face with blacker hairs. Ears short, wide, rounded, at the inferior margin fringed with hairs, which are likewise perceptible on the folds in the ears. Tragus short, on the inner side with an incisure. Nasal ridge bald. Upper lip furnished towards the angles of the mouth with longer cinnamon-brown hairs, with silky lustre. Anterior lip-leaf somewhat elongate, 4-angular, posteriorly bipartite, each part with an indentation in the centre. The nose, leaves of the lower lip, margins of the ear and wings, are blackish brown. The hairs form a cavity above the nose and beneath the chin.

Length of the entire body 3″ 5‴. Length of body from the point of the nose to the commencement of the tail 1″ 10‴. The tail is, down to where it becomes free, 10½‴, the free portion is 2‴ in length. The interfemoral membrane extends from where it becomes free 8½‴ further. Spur 8½‴ long. Breadth 10½″.

The only specimen was taken flying about in the evening in the room of the Cafetal St. Antonio el Fundador.

LOBOSTOMA *quadridens*, Grundlach. Colour of fur pale brownish gray, the tips of the hairs on the upper side darker. About the throat the colour passes more into yellow. Ear-aperture wide. Upper margin much elongated to an obtuse point. Above, at the posterior margin, it is somewhat waved. The lower half of the front margin is expanded; the expansion itself forms four little teeth. The front lip-leaf extends to the angle of the mouth, the hind one is undivided and but little shorter than the front one, on which its margin rests. The warts of the front one are only present in the centre. The membranaceous folds on the sides of the nose projecting at their upper margin to a point. Nose above naked. Wings, nose, lip-leaves and margins of ears blackish brown.

Length of the entire body 1″ 6½‴, of the tail in the membrane

* The genus appears to be the same with Gray's *Chilonycteris* (Ann. Nat. Hist. iv. p. 4); but the species are undescribed, and differ from *Chi. MacLeayii*, Gr., which was likewise found in Cuba.—Wiegmann.

$6\frac{1}{2}'''$, without it $3\frac{1}{2}'''$, of the interfemoral membrane from the becoming free of the tail $7\frac{1}{2}'''$. Of the spur $7\frac{1}{2}'''$. Expanse of wings $8''\ 3'''$.

Hab. same as the former.

4. Rhinopoma *Carolinense*, Geoffr. As, from want of a good description, I am not certain with regard to the determination, I will communicate the description of the animal in my possession.

Fur brownish gray. Above darker than beneath. Base of the hairs whitish. Ears wide, naked, only haired outwardly at the cohesion, and inwardly in front where the concavity commences. 6—7 warts on the front margin of the ear. Furnished with longer bristle-hairs on the nasal bridge, at the toes of the hind feet, and at the anus and sexual orifice. Lip large, projecting far beyond the inferior lip. Wings blackish brown. The membrane between the anterior and posterior legs is, in the vicinity of the body, beset with small tufts of hairs. The margin of the interfemoral membrane has, in the neighbourhood of the tail, two tooth-like projections, of which the exterior one originates from the end of the spur. Tragus 4-angular, at its inner margin somewhat sloped. Length of the entire animal $4''$, of the body from the tip of the nose to the commencement of the tail $1''\ 11'''$, of the tail $2''\ 1'''$. Usually the tail is inclosed $8'''$, and free $5'''$. Spur $9'''$ long. Breadth $9\frac{3}{4}''$.

Hab. During daytime, beneath the roofs at Fundador.

IV.—*Horæ Zoologicæ.* By Sir W. Jardine, Bart., F.R.S.E. & F.L.S., &c.

No. IV. *Remarks on the Structure and Habits of* Lepidosiren annectens.

As stated at the commencement of these 'Horæ,' and implied by our motto*, we consider them intended to convey whatever information, whether partial or complete, may come in our way, and tend to illustrate zoology. The appearance of Professor Owen's important and carefully wrought paper upon *Lepidosiren annectens*, printed in the last volume of the Transactions of the Linnæan Society†, had been some time looked for, and the interest which its perusal excited was still further heightened by the loan of the other specimens of the remarkable animal which Mr. Weir discovered on the Gambia, and which have been kindly trusted for some time in our possession by the sister of that gentleman, now residing in Edinburgh. Upon examination of these specimens, some of the external parts appeared to vary from the figure and description given by Mr. Owen; and as every observation relating to the structure of an animal so curious must draw out some inference associating with those around it, we shall describe them minutely. But for the sake of those who may not have access to the valuable Transactions alluded to, which, through the various changes incident to scientific societies, especially

* See Annals, vol. iv. p. 160. † Vol. xviii. part 3. p. 327.

to such as are now becoming venerable from long duration, have maintained their standard excellence both in illustrations and in the high character of communications, and also for the sake of our correspondents in distant countries, it may be right, first, shortly to run over the history of this singular genus, and the results at which Mr. Owen has arrived in his recent examinations.

The genus *Lepidosiren* was formed by Professor Natterer, from an animal discovered in the rivers, or rather in the swamps of South America. Two specimens only were obtained; the one was found in a swamp on the left bank of the river Amazon, the other was taken in a pond near Borba, on the river Madeira, and they were described in the 'Annals of the Museum of Vienna,' under the generic title above named. In 1837, specimens of a remarkable animal were brought from another continent, the vicinity of the river Gambia, in Western Africa, by Thomas C. B. Weir, Esq.; and one of them being presented to the Royal College of Surgeons in London, has served Mr. Owen for the account which has just now been published*.

In its skeleton the Gambia species is partly osseous, partly cartilaginous; the bodies of the vertebræ, for instance, are not ossified. The articular surface of the lower jaw presents a more complicated structure than is usually observed in Fishes and Reptiles. The ribs are thirty-six pairs, all simple, slightly curved slender styles. The tentacles or rudimentary fins are many-jointed; the colour of the bones is green, and altogether it offers a most singular and interesting combination of the cartilaginous and osseous types. The muscles of the trunk present all the simplicity and uniformity characteristic of the class of Fishes. There are no pancreatic cæca. The intestine is traversed throughout by a spiral valve. The branchiæ resemble in form those of the *Siren*, consisting of separate elongated filaments, attached only by one extremity to the branchial arch; but these extremities are fixed directly to the branchial arch, and not to a common pedicle extended therefrom, as in the *Siren*. Viewed with a moderate lens, the tripinnatifid structure is beautifully seen in each branchial filament. Thus, although these organs correspond in all essential points with those of the true Fishes, yet the gills approximate, in their filamentary form, to those of the Perennibranchiate Reptiles. The female organs of generation present

* When making out the elaborate Catalogue for the learned body to which he belongs, the generic name of *Protopterus* suggested itself, but the perusal of Dr. Natterer's paper led him to believe that it was generically identical.

a grade as high as that which characterizes the Plagiostomous Fishes; while the elongated form of the ovaria and the convoluted disposition of the oviduct resemble more the same parts in the *Axolotl, Amphiuma* and *Siren.*

In all its organs, with a single exception, it is considered as almost intermediate in structure; that exception exists in the organ of smell, a character "which is absolute in reference to the distinction of Fishes from Reptiles. In every fish it is a shut sac, communicating only with the external surface; in every reptile it is a canal, with both an external and internal opening."

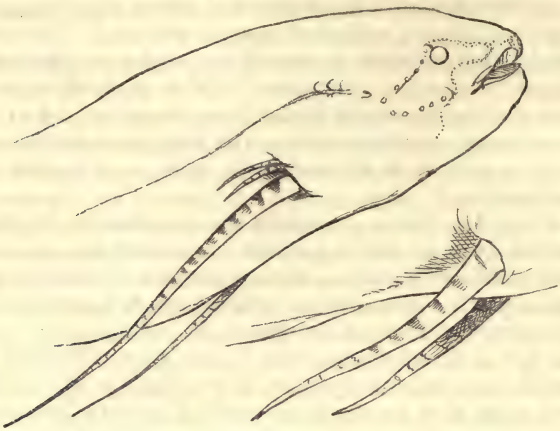
Further, Mr. Owen considers the *Lepidosiren* as typical of a new family, and forming a link to connect the higher Cartilaginous Fishes with the Sauroid genera *Polypterus* and *Lepidosteus*; at the same time, it makes the nearest approach in the class, to the Perennibranchiate Reptiles.

The specimen which we have examined was in total length $8\frac{1}{2}$ inches, and the body was more thickly and decidedly spotted than that represented in the Linnæan Transactions. The spots extend as far forward as the origin of the upper fin, but are continued still further in indistinct cloudings; they take the form of irregular blotches, and are largest, most distinct, and in greatest numbers near the caudal extremity; this may be a variation incident to the animal, in the same way that the spottings on various other fishes seldom agree. The caudal fin or membrane arises gradually from the body, and the scaling is continued apparently as far as the rays reach; above this it becomes like a thin membrane, delicate and transparent, and terminates in a minute and fine point. The whole appearance in fact of this part is more like that of the membrane which is produced at certain seasons upon some species of *Triton.*

The extremities, or fins if they may be so termed, present some differences when compared with Professor Owen's figure and description. They are each regularly barred with brown, or probably, in a living state, with dark olive. In the description alluded to, "the pectoral tentacles" are said to be "somewhat shorter and more slender than the ventral ones; the former are two inches, the latter two inches four lines in length*." In our specimen it is just the reverse: the principal ray of the pectoral tentacle is attenuated to a thread-like point, and is 2 inches long; the posterior is only $1\frac{5}{8}$ths inch in length. They also present another discrepancy: the principal pectoral tentacle is accompanied above by two short and still more rudimentary members, which do not seem to have been

* P. 330.

present in Mr. Owen's specimen. They are of equal length, about $\frac{3}{8}$ths of an inch, and are barred as in the other; but not



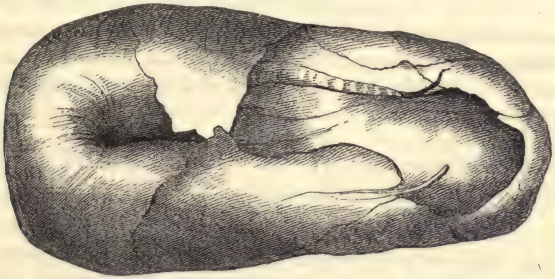
being permitted to make any dissection, it has been impossible to determine whether they were also supported by cartilaginous rays; it is probable that they may not, or that they are very slight, but their presence seems important, as presenting a passage even more modified from the true fin composed of several rays, to the state of a single tentacle destitute of any palmation or approach to the structure of a more perfect extremity. The posterior tentacle is single, but is much more strongly formed than the long ray of the anterior; it presented no other differences except in comparative length. Can the additional pectoral tentacles be a sexual difference?

The pores and ducts upon the head are disposed nearly as we have endeavoured to represent them in the woodcut. They are very large, and supply a large quantity of mucus necessary for, or at least assisting in, the preservation of the animal when it has retired from, or is deprived of, its native element. Above and in front of the eye they are tortuous and apparently continuous canals, and run backwards to commence the lateral line; and there is an angular one above where each nostril is situate, the place of which can easily be detected by looking with a magnifier at the snout, placed between the observer and the light.

The progressive motions of this creature we should conceive to be performed entirely by the caudal or posterior half of the body, their direction being regulated by the tentacles. We can fancy them to be very nearly similar to those of the Tritons,

which advance by a wriggling or sculling motion of the tail, and direct themselves by their small anterior members, which also are used to assist in raising themselves in the water upon any body or plant, and we should scarcely consider these members at all applied or used as organs of touch.

If the structure of this animal is remarkable, so also are some habits in its œconomical history, but we have to regret that our information on these points is still very imperfect. Miss Weir, in allowing us to examine the specimens of the fish, accompanied them with the following note, and a piece of the hard clay alluded to in the Transactions of the Linnæan Society *, bearing the impression of the animal as if it had lain for some time imbedded in it, and with the earth in such a state as to allow the form of the cast to be retained: "Fish taken in the summer of 1835, on the shore of Macarthy's Island, about 350 miles up the river Gambia. They were found about eighteen inches below the surface of the ground, which, during nine months of the year, is perfectly dry and hard, the remaining three months it is under water. When dug out of the ground



and put into water, the fish immediately unfold themselves and commence swimming about." They are dug up with sharp stakes and are used for food; the accompanying woodcut represents the manner in which they are folded up at the time they are procured; it is drawn of the natural size, from a second specimen preserved in spirits, which seemed to have been rolled up in dried leaves, or in the leaves which might have accumulated at the bottom of the water of the inundated ground; several adhered to it, and were kept in their place by means of a large supply of mucus which still invested the specimen, and may serve as a provision to assist in preserving life during the torpidity or hybernation of the animal.

Note.—Since writing the above observations, we have perused the important paper by M. Bischoff from the translation published in a late number of the 'Annales des Sciences Na-

* Note in vol. xviii. part 3. p. 328.

turelles.' The South American species which is there treated of seems to be in several points even more nearly allied to the Cartilaginous Fishes than that from Africa, particularly in the structure of its almost cartilaginous skeleton, and in the spiral intestinal valve, which, from additional observations made by MM. Bibron and Milne Edwards, appeared to be still more developed than in the *L. annectens*. But it has been found to differ from the last, and from Fishes, in an important particular, that of the heart possessing a double auricle; and also in the rays of the tentacles being of one piece, and not jointed. The structure of the nostril we consider as entirely analogous to that of the organ in Fishes: it is not a respiratory organ in *L. paradoxa*, the double opening is only similar to the valvular separation of the sac in Fishes, and, from the structure of the muscles, would seem to act somewhat similarly, and they will cause the passage to resist or promote the flow of the water through it. The position of the opening to the lungs or air-bladder is also of importance in the consideration of this question, and is in favour of its reptile alliance; but all the modifications of form must be balanced with each other, and additional dissections are required of *L. annectens*, which it may even yet be found necessary to separate and place in Mr. Owen's proposed genus *Protopterus*.

V.—*Commentary on* Mr. G. R. Gray's '*Genera of Birds.*' 1840. By H. E. Strickland, Esq., M.A., F.G.S., &c.

[Continued from vol. vi. p. 423.]

P. 26. The date of Thunberg's genus *Brachyurus* (1743) seems to be a misprint; but not knowing in what work it is defined, I am unable to rectify it.

Myiophonus ought, I think, to be placed among the *Turdinæ* near *Petrocossyphus*.

The Rock Thrushes were first defined by Boié in 1822, under the name of *Monticola*, and afterwards altered by him in 1826 to *Petrocossyphus*. The former name ought therefore to stand, as authors ought no more to alter their own generic names when once published than those of others. But should there be any insuperable objection to the name *Monticola* (of which I am not aware), then the name *Petrocincla*, Vig., 1825, has the next claim. Bonaparte divides the Rock Thrushes into two genera, *Petrocincla* (*P. saxatilis*) and *Petrocossyphus* (*P. cyaneus*). There seems not to be sufficient ground for this separation; but if adopted, a new name should be given to *P. cyaneus*, because the name *Petrocossyphus*, Boié, is a *mere synonym* of *Petrocincla*, Vig., and should therefore be cancelled.

P. 27. *Turdus novæ-hollandiæ*, Gm., is quoted by Mr. Gray as

the type both of *Oreocincla* and of *Aplonis* (p. 40). I cannot at the moment ascertain to which of these genera this bird really belongs, having no specimen of it at hand.

The genus *Cichla*, Wagl., belongs to the *Troglodytinæ*, near *Merulaxis*, and its specific name, *atricapilla*, Lin., should be used instead of *longirostra*, Gm.

The name *Aipunemia*, Sw. (αἰπὺς and κνήμη) should be written *Æpycnemia*.

The genus *Malacocercus* (not *Malacocircus*) belongs to the *Sturninæ* rather than the *Crateropodinæ*. The form and colour of the bill and legs show a close affinity to *Acridotheres*. Is not *Timalia Somervillei*, Frankl., a synonym of *Malacocercus striatus*?

P. 28. It is not easy to say where the genus *Icteria* should be classed, but it is clearly out of place among the *Crateropodinæ*, which, when reduced within their natural limits, seem confined exclusively to the old world.

Tanagra capensis, Sparm., seems to be a synonym of *Corvinella corvina*, Shaw (which in that case should be called *C. capensis*, Sparm.). It is certainly not a synonym of *Keropia crassirostris*.

Mr. Gray seems to have omitted the genus *Stenorhynchus*, Gould. (Proc. Zool. Soc. pt. iii. p. 186.)

The genus *Mimeta*, Vig., cannot, I think, be separated from *Oriolus*. Several modern authors have reunited the two genera.

P. 29. The name *Criniger*, Tem., 1820, should be used instead of *Trichophorus*, Tem., which is a later alteration.

The name *Hæmatornis*, Sw., 1831, ought not to supersede the prior name *Ixos*, Tem. Mr. Swainson, in his 'Classif. Birds,' vol. ii. p. 24, discards the genus *Ixos*, Tem., because it is artificial, i.e. it contains species not naturally allied. This is a reason why it should be *restricted*, but not why it should be *cancelled*; for if this principle were admitted, we must discard nearly every generic name of Linnæus. If then the name *Ixos* be used for this restricted group, the word *Hæmatornis* may be retained for the genus of *Falconidæ* so called by Vigors in December 1831 (*Spilornis*, Gray).

After a careful study of the genera *Querula* and *Lipangus*, I feel satisfied that this sub-family *Querulinæ* should merge into that of *Pyroderinæ*, Gray (*Coracinæ*, Sw.), and secondly, that the *Pyroderinæ* should be placed under the family *Ampelidæ* instead of *Corvidæ*. Notwithstanding what Mr. Swainson says (Flycatchers, p. 73) as to *Coracina* (*Pyroderus*, Gray) being merely the representative among the Crows of *Querula* among the Flycatchers, yet the proportion of parts and total structure of these two birds are so nearly identical, that it is almost a question whether they should be even generically separated. Further, on comparing these birds and *Lipangus* with the *Ampelidæ*, and taking also their geographical range into consideration, it will, I think, be evident to the untheoretical naturalist that the family *Ampelidæ* is their proper abode. The rictal bristles at first sight form an objection, but of these we see traces in several genera of the *Ampelinæ*.

It is very doubtful whether *Lanius nengeta*, Lin., can be quoted as synonymous with *Xolmis polyglotta* (Spix), mihi. On comparing a specimen of the latter with Brisson's description of his *Cotinga cinerea* (the foundation of Linnæus's *Lanius nengeta*), taken from Marcgrave, I find neither the black eye-streak nor the white tail-covers which are mentioned by Brisson. That author, moreover, omits to mention the black streak on each side of the chin, and the white basal spot on the remiges of *X. polyglotta*.

P. 30. *Knipolegus* should be written *Cnipolegus* (*k* not being used in Latin).

Vieillot's name *climazura* being of the same date with Spix's name *mystacea* (not *mystax*), and the former word being *dog-Latin*, it is better to call the bird *Fluvicola mystacea*, Spix.

The *Gubernetes forficatus*, Sw., is the *Muscicapa yiperu* of Lichtenstein, not his *M. vetula*, which last bird is the *Milvulus longipennis*, Sw., and *Muscicapa pullata*, Bon., figured in Spix, vol. ii. pl. 18. The type of *Gubernetes* should therefore be called *G. yiperu* (Licht.), unless Vieillot may have given it an earlier name in quoting Azara.

The generic name *Pitangus*, Sw., 1827, should be used instead of *Saurophagus*, Sw., 1831.

Mr. Gray has transposed the specific names attached to the genera *Saurophagus* and *Scaphorhynchus*. The type of the former genus is the *Lanius sulphuratus*, Lin., and of the latter, *Lanius pitangua*, Lin., both of which are accurately described and figured by Brisson. *Scaphorhynchus pitangua* (Lin.) is the *Megastoma ruficeps* of Swainson, *not* his *M. flaviceps*, as is proved by the words *aurantia* and *fulva*, applied by Briss. and Lin. to the coronal spot.

The name *Tyrannus* was first used *generically* by Lacépède in 1799.

It does not appear why Mr. Gray has changed to *Myiobius* the name *Tyrannula*, defined by Mr. Swainson in 1827, and typified by the *Muscicapa barbata*, Gm.

P. 31. Mr. Gray seems to be justified in imposing his name *Pachyrhamphus* on the restricted genus *Pachyrhynchus* of Spix, the latter name being justly cancelled as a mere synonym of *Tityra*, Vieill.

The genuine *Lanius cayanus* of Lin. and Briss. is not the *Psaris cayanensis* of Swainson, but his *P. guianensis*, distinguished by the naked lores, and by having two-thirds of the beak red. I can find no description of Swainson's *P. cayanensis*, but I infer that he means the species with plumed lores, the beak wholly black, and a small black spot on the chin (*Lanius inquisitor*, Olfers, and Licht. Verz., p. 50).

For *Platysteira* write *Platystira* (the ει in Greek being made *i* in Latin).

P. 32. For *Leucocirca* write *Leucocerca*.

The genera *Culicivora* and *Setophaga* would be more naturally placed among the *Sylvicolinæ*, as is done by Mr. Swainson, 'Classif.

Birds,' vol. ii. p. 58. The length of the legs, the absence of a spurious quill, and the geographical range of these genera show that they do not belong to the *Muscicapinæ*.

The *Cryptolopha poiocephala* should be called *C. ceylonensis*, Sw., as it had been known as the *Platyrhynchus ceylonensis* of Sw. 'Zool. Ill.' nearly twenty years before Mr. Swainson changed its name to *poiocephala*.

I cannot but think it injudicious in Mr. Gray to transpose the names *Butalis* and *Muscicapa*, after Boié and Brehm had referred *M. grisola* to the former and *M. atricapilla* to the latter genus, an arrangement sanctioned by the high authority of Bonaparte.

P. 33. For *Leiothrix* write *Liothrix*.

The name *Pteruthius* of Swainson, to be consistent with etymology, should be written *Ptererythrius* (from πτερὸν and ἐρυθρὸς) ; but should it be thought that this is taking too great a liberty with the original name, we may, at least, venture to write it *Pterythrius*.

The name *Laniisoma*, Sw., 1831, should be used instead of *Ptilochloris*, Sw., 1837. Authors should not be encouraged in changing names, even of their own composition. A father may give his son what name he pleases at baptism ; but once given, the law very wisely pronounces that name unalterable.

For *Phœnicircus* write *Phœnicercus*.

For *Pipraeidea* write *Piproidea*.

P. 34. Mr. Gray has correctly disentangled a difficulty by restoring the name *Procnias* of Hoffmansegg to the *Averanos* (*Chasmarhynchus*, Tem.). The fact is, that Vieillot having in 1816 given the name *Tersa* to a *part* of the old genus *Procnias*, this name ought to be retained for the remainder (the *Averanos*); whereas Temminck in 1820 restricted the name *Procnias* to Vieillot's genus, and gave a name of his own to the *Averanos*.

I may remark in passing, that the genus *Tersa* appears to connect the *Ampelidæ* directly with the *Tanagridæ*.

The name *Bombycilla* was first used generically by Vieillot, not by Brisson.

Ptiliogonys, Sw., should be written *Ptilogonys*.

Cuvier, in his 'Règ. An.' vol. i. p. 363, states that the name *Campephaga*, Vieill., was *subsequent* to his name *Ceblepyris*, but I am not aware in what work the latter name was first published. Indeed, I cannot learn whether Cuvier published *any* new genera of birds between 1802, when the first volume of his 'Comparative Anatomy' came out, and 1817, when the 'Règne Animal' was published. I should be obliged by any information on this point.

The groups *Campephaginæ* and *Dicrurinæ* seem to belong more naturally to the *Laniadæ* than to the *Ampelidæ*.

Lanius ferrugineus, Gm., seems to be incorrectly quoted under *Oxynotus ferrugineus*, Sw. Latham's description of *L. ferrugineus* exactly agrees with a bird in my collection which is clearly a *Dryoscopus*, Boié ; and instead of the dorsal feathers being "very rigid" as in *Oxynotus*, they are very soft and downy.

The permanent specific name of the Malabar *Edolius* should be *paradiseus*, Lin., not *malabaricus*, Gm. It is the *Cuculus paradiseus*, Lin., well figured by Brisson, except that one of the fore toes is reversed in the figure which led to its being considered a *Cuculus*.

Mr. Gray has judiciously restored *Irena* to its place among the *Dicrurinæ*, whereas Mr. Swainson had made it a sub-genus of *Oriolus*.

The earliest specific name of *Corvinella* is (*Tanagra*) *capensis*, Sparm. This bird has also received the names of *Lanius cissoides*, Vieill., *L. flavirostris*, Sw., and *L. xanthorhynchus* of the Munich Museum.

Collurio not being defined as a genus by Brisson, and the name moreover having been applied by Vigors to a different genus, it is better to retain the name *Enneoctonus* of Boié, who was the first to separate this group generically from the true Shrikes.

P. 36. *Cyclarhis* should be written *Cyclorhis* (κύκλος and ῥὶς).

The type of *Telophonus* should be called *T. senegalus* (Lin.). It is the *Lanius senegalus*, Lin., and the *L. erythropterus* of Shaw, not of Linnæus.

Nilaus capensis should be called *N. brubru*, Lath., 1801.

Vanga was first used as a Latin generic name by Vieillot, not by Buffon.

P. 37. The genus *Cracticus*, Vieill. (restr.), ought certainly to enter into the sub-family of *Gymnorhininæ*; for though the hooked beak shows an affinity to the Shrikes, yet the majority of its characters and the geographical range show a strong preponderance in favour of its alliance with *Gymnorhina*, Gray.

Pica colliei, as described by Vigors in the 'Zool. Journ.' vol. iv., can hardly be the same as *Cyanurus bullockii*. Mr. Vigors's bird has the throat black instead of white, and its dimensions differ from those given to *C. bullockii* by Wagler. Mr. Gray must also be wrong in quoting *Garrulus ultramarinus*, Bon., under *Cyanurus bullockii*, as Bonaparte, in his Osservazioni sulla 2da ed. Cuv. Règ. An. p. 84, says that it is synonymous with *Pica sieberi*, Wagl., and *Garrulus sordidus*, Sw.

Is not the name *Dysornithia*, Sw., prior to *Perisoreus*, Bon.?

P. 38. For *Crypsirina* write *Crypsirhina*. To the synonyms of *C. varians* add *Colius viridis*, Lath.

P. 39. *Gymnoderus nudus*, Gm., is the *Gracula fœtida*, Lin., and the latter specific name therefore has the priority.

Is not Buffon's Pl. Enl. 268. the smaller species of *Gracula* (*Eulabes indicus*, Cuv.), and not the *G. religiosa*, as Mr. Gray makes it?

I should prefer placing the *Graculinæ* among the *Sturnidæ*, near *Pastor*, to which group they seem much allied in structure.

The genus *Pyrrhocorax* was first defined by Vieillot, not by Brisson.

To the synonyms of *Corcorax* add < *Pyrrhocorax*, Tem.

P. 40. *Megalopterus*, Smith, must be changed, the name being pre-occupied by Boié for a genus of *Sterninæ*.

If the *Acridotheres roseus* be generically separated from the rest of

that genus, it should bear the name of *Psaroides* of Vieillot, who was the first to point out the distinction, and Temminck's name *Pastor* should be cancelled, being a mere synonym of *Acridotheres*.

P. 41. The genus *Creadion* surely belongs to the *Meliphagidæ*. Is it not identical with *Neomorpha*, Gould?

The name *Sturnella ludoviciana*, Lin., is preferable to *S. magna*, Lin., the latter name being comparative, and only correct when the bird was classed as an *Alauda*. Besides, the name *ludoviciana* is adopted by Latham, Richardson, Bonaparte, &c.

The genera *Sturnella* and *Amblyrhamphus* (*not Amblyrhynchus*), if carefully examined, will be found to belong to the *Icterinæ* rather than to the *Sturninæ*. When thus arranged, the whole of the *Sturninæ* will be confined to the old world, and the *Icterinæ* to the new, thus adding to the numerous instances in which geographical distribution coincides with natural affinities. In the same way I believe it will be found that the characters of *Astrapia* refer it to the oriental group *Lamprotorninæ*, rather than to the American one *Quiscalinæ*, in which Mr. Gray places it.

Is not Vieillot's name *Quiscalus versicolor*, prior to that of *Q. purpureus*, Licht.?

Lesson quotes *Corvus mexicanus*, Gm. (and not *Oriolus*, as Mr. Gray has it,) as the type of his genus *Cassidix*.

The confusion which overhangs several of the black Icterine birds of America is very great, but this is not the place to discuss the entire question. I will therefore merely state that, as far as my investigations go, the *Cassidix mexicanus*, Less. (which, however, is *not* the *Corvus mexicanus*, Gm.) is identical with the *Scaphidura barita*, Sw. If so, the names *Cassidix* and *Scaphidura* being of equal date, we may be allowed to retain the latter, and expunge the mongrel word *Cassidix*. To the *Scaphidura barita*, Sw., I also refer *Cassicus niger*, Vieill., Gal. Ois. 89. (which, however, is *not* the *Oriolus niger*, Gm.). Also note that *Scaphidura barita*, Sw., is neither *Gracula barita*, Lin., nor *Gracula barita*, Lath., Syn. pl. 18, Gen. Hist. pl. 44. The *Corvus mexicanus*, Gm., is, I have no doubt, synonymous with *Quiscalus macrurus*, Sw. (See Fernandez's description of his Hocitzanatl quoted by Ray and Brisson.) The *Oriolus niger* of Gmelin, described by Brisson to be under ten inches in length, is a distinct species found in the West Indies, and called *Quiscalus baritus* by Bonaparte. It is, perhaps, the same as *Quiscalus crassirostris*, Sw. The *Gracula barita* of Linnæus (excluding his quotation of Brisson) seems to be known only from his description, and is *not* the same with *Oriolus niger*, Gm. The *Gracula barita* of Latham, Syn. pl. 18, Gen. Hist. pl. 44, is stated by Bonaparte in his 'American Ornithology' to be identical with *Quiscalus versicolor*, an opinion in which I concur.

Cassicus and *Xanthornus* were first used as genera, not by Brisson, but by Lacépède in 1799.

P. 42. The genus *Euplectes* was first defined by Swainson in 1830 (Zool. Ill. ser. 2.), with *E. orix*, Lin., for its type. Is not this prior to the name *Pyromelana*, Bon.?

Should not the name *Philetærus socius*, Lath., be used instead of *P. lepidus*, Smith?

The restricted genus *Ploceus*, Cuv., if *Loxia philippina*, Gm., be considered its type, will contain the greater part of the genus *Euplectes*, Sw.

P. 43. The genus *Symplectes*, Sw., seems to have a fair claim to generic distinction, a conclusion to which Sir W. Jardine arrived independently of Mr. Swainson, when he gave it the name of *Eupodes*. Mr. Swainson's name, however, was published first, and must therefore be retained.

It appears to me that the genera *Spermospiza*, *Pyrenestes*, *Vidua*, *Estrelda*, *Amadina*, *Spermestes*, and *Erythrura*, ought all to be included in the sub-family *Ploceinæ*. Though the varying development of their beak presents analogies to the *Coccothraustinæ* and *Fringillinæ*, yet their true affinity to *Ploceinæ* is indicated by their peculiarly elevated culmen extending backwards on the forehead, their naked nostrils, their geographical extent, and especially by the spuriousness of their first primary quill, a character often of great value as an index of affinity. Moreover, the genus *Vidua* is directly united to *Ploceus* by means of *V. chrysoptera*, Vieill., and *Ploceus capensis*, Lin.

The *Tanagrinæ* would be better placed at the end of *Fringillidæ*, so as not to separate the *Coccothraustinæ* from the *Fringillinæ*.

There is much confusion in the synonyms of *Tanagra episcopus*, but Mr. Gray is probably right in quoting Pl. Enl. 178. The original *T. episcopus* of Linnæus and Brisson seems to be the *T. sericoptera* of Swainson and the *T. cœlestis* of Spix. It is probably also the *Gracula glauca* of Sparrman, though that bird is said to be seven inches long. The *T. episcopus* of Swainson's Birds of Brazil, pl. 39, seems (judging from the figure) to be only the young of his *T. cana*, pl. 37. The *T. cœlestis*, Sw., Birds Braz. pl. 41, is very different from *T. cœlestis*, Spix, as the wing-covers are green. It is possibly the female of *T. cana*, Sw.

There is no doubt that *Tanagrella multicolor*, Sw., is the *Motacilla velia*, Lin., and the latter specific name should therefore be used.

P. 45. On comparing a specimen of *Leucopygia ruficollis* with Lesson's very short description of his *Cypsnagra hirundinacea*, there can be no doubt of their belonging to the same genus; but as Lesson describes his bird as *blue*-black above, and says nothing of the white on the rump and wing-covers, I think they cannot be specifically synonymous. I would fain for once break through the law of priority in order to get rid of the intolerable name of *Cypsnagra*, Less., a word compounded *more Gallico* out of *Cypselus* and *Tanagra*!

Is not *Emberiza quadricolor*, Gm., an earlier synonym of *Erythrura prasina* (Sparm.)?

Mr. Gray seems to have omitted the genus *Pytelia*, Sw., type, *P. elegans*, Gm., Vieill. Gal. pl. 64.

P. 46. I do not think it advisable to change the name *Pyrgita*, Cuv., to that of *Passer*, "Ray." Ray does not define *Passer* as a genus, but merely applies it to designate the House Sparrow in com-

mon with many other birds to which it has no affinity. The Sparrows were first defined as a genus by Cuvier, who gave them the name by which the ancient Greeks designated them.

To the synonymes of *Montifringilla* add *Chionospiza*, Kaup.

Ammodramus should be written *Ammodromus*.

P. 47. It does not appear why the name *Melophus cristata* (Vig.) is changed to *M. lathami*, Gray. I see no objection to *cristata*, but if there be any, Sir W. Jardine's name *erythropterus* should be adopted.

The name *Cynchramus* was first used *generically*, I believe, by Bonaparte.

P. 48. *Agrodroma rufescens*, Tem., should be called *A. campestris*, Bechst.

P. 49. The family *Musophagidæ*, as here constituted, is a very artificial group. The genus *Phytotoma* should certainly be placed next to, if not in, the sub-family *Tanagrinæ*. Its beak approaches in form near that of *Spindalis*, Jard., and the dentations of the margin, though very peculiar, have a distant counterpart in the beak of *Euphone*. Its South American habitat also favours this view of arrangement.

The *Coliinæ* certainly seem to form a *caput mortuum*, which no analysis has yet been able to bring within the limits of any other family of *Conirostres*. They may therefore be raised to the rank of a family with the title of *Coliidæ*.

The sub-family *Musophaginæ* ought, I conceive, to be placed in the family *Cuculidæ*. It decidedly belongs to the *Scansores*, for live specimens of *Turaco* invariably perch with two toes behind the branch. In the structure of their beak and legs they show considerable affinity to the *Cuculidæ*, especially to the genera *Phœnicophæus* and *Crotophaga*. It will be recollected too that the Cuculide genus *Saurothera* has the bill dentated.

Mr. Gray is quite correct in quoting Edwards, pl. 7, under *Turaco persa* (Lin.). The descriptions of *Cuculus persa* given by Linnæus and Brisson are taken from Edwards, and are based on the very rare species with *a green crest margined with red* (*C. buffoni* of Swainson, but not of Vieillot nor of Jardine, which is the *purpureus*, Less., and *senegalensis*, Sw.). There is a specimen of the true *T. persa* in Lord Derby's collection. The name *persa* is commonly but erroneously given to the species with a *green crest margined with white*. This species has never received a distinct appellation, and I therefore recommend that it be called *T. albocristatus*. Stephens's name *africanus* cannot be correctly used for it, for his description is inapplicable to any known species, and is a *mélange* of the descriptions of *T. albocristatus* and *T. persa*.

P. 50. According to the laws of Latinity, *Tockus* should be written *Toccus*, and *Ramphastos*, *Rhamphastos*.

The genus *Scythrops*, though it reminds us at first sight of the *Rhamphastidæ*, yet is much more nearly allied to the *Cuculidæ*, as shown by the position of the nostrils, the red space round the eyes, the form of the wings and feet, and the geographical habitat. *Phæ-*

nicophæus forms its nearest affinity, but in the pointed wings and colour of the plumage it approaches *Cuculus*.

P. 51. The group *Psittacara*, as defined by Vigors in the Zool. Journ. vol. ii., seems sufficiently distinguishable from *Conurus*, Kuhl, to be retained as a genus.

For *Centrourus* write *Centrurus*. Mr. Gray has mistaken the type of this genus as defined by Swainson, which is the *Nestor meridionalis* (Gm.) (*N. hypopolius*, Wagl., *Psittacus australis*, Shaw, Mus. Lev. 87); consequently *Centrourus*, Sw., merges into a synonyme of *Nestor*, Wagl. The *Psittacus australis* of Latham (*P. concinnus*, Shaw) is hardly to be distinguished generically from *Trichoglossus*, but if made distinct, will require a new name.

P. 52. The specific name of *Psittacodis* should be *paraguanus*, Gm., not *paragua*, Marcgrave, the latter name being antecedent to the system of binomial nomenclature.

For *Poiocephalus* write *Pæocephalus*, the *oι* in Greek becoming *æ* in Latin and *e* in English. (Hence the term *poikilitic*, lately introduced in Geology, should be written *pecilitic*, as we write *economy* and not *oikonomy*.)

Mr. Gray seems to have omitted a genus of *Loriinæ* which wants a name. It is the *Psittaculus* of Swainson, and is typified by *P. vernalis*, *galgulus*, and *rubrifrons*.

P. 53. Mr. Gray very properly restores the name *Agapornis*, Selby, to its true type, from which Mr. Swainson had removed it and applied it to the American group *Psittacula*.

The name *Psittacula* should be quoted on the authority of Brisson, not of Kuhl. Brisson divides the genus *Psittacus* into six subgenera, which, *being based on definitions*, may be retained on Brisson's authority. These are *Ara*, *Cacatua*, *Lorius*, *Psittacus*, *Psittaca*, and *Psittacula*. The name *Psittaca*, however, being too near in sound to *Psittacus*, is not retained.

Pl. Enl. 455. f. 1, quoted by Mr. Gray under *Psittacula passerina*, is the basis of *P. capensis*, Gm., so named from a mistake in the habitat. This bird is named *guianensis* by Mr. Swainson, who considers it distinct from *passerinus*, Lin., which he calls *cyanopterus*. The chief distinction is that the *guianensis*, Sw. (*capensis*, Gm.), has the rump *green*, while in the *passerinus*, Lin. (*cyanopterus*, Sw.), it is *blue*.

The bird figured in Phillips, Voy. Bot. Bay, p. 267, pl. 40, is not the *Calyptorhynchus banksii* (Lath.), but the *C. cookii* (Tem.).

The name *Corydon*, Wagl., cannot stand, as it was pre-occupied in 1828 by Lesson (Man. Orn. vol. i. p. 177). A new name will therefore be wanted for *Corydon*, Wagl.

Psittacus nestor was, I believe, never *published* by Forster under the name of *hypopolius*, consequently the name *meridionalis*, Gm., has the priority.

The sub-families composing the family *Picidæ*, as arranged by Mr. Gray, are not of equivalent value. The *Bucconinæ*, *Picumninæ* and *Yuncinæ* form three groups apparently of equal value, and the Woodpeckers form a fourth; but the *Picinæ*, *Dryocopinæ*, *Celeinæ* and *Co-*

laptinæ are only subdivisions of the group Woodpeckers. These last should therefore bei unted into one sub-family *Picinæ*, or, if divided, they should form groups of a lower denomination than a sub-family.

P. 54. Mr. Gray is quite right in keeping the name *Picumnus*, Tem., for the American group (*Asthenurus*, Sw.), because Temminck evidently regarded this as the type of his genus, making it the first division, and giving the name *abnormis* to the Asiatic group (*Picumnus*, Sw., *Microcolaptes*, Gray).

Mr. Gray quotes Rich. Faun. Bor. Am. pl. 56. for *Picoides tridactylus* (Gm.), but Richardson's bird is the *P. hirsutus* (Vieill.), which Bonaparte considers as distinct from the European *P. tridactylus*.

Hemicircus should be written *Hemicercus*.

It does not appear why a new name is given to the genus *Dendrocopus*, proposed by Boié and sanctioned by Bonaparte, the name *Dendrocopus*, Vieill., being superseded by *Dendrocolaptes*.

The name *Dendromus* is pre-occupied for a genus of Mammalia by Dr. Smith in Zool. Journ. vol. iv. p. 438.

Mr. Gray seems to unite the American *Dryotomi* of Swainson with the European group *Dryocopus*, Boié (*D. martius*), and indeed they can hardly be distinguished in structure, though Bonaparte keeps them separate.

P. 55. The name *Tiga*, Kaup., 1836 (Thierreich, vol. ii. p. 37), must supersede *Chrysonotus*, Sw., 1837. The species will then stand as *Tiga tridactyla* (Sw.).

After the Green Woodpeckers have been distinguished as *Gecinus*, Boié, Swainson's genus *Brachylophus* still includes two well-marked groups: first, the Short-thumbed Woodpeckers closely allied to *Tiga*, containing 1. *P. aurantius*, Lin. (*P. bengalensis*, Gm.); 2. *P. goensis*, Gm.; 3. *P. philippinarum*, Lath.; 4. *P. hæmatribon*, Wagl., and 5. *P. erythronotus*, Vieill. To this group I would propose the name Brachypternus. The remaining group contains the Crimson Woodpeckers, *P. miniatus* and *puniceus*. I am not aware whether Boié includes these species in his genus *Gecinus*; but if not, they may retain the restricted name *Brachylophus*, Sw., which in that case, not being precisely equivalent to *Gecinus*, Boié, would escape obliteration as a synonyme.

It is not easy to decide which of the specific names of *Geococcyx* has the priority. Mr. Swainson states (Classif. Birds, vol. ii. pp. 140, 325), that he named it *longicauda* in the Catalogue of Bullock's Mexican Museum in 1824. If, however, it was merely *named* at that time and not *described*, the name cannot be considered to have acquired a right of priority, as the slovenly practice of merely reciting the *names* of new species without defining their characters (for many examples of which see Lesson's Traité d'Ornithologie) cannot be too much discouraged, as it only tends to choke up the science with synonymes. It does not appear whether Blainville ever *published* this species under the name of *Saurothera bottæ*, and therefore the name *californiana* used by Lesson in his Supplement to Buffon some

time previously to 1831, will probably turn out to have the prior claim to all others.

P. 56. The *Centropus ægyptius* (Gm.) seems to be the same as *C. senegalensis* (Lin.), which latter name will therefore prevail.

The name *Coua*, Levaill., was, I believe, never used as a Latin word, and therefore ought not to supersede *Serisomus*, Sw.

The *Cuculus guira*, Gm., distinguished by having only eight feathers in the tail, ought surely to be generically separated from the "four-winged Cuckoos" (*Diplopterus*, Boié). The former constitutes the group *Guira*, Less., 1831, of which *Octopteryx*, Kaup., 1836, and *Ptiloleptus*, Sw., 1837, are synonymes. The type will stand as *Guira piriragua* (Vieill.), *Cuculus guira*, Gm., *Ptiloleptus cristatus*, Sw.

P. 57. Should not *Ptilonopus* be written *Ptilopus*? (from πτίλον and ποῦς).

Is *Treron*, Vieill., prior to *Vinago*, Cuv.? Cuvier says of the latter name, "Vieillot has changed it to *Treron*."

P. 58. *Turtur* was first used as a generic name by Mr. Selby in 1835.

The name of the first genus of *Gourinæ* should be altered from *Peristera*, Sw., to *Phaps*, Selby, and the second from *Leptoptila*, Sw., to *Peristera*, Sw. In 1827 Mr. Swainson defined an American group as *Peristera*, and in 1835 Mr. Selby defined an Australian group as *Phaps*. So far all was well; but in 1837 Mr. Swainson thought proper to transfer his name *Peristera* to the *Phaps* of Selby, and to give a new name, *Leptoptila* (misspelt *Leptotila*), to the genus which he had previously called *Peristera*. It behoves the advocates of the *priority* principle to discountenance such wanton changes by bringing back these genera to their original designations.

The specific name *jamaicensis*, Lin., should supersede *rufaxilla*, Wagl.

P. 59. I see no reason why the name *Geophilus*, Selby (restr.), should not be retained for the *Columba nicobarica*, as Dr. Fleming did not include it in his genus *Verrulia*, and consequently *Geophilus* is not the precise equivalent of *Verrulia*.

To the synonymes of *Goura*, Flem., add *Megapelia*, Kaup.

Chamapetes should be written *Chamæpetes*.

If *Mitu* be retained as a generic name, it should be Latinized into *Mitua*. Lesson is, I believe, the first author who attached the name of *Mitu* to a genus, and it should therefore be quoted on his authority, not on Marcgrave's.

P. 60. *Syrmaticus reevesi* ought to bear the name of *S. superbus* (Lin.). There can be no doubt that this is the species intended by Linnæus, though his description of his *Phasianus superbus*, taken from Chinese documents, is by no means accurate. We have the authority of Temminck and Sir W. Jardine for this identification.

To the synonymes of *Euplocomus* add *Spicifer*, Kaup., 1836.

The Impeyan Pheasant is the true type of *Lophophorus*, Tem., 1813, and this name should therefore supersede *Monaulus*, Vieill.

The *Phasianus leucomelas*, Lath., if generically distinct, must have a new generic name.

It is not correct to quote *Lophyrus*, Steph., as a synonyme of *Lophophorus*, the word *Lophyrus* being merely a mistake of the artist who engraved Stephens's plate 36, vol. xiv.

P. 61. *Francolinus* was first defined as a genus by Stephens, 1819.

It is to be regretted that the legitimate name *Arboricola* had not occurred to Mr. Hodgson instead of the hybrid word *Arborophila*, but it is too late to change it.

Coturnix was first used generically by Cuvier about 1802.

For *Ptilophachus* write *Ptilopachys*.

The name *Cryptonyx*, Tem., 1815, is prior to *Liponyx*, Vieill., 1816.

P. 62. Brisson does not use *Bonasa* to designate a genus, and the name *Bonasia*, Bon., may therefore be retained.

P. 63. The *Turnicinæ* would range more naturally among the *Tetraonidæ* than among the *Tinamidæ*.

For *Rhyncotus* read *Rhynchotus*.

P. 64. The family *Charadriadæ* ought to be in contact with *Scolopacidæ*, although most modern authors interpose the *Ardeidæ* between them.

It is very doubtful whether *Œdicnemus magnirostris*, Tem., Pl. Col. 387, can be correctly quoted as the type of *Burhinus*, Ill. Latham described a bird under the name of *Charadrius magnirostris*, "*the size of the Golden Plover, bill stout and very broad, resembling the Tody genus.*" From this description Illiger founded his genus *Burhinus*. Wagler, in his monograph of *Charadrius*, quotes Latham's description, and places it among his "species à me non visæ."

He also describes as a distinct species the *Œdicnemus magnirostris*, Tem., under the name of *Charadrius magnirostris*. This bird is described as *from* 17 *to* 20 *inches long, with the beak much longer, stronger and more compressed than the other Œdicnemi*, and it seems therefore quite distinct from *C. magnirostris*, Lath. Lesson, however, unites the two in his genus *Burhinus*, and in order to admit Temminck's bird he greatly modifies the original definition of that genus; for instead of the "*Rostrum latum, depressum*" of Illiger, we find in Lesson "*bec très comprimé sur les côtés.*" It would seem then that the true *Burhinus* of Illiger, if such a bird really exists, has yet to be discovered, and that a new generic name is wanted for the *Œdicnemus magnirostris* of Temminck.

To the synonymes of *Ortygodes*, Vieill., add *Ortyxelos*, Vieill.

The *Hemipodius nivosus*, Sw., has the neck and breast ferruginous with white spots, and is therefore perhaps distinct from *Ortygodes meiffreni*.

The earliest specific name of *Pluvianus melanocephalus* (Gm.), is *P. ægyptius* (Lin.).

P. 65. The specific name of *Squatarola*, viz. *cinerea*, Ray, ought not (for reasons above given) to supersede Linnæus's name *helvetica*.

Lesson, in his Traité d'Ornithologie, has made it *almost* certain

that the *Corrira italica*, Gm., is the *Dromas ardeola*, Paykull; but as long as any doubt remains, it is better to retain the latter name as Mr. Gray has done.

P. 66. The four genera, *Egretta*, *Ardeola*, *Botaurus* and *Nycticorax*, originated, not with Brisson, but the two first with Bonaparte, and the two last with Stephens.

For *Tigrisoma lineata* read *T. lineatum*. (All words ending with *soma*, *stoma*, &c., are neuter.)

Ought not the genus *Herodias*, Boié, as restricted by Bonaparte, to be kept distinct from *Egretta*?

P. 67. For *Leptoptilos* write *Leptoptilus*. (The terminal *os* in Greek is always made *us* in correct Latin.)

The specific name *argala* is Latham's, not Gmelin's; but as Gmelin's name *dubia*, though prior, implies an erroneous proposition, for the species is *not* dubious, Latham's name may be allowed to stand.

The genus *Ibis* was founded, not by Brisson, but by Lacepède.

The genus *Falcinellus*, attributed to "Ray," is, I believe, now first established by Mr. Gray. If retained, a new specific name will be wanted for the European bird, as Colonel Sykes is of opinion (Proc. Com. Zool. Soc. pt. ii. p. 161) that the *Tantalus igneus*, Gm., is distinct from *T. falcinellus*, Lin. It would, however, be far better to give a new name to this genus, if a genus it be, the name *Falcinellus* being pre-occupied by Cuvier, who asserts that Vieillot changed it to *Erolia*.

P. 68. The genus *Numenius*, "Ray," was founded by Latham.

Limosa, "Briss.," was first used generically, I believe, by Leisler, and *Totanus*, "Ray," by Cuvier, 1802.

The name *Guinetta*, "Briss.," is now first used generically by Mr. Gray, and therefore should not supersede *Actitis*, Ill., as restricted by Boié.

P. 69. For *Macroramphus* write *Macrorhamphus*.

P. 70. I have been quite unable to reduce the synonymes of the genus *Rhynchæa* into order, and Mr. Gray would do a good work if he would publish a monograph of this genus with all the synonymes at full length, and with the distinctive characters of the species.

Mr. Gray must be in error when he unites the *Scolopax paludosa*, Gm. (*S. undulata*, Bodd.) with *S. sabini*, Vig. Bonaparte, in his elaborate monograph of the genus *Scolopax*, in the 'Osserv. Cuv. Règ. An.' p. 123, describes *S. paludosa*, Gm., as having the beak $3\frac{1}{2}$ inches long, and the lateral rectrices "angustissimi, acuminati," characters which do not apply to *S. sabini*, which Bonaparte there calls (after Vieillot) *S. sakhalina*.

I cannot approve of separating *Scolopax gallinula*, Lin., generically from the other Snipes; but those who do so should retain the name *Gallinago* (founded by Stephens) for the true Snipes, and call the *S. gallinula*, *Philolimnus*, Boié. At any rate, the specific name *gallinula*, Lin., should not be superseded by a term used previously to the binomial System.

The specific name *lobatus*, Wils., should not be given to *Steganopus*, because it was used by Wilson under the erroneous impression

that this bird was the *Tringa lobata*, Gm. The specific name *wilsoni*, Sab., seems to be next in priority, and should therefore stand.

Is *Steganopus*, Vieill., prior to *Holopodius*, Bon. ?

The family *Palamedeidæ* will probably require to be remodelled. Although not prepared to go into details at present, I think it probable that the *Parrinæ* and *Palamedeinæ* would be better arranged under *Rallidæ*, and *Megapodinæ* divided between the *Turdidæ* and the *Cracidæ*.

P. 71. The earliest specific name of *Menura*, is *superba*, given by Davies in the Linnean Transactions in 1800.

The term *Ortygometra*, or "Mother of the Quails," was an old name applied by Aristotle, Aldrovandus, Ray and Brisson to the Corn Crake; therefore, when Bechstein divided these short-beaked Rails from the rest of the genus *Rallus*, no term could have been more appropriate; but unfortunately he neglected to use it, and preferred the term *Crex*. Now as Bechstein was the first to define the genus, the name *Crex* must be retained, and *Ortygometra* cancelled, since it would not be correct to retain the latter (as Bonaparte does) for the remaining group (*Porzana*, Vieill.), in which the Corn Crake is not included.

The name *Ocydromus australis* (Sparm.) has the priority of publication over *O. troglodytes*, Gm.

P. 72. The genus *Gallinula* was founded by Latham.

The *Heliorninæ* would, I think, enter more naturally among the *Colymbidæ* than among the *Rallidæ*, though they certainly connect the two groups.

The *Phœnicopterinæ* ought not to be included in the *Anatidæ*. They surely form too marked a group to be placed on a par with the subdivisions of Linnæus's genus *Anas*. They should rather be made into a distinct family, and be placed near the *Ardeadæ*, to some of which (*Platalea* and *Ibis*) they show an affinity in the scarlet plumage, a colour wholly unknown among the *Anatidæ*.

P. 73. *Chlæphaga* should be written *Chloëphaga*.

The genus *Bernicla*, "Briss.," was founded by Stephens, 1824, and *Cygnus*, "Briss.," by Vieillot, 1816.

P. 74. *Querquedula* owes its foundation as a genus to Stephens, 1826.

To the synonymes of *Micropterus cinereus* add *Oidemia patachonica*, King.

Oidemia should be written *Œdemia*. Add to its synonymes *Maceranas*, Less.

To the synonymes of *Somateria* add *Platypus*, Brehm.

The genera *Fuligula* and *Harelda* were first published by Stephens, 1824.

For *Kamptorhynchus* write *Camptorhynchus*.

P. 76. The *Mergidæ* should not be regarded as a distinct family from the *Anatidæ*; they are only narrow-beaked Ducks, forming a subfamily allied to *Fuligulinæ*.

For *Podicepsinæ* write *Podicipinæ*.

It surely savours of hypercriticism to divide the Little Grebes (*Sylbeocyclus*, Bon.) from *Podiceps*.

P. 77. The generic name *Catarrhactes,* Briss., should be used instead of *Eudyptes,* Vieill., and the specific name *demersus,* Lin., instead of *chrysocome,* Forst. This genus *Catarrhactes* of Brisson is prior in date to Brunnich's genus, which he called *Catarrhacta* (*Lestris,* Ill. restr.).

The genus *Mergulus* was first defined by Vieillot, 1816.

An *h* should be inserted after the *r* in *Synthliboramphus* and *Ptychoramphus.*

P. 78. *Wagellus,* "Ray," is now first introduced as a genus by Mr. Gray, and therefore should not supersede *Fulmarus,* Leach.

The name *Catarrhacta,* Brunn., being too near *Catarrhactes,* Briss., should give way to *Lestris,* Ill.

P. 79. *Chroicocephalus* should be written *Chræcocephalus.*

The name *Gygis alba* (Sparr.) is prior in date of publication to *G. candida* (Forst.).

The true type of *Viralva,* Leach, as exhibited by Stephens, is the Black Tern (*Sterna nigra,* Lin.). Therefore Boié's name *Gelochelidon* should be retained for the genus which contains *Sterna anglica,* Mont., and the name *Viralva* (first published in 1825) sinks into a synonyme of *Hydrochelidon,* Boié, 1822, which is typified by *S. nigra,* Lin. Also note that *Anous,* Leach, is synonymous with *Megalopterus,* Boié, and not with *Hydrochelidon,* Boié, and that *Anous niger,* Leach, is synonymous, not with *Sterna nigra,* Lin., but with *Megalopterus stolidus* (Lin.), Boié.

The genera *Thalasseus,* Boié, *Gygis,* Wagl., *Sternula,* Boié, and *Hydrochelidon,* Boié, appear not to possess structural characters sufficient to entitle them to generic separation from *Sterna.*

P. 80. The genera *Sula* and *Fregata* were first raised to that rank by Lacepède in 1799.

In concluding this Commentary an apology is due for the length to which it has extended, but I felt it impossible to do justice to Mr. Gray's book without going into considerable detail. I should be sorry if any person should be led by the *number* of these criticisms to form an unfavourable idea of the general accuracy of the work. A large proportion of the above remarks rest on questions of *opinion,* in which Mr. Gray is perhaps as likely to be right as I am; and even where I have detected errors, they are only such as are unavoidable in the first edition of a work in which so much labour and research is compressed into so small a compass. I conclude therefore with most heartily recommending the 'Genera of Birds' to the favourable notice of zoologists.

Postcript.—I beg to add one or two remarks which have occurred to me since this Commentary went to press.

Page 1 of Mr. Gray's book. In my remarks on the *Vulturinæ* I had not noticed that Temminck has proved the *Ægypius* of Savigny to be only the young of the *Vultur auricularis,* Daud. (See Tem. Man. Orn. part iv. p. 586.) Therefore the generic name *Ægypius* should be given to the group containing *V. auricularis* and *pondicerianus.*

P. 4. *Asturina cinerea,* Vieill., is said by Cuvier to be the same as *Falco nitidus,* Tem., Pl. Col. 87. If this be the case, *Asturina* might

stand as a distinct genus, being quite different from *Cymindis.* (N.B. Temminck's Pl. Col. 87. can hardly be the *F. nitidus* of Latham, whose expression "legs long," agrees better with the *F. hemidactylus,* Tem. Pl. Col. 3.)

The genus *Astur* was founded by Lacepède in 1799, and is therefore clearly prior to *Dædalion,* Sav.

VI.—Mr. Shuckard *on his falsely alleged participation in* Mr. Swainson's *views of Natural Arrangement.*

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

Gentlemen,

I appeal to you to do me justice against the impression that may be made by what professes to be an "Analytical notice of the 129th volume of Lardner's Cabinet Cyclopædia, entitled, 'On the History and Natural Arrangement of Insects,' by *William Swainson,* F.R.S., &c., and *W. E. Shuckard,* Libr. R.S., &c., published in the 3rd Number of 'The Entomologist,' written by Mr. Newman."

In an advertisement prefixed to this volume of Lardner, dated from my residence, and of course emanating from me, I said, "Those paragraphs in this volume with the initials "*W. E. Sh.* are written by Mr. Shuckard, and where several "of these follow each other they are affixed to the last only; "but the system of classification is exclusively Mr. Swain-"son's." Now, notwithstanding this, which it will be seen below that the 'Analyst' was aware of, he says in the first page of his notice*, "I will now endeavour to show the views "entertained by *Messrs. Swainson and Shuckard* on the sub-"ject:" thus clearly identifying me with the whole scheme, for following this is given the dry systematic frame of the work. He then says, "A glance at this arrangement will "convince the reader that no charge of plagiarism can possi-"bly be brought against its *authors*:" thus confirming my identification with the system: and a line or two beneath this he again says, "If the views of *Messrs. Swainson and Shuckard* "display the slightest approach to nature, then are those of "Mr. Macleay the most distorted, wild and unnatural: there "is no point of similarity between the systems, except the "frequent recurrence of the number Five. The bold altera-"tion made by the *authors* in separating the Diptera from "winged insects, is the most striking feature in the new ar-"rangement; it proves *them* to be profound and original "*thinkers,* and not only this, it displays an indifference to the

* The Entomologist, No. III. p. 38.

"opinions of others, which must be the result of the *mens* "*conscia recta.*"

Would you think it possible, gentlemen, that this repetition of my assumed identity with the system of Mr. Swainson could be made in the face of this Latin phrase, and of the prefixed advertisement? and you will scarcely believe me when I tell you that their writer, at the end of the article, says, very coolly, at the bottom of this same page*, "I have "been led from its title to assign the merits of this volume "conjointly to Messrs. Swainson and Shuckard, and have "been treating them like the Siamese twins, as inseparable "in fame; but *fairness compels me* to add that *the system* "*of classification is entirely Mr. Swainson's.* Mr. Shuckard "has most ingenuously disavowed any share in this, the great "feature of the work, and I am compelled to place the "chaplet of laurel on the brows of Mr. Swainson alone,— "*palmam qui meruit ferat!*"

One would have supposed, if "fairness" was to have any influence in the matter, that the writer being fully aware, as he here shows himself to have been, that I had no participation whatever in Mr. Swainson's system of classification, it would have "compelled" him to abstain from carrying on through the whole of his article these imputations, which he with such amusing naïveté confesses he all the while knew to be unfounded: and is it not rather surprising that, having been driven thus to strangle these his unfortunate offspring from despair of being able to maintain them, he should not at once have quietly buried them out of the way, rather than leave their remains exposed to testify against their parent and their executioner? It would be superfluous for me to make any remark; his own statement is sufficient to give your readers an idea of the *fairness* to be expected in such 'analytical notices.'

No man has a right to complain of *his own* scientific views being *fairly* discussed, but every man has a right to repulse the attribution of views which he does not hold. My own ideas of 'system' must be known to many entomologists; for what I formerly said in my 'Essay on the Fossorial Hymenoptera†,' and subsequently repeated in this journal as

* The Entomologist, p. 40.

† Page 11. I conceive that when all the created species are fully ascertained, the true system will be found to be neither circular, square, nor oval, neither dichotomous, quinary, nor septenary, but a uniform meshwork of organization, spread like a net over the universe. But what gaps remain to be filled! We are truly as yet scarcely upon the threshold of the great temple, and consequently still remote from the adytum where the veiled statue reposes. We have not yet learnt our alphabet, for species are the letters whereby the book of Nature must be read. London, 1835.

lately as July last *, ought to secure me from the suspicion of being wedded to any of these dictatorial systems, which conveniently contrive that where gaps occur in their hypotheses the creatures are yet to be found that must fill them, and where inconvenient redundancies exist in Nature, these are made to merge in groups to which they have no ostensible affinity. To such systems may be applied the judicious observations of the reviewer of Gœthe's 'Theory of Colours † :' they "intentionally obscure what they cannot illustrate, and "affect to be profound when they are only disguising their ig-"norance." I have not even faith in the Septenary system ‡, although that is illuminated by the *seven* golden candlesticks § of Solomon's temple ||, and has found in the *sabbath* an *hebdomadal* repose from the labours of such crude concoctions ¶, but of which Burmeister said, "what is good in it is not new, and what is new is not good," and this has since been repeated here by a very courteous friend ** of the author of the system. Trusting that this appeal to your candour and sense of justice will not be in vain, I subscribe myself, gentlemen,

Your very obedient servant,

W. E. SHUCKARD.

31 Robert Street, Chelsea, Feb. 4, 1841.

* At the conclusion of the 'Monograph of the Dorylidæ,' where I said, "The object I have pursued in studying Natural History has been to ascertain facts, or in their absence the closest possible approximation to them ; for I am sure, to use the words of our great bard,

'Nature is made better by no mean,
But Nature makes that mean.'

And she is too protean in her disguises to be fitted by any boddice we may choose to invest her with."

† Edin. Review, Oct. 1840, p. 141.

‡ *Sphinx vespiformis*, by Edward Newman. London. 8vo. 1832.

§ Were I disposed to cavil at such a display as the adduction of these numbers, made evidently in good earnest, and not sportively, for really it would have been too profane to have cited Scripture in jest, I might object to the incorrectness of the Septenary's attribution of *seven* candlesticks to Solomon's temple ; for they consisted of *ten*, five being placed on the right side and five on the left of the oracle (an argument in favour of the quinarians!), and Moses's single candlestick had but six branches, although, it is true, seven lamps were suspended from it ; but *seven candlesticks* occur only in the vision of St. John at Patmos, which shows what a fantastical affair a system founded upon these seven candlesticks must be. I trust that when the '*Septenary*' dreams again, *his* revelation will be more pertinent than it is in the present instance.

|| *Sphinx vespiformis*, by Edward Newman. London. 8vo. 1832. Page 15.

¶ Wiegmann's Archiv. vol. i. No. 4.

** Westwood's Introduction to the Classification of Insects, vol. i. p. 20.

VII.—Excerpta Botanica, *or abridged Extracts translated from the Foreign Journals, illustrative of, or connected with, the Botany of Great Britain.* By W. A. Leighton, Esq., B.A., F.B.S.E., &c.

No. 5. *On the Anther of* Chara vulgaris *and* Chara hispida, *and the Animalcules contained in it.* By M. Gustavus Thuret. (Ann. des Sc. Nat. vol. xiv. p. 65.)

In the axillæ of the branches of *Chara*, immediately below the carpels, are globular sessile bodies, of a vivid red colour, which, entirely disappearing on the approaching maturity of the carpels, are conjectured to perform the functions of stamens, although in other respects they possess no analogy of organization with the male organs of Phanerogamæ. The outer covering of these consists of a membrane formed of transparent cellules, which produce the appearance of a white ring encircling the anther. Under this membrane are irregular oval cellules arranged into triangular valves, each valve being composed of from twelve to twenty cellules radiating from a common centre, and enclosing the red granules which produce the brilliant colour of the anther. On the full development of the anther these valves disunite, and permit the bodies enclosed in their interiors to expand in the water. Those anthers most remote from the central axis always open first, and those on the lower whorls before those on the upper ones. The interior of the anther is filled with flexuose, transparent, chambered (*cloisonnées*) filaments, of unequal length, emanating chiefly from a central cellular base, from which also radiate a few ovoid utricules, containing orange-coloured granules. Each of these utricules adheres to the cellular base by its narrowest extremity, and is fixed perpendicularly by its largest extremity to the centre of one of the triangular valves. The contained granules are oval, orange-coloured, and arranged in a linear series; whilst, on the contrary, in the cellules of the valves the granules are round, red, scattered without order, and distant from the walls of the cellules.

In these chambered filaments the animalcules are produced. These filaments, when examined in a very young state, appear only as oval utricules enclosing a granular matter, some of them being detached, but the greater number adherent to the cellular base before mentioned. A little later these utricules become chambered, a nucleus appearing in each chamber or division. The introduction of the water through the walls of the filaments seems to conduce towards the formation of the nucleus, at least such is my conjecture, from having frequently

observed the rapid formation of the nucleus in filaments which previously possessed no traces of it. These nuclei have a slight green tinge, probably owing to an optical illusion, and become brown by iodine. They are always affixed (*adossés*) to the partitions (*cloisons*). Gradually they become effaced, and the animalcules begin to be distinguished; indeed, they are frequently observable at one extremity, whilst the nuclei remain at the other, even in the same anther and filament. On the complete formation of the animalcules, the partitions of the chambers are indistinguishable, from the confusion arising from the great number of the curves. At each curvature of the animalcule a swelling (black or brilliant, according to the increase or diminution of focal distance) is perceived, doubtless owing to the optical illusion produced by the greater thickness of the body at these points of flexion.

The animalcules are at first motionless, and remain for a greater or lesser time in the water before they begin to move and struggle to release themselves from their prison. In this they do not always succeed, although their twisted position attests the efforts made for disengagement. Those which do succeed escape laterally by a sudden motion, similar to the elasticity of a slackened spring. After this great effort they remain for some time motionless, or if the temperature and season be unfavourable, their motions are slow and soon cease. On the contrary, the animalcules observed at the end of June and beginning of July agitated themselves with extreme vivacity, and in such a manner as to leave no doubt of their animality. They rapidly traversed the field of the microscope in different directions, crossing and meeting each other, and deviating from their route, and after employing the greater portion of the day in observation, they were left in similar and unrelaxed motions.

The portion of their body most apparent appeared like a spirally-rolled thread of three to five curves (*un fil roulé en tirebouchon, formant de* 3 *a* 5 *tours de spire.*) They were slightly tinged with green similar to the nuclei, and like them turned brown with iodine; their two extremities becoming more or less coloured (according to the quantity of iodine employed) than the rest of the body, thus indicating a difference of nature in these portions. At a little distance behind one extremity proceed two bristles or tentacula of excessive tenuity, which the animalcule incessantly agitates with great rapidity. These are probably organs of locomotion similar to the filiform prolongation found in the Infusoria without ciliæ. Indeed, the part thus furnished with tentacula moves

foremost, drawing after it the rest of the body, which turns about in the water, but always preserves its *turriculate* form. The incessant agitation of these tentacula and their extreme tenuity rendered it impossible to observe them in the living animal; recourse was therefore had to the evaporation of the water or to the application of a slight tincture of iodine, when the animalcules ceased their motions, became contracted, and their spiral unrolled, when the tentacula were rendered very distinct, from their brown colour. These tentacula were frequently observed to be soldered together from one-half to one-third of their length upwards, but others were also noticed to be entirely separated down to their bases. A swelling similar to that in the flexure of the body was perceived in their curves.

Ammonia arrested their motions and contracted the body gradually into a small oval mass, but did not produce the phænomenon of decomposition by solution (*diffluence*) so remarkable in the Infusoria. A very weak solution of chlorhydric acid in water violently contracted them into a shapeless mass.

In escaping from the filaments a portion only of the body of the animalcule was sometimes disengaged, and fruitless efforts were made by it to extricate the rest. In such cases it was noticed that the portion bearing the tentacula invariably remained within the tube of the filament. On the filaments becoming empty, their divisions reappeared very distinctly. No traces of the passage of the animalcule were observed, unless the brilliant points sometimes seen on each division of the filament be regarded as such.

The ovoid utricules accompanying the filaments are spheroidal in the young anthers, but subsequently take the form of an egg truncated at both ends, or nearly that of a parallelogram, having one of its ends narrower than the other. Their wall or paries is transparent, the orange granules contained in them being of an elongated form, and lying in longitudinal lines in the direction of the currents of circulation, their upper extremity alone being destitute of them.

In the interior of the utricules is frequently an oval globule, generally motionless, but sometimes circulating with greater or less rapidity along the walls. Besides this globule, which is apparently formed of a granular fluid, are seen the rapid currents ascending and descending longitudinally. These two circulations, which are doubtless different appearances of the same phænomenon, occur either together or separately in the same utricule. In some utricules the globule was motionless,

whilst three round and thick orange-coloured granules ascended and descended together rapidly along the same line of circulation, and continued visible from one extremity to the other.

After long immersion of the utricules in water, the arrangement of the orange-coloured granules apparently proved the existence of a double sac in which the granules were contained. The circulation in this case was similar to that described by Mr. Slack in hairs of *Tradescantia* (Trans. Soc. Arts, vol. xlix. p. 41). "Each articulation appeared to consist of an exterior glassy tube. Between this and the colouring matter was the circulating fluid with its molecules. The coloured fluid of the hair appeared to be enclosed in a membranous sac, which formed an axis around which the fluid circulated."

On crushing the anther there were observed some purple hairs formed of an immense quantity of granules of extreme minuteness, endowed with a very quick molecular motion.

Iodine rendered the orange granules green. Alcohol did not dissolve them. The latter did not arrest the circulation of the nucleus in the ovoid utricules, although it instantaneously killed the animalcules.

VIII.—*Notes on Saxifraga umbrosa*: By Charles C. Babington, M.A., F.L.S., F.G.S., &c.; and by the Reviewer of Baines's 'Yorkshire Flora.'

In the 39th Number of these Annals (vol. vi. p. 401), the Rev. W. T. Bree expresses his doubt if the *Saxifraga umbrosa* is "in fact a *genuine* native of Britain;" and if he had said Great Britain, I should have been inclined to say that it has all the appearance of having been introduced, and that much more evidence is requisite before we ought to admit it to have been a genuine native. Concerning Ireland, however, I must express quite the contrary opinion, being convinced that there is *no* plant that has a more decided claim to be considered as certainly indigenous. I have myself seen it in the greatest plenty upon the wild mountains of Connamara and Joice's county, but certainly did not notice it in the neighbourhood of Killarney, where *S. Geum* is peculiarly abundant.

It is worthy of notice, that the plant found in Connamara differs as a variety from the Pyrenæan plant, by having its leaves dentate, crenate, and not simply and bluntly crenate, as in the plant from the Pyrenees. The figure given in Eng. Bot. (t. 663), which was taken from a specimen gathered at Throp Arch woods, in Yorkshire, approaches much more

nearly to the foreign than to the Irish plant; and I have reason to believe that all the 'London Pride' found "wild" in Great Britain will prove to be the blunt crenate-leaved plant, and to have escaped from cultivation, or been intentionally planted.

St. John's Coll., Cambridge, Feb. 8, 1841.

On Saxifraga umbrosa.

THE writer of the notice of Baines's 'Yorkshire Flora' begs to state, in reference to Mr. Bree's paper, that he mentioned *Saxifraga umbrosa* as abundant in the west and south of Ireland, in consequence of having seen it himself in great quantity in the west of the county of Cork during a botanical tour made in the year 1811, and having heard from friends whom he considered as good judges, that it is equally common in Connaught. He considered himself as knowing *S. hirsuta* and *S. Geum* at the time he made the tour referred to; and he is confirmed in the belief that he did not commit an error, by having now before him a MS. journal of a rather more extended tour through the same district in 1809 by Mr. James Drummond, then curator of the Cork Botanic Garden, from which it appears that Mr. Drummond found *S. umbrosa* abundantly in the county of Cork, and also met with both *Geum* and *hirsuta* in the mountains between Cork and Kerry.

The station of *S. umbrosa* at Thorpe Arch would be very suspicious, had it not been noticed before the grounds were ornamented as they are at present, and by such an accurate botanist as, for example, the late Rev. W. Wood of Leeds. Respecting the other Yorkshire stations the writer can give no opinion.

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

No. I.

I PROPOSE in the following series of papers to give from time to time such extracts from my note-book relating to Birds as I think likely to prove interesting to my readers; the first portions will be principally occupied with anatomical notes on some Australian Birds received from Mr. Gould, and on some received from Malacca. With regard to the former birds, it is not my intention to go minutely into detail, or further than what I believe to be necessary to show the position of each in a natural arrangement. I take this course, as I understand that eminent anatomist, Mr. Owen, has undertaken to furnish Mr. Gould, for his work on the 'Birds of Australia,' with a more detailed account.

Menura Lyra, Shaw. Male.

Tongue tapering towards the tip, which is slightly bifid, blunt, and furnished with a fringe of bristles; the centre concave, and furnished posteriorly with two strong spines on each side at the base, between which is a row of smaller ones.

Trachea of nearly uniform diameter throughout the rings, broad as far as its entrance into the thorax, afterwards rounded and narrow, with a large membranous space between them; they are arranged somewhat obliquely, as in the bulb found on the trachea of *Clangula vulgaris*. Bone of divarication Y-shaped. Upper bones of the bronchiæ are semicircular, the uppermost largest, the next being inclosed in its arc; the fourth is much flattened, thickest and broadest anteriorly, and with a prominent knob on its anterior extremity, from which it gradually tapers towards the posterior end, where it is somewhat falciform and suddenly narrowed to a point. The next, or fifth bone, is also much flattened, and straight for two-thirds of its length, when it also becomes suddenly falciform, with the point of the hook turned downwards.

In addition to the usual sterno-tracheal muscles, this curious bird has two other pair, both of which have their origin on the rings of the trachea on each side, at the point where it enters the cavity of the thorax. The anterior pair is inserted on the knobs at the extremities of the fourth bones of the bronchiæ; the posterior pair are also inserted on the bronchiæ, but on the three uppermost rings, and on the posterior extremity of the fifth. Besides these muscles, which are very strong, additional support is given to the portion of the trachea over which they extend, by a tendon arising at the same point with the last-mentioned pair of muscles, but between them, and extending to the eleventh, twelfth and thirteenth rings of the bronchiæ, on each of which it is partially inserted: this arrangement gives the bird a great power of shortening or lengthening that portion of the trachea over which the muscles extend.

The œsophagus is small at the upper extremity, slightly enlarged in the middle and towards the proventriculus, the coats of which are not much thicker than the œsophagus itself; nor is it contracted at its entrance into the stomach. The stomach is of moderate size, muscular, and has a large internal cavity, which was filled with seeds, the remains of insects and small pebbles. The epithelium, or membrane lining the stomach, hardened and rugose, particularly on the grinding surfaces; it measures $1\frac{3}{4}$ inch in length, and 1 inch in breadth.

The total length of the intestinal canal, measuring from the pylorus to the cloaca, is about 3 feet 10 inches, that of the rectum $3\frac{3}{4}$ inches; the diameter of the duodenum is equal to that of the rectum, that of both being $\frac{3}{4}$ of an inch; the cæca are scarcely more than rudimentary, measuring only $\frac{1}{2}$ an inch in length; the cloaca is of moderate size, and situated about 1 foot 7 inches above it, and attached to the small intestine is found the remains of the vitelline duct (*ductus vitello-intestinalis*).

The skeleton at first sight is chiefly remarkable for the large size and length of the bones of the legs and feet. The sternum is long and narrow, measuring from the anterior extremity of the manubrial process 3 inches, and transversely, just behind the junction of the coracoids, where it is narrowest, $\frac{8}{10}$ths of an inch; its posterior margin is indented by two slight lateral fissures, between which it is much rounded and projects posteriorly; the lateral margins are slightly curved inwards; the broadest part of the sternum is near its posterior extremity, where it measures 1 inch and 4 tenths. The indentation in which the lesser pectoral muscle lies is very deep, rises into a ridge on the lateral margin, and is continued from the junction of the coracoids about half-way along the sternum; the anterior edge of the keel is slightly curved backwards, the inferior edge is a little rounded and continued to the posterior margin of the sternum; the manubrial process is very long and bifurcate at its extremity; the coracoids are of moderate length and strength. The os furcatum is light, slightly flattened, arched, and with only a very small process at its sternal extremity. The scapula is slightly falciform, of moderate length and size, reaching backwards to the third true rib. The wing-bones are short, but strong.

The bones composing the pelvis are precisely what might be expected to be found in a bird possessing such a large tail; it measures 2 inches and $\frac{8}{10}$ths in length, and $1\frac{7}{10}$ths in breadth; the iliac bones are broad, but form a lengthened process on each side of the caudal vertebræ for the attachment of the levator muscles of the tail. The ischium is also broad, and placed nearly perpendicularly to the plane of the ilium. The ischiadic foramina are large and rounded; the sides of the pelvis are much compressed from the point at which they penetrate to the posterior margin, the bones of the ilium being expanded beyond, and overshadowing, as it were, those of the ischium; the os pubis is narrow and curved upwards beyond its second junction with the ischium. The obturator foramen is of moderate size and oval; the cotyloid cavity for the reception of the head of the femur is deep, and has the hinder portion of its upper edge very protuberant. The ribs are eight in number, five true and three false: two of the false ones are placed anteriorly and one posteriorly; the latter has a sternal rib attached, but it does not articulate with the sternum; the upper portions of the ribs next the vertebræ are much flattened, but they become thicker and narrower as they approach the appendage on their posterior margin, which is slightly turned upwards, and of moderate strength.

The numbering of the vertebræ, as near as could be ascertained from a natural skeleton, is*, Cer. 12; Dor. 6; Sac. 12? Caud. 9. The

* I have followed the same plan in the enumeration of the vertebræ here as I did in the 'Monograph on the Anatidæ,' viz. by considering all those which are anterior to the ribs and have no attachment to them, cervical; those anterior to the pelvinal bones and having ribs attached to them, dorsal; those which are anchylosed together immediately succeeding the dorsal, sacral; to some these ribs are sometimes attached: and those immediately succeeding these, and not anchylosed to them, caudal.

lateral processes of the caudal vertebræ are much prolonged, particularly those of the last four but one; the terminal one is without any lateral process, and nearly triangular.

Remarks.—The extraordinary and doubtful structure of this bird is at once shown by the different places in which it has been arranged by authors; by Cuvier it is placed among the Passeres, by Lesson and Swainson among the Gallinaceous birds, and by Gray among the Grallatores. The large and powerful legs which *Menura* possesses in such an eminent degree, has been doubtless the principal reason why it has been classed by the authors above-mentioned among Rasores and Grallatores; but on minute examination the scutellations of the tarsi will be found to differ from any of the typical birds in either of these orders, and to agree with that of the true Insessores. Another very striking point in the external structure consists in the great length of the claws, their great strength, and in their being rounded and blunt at the points, and attached to toes of moderate size*. Some of the *Rallidæ* possess lengthened claws, but they are sharp, in general weak and attached to long thin toes, therefore differing from *Menura.* The *Alaudidæ* have the hind toe lengthened, but it is also weak and sharp; some of the *Cuculidæ* also have this structure, as the genus *Pelophilus*, in which the claws are not so much sharpened as in any of the preceding instances. The genus *Pteroptochos*† has precisely the same form of claw as in *Menura*, and agrees with that genus in many anatomical peculiarities, nearly the only difference being that it has four fissures on the posterior margin of the sternum instead of two. *Menura* appears to be nearly connected with *Megapodius*, and perhaps with *Alecthelia*, judging merely from external characters; but differs from *Talegalla*, *Chauna*, *Palamedea*, *Dicholophus*, *Psophia*, *Crax*, *Ourax*, *Ortalida*, *Penelope* and *Lophocerus*, with all of which it has been associated in the same family‡, in presenting an almost total difference in the structure of the tarsi and feet as well as in the form of the bill, which any one who has an opportunity of examining them, or even some of the best plates, will at once perceive.

In the structure of the soft parts and digestive organs, *Menura* agrees with that of Insessores; and with many of them,

* On comparing the feet of *Menura* with those of Insessorial birds, they will not be found, exclusive of the claw, to be of a larger proportion to the size of the bird than many birds among Insessores.

† For some account of the anatomy of this genus, see 'The Zoology of the Voyage of the Beagle,—Birds.'—Appendix.

‡ This family appears to be a sort of refuge for the destitute.

especially with the genus *Grallina* of Vieillot, in the complicated muscular structure of the inferior larynx.

The pelvis, as before remarked, is precisely of that form which might be expected to be found in a bird having powerful legs and a large tail, and therefore presents some similarity to the Rasores in this respect, but differs from that order in those portions of it not immediately connected with those parts; thus the obturator foramen in *Menura* is large, while in Rasores it is small or altogether obliterated; the extremity of the os pubis is turned upward, while in Rasores it is turned downward; in the former of these particulars it agrees with Insessores and Scansores, but in the latter with most of the Insessores.

The structure of the sternum agrees with Insessores in having only two fissures on its posterior margin, but differs essentially from any birds I am acquainted with in that order in being much prolonged backwards and rounded between them. The only approach to this structure that I am aware of is among the *Psittacidæ*, some of the Australian Ground-Parrots having nearly the same structure as *Pezoporus formosus* on the posterior margin, with this exception, that foramina take the place of fissures*.

The os furcatum is slight, and destitute of any terminal process at its sternal extremity, in which respects it agrees with Scansores.

The structure of the ribs, in being much broader above the posterior process, coincides both with many Insessores and Scansores; but this character is most marked in the latter order.

Such is the mixed and doubtful character which *Menura* shows, but by far the strongest affinity is shown to Insessores; in which order this genus may form a family with *Pteroptochos*, and perhaps with *Alecthelia* and *Megapodius*†, bearing an affinity to Scansores. Although a full account of the habits of this bird may be shortly expected from the pen of Mr. Gould, I shall here remark, that what has hitherto been considered fabulous, namely, that this bird has the power of song, is far from improbable, considering the structure of its

* These birds have also the claws and tarsi considerably lengthened. Some resemblance to the posterior margin of the sternum of *Menura* is also found among the *Scolopacidæ*, in the Common Woodcock for instance; but the remainder of the skeleton is so totally unlike, that I cannot for a moment suppose that any degree of affinity exists.

† I venture this opinion with very great doubt; nothing but an anatomical examination can decide the point; the habit appears to be different. See Freycinet's Voyage, Zoologie, p. 124.

trachea and muscles. Its affinity to Scansores is also, I think, explained by the great facility with which it scrambles or climbs over rocks and stumps*.

I have considered Scansores as distinct from Insessores throughout this paper; and think that ornithologists will, until more is known of the anatomy of birds than at present, find it convenient to class Birds in the following Orders, which may be distinguished in general by their skeletons:—RAPTORES, VOLITORES (containing the Fissirostral groups), SCANSORES, INSESSORES, RASORES, CURSORES, GRALLATORES and NATATORES. Perhaps the Pigeons also with advantage may be divided from the other RASORES.

BIBLIOGRAPHICAL NOTICES.

An Introduction to the modern Classification of Insects, founded on the Natural Habits and Corresponding Organization of the different Families. By J. O. Westwood, F.L.S., &c. 2 vols. 8vo, with Figures. London: Longman and Co.

No branch of natural science has made such extraordinary and rapid strides within the last few years in this country as the study of insects. The contrast which it exhibits at the present day, compared with its state thirty years ago, is most striking. *Then*, at the period when we commenced our entomological career, the literature of the science was most meagre and marrowless; we had, it is true, for our guides Stewart's 'Elements,' Marsham's 'Coleoptera,' Haworth's 'Lepidoptera,' and the picture-books of Doudran, estimable works enough in their way, but from which the inquirer who wished to obtain more than a knowledge of the mere name of his species would not derive a particle of philosophy. The minute investigations of the anatomist, the principles of natural classification founded upon the various relations of the different tribes and the variations in the metamorphoses of all insects, save the Lepidoptera, were subjects scarcely dreamt of; and, in truth, the entomologist merited no other name than that of a collector, his only aim being the getting together of as great a number of species as possible, and storing them up in his cabinets.

The appearance of the first two volumes of the 'Introduction' of Messrs. Kirby and Spence placed the science on a far different footing, showing the inquirer, in a most engaging manner, that it possessed far higher claims to his attention. In these delightful volumes the natural history and œconomy of the insect tribes were proved to be as interesting and worthy of observation as those of the highest animals. The subsequent appearance of the third and fourth volumes of the same work opened the wide field of insect anatomy and the principles of entomological classification; thus forming,

* See Collins's Account of New South Wales.

with the preceding volumes, the most complete general 'Introduction' to the study hitherto published. These were shortly followed by the appearance of Mr. Curtis's beautiful work on the 'Genera of British Insects,' recently noticed in our pages, and by the 'Systematic Catalogue and Illustrations' of Mr. Stephens, the latter consisting of detailed descriptions of all the British species.

Besides these, a very considerable number of minor treatises have been produced by authors who have in a great measure been instigated to the pursuit by the establishment of the various entomological societies, and whose works are scattered through the pages of numberless English and Foreign Transactions and other similar works. During this period also the principles of natural classification have been greatly investigated both at home and abroad, but in no work have these principles being applied throughout to the numerous families of insects.

The object of the present work may be best shown by the following passages from the preface to the first volume. After noticing the distinction between the *general* nature of Introductions to Entomology and the *generic* and *specific* nature of the works of Curtis, Stephens, etc., the author observes that the student has hitherto been "led at once from the *general views* he had gained on the subject to the minute technical details of *genera* and *species*, there being no work which he could take up to serve as a guide to the development of the principles of modern classification in the distribution of the *orders* and *families*. For years this deficiency has strikingly manifested itself to me, and it is long since I announced my present undertaking, in which I had proposed to myself to show the application of the modern views which have been entertained relative to the natural relations of animals in the arrangement of the entire groups of winged insects; illustrating the subject by details of the natural habits, transformations, and structure of the different families."

The work opens with a series of general observations upon the class of Insects, their general structure and transformations, and the various systems of Swammerdam, Linnæus, Fabricius, Latreille and MacLeay, the respective authors of the metamorphotic, alary, cibarian, eclectic, and representative systems. The arrangement adopted by the author nearly corresponds with that of MacLeay, the orders of Hexapod, Metamorphotic Insects (which are alone treated upon in this work), being divided into two parallel sub-classes. Each order with its sections is then passed in review, ample details being given of the characters, structures, habits, transformations, and general distribution and relation of the different families, with an illustration of their characteristic anatomical details and preparatory states. It is thus that the author has endeavoured to make his work a fitting 'Sequel' to the 'Introduction' of Kirby and Spence, whilst at the same time it will be found equally, if not still more, useful to the student who would extend his inquiries beyond the details of genera and species: in this respect it forms an equally fitting precursor to the works of Curtis, Stephens, etc. A few extracts, however, will

more satisfactorily show the manner in which the author has treated the subject in its various bearings; we will therefore take the distribution of the Coleoptera, which has lately been the subject of much discussion, as an example of the manner in which the *natural classification* of insects is treated. After reviewing the arrangements of Linnæus, Latreille, MacLeay, etc. (that of the last-named author being founded upon the analogical relations of the preparatory states and the asserted inaccuracy of the tarsal system), the author observes, in addition to our ignorance of the larvæ of many important groups, "that Mr. MacLeay himself admits the existence of a variation in the tarsal structure concurrent with the variation in the form of the larvæ, a circumstance dependent, as it seems to me, upon the principle that modifications of the preparatory states of an insect ought merely to be regarded as indications of corresponding peculiarities in the final state, the former modifications being subordinate to those observed in the imago, and having, in fact, been undergone with a direct view to the perfection of the insect. We might indeed carry the subject still further. Thus, whilst the intimate connexion existing throughout the whole of the Tetramerous Beetles cannot be denied, yet Cerambyx has a subvermiform and Chrysomela an anopluriform larva; whilst the latter and Coccinella (Mr. MacLeay's two examples of the Anopluriform Stirps), although agreeing in the larvæ, are totally different in the habits and in the structure of the tarsi of the imago." After some further observations, he adds, that "The Coleoptera are therefore divisible into the four following sections: 1. Pentamera, in which all the tarsi are 5-jointed, the fourth being of ordinary size; 2. Heteromera, in which the four anterior tarsi are 5-jointed, and the two posterior 4-jointed; 3. Pseudotetramera (or Subpentamera, Tetramera, Latreille, Cryptopentamera, Burm.), in which the tarsi are 5-jointed, but the fourth joint is exceedingly diminutive, and concealed between the lobes of the preceding; 4. Pseudotrimera (or Subtetramera, Tetramera, Latr., Cryptotetramera, Burm.), in which the tarsi are 4-jointed, the third joint being very diminutive, and concealed between the lobes of the preceding."

As a specimen of the *structural details*, the following account of the structure of the mouth of the preparatory states of the May-fly (*Ephemera vulgata*) may be quoted:—"Considering the rudimental nature of the mouth of the imago, it is surprising that no one has hitherto described the real structure of the mouth in the preparatory states. Reaumur has attempted it, but his figures are so rude and insufficient, that no idea can be gleaned as to their true structure; Swammerdam also passes them over undescribed. In the pupa of *E. vulgata* the upper lip is of moderate size, with the anterior angles rounded off and ciliated; it is flat and quite membranous: the mandibles are horny, armed with several teeth within, near the base, which is dilated into a flattened molary plate, whilst the upper angle of the mandible is produced into a long curved horn. The maxillæ are small, membranous, curved, pointed at the tip and internally setose: the maxillary palpi do not extend beyond the front of the head;

they are 4-jointed, the basal joint being very short: the lower lip is very large and membranous, covering the under side of the mouth; it is quadrilobed and furnished within with a broad tongue, of which the anterior angles are produced and pilose; the labial palpi are broad and 3-jointed."

The account of the proceedings of the Ant-lion may be taken as an example of the manner in which the *natural history* of the various families is treated:—

"It is in very fine sand that the larva makes its pitfall. When placed upon the surface, it bends down the extremity of the body, and then pushing, or rather dragging, itself backwards by the assistance of its hind legs, but more particularly of the deflexed extremity of its body, it gradually insinuates itself into and beneath the sand, constantly throwing off the particles which fall upon, or which it shovels, with its jaws or legs upon its head, by suddenly jerking them backwards,

'Ossaque post tergum magnæ jactata parentis.'

"Proceeding in this manner, in a spiral direction, it gradually diminishes the diameter of its path, and by degrees throws so much of the sand away, as to form a conical pit, at the bottom of which it then conceals itself, its mandibles, widely extended, being the only parts that appear above the surface; with these, any luckless insect that may happen to fall down the hole is immediately seized and killed. When the fluids of the victim are exhausted, the Ant-lion, by a sudden jerk, throws the dry carcass out of the hole; should, however, the insect by chance escape the murderous jaws of its enemy, the latter immediately commences throwing up the sand, whereby not only is the hole made deeper and its sides steeper, but the escaping insect is probably hit, and again brought down to the bottom of the pit. It is chiefly upon ants and other soft-bodied insects that these larvæ feed. They are, however, capable of undergoing long fasts, for one of my larvæ remained from October till March without food. It has been supposed that, as the food of these larvæ consists entirely of juices, and as they appear to be destitute of anal aperture, the whole of their food is assimilated. M. L. Dufour has, however, traced the intestinal canal terminating in an anus, which is, indeed, very difficult to discover. (Ann. Soc. Ent. de France, tom. ii. p. 67. App.) Latreille states that these larvæ are produced in the summer or autumn, and become pupæ in the following spring. I found the larvæ of all sizes in July, one of which became a pupa, and assumed the perfect state; whilst another, of equal size, remained through the winter in the larva state. Previous to assuming the pupa state, the larva forms a globular cocoon of less than half an inch in diameter of fine sand, glued with silken threads spun from a slender telescopic-like spinneret placed at the extremity of its body, and lined with fine silk. The pupa is small, not being half an inch long, inactive, and with all its limbs laid at rest upon the breast. When ready to assume the perfect state it uses its mandibles, which are quite unlike those of the larva and imago, and

which have not been before described, to gnaw a hole through the cocoon, and pushes itself partly through the aperture, in which it leaves the pupa skin."

The work is illustrated with a coloured plate, containing examples of most of the orders, and by nearly 2500 figures representing the types of the different families, with their preparatory states and structural peculiarities, there being not fewer than 340 figures of perfect insects, and more than 420 of larvæ and pupæ. Another important feature in the work, and one which we can well believe must have cost the author very great labour, is the bibliographical references to each of the families. These cannot fail to be of infinite service to the student, as they contain notices of every paper or detached memoir of the least value published on the subject up to the date of the work. At the same time, in order to render it still more useful, a complete synopsis of the British genera, brought down to the present time, is added, and in which are included the characters, synonyms, and authorities of the genera, the number of British species, and name of the type, with a reference to a figure of the genus. Having thus given our readers an insight into the comprehensive nature of the work before us, we must observe, that the discussion of the relations of the different families, and of the views entertained thereof by preceding writers, appears too much detailed. The great extent of the subject, however, and the comparatively slight grounds existing towards a perfect classification of the very numerous tribes of insects, have necessarily involved many of their relations in doubt, and of which the discussion cannot fail to be productive of advantage. We also notice a few typographical errors, some of which, however, are corrected in the Appendix. In conclusion, as this work has the rare merit of interfering with no other hitherto published, we cordially recommend it as one rendered necessary by the progress of the science, and as the result of the most laborious research, and consequently as deserving, both from its nature and execution, of becoming a standard work of reference in every zoological library.

Otia Hispanica. Auctore P. B. Webb. Pentas 2, 1839.

The present number of this valuable work, which has only recently reached us, is occupied by figures and descriptions of five species of Algæ, by C. Montague, M.D., and as they are all either new or but little known, we cannot do better than transcribe their specific characters; we must, however, previously state that each of the species is fully illustrated by magnified dissections, and by a detailed description and copious observations.

1. *Griffithsia flabellata* (Montag.), filis setaceis virgatis, ramis alternis pinnatis, pinnis tandem divaricato-recurvis, pinnulis subsecundis erectis, articulis diametro quintuplo-duplo longioribus, capsulis maximis involucratis.—Ceramium et Callithamnion flexuosum, *Agardh.*

Agardh appears never to have seen the fruit of this plant, and

therefore referred it to *Callithamnion*, to which genus it is closely allied in general appearance. Its fruit is that of a *Griffithsia*.

2. *Griffithsia Schousboei* (Montag.), repens, intricata, filis dichotomis articulato-constrictis, articulis elliptico-sphæricis e geniculis radicellas hyalinas emittentibus.

"The absence of fructification causes me to doubt if this is not an abnormal state or a rampant variety of *G. corallina* (Ag.)."

3. *Gigartina conferta* (Schousb.), fronde cartilaginea, filiformi, vage ramosa, ramis fasciculatis confertis, ramulos abbreviatos patentes apice incrassato-ovoideos undique emittentibus.

4. *Gigartina gaditana* (Montag.), fronde cartilaginea, filiformi, dichotoma, aculeis simplicibus brevissimis subsecundis utrinque attenuatis obsita.

Probably closely allied to the *Sphærococcus armatus* (Agardh).

5. *Delesseria interrupta* (Ag.), fronde membranacea tenerrima, interrupte costata, lineari, dichotoma, apice furcata rotundataque.

This second number fully supports the high character which had been obtained by its predecessor, and we trust that the work will receive that support which it deserves from the botanists of Britain.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 23, 1840.—William Yarrell, Esq., V.P., in the Chair.

The Rev. F. W. Hope read a paper entitled "Observations on the *Stenochoridæ* of New Holland, with descriptions of new species."

Of this paper the following is an extract:—

Fam. Stenochoridæ, Leach.

Type of the family *Stenochorus semipunctatus*, Fab.

Section 1. *Armigeri.*

Antennis thoraceque spinosis, apicibus elytrorum bidentatis.

Sp. 1. Stenochorus gigas. *Sten. ater thorace spinoso inæquali, elytris basi nigro flavoque variegatis.*

Antennæ corpore fere duplo longiores, articulis ternis primis nigricantibus, reliquis fusco-ferrugineis, articulis intermediis apice spinosis. Caput atrum antice rufo-ciliatum palpis ferrugineis. Thorax utrinque spinosus spinis brevibus, tuberculatus, rugosus et ater. Elytra bidentata, basi nigro flavoque variegata, varioloso-punctata. Corpus infra nigrum abdomine postice piceo, femoribus atris, tibiis tarsisque fusco-brunneis et tomentosis.

Long. lin. $18\frac{1}{2}$; lat. lin. $5\frac{1}{2}$.

Hab. In interiori parte Novæ Hollandiæ.

This magnificent species, the largest of the genus, was given to Captain Roe, when engaged on his survey of the Australian coast; it was labelled as coming from the inner country.

In Museo Dom. Hope.

Sp. 2. Stenochorus latus. *Sten. fusco-brunneus, thorace cinereo-*

tomentoso, elytris flavo brunneoque variegatis. Caput cinereum. Antennæ longitudini corporis vix æquales. Thorax utrinque spinosus, spinis acutis, tomentosus et rugosus, antice binis tuberculis rubro-piceis insignitus. Elytra flavo-brunnea maculisque nigris variegata, macula suturali magna lunulata, ad apicem posita, corpus infra nigrum, pectore pedibus brunneo-piceis, tarsisque auricomatis.

Long. lin. 15; lat. lin. 4.

Hab. In Nova Hollandia circa Flumen Cygneum.

In Mus. Dom. Hope.

Sp. 3. Stenochorus longipennis, *Sten. atro-brunneus, thorace cinereo, elytris antice flavo variegatis, postice, piceo-brunneis. Antennæ longitudine corporis, fusco-flavæ et tomentosæ. Thorax utrinque spinosus spinis acutis, ad humeros elytrorum curvatus, rugosus, tuberculo nigro et glabro in medio disci posito. Elytra elongata ad apicem parum attenuata, antice brunnea, lineis flavis longitudinalibus variegata, postice reliqua parte disci atro-brunnea. Corpus infra fusco-brunneum, femoribus tibiis pallidioribus et tomentosis, tarsisque auricomatis.*

Long. lin. 13; lat. lin. $3\frac{1}{2}$.

Hab. Van Diemen's Land.

Sp. 4. Stenochorus Mitchelli. *Sten. straminicolor, caput nigrum antennis flavis, thorace atro-cinereo, elytrisque flavo brunneoque variegatis. Caput atrum thorace bispinoso, spinis utrinque minutis, disco rugoso atro-cinereo. Elytra pallide flava sutura brunneisque maculis variegata. Corpus infra rubro-brunneum annulis abdominis aurato-tomentosis, femoribus et tibiis concoloribus tarsisque aurato-spongiosis.*

Long. lin. 12; lat. lin. $3\frac{1}{4}$.

Hab. In Nova Hollandia.

This singularly marked insect I have named in honour of Sir T. Livingston Mitchell, the author of one of the most interesting works which has yet appeared respecting Australia.

Sp. 5. Stenochorus trimaculatus. *Sten. pallide flavus, antennis pedibus luteis thorace cinereo elytrisque nigro maculatis. Caput piceo-brunneum. Antennis flavis sparsimque tomentosis. Thorax utrinque spinosus, spinis brevibus, rugoso-tuberculatus et argenteo-cinereus, scutellum flavum. Elytra ad basin nigra, macula magna ovali pallide flava, ante apicem in singulo posita. Corpus infra rubro-fuscum et argenteo-tomentosum. Pedibus luteis.*

This elegant species I received from Captain Roe; it was captured at the Swan River Settlement.

Sp. 6. Stenochorus obscurus, *Donovan. Sten. thorace rugoso spinoso, fuscus elytris antice punctato-rugosis, postice lævibus nitidis apice bidentatis.*

Long. lin. 11; lat. lin. 3.

This species appears to be of rare occurrence. I have seen only three specimens; all of them were from Van Diemen's Land.

Sp. 7. STENOCHORUS PUNCTATUS, *Donovan. Sten. thorace spinoso, fuscus, elytris punctatis antice subrugosis, apice bidentatis maculis tribus flavis.*

Long. lin. 11; lat. lin. $2\frac{1}{2}$.

This species I obtained at the sale of the late Mr. Donovan's insects; it was labelled as received from Van Diemen's Land. The colour of this species in Donovan's plate is not dark enough; the variety with the basal and medial spots united on the elytra, is by no means uncommon; the species is also liable to vary considerably in size; a small specimen measured only $8\frac{1}{2}$ lines long and 2 in width.

Sp. 8. STENOCHORUS SEMIPUNCTATUS, *Fabricius. Sten. thorace spinoso, fuscus, elytris antice punctato-rugosis, flavo-fasciatis, postice lævibus, apice bidentatis macula flava.* Vid. Oliv. 4—67. p. 37, 48; Stenoch. 69. tab. 2. f. 19; Enc. Méth. 5. p. 303, 56; Schonherr. Syn. Ins. vol. i. part 3. p. 404. species 9.

Long. lin. 11; lat. lin. 3.

The localities of 'Brasilia' and 'Nova Hollandia' are mentioned by the latter author; there cannot exist a doubt that the former locality is erroneous. The species is subject to great variation. I mention some of the most particular.

Var. α. *Elytris* (*long. lin.* 8; *lat. lin.* $1\frac{3}{4}$) *mediis trimaculatis, maculis binis antice parvis, postica triplo majori.*

Var. β. *Elytris* (*long. lin.* 7; *lat. lin.* $1\frac{1}{2}$) *late flavo-fasciatis maculis nigris aspersis.*

Var. γ. *Elytris* (*long. lin.* 11; *lat. lin.* 3) *late flavo-fasciatis nigris binis maculis notatis, apice late flavo, spinisque concoloribus, antennis pedibusque pallidis.*

This is probably an immature specimen. It is by no means uncommon.

Sp. 9. STENOCHORUS ANGUSTATUS, *DeJean. Sten. valde elongatus, parallelus, pubescens, fusco-cinereus, thorace subplicato, conico, lineis duabus albidis. Elytris macula laterali antica, elongata, fusca.*

Long. lin. 10; tot. 15.

In Museo M. M. DeJean et Gory.

The above description is taken from the Voyage De l'Astrolabe, by Mons. Boisduval, vide part 2. p. 475.

Sp. 10. STENOCHORUS UNDULATUS. *Sten. nigro-brunneus, antennis aurato-tomentosis thorace supra tuberculato et concolori, medio disci macula elevata rubro-picea et polita. Scutellum aureo-tomentosum. Elytra fusco-brunnea, fasciis binis mediis undulatis pallide flavis apicibus concoloribus. Corpus infra rubro-piceum pedibus aureo-tomentosis.*

Long. lin. 10; lat. lin. $2\frac{1}{2}$.

This species inhabits New Holland, and was sent me by Captain Roe from the New English Settlement at the Swan River in Australia. I must remark that in this species the spines at the apex of the elytra appear unusually short, those at the suture are scarcely

perceptible. I imagine therefore, as the insect is unique and much damaged, that probably they have been broken off.

Sp. 11. STENOCHORUS ASSIMILIS. *Sten. affinis præcedenti, rufo-brunneus, antennis concoloribus et tomentosis. Thorax-rufo-piceus, supra tuberculatus tuberculis quinque elevatis majoribus ita dispositis :|: reliquis minoribus. Elytra rufo-brunnea, fascia elongata irregulari undulata et flava apicibus flavo-maculatis. Corpus infra rufum femoribus et tibiis concoloribus et sub-tomentosis tarsisque auricomatis.*

Long. lin. $10\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

I received this insect from Van Diemen's Land.

Sp. 12. STENOCHORUS ACANTHOCERUS, MacLeay. *Sten. fusco-ferrugineus capite punctato; antennis rubris, articulo* 3^{tio}, 4to, 5to *et* 6to *apice spinosis; ore rubro; maxillis elongatis, apice ciliatis membranaceis; palpis securiformibus; thorace obscuro utrinque unispinoso margine antico tuberculisque dorsalibus utrinque posticoque semicirculari rubris; scutello rubro; elytris rubris fasciis tribus nigris undatis, ad basin inter lineas elevatas subcrenatis, apicemque versus punctatis, apice bidentatis; corpore subtus nigro nitido tomentoso pedibus rubris.*

In Mus. Dom. MacLeay.

Sp. 13. STENOCHORUS DORSALIS, MacLeay. *Sten. fulvo-piceus capite angusto labro palpisque testaceis; vertice canaliculato; thorace inæqualiter rugoso eminentia media ovali glabra tribusque aliis utrinque inconspicuis; elytris bidentatis subelevatis interstitiisque punctatis macula media suturali testacea antice subemarginata; antennis subtus villosis, articulis apice haud spinosis; corpore pedibusque piceis; femoribus incrassatis.*

In Mus. Dom. MacLeay.

Hab. In Nova Hollandia.

Section 2. *Tubericolles.*

Antennis spinosis, thorace tuberculato haud spinoso, apicibus elytrorum bidentatis femoribusque incrassatis.

Sp. 14. STENOCHORUS UNIGUTTATUS, MacLeay. *Sten. fuscus capite cum antennis villosis, thorace inæquali rugoso, tuberculato. Elytris depressis crebrissime punctulatis, in singulo macula quadrato-elongata, et lutea fere in medio disci posita. Corpus infra rubro-fuscum tomentosum femoribus incrassatis et concoloribus, tarsis infra flavo-spongiosis.*

This species I received from the Swan River: it is subject to great variation in size. A specimen similar to Mr. MacLeay's *Uniguttatus* measures in length, lin. $10\frac{1}{2}$; lat. lin. 2. It seems likely that *Sten. elongatus* of DeJean is the same as the above species.

Sp. 15. STENOCHORUS RHOMBIFER. *Sten. affinis præcedenti at multo minor. Fuscus, antennis et corpore sparsim flavo-tomentosis, capite haud villoso, rubro. Thorax inæqualis et tuberculatus. Elytra depressa bidentata, macula quadrato-elongata lutea fere*

in medio disci posita. Corpus infra rubro-piceum nitidum, binis ultimis segmentis pallidioribus. Pedes rubro-fusci femoribus parum incrassatis tarsisque infra aureo-tomentosis.

Long. lin. 7.; lat. lin. $1\frac{1}{4}$.

I received this species in a box of insects from Mr. Charles Darwin. Its true locality is either Sidney or Van Diemen's Land.

I consider it quite distinct from Mr. Sharpe MacLeay's *Stenochorus uniguttatus.*

In Mus. Dom. Hope.

Sp. 16. Stenochorus tunicatus, MacLeay. *Sten. flavus antennarum articulis duobus primis nigris quinto apice septimo nonoque nigris; thorace subcylindrico utrinque unidentato, supra quadrituberculato tuberculis anticis majoribus; elytris apice flavis unidentatis, parte basali ultra medium subviolaceo-flava linea obliqua terminata; corpore pedibusque flavo-testaceis.*

In Mus. Dom. MacLeay.

Sp. 17. Stenochorus rubripes, Boisduval. *Sten. elongatus parallelus; antennis pedibusque rufis; thorace angustiori, cylindrico, tuberculato, coleopteris dilute fuscis; apice spinosis, punctis crebris impressis, macula communi maxima irregulari, nigra notata, altera postica, scutelloque flavis.*

Long. lin. $10\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

Described from Mons. Boisduval's 'Voyage de l'Astrolabe,' vid. part ii. page 479. I had given the name of *Undulatus* to the species, and had figured it before I was aware of its being described: the sexes apparently differ considerably in size.

Sp. 18. Stenochorus Roei. *Sten. rubro-fuscus; antennis pallidioribus; thorace tuberculato, elytrisque macula irregulari flava notatis, alteraque apicali lutea, spinis apice brevibus, externo longiori. Corpus infra rubro-piceum nitidum pedibus concoloribus et tomentosis.*

Long. lin. $6\frac{1}{4}$; lat. lin. $1\frac{1}{4}$.

This species was sent to me from the Swan River by Captain Roe; it is named after that indefatigable and enterprising officer.

Section 3. *Fissipennes.*

Antennis spinosis, thorace inæquali tuberculato seu denticulato, apicibus elytrorum transverse truncatis, haud spinosis.

Gen. Coptocercus*, Hope, Nov. Gen.

Caput antice rugosum, antennis spinoso-tomentosis. *Thorax* fere cylindricus, tuberculatus. *Elytra* parallela thorace latiora ad apicem parum contracta, transverse fissa, haud spinosa. *Corpus* infra convexum, antennis pedibusque fere ut in *Sten. Roei* conformatis.

Type of the Genus, *Stenochorus biguttatus* of Donovan.

Sp. 1. Coptocercus biguttatus, Donovan, vid. pl. 2. fig. 7.

* Koptocercus, from κοπτω, *scindo*, and κερκος *cauda*.

Copt. biguttatus, thorace mutico, ferrugineus, elytris antice punctato-rugosis, testaceo-maculatis, bidentatis macula flava.

Long. lin. 8; lat. lin. 2.

I received this insect from Mr. Donovan, and therefore have no doubt respecting the individual species. The elytra, according to the above description, can scarcely be considered as bidentate; they appear as if they were abruptly broken off at their apex. The sexes vary very much in size.

Sp. 2. Coptocercus sexmaculatus. *Copt. niger; antennis brunneis; thorace tuberculato et rugoso; elytris 6 maculis luteis notatis, pedibus rufescentibus. Caput atrum antennis brunneis. Thorax utrinque denticulatus, inæqualis, rugosus, tuberculatus, macula media elevata et glabra. Elytra nigra antice varioloso-punctata, postice punctis minoribus. Sex-maculata, macula* 1ma *lutea paullo infra basin,* 2da *fere media seu melius fasciata,* 3tia *apicali pallidiore. Corpus infra cinereo-piceum; pedibus rufo-brunneis.*

Long. lin. 7; lat. lin. $1\frac{3}{4}$.

This species, which appears to have escaped the notice of entomologists, is abundant. I suspect that the male sex will have the denticulation on each side of the thorax more marked than in the female described.

Sp. 3. Coptocercus unifasciatus. *Copt. ater thorace inæquali tuberculato, elytris nigris punctatis, et flavo-fasciatis, punctis ternis, maculisque minutis in singulo, inter basin et medialem fasciam positis. Corpus infra rubro-piceum; pedibus concoloribus, aureo-tomentosis; abdomine nigro, et nitido.*

Long. lin. 6; lat. lin. $1\frac{1}{2}$.

The above insect I received from Captain Roe, of the Swan River Settlement in New Holland.

Section 4. *Denticolles.*

Antennis tomentosis, thorace utrinque spinoso; dorso dentato; elytris apice obtusis.

Gen. Trachelorachys*, Nov. Gen.

Type of the Genus, *Stenochorus fumicolor.*

Caput exsertum, oculis prominentibus, antennis corpore brevioribus. *Palpi* maxillares mandibulis longiores. *Antennæ* 11-articulatæ, 1mo cylindrico parum deformi ad basim tenuiori et externe crassiore, 2do brevi subcyathiformi, reliquis fere æqualibus, at extimo minori, apice attenuato. *Thorax* convexus utrinque spinosus, disco spinis armato. *Elytra* thorace quadruplo longiora, depressa, ad apicem obtuse rotundata et inermia. *Pedes* simplices, femoribus haud incrassatis.

Hab. In Nova Hollandia.

Trachelorachys fumicolor. *Trach. fusco-niger; thorace utrinque spinoso, disco spinis quatuor fere in medio armato. Elytra parallela marginibus undique elevatis ad basim crebre granu-*

* The above word is formed of τραχηλος, *collum*, and ραχις, *a spine.*

lata, granulis ad apicem e medio elytrorum magnitudine decrescentibus. Corpus infra piceo-nigrum, pedibus pallidioribus et tomentosis, plantisque aurato-tomentosis.

Long. lin. $10\frac{1}{2}$; lat. lin. $2\frac{1}{2}$.

This insect was obtained from a collection made in the vicinity of Sydney.

TRACHELORACHYS PUSTULATUS. *Trach. flavo-fuscus antennis tomentosis; thorace concolori utrinque spinoso; spinis binis fere in medio armatis. Elytra marginata; pustulis nigris in lineis sparsim dispositis. Corpus infra fusco-rubrum; pedibus subtomentosis.*

Long. lin. 8; lat. lin. $1\frac{1}{2}$.

The above insect was purchased out of a New Holland box, along with various nondescripts; most likely they were from Hobart Town.

Section 5. *Femorales.*

Antennis tomentosis; thorace utrinque spinoso, dorso dentato; elytris transverse sectis; femoribus incrassatis.

Gen. MEROPACHYS*.

Caput exsertum, antennis tomentosis articulis undecim articulatis; 1mo fere ut in *Trach. fumicolori,* at externe crassiori et ovato; 2do brevi et globoso; 3tio triplo longiori; 4to paullo breviori, reliquis gradatim increscentibus, extimo apice subacuto. *Thorax* antice et postice contractus, utrinque in medio spinosus; dorso dentato. *Elytra* depressa; thorace latiora postice latiora transverse fissa. *Totum corpus* supra et infra argenteo sericie aspersum. *Femoribus* valde incrassatis in medio fortiter globosis.

MEROPACHYS MacLeaii. *Merop. fusco-flava antennis flavis tomentosis, thorace concolori, utrinque spinoso, maculis binis atris, antice et postice signato. Elytra aurato sericie aspersa, ad humeros tuberculata, fascia nigricanti ante apicem posita. Corpus infra rubrum nigro et argenteo variegatum. Pedes flavescentes; femoribus globosis, nigro-maculatis; tibiis quatuor posticis medio atratis; tarsisque pallidis binis anticis fere omnino nigris subtusque auri-comatis.*

Long. lin. 8; lat. lin. $1\frac{1}{2}$.

This beautifully sericeous insect is named in honour of William Sharpe MacLeay, Esq., from whom we may shortly expect some valuable communications relating to the entomology of Australia.

This genus appears to differ chiefly from *Trachelorachys* in having both the sexes remarkably characterized by their incrassated femora; and it is probable that, as in other New Holland Stenochoridous genera, the length of the antennæ will vary in the sexes.

MEROPACHYS TRISTIS. *Merop. flavo-fuscus antennis tomentosis, thorace aurato lanugine obsito. Elytra depressa, minutis pustulis lineari serie insignitis. Corpus infra rubro-piceum sericie*

* Meropachys is from μηρος, *femur*, and παχυς, *crassities.*

aurato tectum. Femora valde incrassata; tibiis rubro-testaceis; tarsisque infra auri-comatis.

Long. lin. 9¼; lat. lin. 2.

The above species was sent to me by Captain Roe from the vicinity of the Swan River settlement. There were also other species allied to the present, but they arrived in too mutilated a state to describe.

CONICOLLES.

Scolecobrotus Westwoodii. This species was described at p. 109 in the first volume of the Zoological Transactions, and is admirably figured at Plate XV. *n.* 5. It is remarkable for the joints of the antennæ, all excepting the first three appearing as if they were eaten by worms. I have lately obtained from Mr. Fortnum the other sex of this singular insect, and now briefly describe it. The antennæ are of a light coral-red colour, which may partly be occasioned by abrasion. The joints of the antennæ do not appear serrated as in the former sex, excepting under a high magnifying power, and even then it is scarcely perceptible. The spines at the apex of the elytra are wider apart than in the specimen previously described; in other respects the insects accord almost entirely. I have reason to think that both the above specimens are from the Swan River settlement, and am not aware that any others are to be found in our metropolitan, or even in the French collections.

Uracanthus, Hope. For the description of this genus, *vide* the details published at page 108 of the 'Zoological Transactions,' where only one species was described; two more are now added.

URACANTHUS PALLENS. *Uracan. affinis præcedenti at multo minor. Cervino-brunneus thorace conico et albo-lineato; elytris pallidioribus apicibus bidentatis.*

Caput fronte forte canaliculata pubescenti-albida tectum. Thorax alba linea utrinque notatus, binisque tuberculis ad latera subarmatus, rugisque transversis constrictus. Elytra cervino-brunnea, sericea, triangulis in singulo colore saturatiore inquinatis. Corpus infra brunneo-sericeum, femoribus parum compressis.

Long. lin. 10; lat. lin. 2.

I had originally given the name of *sericeus* to this species, which, as it seems common to all that are now known, I change it at present to *pallens*. It was received from Van Diemen's Land in 1839.

URACANTHUS MARGINELLUS. *Uracan. fusco-brunneus thorace albo-lineato, elytrisque brunneo marginatis.*

Totum corpus supra tomentosum, capite porrecto et inter oculos parum sub-canaliculato. Thorax rugis constrictus, tuberculo utrinque posito. Elytra albo-pubescentia marginibus brunneis apicibus abrupte truncatis, spinis parum prominentibus. Corpus infra concolor, femoribus compressis.

Long. lin. 9; lat. lin. 1⅓.

I received this insect from Captain Roe, of the Swan River. In form it approaches a singular genus named *Stephanops* by Mr. Shuck-

hard; it is however decidedly an *Uracanthus*, and there can be little doubt that *Stephanops Nasutus* of the above author belongs to my section of the cone-necked-shaped *Stenochoridæ*.

Section *Conicolles*, Hope.

Genus STRONGYLURUS, Hope.

Type of the Genus *Sten. scutellatus*, Hope.
Vide Zool. Trans., vol. i. p. 107.

Caput porrectum, oculis prominentibus. *Antennæ* undecim articulatæ: articulus 1mus crassus antice latior quam ad basim; 2do brevi, reliquis gradatim increscentibus, compressis. *Thorax* coniformis antice et transverse truncatus. *Elytra* thorace latiora, parallela apicibus rotundatis. *Femora* in utroque sexu subincrassata, et parum compressa.

Sp. 1. STRONGYLURUS SCUTELLATUS. *Strong. fuscus et tomentosus, thorace flavo-ochraceo colore utrinque lineato medio disci nigricante. Scutellum valde distinctum flavum. Elytra fusco-brunnea, fasciisque undulatis parum distinctis notata. Corpus infra sordide fuscum, abdomine rubro-piceo, pedibus concoloribus et tomentosis.*

Long. lin. $12\frac{1}{3}$; lat. lin. 3.

The above insect I have received from various parts of New Holland; as it is accurately figured, I have not given very full generic details. I must remark, however, that in the sexes of this genus the antennæ vary very considerably, in one instance exceeding the length of the body, whilst in the other sex they are shorter than the elytra. These Longicorn beetles also vary much in size, which is a remark that appears to apply to most of the *Cerambycidæ* of New Holland. Can the long drought which sometimes prevails in this country be regarded as the cause of *dwarfishness*, which is certainly one of the striking features of the *Coleoptera* of Australia?

Sp. 2. STRONGYLURUS VARICORNIS. *Strong. testaceo-fuscus, antennis flavo-nigroque variegatis. Thorace tomentoso utrinque, dentibus atris armato. Scutellum distinctum et album. Elytra fusco-testacea fasciis binis undatis parum distinctis. Corpus infra concolor, pedibus tomentosis.*

Long. lin. $5\frac{1}{3}$; lat. lin. $1\frac{1}{2}$.

There are in our English collections two other species belonging to this genus; as however I have them not at hand, I must leave others to describe them.

Genus COPTOPTERUS, Hope.

Type of the Genus *Stenochorus Cretifer*, Hope.
Vide Zool. Trans., vol. i. p. 107.

Caput porrectum inter oculos canaliculatum. *Antennæ* compressæ, et fere ut in Strongyluro. *Thorax* obconico-truncatus, lateribus rotundatis. *Elytra* thorace latiora parallela; apicibus sub-ob-

lique truncatis, seu abrupte sectis. *Femora* sub-incrassata et parum compressa; tibiis subincurvis.

Coptopterus cretifer. *Copt. fusco-brunneus, capite albida macula inter oculos posita. Thorax nigro-cinereus variis maculis cretaceis notatus. Elytra brunnea maculis nigris aspersa, in quibusdam speciminibus maculæ conjunctæ fascias exhibent. Corpus infra fusco-rubrum maculisque variis albidis obsitum. Pedes rubro-picei et tomentosi.*

Long. lin. 10½; lat. lin. 3.

This insect appears to be abundant at Sydney: there are also other allied species undescribed, and from the vicinity of the Swan River.

Genus Piesarthrius, Hope.

Type of the Genus *Stenochorus marginellus.*
Vide Zool. Trans., p. 112. Genus 12.

Caput exsertum. *Antennæ* valde compressæ, 11-articulatæ. *Thorax* fere tetragonus angulis anticis parum rotundatis. *Elytra* thorace paullo latiora parallela, interne spinosa, angulis externis rotundatis. *Femora* antica quatuor vix incrassata, posteriora minora; tibiis subincurvis.

Hab, In Nova Hollandia.

Piesarthrius marginellus. *Piesar. flavo-fuscus antennis compressis, tomentosis et pallidis. Thorax niger, lateribus flavo-ochraceis. Scutellum distinctum et flavum. Elytra testaceo-flava marginibus interne et externe rubro-piceis. Corpus infra brunneo-piceum lateribus pectoris annulisque abdominis utrinque flavo-maculatis, pedibus pallidioribus.*

Long. lin. 10; lat. lin. 2½.

This insect I received from Captain Roe of the Swan River, and it is, I believe, unique in our London cabinets. I have seen a second species, but have not been able to obtain permission to describe it.

GEOLOGICAL SOCIETY.

April 29, 1840.—A paper was read, entitled, "Description of the mains of a Bird, Tortoise, and Lacertian Saurian, from the chalk;" by Richard Owen, Esq., F.G.S.

Bird.—The three portions of Ornitholite were obtained by Lord Enniskillen from the chalk near Maidstone, and were recognised by him and Dr. Buckland as belonging to some large bird. One of the bones is nine inches in length, and has one extremity nearly entire, though mutilated, but the other is completely broken off. The extremity, partially preserved, is expanded. The rest of the shaft of the bone has a pretty uniform size, but is irregularly three-sided, with the sides flat and the angles rounded: its circumference is two inches and a quarter. The whole bone is slightly bent. The specimen differs from the femur of any known bird, in the proportion of its length to its breadth; and from the tibia or metatarsal bone,

in its triedral figure, and the flatness of the sides, none of which are longitudinally grooved. It resembles most the humerus of the Albatross in its form, proportions and size, but it differs in the more marked angles bounding the three sides. The expanded extremity likewise resembles the distal end of the humerus of the Albatross, but it is too mutilated to allow the exact amount of similarity to be determined.

On the supposition that this fragment is really a part of the humerus, Mr. Owen says, its length and comparative straightness would prove it to have belonged to a longipennate natatorial bird, equalling in size the Albatross.

The two other portions of bone have been crushed, but Mr. Owen states that they belong to the distal end of the tibia, the peculiar strongly-marked trochlear extremity of which is well preserved. Their relative size to the preceding bone, supposing that specimen to be part of a humerus, is nearly the same as in the skeleton of the Albatross. There is no bird now known north of the Equator with which the fossils can be compared.

Tortoise.—The remains of the Chelonian Reptile consist of four marginal plates of the carapace, and some small fragments of the expanded ribs. The marginal plates are united by the usual finely-indented sutures, and each is impressed along the middle of its upper surface with a line corresponding to the margin of the horny plate which originally defended it. The external edge of each plate is slightly emarginated in the middle. These plates are narrower in proportion to their length than in any of the existing marine Chelonia; and they deviate still more in the character of their internal articular margin, from the corresponding plates of terrestrial Chelonia; but they sufficiently agree with the marginal plates of the carapace of the Emydes, to render it most probable that these cretaceous remains are referable to that family of Chelonia which live in fresh water or estuaries.

Lacertian Saurian.—This fossil belongs to the collection of Sir Philip Egerton; and it consists of a chain of small vertebræ in their natural relative position, with fragments of ribs and portions of an ischium and a pubis.

The bodies of the vertebræ are united by ball and socket-joints, the socket being on the anterior and the ball on the posterior part of the vertebra; and they are further proved to belong to the Saurian class of reptiles by the presence of many long and slender ribs, as well as by the conversion of two vertebræ into a sacrum, in consequence of the length and strength of their transverse processes. The remains of the ischium and the pubis are connected with the left side of the sacrum, proving incontestably that this reptile had hinder extremities as well developed as in the generality of Saurians. Of these extremities, as well as of the anterior and of the head, there are no traces.

Mr. Owen then proceeds to determine to which division of Saurians, having ball and socket vertebral joints, the fossil should be referred. In the crocodilian or Loricate group, the transverse costi-

gerous processes are elongated, and three, four, or five of the vertebræ which precede the sacrum are ribless, and consequently reckoned as lumbar vertebræ: in the lacertian Sauriæ there are never more than two lumbar vertebræ, and those which have ribs support them on short convex processes or tubercles.

In the fossil from the chalk, the ribs are articulated with short processes of the kind just mentioned, resembling tubercles, and they are attached to the sides of the anterior part of all the vertebræ, except the one immediately preceding the sacrum. These characters, Mr. Owen says, in conjunction with the slenderness and uniform length of the ribs, and the degree of convexity in the articular ball of the vertebræ, prove incontestably, that the fossil is part of a Saurian, appertaining to the inferior or lacertian group.

The under surface of the vertebræ is smooth, concave in the axis of the spine, and convex transversely. As there are twenty-one costal vertebræ anterior to the sacrum, including the single lumbar, the fossil, Mr. Owen observes, cannot be referred to the genera *Stellio*, *Leiolepis*, *Basiliscus*, *Agama*, *Lyriocephalus*, *Anolis*, or *Chamæleon*, but that a comparison may be instituted between it and the *Monitors*, *Iguanas*, and *Scinks*. In conclusion, he states, that in the absence of the cranium, teeth, and extremities, any further approximation of the fossil would be hazardous, and too conjectural to yield any good scientific result.

June 10, 1840.—A memoir descriptive of a "Series of Coloured Sections of the Cuttings on the Birmingham and Gloucester Railway," by Hugh Edwin Strickland, Esq., F.G.S.

The author commences by expressing his regret at the irrecoverable loss, which science has experienced, in full advantage not having been taken of the valuable geological information, which has been exposed by the railway cuttings in different parts of England during the last ten years; and he suggests the propriety of each line of railway being systematically surveyed by a competent observer, while the cuttings are in progress.

Anxious to contribute towards so desirable an end, Mr. Strickland gladly yielded to a request made to him by Captain Moorsom, the chief engineer of the Birmingham and Gloucester Railway, to undertake a geological survey of the line; and he expresses his obligations to that gentleman and to Captain J. Vetch for the valuable assistance they afforded him. The line was originally surveyed by Mr. Burr, when only the trial shafts had been sunk, and before the cuttings were commenced; but Mr. Strickland bears testimony to the accuracy of the account which Mr. Burr laid before this Society.—(Geol. Proceedings, vol. ii. p. 593.

The direction of the railway ranges nearly parallel to the strike of the strata, and therefore intersects only the new red sandstone and red marl, the lias, and superficial detritus.

New red sandstone and red marl.—The lowest rock exposed belongs to the new red or bunter sandstone, resting on the anticlinal

axis of the Lickey, ten miles south-south-west of Birmingham, and one mile south of the termination of the altered rock, or Lickey Quartz*. The sandstone is there thick-bedded, soft, and red, and dips on the western flank about 5° west-south-west, and on the eastern 5° east-south-east. In Grovely Hill, on the north-east of the Lickey, it passes occasionally into a hard quartzose conglomerate with a calcareous paste †; and at Finstal, on the south-west of the Lickey ridge, the upper portion of the sandstone is light-coloured, and contains obscure vegetable impressions, being a prolongation of the stratum, with similar impressions, at Breakback Hill, on the west of Bromsgrove ‡.

On each side of the Lickey, the sandstone is conformably overlaid by red marl, which extends on the north-east to Birmingham§, and on the south-west to Stoke Prior and the neighbourhood of Hadnor, where the railway intersects a ridge of lias. On the north side the marl is there cut off by a fault, but on the south, at Dunhamstead, the following juncture section is exposed:—

(*a*.)	Lias clay with contorted beds of lias limestone.	
(*b*.)	White micaceous sandstone, with numerous specimens of a smooth oval bivalve	2 Feet.
(*c*.)	Lias clay	6
(*d*.)	Grey marl	35
(*e*.)	Red marl	

Dip of the beds 5° north-north-east.

In the hill south of Dunhamstead, the grey marl (*d*) abuts against the red marl (*e*) in consequence of a fault. For the next five miles the railway traverses a valley of red marl, between the escarpment of the lias and a ridge of Keuper sandstone. On the south-east of Spetchley the strike of that sandstone is altered by a fault from south by east to south-west, and a projecting angle has been produced which is intersected by the railway. This stratum is a feeble representative of the Keuper sandstone of Burg Hill, &c.||, consisting chiefly of greenish marl with thin laminæ of white sandstone, about twenty feet thick, with red marl above and below. At Norton the railway ascends the lias escarpment, and cuts through a section exactly analogous to the one given above. A mile further south the lias clay contains many calcareous concretions abounding with fossils, including *Plagiostoma giganteum, Modiola*

* See Mr. Murchison's Silurian System, p. 492.

† Similar conglomerates occur in Worcestershire, Staffordshire, and Warwickshire.—Silur. Syst., p. 42. Geol. Trans., 2nd Series, vol. v. 347.

‡ Geol. Trans., 2nd Series, vol. v. p. 341; Proceedings, vol. ii. p. 564.

§ The red marl extends from Birmingham along the London railway as far as Berkswell, forming the basin, in which occurs the lias outlier of Knowle south-west of Berkswell. The true boundary of the sandstone and marl in this district has been only recently ascertained; it ranges from Hewell Grange, nearly north, by Cofton Hacket to Northfield, and thence north-east to the south suburbs of Birmingham.

|| Proceedings, vol. ii. p. 503. Geol. Trans., 2nd Series, vol. v. p. 332.

minima, and a coral. At Abbot's Wood the fissile sandstone at the base of the lias is again exposed, having been brought up by a fault. At Defford and Eckington the lias clay encloses numerous specimens of *Pachyodon Listeri* (Stuchbury), or *Unio Listeri* of Sowerby, and *Ammonites Turneri*. At Bredon a higher portion of the lias series was reached, and a different suite of fossils found, the most marked being *Pleurotomaria Anglica, Hippopodium ponderosum, Gryphæa incurva, Nautilus striatus*, and several species of Ammonites. Between Cheltenham and Gloucester the lias has yielded great abundance of organic remains, a considerable number of which are considered to be new, and with the exception of *Hippopodium ponderosum, Gryphæa incurva*, and one or two others, they are distinct from the fossils of Bredon Hill; and at Hewlitt's, east of Cheltenham, the lias near the base of the marlstone presents another series of distinct fossils. The lower lias, therefore, Mr. Strickland observes, affords evidences of at least four well-marked successions of molluscous faunæ, in a vertical height of 400 or 500 feet, and unaccompanied by any change in the mineral character of the deposits.

Superficial detritus.—The author then proceeds to describe the deposits of superficial detritus, and he states, that they entirely confirm the views which he had previously entertained, respecting the distinction between the ancient terrestrial alluvia in which bones of mammalia occur, and the submarine drift which covers most parts of the island*.

He divides the detritus into fluviatile and marine, and the latter, according to its origin, into local and erratic, and this, according to its composition, into gravel with flints and without flints.

Marine erratic gravel without flints†.—Commencing his details with the Birmingham end of the line, Mr. Strickland shows, that these accumulations occur extensively on all sides of that town, and at intervals along the line of the railway till it approaches the valley of the Avon. Mammalian remains appear to be totally wanting. Chalk flints are so extremely rare in it around Birmingham as to prove that the materials were transported from the north. At Mosely it is upwards of 80 feet thick, and consists of rolled pebbles, rarely exceeding 4 inches in diameter, of various granitic and quartzose rocks and altered sandstones, imbedded in a clean ferruginous sand; and a bed of sand 30 feet thick, without pebbles, occurs in the middle of the gravel. Between Cotteridge and Wytchall is an erratic boulder, or shapeless mass of porphyritic trap, about 5 feet by 4, with the angles slightly rounded. At the Lickey, gravel analogous to that near Birmingham, but with a large proportion of slate rocks, attains, on the line of the railway, a height of 387 feet, and at the Lickey Beacon of more than 900 feet. Sugar's Brook is the next locality noticed by Mr. Strickland, but from that point no gravel occurs for sixteen miles. Near Abbot's Wood is another extensive deposit of quartzose gravel and ferruginous sand, devoid of flints and resting upon lias.

* See Reports of the British Association, vol. vi., Sessional Meetings, p. 61.

† Northern drift of Mr. Murchison, Silur. Syst., p. 523.

Marine erratic gravel with flints.—These accumulations commence immediately south of the Avon. The village of Bredon stands on a platform, seventy feet above the ordinary level of the Avon, composed of lias with an uneven surface, and capped with 10 to 15 feet of this gravel. It contains no mammalian remains.

Fluviatile gravel.—The only example of this drift, on the line of the railway, occupies the two opposite flanks of the Avon at Defford and Eckington, north of Bredon. At these localities the surface is a tabular platform which does not exceed forty-five feet above the Avon, including a capping of ten feet of gravel precisely similar to the flinty gravel of Bredon, but containing abundance of mammalian remains. They were chiefly found in the cutting north of Eckington, at the lower part of the deposit, and often on the surface of the lias clay; and are referrible to *Elephas primigenius, Hippopotamus major, Bos Urus,* and *Cervus giganteus* ? On the north, or Defford side of the Avon, the remains of *Elephas primigenius* and *Rhinoceros trichorhinus* have been obtained. Associated with these bones are numerous freshwater shells, agreeing with those found at Cropthorne *; the most abundant species being *Cyclas amnica* and *C. cornea.* In endeavouring to account for the presence of these remains at only one point in the line of the railway, Mr. Strickland states that he can offer no other explanation than that previously proposed by him †, namely, that after the beds of marine gravel had been deposited and laid dry by the elevation of the land, a large river or chain of lakes extended down the valley of the Avon, at a height varying from twenty to fifty feet above its present course; and that the gravel previously accumulated by marine currents, was remodified by the river, and mixed up with remains of mammalia which tenanted its banks, or of mollusca which inhabited its waters.

Local gravel—This species of detritus occurs abundantly at Cheltenham, and consists exclusively of detritus from the oolites and lias of the vicinity. No bones or terrestrial remains have been found in it; and, therefore, the author assigns to it, in the absence of other evidence, a marine origin.

Modern alluvia.—The only deposits of this nature mentioned in the paper, are the peaty accumulations on the banks of the Avon and its tributaries.

The memoir was accompanied by a copy of the Railway Section, and of the Tewkesbury branch, and the junction branch from the main line to the London and Birmingham Railway, presented by Capt. Moorsom, but coloured geologically by Mr. Strickland.

MICROSCOPICAL SOCIETY.

Jan. 27, 1841.—Richard Owen, Esq., President, in the Chair.

A paper was read by Mr. Bowerbank, "On the Keratose or Horny Sponges of Commerce."

The author, after noticing the labours of Dr. Grant and Dr. Fle-

* Silur. Syst., p. 555; and Proceedings, vol. ii. pp. 6 and 95.

† Reports of British Association, vol. vi. Sections, p. 64.

ming, who have described these bodies to be animals which are "porous, with skeletons consisting of cartilaginous tubes destitute of earthy spicula," proceeds to state that he was induced to investigate this division of the Sponges in consequence of having received from Rupert Kirk, Esq., of Sydney, numerous specimens of Sponges, among which were many exhibiting every appearance of being true Keratose sponges, but which, upon a close examination with a high microscopic power, were discovered to be abundantly furnished with siliceous spicula. The existence of spicula in these specimens led the author to suspect their presence in the keratose sponges of commerce. Upon examining these sponges, there were found to be two well-marked species from the Mediterranean, and a third which is obtained from the West India Islands. The first and commonest species of Mediterranean sponge, is the *Spongia officinalis* of Lamarck. When examined, before it has been cleaned and bleached by the dealers, with a power of five hundred linear, the fibre from the exterior presents the appearance of a smooth, light, amber-coloured thread; but when taken from the interior it is seen to be coated with a thin and somewhat rugose film, containing minute granules, which the author believes to be the incipient gemmules of the sponge, by which the sponge is propagated, after the manner described by Dr. Grant as occurring in other divisions of this class. The greater part of the fibres consist of cylindrical transparent threads, frequently anastomosing and varying considerably in their size. This portion of the tissue is destitute of spicula; but there frequently occur, dispersed amid this form of tissue, large flattened fibres running in a straight direction, and it is in these that spicula are found imbedded in the centre of the tissue. The spicula vary considerably in their size and form, and are best obtained for examination by burning small pieces of the sponge to a white ash, and washing this with dilute muriatic acid. In the other sponges of commerce, spicula are found in equal abundance. All the writers who have treated of *Spongia officinalis* have described it as consisting of horny tubes; but the author states this to be an error, and proves the thread in all the species of the sponges of commerce to be a solid horny fibre. The second species of Mediterranean sponge is described as being very similar in its external characters, and in the size, form and arrangement of its fibres, to *S. officinalis*, but is distinguished from it by the possession of a beautiful vascular tissue, which surrounds in great abundance nearly every fibre of its structure, frequently anastomosing and running in every possible direction over its surface. This tissue is not imbedded in the horny mass of the fibre, but is contained in a sheath, which closely embraces it. In one of these vessels the author observed numerous minute globules, exhibiting every appearance of being globules of circulation analogous to those found in the blood of the higher classes of animals. These molecules were extremely minute, the largest being but the 16,666th of an inch in diameter, and the smallest the 50,000th of an inch in diameter. A similar vascular tissue is stated to exist in a considerable number of the keratose sponges of Australia. The author concludes by some observations on the nature

and structure of the spicula of sponges in general, and endeavours to prove that they bear no relation to the raphides of vegetable bodies, but are truly of animal origin, having their internal surfaces lined with an animal membrane, which becomes converted into a thin film of carbon when the spicula are exposed to the action of the blow-pipe.

The author illustrated his paper by numerous drawings of the tissues described, and exhibited the specimens from which they were delineated.

Mr. Owen exhibited the specimens of the teeth of the Labyrinthodon, described by him at the last Meeting of the Geological Society, and he explained the peculiarities of the dental structure in that extinct species of Reptiles.

Mr. Varley called the attention of the Society to a new form of Microscope, which he had constructed with a view to facilitate the examination of minute living objects.

MISCELLANEOUS.

Absorption of Liquid Solutions by the Sap-vessels of Plants.—M. Dumas reported to the Academy of Sciences on the 30th November, 1840, that by the absorption of various fluids, Dr. Boucherie had discovered a method of rendering wood more durable, of increasing its tenacity and hardness without impairing its elasticity, and of imparting to it various permanent colours and odours.

Dr. Boucherie found that the attractive power of the vegetable tissue was sufficient to carry from the base of the trunk to the leaves all the fluids he wished to introduce, provided they were kept within certain limits of concentration. He cut a tree near the base when in full sap, and plunged it into a tub containing the fluid he wished to introduce, and in a few days he found that it had risen even to the most elevated leaves, and had penetrated all the tissue except the heart of the tree. The same result followed whether the trunk was in an erect or inclined position. It was not even necessary to divide the trunk completely, for a cavity hollowed out at its base, or a groove made with a saw over a considerable part of the circumference, was sufficient, when the cut part was brought into contact with the fluid, to allow a rapid absorption to take place.

Dr. Boucherie ascertained that the absorption of a solution of pyrolignite of iron containing some creosote augmented the hardness of wood and prevented its decay, while the penetration of the wood with solutions of the earthy chlorides and various saline matters rendered it less combustible.

Various colours were given to wood by causing different substances to be absorbed in succession. Pyrolignite of iron by itself gave the wood a beautiful brown colour; when it was followed by an astringent fluid containing tannin, a blue, black, or gray colour ensued; and when succeeded by ferrocyanate of potash, a deep Prussian blue re-

sulted. In the same way the absorption of acetate of lead and of chromate of potass imparted a yellow colour, and by the mixture of several of these substances a still greater variety of shades was produced.

Different odours were in a similar manner given to various kinds of wood.

The Highland Society of Scotland have offered a gold medal or thirty sovereigns as a premium for the best account of a series of similar experiments.

Congrès Scientifique de France.—The Ninth Meeting of this Association, which in its plan and objects resembles the British Association for the Advancement of Science, will be held at Lyons, and will occupy twelve days. The Session will open on Wednesday, September 1st, 1841, in the great hall of the Palais des Terreaux. The Association will be particularly gratified by the attendance of men attached to science, literature and the arts, from the British Isles.

Eels killed by the late Frost.—Although it is well known to naturalists that the Eel, otherwise tenacious of life, cannot bear excessive cold, I conceive that the following facts upon the subject, though by no means so satisfactory as could be wished, are worthy of being placed on record. On the 6th, 7th, and 8th of the present month (February, 1841) great quantities of this fish in a dead state floated down the river Lagan to the quays at Belfast. Here upon these days, and along the course of the river within the tide-way, collecting dead eels was quite an occupation at low water, and to the numerous loiterers about the quays proved in some cases more productive for the time than the "chance jobs" by which they gain a livelihood. One individual earned his two shillings for nearly a bushel-full*, and another, selling them at the same rate, gained five shillings for what he collected at the fall of a tide. Three examples sent me by my friend Edmund Getty, Esq., were the common Eel (*Anguilla acutirostris*, Yarr.), in excellent condition, and in all respects of ordinary appearance; one was about a foot, the others were two feet in length. They were found dead of all sizes up to the largest.

The only experiment I heard of being made on these Eels was, that four of them, of gradations in size from a foot to two feet in length, were placed in water warmed to a high summer temperature, to see if they would revive; but, as may be anticipated of such a proceeding, none of them exhibited any signs of life. A highly interesting fact connected with this fatality among the Eels is, that on the three days on which they perished from the cold, the thermometer was nearly ten degrees higher than it had been for three days successively in the preceding month, when none were known to have suffered from it. At that time the wind was south-west and moderate. When they were killed there was a gale from the east, accompanied by hard frost: to the human body the cold was at this

* The price of Eels in our market is three-pence or four-pence per pound.

time extreme and piercing, though at the period mentioned in January it was not disagreeable. At low water a great extent of mud-banks is uncovered at the part of the river where the Eels were killed, and at this season these fishes are believed to be imbedded in the mud; they would seem to have suffered from the intense cold arising from the rapid evaporation produced by the piercing east wind.

Since January 1814, such a sensation of extreme cold has not been experienced at Belfast, and at that time, as I am informed by Mr. Hyndman, great quantities of Eels met with a similar fate in the river Lagan. They were seen by him floating down the stream dead, at the Long Bridge in this town. It is most probably in reference to 1814 that Mr. Templeton has remarked in his 'Catalogue of Irish Vertebrate Animals,' that "great numbers of eels inhabiting the shallow watery mud on the shore of Belfast Lough were killed during a severe winter*." It is worthy of remark, that at the time just mentioned the wind was also easterly. In the Meteorological Report for January 1814, published in the 'Belfast Magazine,' it is observed, "The continuance of the wind in the east for a longer time than usual has produced such a degree of cold as the oldest person in Ireland now alive cannot remember. Notwithstanding the rise of the tide, a sheet of ice has covered the bay of Belfast, strong enough to enable people to walk about with perfect safety over the channel, and full half a mile from the quays. Lough Neagh has also been so much frozen as to allow people on horseback to ride into Ram's Island, situated two miles from the shore." I have been credibly informed that at the same period laden carts were taken over the ice to the island, and that some sportsmen of the neighbourhood had a drag or trail hunt upon the lake, and followed the hounds on horseback.

A lighter, when coming to Belfast on the 6th or 7th of the present month, on breaking the ice at a part of the river where the banks are not uncovered to the same extent at low water as where the eels were chiefly killed, exposed a number of them, which, though not dead, were so weak as to be unable to offer any resistance, and were lifted into the vessel. On the days which proved fatal to the eels here great numbers were likewise found dead in the bay at Dundalk.

The minimum thermometer at the Belfast Library indicated on the morning of

		° ″	
January	7, 1841	19·00	Wind south-west; moderate.
———	8, ——	18·50	
———	9, ——	18·50	
February	6, ——	27·75	Wind very high from the east; dry.
———	7, ——	27·75	
———	8, ——	27·50	

WM. THOMPSON.

Donegal Square, Belfast, Feb. 1841.

* Mag. Nat. Hist., vol. i. New series.

OBITUARY:—FRANCIS BAUER, ESQ.

Mr. Bauer was born at Feldsberg, in Austria, on the 4th of October, 1758, and died at Kew on the 11th of December, 1840. He lost his father (himself an artist) at an early age, and was initiated, with his brothers, in the ready use of the pencil, under the guidance of an excellent mother. He came to England in the year 1788, with the intention to proceed to Paris, where, notwithstanding the progress of the Revolution, artists and scientific men were allowed to follow their pursuits without molestation. His brother Ferdinand, scarcely less skilful in the art of delineating botanical subjects, and who subsequently accompanied Mr. Robert Brown as draughtsman on Flinders's voyage, had already been with Sibthorpe in Greece, and was then at Oxford, busy in completing the 'Flora Græca.' Sir Joseph Banks soon appreciated Mr. Bauer's rare talents, as well as his singular sagacity in botanical physiology, and prevailed on him to remain in England. Sir Joseph, in fact, settled on him 300*l.* per annum for life, on condition that he should reside at Kew, as botanical painter to the Royal Gardens, which were then rapidly advancing to a high state of perfection. The munificence of Sir Joseph enabled Mr. Bauer to pursue the bent of his genius independent of the public and of booksellers; and numberless beautiful illustrations of the rare plants introduced in rapid succession at Kew, by the many travellers and navigators of the reign of George the Third, were the result—works now deposited with Sir Joseph Banks's library at the British Museum, and which all who have examined must acknowledge to be, for accuracy of delineation and colouring, elegance of execution, as well as for physiological and anatomical truth, unexampled at that period. Mr. Bauer was also appointed drawing-master to the Princess Elizabeth; but he was a better philosopher than courtier, and his services, which were given gratuitously, were soon dispensed with. At that time he was occupied on the Heath tribe, then in course of introduction, chiefly from the Cape, by Menzies. Engravings were made from these drawings, and Queen Charlotte and the Princess used to colour them under his superintendence. These were afterwards sold by public auction, with other of Her Majesty's effects!

Towards the end of the last century, Mr. Bauer commenced his illustrations of Orchideous plants, since published by Dr. Lindley. He subsequently turned his attention to the diseases in corn, in which, from his skill in the use of the microscope, he made discoveries of great importance to agriculture, and therefore to mankind; and we may here state, that the *only money* which he received during his long life, beyond the above-mentioned income, was fifteen guineas, which the editor of one of the cheap publications of the present day sent to him for some short papers on the smut in wheat.

In 1816, the late Sir Everard Home, being engaged in some researches respecting the anatomical structure of the foot of the common house-fly, communicated the difficulties he experienced to Sir Joseph Banks, who immediately introduced him to Mr. Bauer. This led to an intimacy of the most lasting and most useful kind. Mr. Bauer solved every difficulty, and, at the suggestion of Sir Everard, entered on a number of other anatomical inquiries, the results of which

were published by Sir Everard in the Transactions of the Royal Society. The most remarkable of these were his dissections and drawings of the common red earthworm, the lampreys, conger-eel, Mexican Proteus, metamorphosis of the tadpole, generations of oysters and muscles, process of incubation from the egg to the perfect chicken, the eye, structure of brain, nerves, blood, lungs, urethra, and muscular fibre—some of which labours have led to great improvements in the treatment of diseases, and consequent alleviation of human suffering; and all display an unrivalled degree of skill, perseverance, and philosophical acumen, sufficient to have conferred on him the highest fame, had such been his aim. At the suggestion of Sir Everard Home, George the Fourth resolved to establish a Botanical Museum at Kew, which was to be entrusted to Mr. Bauer. The house now belonging to the King of Hanover was purchased for this purpose—the shelves were prepared—all the botanical books in the King's library were to be removed there, and some had, in fact, been sent down, when, unfortunately, a dispute arose respecting the land, to which the Commission of Woods and Forests laid claim; and some artillery waggons driving off with the book-cases gave Mr. Bauer the first intimation that the plan had been abandoned.

About this period Mr. Bauer made his superb drawings of the *Rafflesia Arnoldii* (the plant of which a model in wax is preserved at the rooms of the Horticultural Society). He still continued his delineations of Kew plants, and latterly, more especially of the ferns published by Sir William Hooker. He, at the same time, directed his attention to many microscopical researches—such as the structure of cotton, flax, and wool, the hairs of the various races of men, as well as of many animals, the red snow of Sir John Ross; and, though little known to the public, he had so well established his reputation amongst the select in every walk of science, that rarely indeed would any man of science or any traveller of eminence pass through London without visiting him, and no one returned otherwise than gratified and instructed. Of Mr. Bauer, indeed, it has been truly said, "that nothing prevented his acquiring an extraordinary degree of fame, except his remarkably unobtrusive modesty—he worked rather for the credit of others than for his own."

Mr. Bauer continued, up to a late period, his microscopic researches and drawings; but, unwilling to risk the chance of leaving any work unfinished, he at last determined to rest, and to attempt no more. Seated near his microscope, which long use had made almost essential to his happiness, he spent his hours in re-examining what his pencil had so admirably perpetuated, and reviewed, in the monuments of his labour, the history of his life. His was, indeed, a life of incessant activity and usefulness. The motives which stimulate common men never influenced him! Vanity, selfishness and illiberality were wholly foreign to his disposition; and that his innocent labours had spared him from all self-reproach and remorse, his serenity, his cheerful resolve to abide his time in peace, and his final departure from this world under circumstances the most consolatory, full of resignation, faith and hope, and free from sufferings, save the increasing debilities of old age, sufficiently prove.—*Athenæum*, No. 687.

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

GENTLEMEN,

IN the Cambridge Anatomical Museum there are two skeletons of Seals, which possess the characters of the *Halichærus Gryphus*, given in Bell's 'British Quadrupeds.' One of them was formerly in the Museum of Dr. Macartney at Dublin, and was probably taken off the eastern coast of Ireland; the other, of large size, and of advanced age, if we may judge from the state of its teeth, was captured in fishing nets off the Essex coast, a few years ago.

I have the honour to be, gentlemen,

Your obedient servant,

Caius College, Cambridge, Feb. 8, 1841. L. E. PAGET.

METEOROLOGICAL OBSERVATIONS FOR JAN. 1841.

Chiswick.—Jan. 1. Hazy: fine with clouds. 2. Rain: clear and fine: hurricanes at night. 3. Thunder-storm about 7 A.M., accompanied with large and vivid flashes of lightning, rain, hail and sleet, and high wind, which soon after subsided into a perfect calm. 4. Sharp frost: slight fall of snow: clear at night. 5. Densely overcast: snow: large lunar halo in the evening. 6. Hazy. 7. Intense frost. 8. Dense fog: severe frost. 9. Intense frost. 10. Overcast: slight haze: rain at night. 11. Overcast. 12. Cloudy: clear. 13. Foggy: rain: fall of snow. 14. Cold haze: rain: sleet and snow. 15. Rain. 16. Thawing rapidly: occasioning inundations, the frozen crust preventing the water from sinking into the earth. 17. Continued thaw. 18. Rain. 19. Overcast. 20. Cloudy and cold: sharp frost at night. 21. Frosty: fine. 22. Frosty: rain at night. 23. Clear. 24. Boisterous: cold and dry. 25. Clear and frosty. 26. Overcast and fine. 27. Very fine. 28. Cloudy. 29. Fine. 30. Hazy. 31. Foggy: rain.

Previously to the thaw, in the beginning of the month, the frost had penetrated in some soils to a depth of 12 inches.

Boston.—Jan. 1. Cloudy. 2. Fine. 3. Cloudy: stormy with lightning and rain early A.M. 4. Cloudy: snow early A.M.: stormy with rain P.M. 5. Stormy. 6, 7. Fine. 8. Fine: thermometer 17°·0 three o'clock P.M. 9. Fine: thermometer 28°·0 three o'clock P.M. 10. Cloudy: large fall of snow early A.M. 11. Cloudy: snow early A.M. 12. Cloudy. 13. Fine: rain P.M. 14, 15. Cloudy. 16. Cloudy: snow early A.M.: rain P.M. 17. Fine. 18. Cloudy. 19. Cloudy: rain early A.M. 20. Snow: snow P.M. 21. Cloudy: snow early A.M. 22, 23. Fine. 24. Stormy: heavy snow-storm P.M. 25, 26. Fine. 27. Fine: beautiful morning. 28. Cloudy. 29. Fine. 30. Cloudy. 31. Rain: rain early A.M.: snow-storm P.M. N.B. The 8th of this month was the coldest day since Jan. 1, 1820.

Applegarth Manse, Dumfries-shire.—Jan. 1. Slight showers. 2. Slight showers: frost in the morning. 3. Snow-storm. 4. Snow-storm and frost. 5. Snow-storm. 6. Fair: snow lying. 7. Snow-fall: frost very keen. 8. Snow-fall slightly: frost keen. 9. Thaw, with slight snow. 10. Snow and frost again. 11. Fair: snow lying: thaw P.M. 12. Fair: but freezing hard. 13. Fair: freezing. 14, 15. Fair. 16. Storm of snow, sleet and rain. 17. Thaw: heavy rain P.M. 18. Frost again: clear. 19. Frost again. 20. Frost again: Aurora borealis. 21. Thaw: drizzling rain. 22. Wet and boisterous. 23. Wet and boisterous: slight snow-fall. 24. Fair: frosty: slight snow-fall. 25. Frost A.M.: drizzle P.M. 26. Thaw and thick fog. 27. Shower in afternoon. 28. Fair and fine: snow melting. 29. Drizzling. 30. Thick fog all day. 31. Clear and cold: moist P.M.

Sun shone out 25 days. Rain fell 10 days. Snow 8 days. Frost 16 days. Fog 2.

Wind north 2 days. North-east 5½ days. East 2 days. East-south-east 3½ days. South-east 1½ day. South-west 4 days. West-south-west 1 day. West 4 days. West-north-west 2½ days. North-west 3 days. North-north-west 2 days.

Calm 8 days. Moderate 8 days. Brisk 3 days. Strong breeze 7 days. Boisterous 4 days. Stormy 1 day.

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. Roberton, *by* Mr. Thompson *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. Veall *at Boston, and by* Mr. Dunbar *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1841. Jan.	Barometer.						Thermometer.								Wind.				Rain.				Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dumfries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Self-register. Min.	Max.	Min.		Max.	Min.									
1.	29·962	29·942	29·882	29·50	29·72	29·76	40·3	44·2	37·5	45	34	39	47	38	w.	w.	calm	w.	·016	...	...	...	34
2.	30·096	30·086	29·816	29·70	29·95	29·61	39·7	45·5	40·0	45	32	35	43	33	w.	w.	calm	w.	...	·15	...	...	35
3.	29·304	29·302	29·084	28·86	29·01	28·74	35·8	44·8	36·0	39	21	37	44	30	s.	nw.	w.	wnw.	·166	...	·13	...	35
4.	29·002	29.185	28·978	28·75	29·20	29·46	30·4	38·7	29·8	35	29	28·5	35	29	s.	nw.	calm	ne.	·061	...	...	...	32
5.	29·308	29·376	29·316	29·10	29·53	29·60	31·8	36·3	30·0	33	22	33	35	27½	nw.	n.	nw.	ne.	·036	...	·47	...	29
6.	29·528	22·631	29·518	29·28	29·55	29·61	27·7	34·4	28·3	30	12	27	29	19	n.	se.	calm	e.	...	...	...	...	27
○ 7.	29·696	29·760	29·698	29·45	29·58	29·58	19·7	29·8	20·7	27	6	13·5	19	1	nw.	ne.	calm	ne.	...	...	...	0·00	21
8.	29·884	29·893	29·866	29·70	29·60	29·67	19·7	27·3	19·5	20	6	9·5	30½	8½	ssw.	nw.	calm	se.	...	...	...	...	24
9.	29·706	29·738	29·441	29·47	29·37	29·07	21·2	21·4	14·9	33	27	15·5	34	18	sw.	s.	calm	ese.	...	...	...	...	18
10.	29·230	29·247	29·089	29·04	29·00	28·94	32·4	32·8	22·2	39	31	27	33½	27	se.	se.	calm	ese.	...	·40	...	...	25
11.	28·864	29·064	28·864	28·66	28·90	29·05	34·3	37·7	32·8	39	33	32·5	35½	23½	s.	sw.	calm	ese.	·205	·02	...	..	28
12.	29·366	29·578	29·364	29·02	29·19	29·38	35·2	37·2	33·0	39	22	34	34½	28	w.	sw.	calm	ne.	...	...	...	..	30
13.	29·550	29·563	29·324	29·27	29·38	29·38	35·2	38·0	32·8	38	32	27	33½	10	s.	e.	calm	nw.	...	·29	...	...	32
☾ 14.	29·370	29·398	29·176	29·16	29·40	29·46	35·2	39·2	34·0	36	32	35	29½	14	ne.	ne.	calm	nnw.	·352	·80	·11	0·00	32
15.	29·578	29·687	29·559	29·29	29·55	29·57	34·8	37·2	33·3	39	31	36	31	15½	nw.	se.	calm	ne.	·700	·15	...	...	33
16.	29·654	29·631	29·365	29·39	29·40	28·93	37·4	38·2	33·6	52	40	33·5	37½	30	e.	sw.	calm	e.	·088	·16	...	...	35
17.	29·632	29·729	29·605	29·20	29·18	29·34	47·4	51·8	37·0	52	45	42	40½	35½	se.	sw.	calm	wsw.	·166	·02	·38	...	41
18.	29·736	29·725	29·685	29·29	29·52	29·70	46·8	52·3	46·7	47	33	43·5	35	31½	s.	w.	calm	n.	...	·24	...	...	42
19.	29·812	29·918	29·778	29·45	29·80	29·91	35·5	48·7	35·0	36	28	35	34	24	nnw.	n.	calm	nnw.	·227	·02	·05	...	37
20.	30·050	30·182	30·019	29·73	30·03	30·14	34·3	37·8	32·6	34	22	30	32½	23	nw.	n.	n.	n.	·022	...	...	...	32
21.	30·410	30·505	30·374	30·00	30·19	30·20	29·8	34·7	28·4	38	25	29	39	23½	w.	nw.	calm	nw.	...	...	...	...	29
● 22.	30·396	30·303	30·157	29·96	29·97	29·70	34·5	39·4	30·2	44	32	36	42	35½	s.	sw.	calm	sw.	...	·10	...	2·35	34
23.	30·084	30·108	30·001	29·65	29·85	29·75	39·3	44·7	34·3	43	32	36	38	31	nw.	nw.	n.	wnw.	·100	...	...	...	37
24.	29·796	30·161	29·796	29·41	29·77	30·13	36·7	42·0	36·0	38	26	34	34	26½	nw.	n.	n.	nw.	...	·02	...	...	33
25.	30·350	30·336	30·195	30·00	30·10	29·88	31·5	38·0	31·0	40	32	28·5	35	21½	sw.	w.	calm	sw.	·033	·01	·15	...	31
26.	30·000	30·000	29·988	29·59	29·70	29·70	42·7	43·6	31·0	49	43	38	42	36	wsw.	sw.	calm	sw.	...	...	...	...	35
27.	30·050	30·225	30·015	29·58	29·77	29·97	47·3	48·6	43·0	53	34	47	48	38	ssw.	w.	calm	w.	...	...	...	...	40
28.	30·322	30·300	30·250	29·83	30·12	30·14	37·8	52·8	36·0	44	28	41	45½	37	sw.	w.	calm	wnw.	...	...	...	...	36
29.	30·202	30·208	30·176	29·80	30·10	30·11	37·7	44·8	36·0	46	32	36·5	42½	41	nw.	n.	calm	w.	...	·02	...	0·55	37
☽ 30.	30·282	30·251	30·212	29·90	30·08	30·13	40·2	44·2	37·9	40	37	37	43½	38½	s.	w.	calm	s.	...	·08	...	...	37
31.	30·210	30·190	30·165	29·82	30·20	30·35	40·8	41·7	40·2	42	28	39	42	34	s.	e.	calm	ne.se.	·052	·12	·26	...	38
Mean.	29·788	29·813	29·701	29·44	29·635	29·647	35·3	40·3	32·7	39·90	28·61	32·7	37·0	26·7					Sum. 2·224	2·60	1·55	0·92	Mean. 33

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 42. APRIL 1841.

X.—*Contributions to British Actinology.* By Edward Forbes, M.W.S., For. Sec. B.S., &c.

I. *On* Kapnea, *a new Helianthoid Polype**.

In August 1840, I dredged on the east coast of the Isle of Man, about a mile from Douglas Head, a very remarkable and beautiful Zoophyte, of the family *Actiniadæ*. It came from a depth of 18 fathoms, and the sea-bottom at the place where it was taken is chiefly *Millepora*. To a fragment of that coral it was adhering by its expanded base, and when taken its tentacula were retracted. The body presented the appearance of a lengthened cylinder arising from a broad-spreading inflated base, and terminating in a round tentaculiferous disc, in the centre of which is a circular mouth. The tentacula are very short, and have the aspect of squared tubercles. They are arranged in three circles, sixteen in each circle, those of the outermost or marginal row largest. Below the tentacula and surrounding the disc is a granulated calycine circle or belt; and a little below it, extending downwards over a portion of the base, the body is invested by a woolly, brown epidermis, which is eight-cleft or lobed at its upper part. The base is somewhat lobed, and usually swelled out with sea-water. The body and base are of a vivid vermilion colour, the latter with darker longitudinal stripes. The tentacula are somewhat paler and inclined to orange. They can be drawn within the body, the upper part of which can be retracted as low as the commencement of the epidermis. When fully expanded, this animal was an inch in height by one-fourth of an inch broad at the disc. It is rather an active creature, changing its form often, but always presenting more or less of a tubular shape, like a chimney-crock or steamboat funnel.

The shape of the tentacula and the presence of a regular epidermis are the most remarkable features of this *Actinea*,

* Communicated to the Wernerian Society, January 23, 1841.

and distinguish it at once from all its tribe. Its general form and calycine rim approach to the *Actinea bellis* and some other species appertaining to the genus *Actinocereus* of Blainville. The epidermis and the imperforate tentacula separate it from Ehrenberg's restricted genus *Actinea*, and the absence of dermal pores from his *Cribrina*; neither of which divisions, as defined by that naturalist, I am inclined to admit, and therein agree with my friend Dr. Johnston. It is more nearly related to the *Zoanthidæ* than any known species of its family, and presents a most interesting transition from the typical *Actiniadæ* to that tribe. The regular form of the singular epidermis would lead us to consider that appendage as an imperfect tube, and some curious analogies might result from such a view. Both the number of the tentacula and of the clefts or lobes of the epidermis being multiples of four, is important, as supporting the notion that four is the typical or dominant number of the *Actiniadæ*, perhaps of all Zoophytes.

On account of the above characters, I have thought it right to constitute a separate genus for its reception under the name of *Capnea* (from καπνη, a chimney), and define it thus:

Body cylindric, invested in part by a lobed epidermis, and adhering by a broad base. *Tentacula* simple, very short, retractile, surrounding the mouth in concentric series.

Sp. *Capnea sanguinea*, Forbes.

Tentacula arranged in three series, sixteen in each. Body and disc scarlet. Epidermis brown.

Hab. Deep water, Irish Sea; among *Millepora*. Pl. I. fig. 1, *a*, *b*, *c*, *d*.

II. *A British* Hippocrene.

The genus *Hippocrene* was constituted by Brandt for a very curious and beautiful little Medusa observed by Martens in Behring's Straits, and which had been previously described by Lesson, who had it from the Malanine Isles, under the name of *Cyanæa Bugainvillii*. Lesson afterwards re-named it *Bugainvillia macloviana*, but Brandt's generic name takes precedence by right of priority. The generic character depends on the production of the mouth into a sort of trunk, which has wing-like appendages at its sides, and terminates in four branching tentacular arms. From each of the appendages runs a canal to the margin, where we find the tentacula collected in fasciculi, and not surrounding the edge, or separate, as in most allied Medusæ.

When naturalizing on the north coast of Ireland with Mr. Smith, of Jordan Hill, in 1839, I took a number of Medusæ

of this genus by the towing-net, in Ballycastle Bay and at Port Rush, and afterwards, during the same summer, found it on the other side of Britain, at the mouth of the Frith of Forth. My animal is larger, and differs in several particulars from that described by Brandt and by Lesson, and I regard it as a new species. In form it is almost globular, and it measures an inch in length. The central cavity is oblongo-quadrate, and occupies about one-half of the globular umbrella. At its summit interiorly are seen four stomachal appendages, placed at right angles to each other so as to form a cross. They are equal in size, of a yellow colour, squared above, rounded below, and oblong. At their lower or oral extremity are seen four slender white arms, which dichotomously divide into numerous tentacula with globular tips. These arms are very extensile, but are never sent from out the cavity. From each of the four oral appendages or *alæ* runs a translucent canal to one of the four fascicles of the tentacula, one of which is seen at each angle of the quadrate cavitary opening. These tentacula are very curious. They are highly contractile, and spring from little arches of a glandular appearance and a red colour, which form the bases of the fascicles, and into which the four canals run. On magnifying one of these arches, we find it to consist of two parts, one (the upper) red, the lower white, and each of these to consist of a great number of tubercles, which form the roots of the tentacula. On each tubercle is a minute black ocular dot. The tentacula are not all extended at the same time; very often one, two or three only are sent out, but there appear to be more than a dozen pairs of tubercles in each arch. Between the arches the margins of the cavity are straight, and furnished with a semicircular lip or valve. The outer surface of the body is smooth, and the appearance of the creature is that of a crystal bubble, with four red dots round a square opening, and a central yellow nucleus, having branched threads suspended from it.

Sars, in his 'Beskrivelser,' &c. has figured and described a minute Medusa under the name of "*Cytæis? octopunctata,*" which evidently belongs to the same group with the above. The known species of *Hippocrene* may be summed up as follows:—

H. Bugainvillii, Brandt. (See figure in Petersburgh Transactions for 1838.) Stomachal appendages as long as the proboscis, eight, the four larger ones oblong, yellow, with red centres. Tentaculiferous glands four, red and yellow, with pink tentacula. Umbrella in part pilose. North Pacific.

H. brittanica, Forbes. Stomachal appendages as long as the proboscis, four, equal, yellow. Tentaculiferous glands four, red and white, with white tentacula. Umbrella smooth. North of Ireland and East of Scotland.

H. octopunctata, Sars. (Beskr. og Jagt. p. 28. t. 6. f. 14.) Stomachal appendages shorter than proboscis, four, unequal. Tentaculiferous glands eight, black. Umbrella smooth. Coast of Norway.

Plate I. fig. 2 *a*, *Hippocrene brittanica*, of the natural size; 2 *b*, its stomachal appendages and oral arms; 2 *c*, a tentaculiferous gland and tentacula.

III. *New Species of* Thaumantias.

The Medusæ of this very natural genus, established by Eschscholtz, have a simple stomachal cavity, from which proceed four simple canals; no arms, but a proboscidiform mouth, which cannot be prolonged beyond the general cavity, and a margin surrounded by tentacula, which are usually bulbous at their bases, and are highly extensile. The species of *Thaumantias* are small animals, and probably numerous in the northern seas. Hitherto they appear to have been mostly confounded under the *Medusa hæmisphærica* of Muller, which is a prettily coloured species, already recorded as a native of the British seas. I have never met with an example which I could refer to Muller's animal, but have found four very well marked species which have hitherto been unrecorded.

1. *Thaumantias pileata*, nov. sp. Umbrella cap-shaped. Oral peduncle and clubs of the vessels pink. Proboscis four-cleft at the mouth, lobes acute. Eyes large, black and yellow, on the bulbous origins of the twenty tentacula.

This pretty species, the shape of which resembles that of a Chinese hat, measured about an inch across. The clubs of its vessels are small and narrow. It was taken at Port Rush, on the north coast of Ireland, in June 1839.

Pl. I. fig. 3 *a* & *b*, *Thaumantias pileata*; 3 *c*, its oral peduncle.

2. *Thaumantias Thompsoni*, nov. sp. Umbrella hemispherical, very convex. Proboscis four-cleft, lobes triangular. Clubs of the vessels, proboscis and bases of tentacula yellow. Eyes minute, black, on the triangular bases of the sixteen tentacula.

Pl. I. fig. 4 *a* & *b*, *Thaumantias Thompsoni*; 4 *c*, one of the tentacula.

Taken abundantly in Clifden Bay, Cunnemara, by Mr. Thompson, Mr. Ball, and myself, in July 1840. A small species, one-fourth of an inch across; clubs of the vessels short and broad.

3. *Thaumantias punctata*, nov. sp. Umbrella hemispherical. Clubs and proboscis pink. Proboscis four-cleft, lobes sub-acute. Eyes large, black, on the bulbous bases of the thirty-two tentacula.

Pl. I. fig. 5 *a b*, *Thaumantias punctata*; 5 *c*, one of its tentacula.

This species, measuring near an inch across, was taken plentifully in July 1839, in the Frith of Forth, near the Isle of May.

4. *Thaumantias sarnica*, nov. sp. Umbrella hemispherical. Clubs and proboscis bluish. Proboscis four-cleft, lobes acute. Eyes? Tentacula twenty.

Measured half an inch across. Taken in the Channel, between Guernsey and Herm, August 1839.

Pl. I. fig. 6 *a b*, *T. sarnica*; 6 *c*, its proboscis.

These additional species double the number of members of this genus. The four previously recorded were, 1. *T. cymballoïdea* (*Medusa cymballaroides*, Slabber, *Dianœa*, Lamarck, see fig. in Encyc. Méth. pl. 93. fig. 2—4). 2. *T. hemisphærica* (see fig. in Zool. Dan. t. 7.), recorded as English by Dr. Macartney, as Irish by Mr. Thompson. 3. *T. multicirrhata* (Sars, Jagt. og Beskr. p. 26. t. 5. fig. 12.). 4. *T. plana* (Sars, p. 28. t. 5. f. 13.), both natives of the Norwegian seas, and to be looked for in our own. The former of Sars's species is easily recognised by its numerous tentacula, above 200, and the elongated clubs of the cross-vessels; the latter by its being quite flat, and also having numerous tentacula.

In observing species of *Thaumantias*, of which many more may occur in our and in other seas, the points especially to be noted are, 1st, the number of tentacula (always a multiple of four); 2nd, the presence, absence, size and colour of eyes at their bases; 3rd, the colour of the cross-vessels and proboscis; 4th, the shape of the umbrella; 5th, the shape of the clubs of the vessels; and 6th, the form and lobation of the oral proboscis or peduncle. I have mentioned these sources of character in what I conceive to be the order of their respective importance, but all should if possible be noted.

XI.—*Description of some new Species and four new Genera of Reptiles from Western Australia, discovered by* John Gould, Esq. By J. E. Gray, Esq., F.R.S., &c.

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

Gentlemen,

Mr. Gould having kindly placed in my hands the collection of Reptiles which he made during his visit to New Holland to gather materials for his 'History of the Birds of Australia,' I have sent you the description of the following species, which appear to be new to science. The two new genera are very interesting; the one, *Ronia*, being exactly intermediate in organization between the two-legged and the four-legged Scincs; and the other, *Moloch*, for its extraordinary appearance and grotesque forms.

I may remark, this collection contains two specimens of *Soridia lineata*, Gray, which MM. Dumeril and Bibron have accused me of erroneously describing as an Australian animal. (See 'Erpétologie Générale,' v. 787.) I believe that this has arisen from M. Bibron supposing all the Reptiles that he saw at the Chatham Museum to be from the Cape of Good Hope; whereas that collection is very rich in Australasian Reptiles. *Chelomeles* of MM. Dumeril and Bibron appears to be very nearly allied to *Soridia*, and should most probably be arranged with it in the family of *Rhodonidæ*.

Mr. Gould's specimens of *Delma* having enabled me to examine more minutely the characters of that genus, I am now convinced that it should be referred to the family *Pygopidæ*. It chiefly differs from the genus *Pygopus* in the small size of the rudimentary feet and in the absence of the pre-anal glands.

The genus *Lialis*, which heretofore has been placed with *Pygopus*, appears to be the type of a new family. It, *Delma* and *Pygopus* are all found in Western Australia, as is also the genus *Aprasia*, which ought, in my Catalogue of Slender-tongued Saurians (Ann. Nat. Hist. vol. i. and ii.), to have been arranged with the Apodal Scincs. On examining Mr. Gould's better-preserved specimen, I am inclined to consider it also as the type of a family characterized by the shields of the head and the position of the nostrils, to which, most probably, MM. Dumeril and Bibron's genus *Brachymeles* will also have to be referred. These genera will then range thus:—

Fam. Lialisidæ:—*Lialis.*

Fam. Pygopidæ:—*Pygopus, Delma.*

Fam. Rhodonidæ:—*Rhodona, Soridia, Chelomeles.*

Fam. Aprasiadæ:—*Aprasia, Brachymeles.*

RONIA, Gray. Fam. Scincidæ.

Head rather shelving, shielded with one transverse frontal and two large vertebral plates, the hinder largest; the rostral plates large, with two unequal superciliary plates. The nasal plate triangular, interposed between the rostral plate and the frontal ones, with the nostrils in its centre; loreal plates two, square; labial plates large; ears none, only a very indistinct sunk dot in their place. Body cylindrical; tail conical, tapering. Scales smooth, ovate, imbricate, of the belly 6-sided. The front limbs very small, rudimentary, undivided; the hinder limbs moderately developed, ending in two very unequal toes, with distinct claws.

Ronia catenulata, Gray. Back with eight series of small black dots, one dot on the centre of each scale; cheeks black, speckled; sides and beneath whitish.

Body $3\frac{1}{2}$, tail $2\frac{1}{2}$ inches.

Inhab. Western Australia. Mr. J. Gould.

The scales under the tail are rather larger, and the spots on the tail are rather larger than those on the back.

Grammatophora cristata. Nape with a crest of distinct, rather short, curved, compressed, spinose scales; back and tail with a series of compressed scales forming a slight keel; occiput with separate short strong conical spines; sides of the neck and back with folds crowned with series of short compressed scales; base of the tail with some scattered larger scales. In spirits, dull olive; crown black with large white spots, beneath black; middle of the belly and under sides of the base of the tail white; tail with black rings at the ends; feet whitish.

Inhab. Western Australia. Mr. J. Gould.

The underside is coloured somewhat like *G. maculatus* (*G. Gaimardii*, Dum. and Bibron), but the sides of the head near the ears are spinose, and the nape is distinctly crested. But as MM. Dumeril and Bibron's species is only described from a single specimen, which is in a bad state, and has lost its epidermis, and as the description itself, though long, refers chiefly to parts which do not differ in the species of the genus, this species may prove to be identical with it.

These authors, in giving the character of *Grammatophora Gaimardii* and *G. Decresii*, appear to place great reliance on the one having tubular and the other non-tubular femoral pores, which is a fact entirely dependent on the state in which the animal might be at the time when it was put into the spirits, as I have verified by comparing numerous specimens of different reptiles furnished with these pores.

But in this genus the size of the pores is apparently of less importance than in many others, for they appear to be quite invisible in some states of the animal: thus out of many specimens of *G. muricata* brought by Mr. Gould from Van Diemen's Land and Western Australia, eight specimens have no visible pores; these specimens differ from the others in being of a rather paler colour beneath. This state

of the pores may entirely depend on the manner in which they were preserved, for all these specimens had a slit made into their abdomen to admit the spirits; while in all specimens in which this care had not been taken the pores are distinctly seen, sometimes moderately sized, and sometimes tubularly produced.

Grammatophora Decresii, Dumeril and Bibron, Erp. Gén. iv. 472. ? Tail conical, with nearly regular scales; the base rather swollen, without any series of spines on the side; back with small subequal scales and a few larger ones in cross series; the nape and back with a series of rather larger, low, compressed scales; side of the head near the ears and side of neck with two or three ridges crowned with short conical spines. In spirits black, yellow spotted and varied, beneath gray, vermiculated with blackish; tail black-ringed.

Inhab. Western Australia.

This species is so much smaller than *G. muricata*, that I might have considered them as young animals if one of them had not had the body filled with well-formed eggs; and the tail is much shorter than in the young of that species.

The specimens agree in most points with the description given by MM. Dumeril and Bibron, but not in the colour and the size of the tail. The specimens in this collection greatly differ in their colour, but are all very different from any other species.

Grammatophora muricata, Cuvier. The young animals have a series of small spines on each side of the base of the tail, and a series of spots on each side of the back.

Mr. Gould has brought home two very distinct local varieties.

Var. 1. *Diemensis*. *Young* dark-coloured, with vermiculated marks on the chin, chest, and abdomen. The *adult* dark, beneath gray, varied with black spots placed in irregular lines.

Inhab. Van Diemen's Land.

Var. 2. *Adelaidensis*. *Young* pale above and beneath, with three broad diverging black lines on the chin, leaving an oblong spot in the centre of the throat, with a broad streak on the chest separated into three lines on the abdomen, which unite together again on the pubis. The *adult* gray, with a few spots beneath.

Inhab. Adelaide, Western Australia.

MOLOCH, Gray. Fam. Agamidæ.

Body depressed, covered with irregular, unequal, small, granular plates, each furnished with a more or less prominent central spine, and with a series of large, conical, convex, acute spines; head and limbs covered with similar scales and spines; head small, with very large spines over each of the eyebrows; tail with irregular rings of large acute spines; femoral and subanal pores none; teeth small, subequal; toes 5· 5, short, covered above and below with keeled scales; claws long, acute.

The external appearance of this Lizard is the most ferocious of any that I know, the horn of the head and the numerous spines on the

body giving it a most formidable aspect. The scales of the back are small and unequal; they gradually increase in size as they approach the base of the conical spines, which is surrounded with a ring of larger scales with longer spines: the large spines are conical; rather compressed, spinulose below, smooth and acute at the tip, and are usually furnished with a sharp toothed ridge on the front edge, and sometimes on the hinder one. These spines only consist of a horny sheath placed on a fleshy process of the very same form and appearance as the spines they bear. The scales of the under side of the body are of the same form, and are furnished with similar but smaller and less produced spines than those of the back. The back of the neck of the only two specimens I have seen is furnished with a large rounded protuberance like a cherry, covered with large granular spinous scales, and armed on each side with a large conical spine; but I do not know if this is common to the species or merely accidental in these individuals; at any rate it adds considerably to the singularity of their appearance.

I have named this genus, from its appearance, after "*Moloch*, horrid king,"

Moloch horridus. Pale yellow, marked with dark brown regular spots; sides and beneath black-edged, dark red similar spots.

Inhab. Western Australia. Captain George Grey, Mr. J. Gould.

The marks on the body are very definite, but from the irregularity of their form they are not easily described. The lips are dark brown, with two streaks up to the small spines on the forehead; there is a dark cross-band from the base of the two large horns over the eyebrows, running behind and then dividing into two broad streaks, one along each side of the centre of the back of the neck to between the shoulders, crossing the nuchal swelling. In the middle of the back there is a very large black patch nearly extending from side to side, and over the loins are two oblong longitudinal black spots; the dark lines commencing from the lower angle of each eye extend to the legs, along the upper part of each side to the upper part of the groin. On the front of the fore- and hind-legs and the sides are marked similar dark bands. A dark band commences from the hinder part of the lower lip, merging in the throat, and expanding out so as to be united together at the back part of the chin. There is a large, rather oblong spot in the centre of the chest and the hinder part of the abdomen, separated from each by a large, somewhat triangular spot on each side of the middle of the abdomen; body 4½ inches.

This is the Spinous Lizard exhibited by Mr. Gould at the meeting of the Zoological Society, on the 25th day of August, 1840.

Breviceps Gouldii. Smooth, with a few scattered low tubercles; gray-brown, yellowish beneath.

Inhab. Western Australia.

This animal has all the external appearance and character, as far as they are given in MM. Dumeril and Bibron's work, of the *Breviceps gibbosus* of the Cape of Good Hope, except that it has not the yel-

low dorsal band, and the back is scarcely to be designated as granular. It is the second species of the genus, and only the second Toad found in Australia, the other being *Phreniscus australis*, which I described in the 'Proceedings of the Zoological Society' under the name of *Bombinator australis*.

UPEROLEIA, Gray. Fam. Ranidæ.

Head large; palate quite toothless; upper jaw with small close teeth; the tympanum hid under the skin; the toes of the fore- and hind-feet elongate, slender, quite free; the ankle with a roundish external and a small conical inner tubercle; the tongue small, oblong, roundish, and entire behind.

This genus is most nearly allied to *Leiuperus* of MM. Dumeril and Bibron, with which it agrees in having no teeth on the palate, but it differs from it in the tympanum being quite hid.

The internal nostrils are some distance in front of the cross-ridge on which the palatine teeth are generally placed.

Uperoleia marmorata. Black and green marbled, leaving a triangular greenish spot on the forehead, beneath lead-colour.

Inhab. Western Australia.

Dr. Tschudi has formed a genus under the name of *Crinia*, which appears by his characters to be nearly related to the above; but MM. Dumeril and Bibron (Erp. Gén. viii. 416) observed that the specimens he described have two very small groups of teeth on the vomer.

Hyla bioculata, Gray. Slender; fore-toes quite free; hinder toes webbed to the last joint (in spirits). Grayish white, with a series of very small, indistinct, oblong tubercles, with a dark streak from the nostrils to the shoulder, enclosing the eyes, and a white streak below it from the under side of the eye; sides purplish, with small white spots; back of the thighs purple, with two yellow spots; belly and under side of thighs whitish, granular.

Var. 1. Back of thighs with one or two additional yellow spots.

Var. 2. Back bluish gray; back of the thighs with six or seven small subequal yellow spots.

Inhab. Western Australia.

Hyla Adelaidensis, Gray. Slender; fore-toes quite free, hinder toes webbed to the last joint; (in spirits) gray-blue, with a series of small oblong tubercles; the sides purple-brown, with a white streak from the under side of the eyes to the shoulders; sides of the belly and region of the vent purplish, with small white spots; the hinder side of the thighs purple-brown, with three large oblong white spots; belly and under side of thighs granular; chin white, brownish dotted; palatine teeth in two roundish groups between the internal nostrils.

Inhab. Western Australia.

HELEIOPORUS, Gray. Fam. Ranidæ.

Head short, swollen; eyes large, convex; palatine teeth in a straight interrupted ridge between the two internal nostrils; teeth very small; body swollen; skin of the back minutely granular, of the belly smooth; legs rather short; toes 4·5, short, warty beneath, quite free; the hind wrist with a large, oblong, compressed, internal tubercle; the base of the inner finger with a conical wart, ending in a small acute bony process; tongue large, entire behind.

This genus has many of the characters of *Cystignathus*, but differs from it in being warty and swollen, and in having short toes like a Toad.

Heleioporus albo-punctatus. Lead-coloured (in spirits), with white spots; beneath dirty white, with some small white warts at the angle of the mouth; legs smooth.

Inhab. Western Australia.

Cystignathus dorsalis. The palatine teeth in a single large straight line, just behind the inner nostrils; tongue large, slightly nicked behind; the tympanum nearly hid under the skin, gray-brown (in spirits), marbled with dark irregular spots, with a white streak down the middle of the forehead and front of the back; sides pure white, spotted and marbled with black, beneath white; toes elongate, slender, tapering; back part of thighs brown, white speckled.

Inhab. Western Australia. J. Gould.

This species is very distinct from *C. Peronii* and *C. Georgianus*, the two Australian species described by MM. Dumeril and Bibron. It agrees with the former in the disposition of the palatine teeth.

Elaps Gouldii, Gray. Pale yellowish; the scales of the back small, six-sided, with a dark anterior margin, giving the back a netted appearance; top of the head and nape black, with a yellow spot on the rostral scale on each side just before the eyes; head small; the occipital plates large, elongate; the nasal plate triangular; one moderate anterior, and two subequal posterior ocular shields; six upper and lower labial shields, the fourth under the eyes; eyes small, pupil round.

There is an indistinct small yellow spot behind the upper part of the eye; but this may be an accidental variety, as the spots on the two sides are not equally defined.

Inhab. Western Australia.

This species resembles *Calamaria Diadema*, which is also found in Western Australia; but it is larger, and the head is larger in comparison with the body, and in this species it is the base of the scales, while in the latter it is the outer margin that is dark.

XII.—*Description of some new species of Madeiran Fishes, with additional information relating to those already described.* By the Rev. R. T. Lowe, M.A.*

[Continued from vol. iv. p. 424.]

Family Triglidæ.

Scorpæna ustulata. *S. minor, laciniis nullis, rubra, pallido variegata nigroque punctata; genis operculisque granulato-pustulosis, macula fusca notatis: pinnæ dorsalis medio unimaculatæ spina quarta ceteris longiore: capite s. rostro abbreviato, obtuso; maxillis æqualibus: squamis majusculis, scabriusculis.*

D. 12+9; A. 3+5; P. 1+VII.+10; V. 1+5; C. $\frac{5+\text{VI}}{5+\text{V}}$.

Rariss.

Occasionally taken with the common sort (*Sc. scrofa*, L.), with which it agrees in general colouring, resembling rather the Rocaz (*Sebastus maderensis*, nob.) in shape. It appears undescribed, and is very distinct in its characters, being a true *Scorpæna*, notwithstanding the absence of *laciniæ*, having the whole head naked or scaleless. It scarcely attains half the size of *Sc. scrofa*, L.

Fam. Scombridæ.

Nauclerus abbreviatus, Cuv. et Val. Hist. IX. 251.

Two individuals have occurred of this pretty little fish, answering so well to the species above referred to, that it were unreasonable to doubt their identity, although its describers have omitted mentioning a strong superscapulary spine, and a fourth smaller tooth or spinule along the lower border of the preopercle, anterior to the three which arm its angle. Alive, and in a glass of sea-water, the activity and lovely colours of these little fishes rendered them most interesting objects. They were taken following a piece of floating timber; and until close examination after death, could scarcely be distinguished from the young of *Naucrates ductor*, Cuv., but for the absence of the caudal keels.

Tetrapturus Georgii.—"*Peito.*"

Having at length, through Mr. Leacock's kind exertions, obtained a fine example of the *Peito* in perfect condition, I am enabled to state that it forms a new and very distinct species of *Tetrapturus*, Rafin.; differing from *T. belone*, Raf., as described by MM. Cuvier and Valenciennes, especially in having the pectoral fins proportionally twice as long, and the body clothed with large scales of a peculiar shape and nature. I only forbear to draw up its specific character till I have checked my notes and observations by examination of more examples; but I hope to be allowed the privilege at once of commemorating by its specific name the valuable assistance rendered to the cause of Ichthyology by Mr. George Butler Leacock, of this island generally, as well as in the present instance.

* Read before the Zoological Society, June 9, 1840.

Fam. Coryphænidæ.

Asteroderma coryphænoides (Bon.); *Astrodermus coryphænoides*, Cuv. et Val. IX. 353. *t.* 270.—*Diana semilunata*, Risso, Hist. iii. 267. *f.* 14.

A single small example only has occurred.

Fam. Labridæ.

Ctenolabrus iris, Cuv. et Val. XIII. 236. Rariss.

A most elegant and well-marked little species.

Julis unimaculata.—"*Peixe verde.*"—*J. elliptico-oblonga, graciliuscula: corpore aurato-viridi, lateribus medio fascia longitudinali obscura: squamis magnis, litura rufa perpendiculate notatis: capite rosaceo-rufo, strigis fasciisve flexuosis cœruleis picto: pinna dorsali medio unimaculata analique basi squamatis: operculo postice biangulato: cauda lunata, lobis abbreviatis.*

D. 8+13; A. 3+11; P. 2+13; V. 1+5; C. $\frac{2\text{ v. }3+\text{VI}}{2\text{ v. }3+\text{VI}}$.

Var. *α. tæniata*: corpore 5–6-fasciato: fasciis angustis viridibus, immaculatis. Vulgatiss.

Var. *β. lineolata*: corpore efasciato, toto lituris rufis creberrimis ad perpendiculum ductis æqualiter picto. Vulg.

Blended apparently by Valenciennes (Hist. XIII. 377.) with the blue-collared *J. turcica*, Risso, under the name of *J. pavo*; as formerly by me considered merely a variety of *J. turcica*. Long-continued observations have, however, established its claim to rank as a species, which is composed of two varieties, precisely corresponding with the two of which the true *J. turcica* consists.

Fam. Gadidæ.

Merlucius ambiguus.—"*Morcégo do mar.*"

Having only obtained a single individual, I forbear attempting a specific character of this little Hake, which, in the production into a filament of the second ray of the ventral fins and grooved nape, resembles a *Motella*; wanting, on the other hand, the beards, and having no trace of any fin within the nuchal groove. From *Merlucius Maraldi*, Risso, Hist. iii. 220. it differs in the colouring; and though the upper jaw closes over the under, it scarcely can be called "longer." In Risso's fish the nape is grooved (*sillonnée*), but he says nothing of any peculiarity about the ventral fins.

The Madeiran Hake, or "Pescada," *Merlucius vulgaris* of my Synopsis, p. 189, proves, upon better acquaintance, distinct from the common British Hake, *M. vulgaris*, Cuv., Yarr., &c. (*Gadus Merluccius*, L.). Instead of being even, the dorsal and anal fins are each produced at their hinder end into a rounded lobe; the jaws are nearly equal in length; the teeth are large and numerous; the scales small. I do not name it, for I believe it has already been called by Mr. Swainson *M. sinuatus*; and I am doubtful whether it may not also be the *M. esculentus* of Risso, iii. 220, though in his synonyms

he has confounded it with the true Northern Hake. I believe it to be the fish imperfectly figured long ago by Salviana, p. 73, copied by Willoughby, *t.* L. membr. 2. *n.* 1, which has usually been referred to also for the Northern Hake.

Fam. Esocidæ.

Cypselurus pulchellus.

From want of materials for comparison, I am unable to give correctly the specific characters of this most elegant little Flying-fish, which is remarkably characterized by two or three bright rose-coloured horse-shoe-shaped marks on each side of the belly, one behind the other. The ventral fins are placed a little behind the middle of the body, not reckoning the caudal fin, and their tips reach to the base of the latter. The tips of the pectoral fins reach only to the end of the base of the dorsal fin, which is large, high, and produced. The anal fin is small and low, but a little produced backwards. The cirrate appendage to the lower jaw is like a leathern flap or apron, torn irregularly at the bottom into strips or thongs. I willingly abandon my own MS. name of *Cheilopogon* for this genus, distinguished from *Exocœtus* by the variously-appendaged lower jaw, in favour of the designation which I find this group of fishes has received from Mr. Swainson whilst this paper has been going through the press.

Fam. Diodontidæ.

Diodon Hystrix, a. Linn.—*D. punctatus,* Cuv.—*Histrix piscis Clusii,* &c., Will. *t.* I. 5.

A single example only has occurred.

Fam. Squalidæ.

Carcharias microps.—"*Tubarao.*"

The *Tubarao* of Madeira proves to be a genuine species of *Carcharius,* as defined by MM. Müller and Henle in the Magazine of Natural History for the year 1838, p. 35. It is remarkable for the smallness of the eye; and the teeth, as reported previously by the fishermen, are really feeble in proportion to its bulk; they are in only two rows, and precisely similar in both jaws. The tail is very large and powerful. The individual examined measured eight feet five or six inches in length. I name it only provisionally, and abstain again from attempting a specific character,—deferring, in both points, to the expected publication of MM. Müller and Henle, amongst whose indicated "twenty species" it will probably be found.

Alopecias superciliosus.

At once distinguished from the only other known species of the genus, *Carcharias vulpes,* Cuv., by the enormous eye and its prominent brow. I have at present only seen a single young example.

XIII.—*On the species of Stickleback* (Gasterosteus, *Linn.*) *found in Ireland.* By Wm. Thompson, Vice-Pres. Nat. Hist. Society of Belfast.

In the 'Histoire des Poissons' of Cuvier and Valenciennes, the *Gasterosteus aculeatus* of Linnæus is divided into several species. The views there adopted are followed in Great Britain * by Mr. Yarrell and Dr. Parnell in their respective works; but in Mr. Jenyns's 'Manual,' four of these species—all that have been recognised as British—are, after a close comparison of examples from the same pond, and of these again with others from different waters, reduced to one species †. Having myself compared specimens of the fish in question from still more numerous localities than the last-named author, I arrive at the same conclusion in so far as it extends; but go still further, and venture to consider six or seven of the species of the 'Hist. des Poiss.' as in reality but one, assuming so many different appearances. To allude to the extreme accuracy of description characteristic of that truly great work—the 'Hist. des Poiss.'—would be most superfluous. On another point altogether the different view adopted in the present paper turns; namely, on the *permanency of characters* there attributed to the 3-spined *Gasterosteus.*

In this genus, Ireland possesses all the forms which are included in the British catalogue. An additional one—*G. semiloricatus,* Cuv. and Val.—will be particularly treated of, and come first under notice, as one of the two varieties which are protected with scaly plates throughout the sides.

G. trachurus, Cuv. and Val., t. iv. p. 481.

G. semiloricatus, Cuv. and Val., t. iv. p. 494.

March 20, 1835.—On examination of a number of 3-spined Sticklebacks from the island of Rathlin, (sent by Mrs. Gage

* Nilsson, in his 'Prodromus Ichthyologiæ Scandinavicæ,' published in 1832, thus describes varieties of *Gast. aculeatus,* Linn.:—

"α.) Capite, a latere inspecto, magis acuto; spinis dorsalibus longioribus, media longitudinem capitis dimidiam æquante et dimidiam corporis altitudinem superante.

"β.) Capite, a latere inspecto, magis obtuso; spinis dorsalibus brevioribus; media multo breviore quam ½ capitis et dimid. corpor. altit."—*p.* 86.

This author makes *G. trachurus* synonymous with *G. aculeatus,* Linn.—he does not offer any opinion on the species of *Gasterosteus* in the 'Hist. des Poiss.'

† In a note to p. 350, Mr. Jenyns observes with reference to *G. brachycentrus,* that "it is more than probable that some of the other foreign *Gasterostei* described by Cuvier are mere varieties of this species"—*G. aculeatus,* Linn.

to Dr. J. D. Marshall, who submitted them to my inspection,) I find that in some the lateral plates extend throughout the entire sides, as in *G. trachurus*; in others, so far only as in *G. semiarmatus*; and in some again no further than in *G. lieurus*. No other difference can be perceived in these specimens, which are all of a small size, from an inch to an inch and a half in length. From between tide-marks in Larne Lough (Mrs. Patterson); from oozy and rocky pools over which the tide regularly flows, situated near the edge of Belfast Bay (Richard Langtry, Esq.—W. T.); also from a deep pool in the middle of it (Mr. James Nichol)—and from the harbour of Donaghadee (Capt. Fayrer, R.N.)., I possess examples of the full-armed Stickleback of various sizes up to 3 inches.

In addition to these Irish examples of the full-armed Stickleback, some 2 inches in length from the Thames, communicated in 1834 by Mr. Yarrell, are before me for comparison, and several from $1\frac{1}{4}$ to $1\frac{3}{4}$ inch, which I obtained in a marine rock-pool at Ballantrae, Ayrshire, in August 1839.

In June 1836, Lieut. Davis, R.N., sent to the Belfast Museum, from the neighbourhood of Donaghadee, some gigantic specimens, two of which are $3\frac{1}{2}$ inches in length and 10 lines in depth; a third is 3 inches 4 lines long and 9 lines deep; the number of fin-rays is the same in all, viz.

D. III + 12; A. I + 9; P. 10; V. I + 1; C. 12.

These three individuals have each 23 plates on the side of the body to the origin of the caudal keel, and thus agree with the *G. semiloricatus*. Colour as usual in female specimens, no red appearing anywhere. With the above were two others of ordinary size; one of which was red on the lower portion of the body. Lieut. Davis stated in a note respecting them, that they "were found in a pool of brackish water accessible to the sea, at the Foreland rocks near Donaghadee." The example, $2\frac{1}{2}$ inches in length, from deep water in Belfast Bay, differs very much from the large individuals just noticed, in the free margins of the lateral plates; these, in the latter are finely, regularly, and very minutely serrated, while in the former they are distinctly toothed, the denticles becoming larger on the plates as these latter approach the tail. The number of these plates to the origin of the caudal keel is about 23, as in the large examples—this number likewise appears in the Thames specimen of *G. trachurus*. With the exception of a ray less in the anal fin, the number of fin-rays is the same in that under consideration as in the large fish. The example, 2 inches in length, from Donaghadee harbour, has likewise about 23

plates on the side to the origin of the caudal keel: the serration on the free margin of these plates is intermediate between that exhibited in the specimens from the Foreland Point and the one just noticed from Belfast Bay.

In the full-armed Sticklebacks from the localities generally, which have been enumerated, great differences are observable, as—considering for the present adult fish only—in the comparative length of the dorsal and ventral spines, and in the lateral plates. In some individuals these do not occupy more than the central portion of the sides, in others the whole sides, and again are intermediate.

In the absence either of a specimen for comparison, or a figure to refer to, it may perhaps be considered that certainty cannot be arrived at respecting *G. semiloricatus.* This fish is stated to differ from *G. trachurus* in having only 22 or 23 plates on each side to the origin of the caudal keel instead of its 25 or 26, and in the shoulder-plate (plaque de l'épaule) being larger. It has been seen that some of my specimens, and of these, some of the largest size, possess only the number of lateral plates attributed to *G. semiloricatus.* In examples of equal length, and from the same as well as from different localities, I find the size of the shoulder-plate to vary like other characters. Hence I am disposed to regard some of the examples under consideration as this fish.

In the 'Hist. des Poiss.' it is remarked of *G. semiloricatus*, "Nous n'avons pu trouver aux environs de Paris que des épinoches à queue nue; il nous en est venu de pareilles des départemens de la Somme et de l'Oise, de la Rochelle et de quelques autres lieux: nous avons observé celle à queue cuirassée dans les ruisseaux des côtes de Normandie, et encore récemment M. Deslongchamps nous l'a envoyée de Caen, et M. Baillon en a pris dans le Hable-d'Ault, lac saumâtre de l'embouchure de la Somme, près du Tréport. C'est la seule qui se trouve dans les étangs des environs de Berlin, et elle y est en quantité innombrable. Peut-être est-ce l'espèce qui habite plus fréquemment près des bords de la mer, et qui peut entrer dans l'eau salée. Des observations ultérieures nous apprendront sans doute bientôt ce qui en est."—*t.* iv. *p.* 494.

This accords generally with my own observation, as in seven out of the nine localities whence my specimens mailed throughout the sides were derived—whether they be called *G. trachurus* or *G. semiloricatus*—they were taken either in the sea or estuary. The exceptions are the largest specimens, which were procured in a "pool of brackish water accessible to the sea;" and those from Rathlin, obtained in

fresh water. From the passage just quoted, we learn that the *G. semiloricatus* inhabits the pools about Berlin. It has always seemed to me not improbable, that in the sea, where the enemies of this diminutive fish are more numerous than in the fresh water, the protecting hand of Nature had as a defence armed its body with these lateral plates. That some fishes have the power of accommodating their colour to that of the ground or bottom of the water they frequent, and are thus rendered comparatively inconspicuous to their enemies, is well established.

A third species of 3-spined Stickleback, armed throughout the sides like those here treated of, is the *G. Noveboracensis*, which, as its name denotes, is found at New York. Judging from the description and figure of this fish in the 'Hist. des Poiss.,' I should not consider it distinct from *G. trachurus* or *G. semiloricatus*. The specimens which have come under my examination differ much in the few characters which are said to distinguish this fish from *G. trachurus*. The high position of the lateral line is the chief character of *G. Noveboracensis*—in some specimens before me this line is so near the back, that three-fourths of the body of the fish are below it. Our *G. Pungitius* is admitted as an American species by Dr. Storer in his interesting work on the 'Fishes, &c. of Massachusetts' (p. 32), and for a copy of which I am indebted to his kindness.

The descriptions and figures of the *G. obolarius*, Cuv. and Val.—a 3-spined Stickleback armed throughout the sides, and found in the North Pacific Ocean and the Gulf of Kamtschatka,—are said in the 'Hist. des Poiss.' to be insufficient to mark it with certainty as a species distinct from the full-armed *Gasterosteus* of Europe or America (p. 500).

Dr. Parnell, in his 'Fishes of the Frith of Forth' (p. 34), after stating that he agrees with Cuvier and Yarrell in considering the *G. trachurus* as "a constant and well-marked species," observes that the "square tail" does not exist in the other Sticklebacks. According to my observation, it is certainly less developed in them, and generally (but not invariably) corresponds with the protecting side-plates, presenting a greater or less developement accordingly as the armature of the body is of a heavier or lighter cast. Dr. Parnell further remarks, as corroborative of *G. trachurus* being a distinct species, that he has "examined carefully several hundred from half an inch to two inches and a half in length, and in all the specimens the lateral plates were constant." In particular localities I have met with the same result on ex-

amining specimens of all sizes of *G. trachurus* and of the other varieties also*, but in some places again the different varieties are found together and of every size†. Mr. Yarrell has so noticed three of them in the Thames at Woolwich; and in Rathlin, as before mentioned, they occur together—in the former locality in brackish, in the latter, in fresh water.

G. semiarmatus, Cuv. and Val., t. iv. p. 493, appears to be the rarest of the 3-spined Sticklebacks in Ireland. I possess specimens from the island of Rathlin, as before mentioned, and from Wolfhill, in the neighbourhood of Belfast. One example only occurred in the latter locality, where it was taken in 1832 with a number of *G. brachycentrus,* the Stickleback of that district—it is indeed this variety in every respect, except in having the lateral plates extending along the sides so far as in *G. semiarmatus*; the other characters assigned to this supposed species in the 'Hist. des Poiss.' are very variable. From the half-armed species I turn to the

G. lieurus, Cuv. and Val., t. iv. p. 487, in which the lateral plates do not extend beyond the pectoral region. In every respect but this, it is considered in the 'Hist. des Poiss.' so similar to *G. trachurus,* that the one description is given as equally applicable to both. The *G. lieurus* would seem to be the most common *freshwater* Stickleback in Ireland‡.

The localities whence specimens of this fish are now before me, are—the island of Rathlin;—the neighbourhood of Belfast (W. T.);—river Bann at Toome (W. T.);—Portaferry and Newcastle, county Down (W. T.);—Lough Melvin, county Fermanagh (W. T.);—neighbourhood of Dublin (Mr. R. Ball);—Glendalough, county Wicklow (Mr. G. C. Hyndman);—Portarlington, Queen's-county (Rev. B. J. Clarke);—some of the examples from this locality are very handsomely marked, being along the back of a rich brown colour, which

* The partial exception to this is in *G. brachycentrus,* in which the dorsal spines are comparatively longer in young than in adult individuals, and hence the young in this respect accord with *G. lieurus.* I here speak of localities in which all the full-grown fish are *G. brachycentrus.*

† From the many small examples of all the varieties about nine lines in length that have come under my observation, I should think the number of lateral plates they are to possess through life is then as decided as the number of fin-rays; *i. e.* provided they would have remained in the locality whence they were taken. Whether such a change of habitation, as from fresh water to the sea, would cause the smooth-sided at any age to put on the lateral armour, may remain a question.

‡ From drains which are occasionally replenished by the tide I have also taken it.

is continued down the sides in the form of regular transverse bands upon a yellow ground;—river Shannon, at Killaloe (Rev. C. Mayne);—Youghal, county Cork (Mr. R. Ball).

From Scotland I have specimens obtained in the neighbourhood of Portpatrick by Capt. Fayrer, R.N. Examples from the Thames have been favoured me by Mr. Yarrell; and in the river Leam, at Leamington, Warwickshire, the *G. lieurus* has occurred to myself. Next to this variety naturally comes the

G. brachycentrus, Cuv. and Val., t. iv. p. 499, which like it, is smooth along the sides from the pectoral region, but differs in the shortness of the dorsal and ventral spines. From the comparative length of these spines alone do I distinguish the two varieties, the other characters attributed to *G. brachycentrus* being ever varying. The Irish localities whence I have this fish, are the neighbourhood of Belfast, and pools along the margin of Lough Neagh (W. T.), Dublin, Youghal, and Portarlington—supplied from these three localities by the friends before mentioned.

The largest example which has come under my observation was one taken by myself in England, at Stow Pool, Lichfield, in July 1836, and which was noticed in the 'Proceedings of the Zoological Society' for the next year. This is the only allusion I have seen to the *G. brachycentrus* in Great Britain.

This variety, which from the shortness of its spines is the most defenceless of the 3-spined Sticklebacks, we should, *à priori*,—i. e. if the suggestion respecting the full-armed variety be correct—expect to find where it has fewest enemies, and such, according to my very limited observation, is the case. This would seem to be the variety more peculiar to still water, in which it often attains a very large size. The only continental notice of this fish known to me is that in the 'Hist. des Poiss.,' where it is stated to have been obtained by M. Savigny in the brooks of Tuscany.

The following comparison between *G. brachycentrus* from the neighbourhood of Belfast, and specimens of *G. lieurus*, &c. from the Thames, favoured me by Mr. Yarrell, was drawn up early in 1834:—

In form of outline the Irish fish generally differs much from the *G. lieurus*, the latter being from the centre of the back alike gracefully sloped on either side to the head and tail, giving that part a handsome and finely-arched appearance; the under side of the body also exhibits more of this form than that of its congener. The back of the Irish species, instead of thus sloping gradually to the centre,

is at that part rather flat, and is at least as high where the dorsal fin originates as elsewhere. The Irish fish is in proportion to its depth longer than the *G. lieurus*, as specimens of the latter under $2\frac{1}{2}$ inches in length, when compared with Irish specimens 3 inches long, proved of equal dimensions (8 lines) at the deepest part. The difference is also strongly marked in the relative breadth of the two species, the Irish maintaining considerable breadth throughout, even to the origin of the caudal fin. The *teeth* in the lower jaw of the Irish species consist in the centre of about four rows irregularly disposed, but become gradually less numerous towards the back of the mouth, where they terminate in a single line: the upper jaw contains three rows in front, the outer and inner being regular in distribution. In number, the *G. lieurus* which I examined does not possess so many teeth as that species, but in their arrangement there is little difference. On reckoning the *vertebræ* in a specimen of the *G. lieurus* and in one of the Irish Sticklebacks of similar length, I find that the number in the latter exceeds that in the former species, and that they are throughout more regularly equidistant than in the *G. lieurus*.

In the three English Sticklebacks, *G. trachurus*, *G. semiarmatus* and *G. lieurus*, the bony plate covering the head is much stronger than in the Irish fish—the outline of the lower jaw more angular—the lips smaller and less fleshy—the number of rays in the fins different, consisting generally, in the Irish specimens, of twelve in the dorsal, ten in the pectoral, eight in the anal, and twelve in the caudal. In the three English *Gasterostei*, also, the ventral spine is longer, but not so broad as in the Irish fish—the dorsal spines considerably longer, and the plates whence they spring proportionately larger. The following is the measurement of the spines in the four species:

	Total length of fish.		First dorsal spine.	Second.	Ventral.
G. trachurus	2 in.	$1\frac{1}{2}$ lin.	$2\frac{1}{4}$ lin.	$2\frac{3}{4}$ lin.	4 lin.
G. semiarmatus . .	2	6	$2\frac{1}{2}$	3	$4\frac{1}{2}$
G. lieurus	2	6	$2\frac{1}{2}$	3	$4\frac{1}{2}$
Irish species, G. brachycentrus	3	0	$1\frac{1}{2}$	$1\frac{3}{4}$	$3\frac{1}{4}$

In the last species* the membrane extends to the extremities of all the spines.

About Belfast I have taken the smooth-sided Sticklebacks —*G. lieurus* and *G. brachycentrus*—from ditches in the low grounds, from clear mountain-streams at an elevation of 600 feet above the level of the sea, from the muddy rivers Blackwater and Lagan, and from water which was partially salt (here *G. lieurus* only), when, contrary to what might be ex-

* Agreeably to the view taken in the 'Hist. des Poiss.,' the term "species" was here applied to *G. brachycentrus*. I was disposed at the time (1834) to regard it as a local variety, but had not the means, which have since been afforded by a comparison of specimens from numerous localities, to arrive at a certain conclusion on the subject.

pected, the largest were invariably found where the temperature was lowest, specimens there (*G. brachycentrus*) not uncommonly attaining the length of three inches, and perfectly free from the pearl-like tumours, which, adhering to the body, infest those inhabiting the comparatively warm waters of the lower grounds. This short-spined Stickleback here exhibits, in all respects, the same colours as the most common of the English varieties; of many of the larger individuals captured in the month of September, about the one-half were red on the under parts. In large shoals too I have remarked fully this proportion to have assumed the scarlet, and in the early summer months have observed that full-grown fishes, in which the most intense shade of this colour prevailed, never appeared to be with spawn*, very few in that state being so much as faintly tinged with it. This *Gasterosteus* and the Trout (*Salmo Fario*) seem not to co-exist in some of our smaller rivers, or do so very partially. In the stream whence the largest of these were taken, trout (*Salmo Fario*) were a dozen years ago very common, and the Stickleback unknown, and it is only since the almost total disappearance of the Trout that this fish has been established in its waters. In a similar stream issuing from the same mountain-range at about four miles distance, the Trout yet maintains its place, and in the parts of the river frequented by it I have in vain looked for the Stickleback.

The figure of *G. brachycentrus* in the 'Hist. des Poiss.' resembles the Irish fish when in spawn, and not its usual appearance.

In addition to that fish, there is another 3-spined Stickleback, brought by M. Savigny from the brooks of Tuscany, described as new in the 'Hist. des Poiss.'—from its brilliant operculum, it is named *G. argyropomus*. In this and the other characters assigned to it, Irish specimens in my possession fully accord. It is suggested, indeed, with reference to the characters attributed to this and the two other *Gasterostei*—*G. brachycentrus* and *G. tetracanthus*—brought by M. Savigny from Tuscany—"Nous allons les indiquer, pour engager les observateurs à s'assurer de leur constance," p. 498. In the next page it is however remarked of *G. brachycentrus*, that there is no doubt of its being a true species†.

Four-spined Stickleback, *G. spinulosus*, Yarr. and Jenyns.

Among specimens of *Gasterostei* kindly procured for me at

* So late as the 19th Sept. 1832, I remarked one large with spawn.

† The different varieties of the 3-spined Stickleback are commonly known in the North of Ireland by the name of Spricklebag—evidently a corruption of the proper term—Pinkeen is applied to them in the South; and from the Shannon they have been sent me under the name of Thornback.

La Bergerie, near Portarlington, Queen's-county, by the Rev. B. J. Clarke, is an individual with four spines. It is 1¼ inch long; the first and second spines are of ordinary length; the third spine is short, but exceeding the fourth. In no other character than that of having four spines, does this fish differ from the 3-spined examples taken with it, and consequently I cannot look upon it otherwise than merely an accidental variety of *G. aculeatus*, Linn. It was among a parcel, consisting of *G. lieurus*, *G. brachycentrus* and *G. Pungitius*, taken in a pond and in some neighbouring drains. The "ascending plate from the base of the ventrals" (see Jenyns's Manual, p. 350), I find subject to variety of form like other parts.

That the fish under consideration is the *G. spinulosus*, seems to me not to admit of doubt*.

Ten-spined Stickleback, *G. Pungitius*, Linn.

This diminutive fish is "rare"—as has already been noticed by Templeton †—in Ireland, comparatively with the 3-spined species. The localities whence I possess it are very few in number, viz.—pits excavated in brick-making on the banks of the Blackstaff river, near Belfast; a marsh in the neighbourhood of Portaferry, county Down (W. T.); and La Bergerie, Queen's-county (Rev. B. J. Clarke)—from this locality a considerable number were sent, and among them the largest native specimens I have seen, a few being 1¾ inch in length, and one having attained to 2¼ inches.

From the neighbourhood of Portpatrick, Scotland, this species has been sent me by Capt. Fayrer, R.N. For examples from the Thames I am indebted to Mr. Yarrell; and in the river Leam, near Leamington, Warwickshire, it has occurred to myself.

In most of the above localities the 3-spined species was taken with the *G. Pungitius*. All of the latter, whether from brackish or fresh water, are smooth throughout the sides (*G. lævis*, Cuv. 'Règne Animal,' 2nd ed.‡), and but a very few individuals present any appearance of a keel on the sides of the tail. The dorsal spines vary from nine to eleven in number, and do so in examples of equal size from the same place.

* Since the above was written, I have been gratified to find that my friend Dr. Johnston, in a 'List of the Fishes of Berwickshire, exclusive of the Salmones,' considers the *G. spinulosus* a variety only of the 3-spined species—of these he notices the "Rough-tailed, Half-armed, and Smooth-tailed Sticklebacks" of Yarrell, as varieties only of one species. (See Report of the Berwickshire Naturalists' Club for 1838, p. 171.)

† Mag. Nat. Hist. vol. i. New Series.

‡ See also Hist. des Poiss. t. iv. p. 507.

Fifteen-spined Stickleback*, *G. Spinachia*, Linn.

This species, differing from *G. aculeatus* and *G. Pungitius* in being strictly a marine fish, is found around the coast of Ireland. I possess examples obtained at Rathlin, in the north (by Dr. J. D. Marshall); Bundoran, in the west (W. T.); Youghal, in the south (by Mr. R. Ball), and on the coasts of Down (W. T.); and Antrim (by Mrs. Patterson), in the north-east.

On the southern coast, where sprat-fishing is regularly practised, the *G. Spinachia* is taken in greater quantity than in the north. Mr. R. Ball on one occasion knew as many to be captured with the Sprat (*Clupea Sprattus*), at Youghal, as would "fill a bushel," and at Glendore and the south-west coast of Cork generally, Mr. G. J. Allman informs me that it is often taken at the same time with this fish. On the coast of Down full-grown specimens have occasionally occurred to me when dredging, and likewise under stones between tide-marks, and one or two individuals may sometimes be seen in the fish-market at Belfast, whither they are brought with quantities of the Atherine (*Atherina Presbyter*) from Portaferry, in the winter and early spring. In the rock-pools, on different parts of the coast, the fry of *G. Spinachia* may be observed in the month of June about three-quarters of an inch in length; and in such places I have at Bangor (county Down), in the middle of September, captured them of twice that size, where in winter neither young nor adult examples ever occurred to me.

Both the *G. aculeatus* and *G. Pungitius* were included in Dr. Patrick Brown's 'Catalogue of the Fishes of Ireland,' published in Exshaw's Magazine for 1774—the former species was noticed two years before in Rutty's 'Natural History of the County of Dublin.' In M'Skimmin's 'History of Carrickfergus,' and in Mr. Templeton's 'Catalogue,' the *G. Spinachia* has a place.

In one respect the foregoing pages may be considered rather as exhibiting a retrogression than an advancement of the subject, as in them an attempt is made to restore what have latterly been considered as several species simply into the three described by Linnæus as *Gast. aculeatus*, *G. Pungitius* and *G. Spinachia*.

* Horn-eel is a common name for this species in the North.

XIV.—*Notice of Plants and Animals found in the Sulphureous Waters of Harrowgate and Askern, Yorkshire.* By E. Lankester, M.D., F.L.S., &c.

In the distribution of organized beings over the surface of the earth, we generally find an adaptation of the former to the various conditions of the latter.

In many marked cases this adaptation is so great, that organized beings cannot exist but in the peculiar circumstances in which they are first engendered. From this law arises the great variety of organized beings which we find adapted to occupy almost every existing condition of matter. There are, however, some conditions of the inorganic kingdom in which organic beings have not been detected, as excessive cold or heat, the absence of oxygen or the presence of injurious gases, &c. The extent, however, of these exceptions is continually on the decrease, and animated beings or their remains are now found in circumstances which but a few years since would have been thought quite impossible. For an increasing knowledge on this point we are in a great measure indebted to the use of the microscope. By its agency both animal and vegetable productions can be detected in almost all conditions of matter, so that it is difficult to say, with the exceptions of the extremes of heat and cold, under what combination of agencies we might not expect to find a plant or an animal. This extensive adaptation of the one kingdom to the other can now be demonstrated to be essential to the welfare of the whole, as in many instances the lower organic beings derive existence from, and convert into their own substance, those elements which would be destructive of the existence of beings higher in the scale of life. Hence the investigation of this department of science becomes interesting to the physiologist.

Among those conditions of matter which, from their powerful influence on man, might be supposed to be destructive of all animal life, are some varieties of those waters which, from the nature of their contents, are called mineral. Some of these have a temperature exceeding greatly that of the human body, yet many of them contain both plants and animals; in fact, wherever the former are found we may anticipate the existence of the latter.

On the present state of our knowledge with regard to the composition of mineral and thermal waters a report has already appeared, drawn up by Dr. Daubeny at the request of the British Association for the Advancement of Science; in this report reference is made to the existence of both animal and vegetable matter in many cold and thermal springs.

Amongst the substances found in sulphureous springs is one called *glairine*, which has for a long time been recognised by continental chemists, and was carefully investigated by Professor Anglada, who thought it resulted from the chemical action of some of the constituents of the water in which it was found. Dr. Daubeny has also investigated this substance, and, in opposition to the opinion of Anglada, believes it to arise entirely from organic matters in the waters in which it occurs. This notice first induced me to ascertain if this substance was present in the sulphureous waters of Askern and subsequently in those of Harrowgate, and the result has been the detection of forms of animal and vegetable life in circumstances in which I had not previously suspected them.

Previously to Dr. Daubeny's investigation, Dr. Willan had announced the presence of a peculiar organic substance in the waters of Croft in Yorkshire, which Dillwyn named *Conferva nivea*; and many French and German chemists had described organic matters in mineral waters, as resin of sulphur, humus, extractive, Baregine, zoogene, &c., &c.

As great medicinal virtues have been attributed to these substances, they have in certain quarters attracted considerable notice; but not having visited any of the mineral waters of the continent with the view of investigating them, I am not able to say how far those which I have found at Harrowgate and Askern may resemble those described on the continent, and shall only endeavour in this place to point out the nature of certain substances in these waters, which appear to resemble those spoken of by continental writers.

Throughout the whole district in which Askern is situated, the soil in many places, and the mud in the ditches and pools, when tested, gives very decided proof of the existence of sulphuretted hydrogen. At certain seasons of the year many of these spots are covered with a whitish-looking Conferva, which I have supposed to be the *Conferva nivea* of Dillwyn. The specimens obtained from off the sulphuretted mud of waters which contain no sulphuretted hydrogen, present a greenish fibre, surrounded by verticilli of numerous smaller fibres. This appears to be the plant in a mature stage of growth. If however a small portion of the mineral water be put aside, it will in the course of a little time present on the sides of the vessel in which it is contained a whitish-looking substance, which, on being examined by the microscope, exhibits a mass of very delicate fibres. The same fibres are found to constitute the white substance which collects around the sides of the sulphur wells, as well as at the bottoms of the cisterns and the pipes through which the water is drawn.

In places where this substance has been allowed to collect for some time, a layer of darker fibres will be found to have formed, which present all the characters of the fibres collected from the sulphuretted mud of the running streams. From this circumstance I have been led to suspect that the two are but different forms of the same plant. If this white substance be kept in a warm room it decomposes and gives out a sulphurous smell, which is stronger and more disagreeable than that of sulphuretted hydrogen. A film also collects upon the surface of the water, and in this state it corresponds very closely to Anglada's description of *glairine*. In one instance I observed this substance to form in a glass-stopped bottle of sulphur water, from which the atmospheric air was excluded, with the exception of a small globule which existed in the neck of the bottle. It forms, however, most rapidly when exposed to the atmosphere; and so quickly does this process go on, that the stone vessels into which the water runs over at the Bath-houses, if cleaned in the morning, will be found covered in many places by night. When exposed to the air the sulphur water is constantly depositing small portions of the salts which it holds in solution, which, in places where it is undisturbed, mix with the vegetable fibres and present themselves in the form of crystals mixed with the fibres. In this state, when collected and dried and submitted to heat, it gives out sulphurous acid gas. Some of the sulphur of this compound may be precipitated from the water; but from the smell of the fibres in decomposing, I am inclined to think that they themselves contain sulphur, and that this is the agent which determines their existence and peculiar form.

Being at Harrowgate during the past summer, I was desirous of confirming the existence of this substance in the sulphur water there. In most of the wells I found on their sides deposits varying in colour and appearance. The different-coloured deposits were arranged in layers, so that on examining a portion it presented several layers one above the other. The principal layers are green, white and red. On examining the green layers I found them to consist of simple fibres of a dark green colour, with transverse bands of a darker shade, resembling some of the species of *Oscillatoria*. The white I found to consist of opake masses of a crystallized character, which were probably salts deposited from the waters by evaporation and the escape of carbonic acid. The red I shall have occasion to mention presently, only observing now that Anglada mentions having observed *glairine* sometimes of a red colour.

In the specimens I brought with me from Harrowgate I could not find the *Conferva nivea*, but in Hooker's 'British Flora' it is stated to have been found at this place.

All the substances which have been enumerated have been referred to very different sources for their origin. Thus Anglada supposed *glairine* to be of chemical origin, whilst others referred it to the vegetable kingdom, and a third class of observers have referred a similar compound to the animal kingdom, calling it zoogene, &c. The different states, in which these substances are presented by nature, would undoubtedly add to these various conclusions. I am not however aware that those who have referred this substance to the animal kingdom have observed living animals in the waters from which it has been taken. Dr. Daubeny remarks in a note, that Turpin had found in the substance called *Baregine* the remains of Infusoria; but no writer that I am aware has recorded the fact of the existence of living animals in waters impregnated with sulphuretted hydrogen.

I have however met with several species of animalcules in these waters, two of which I have more particularly examined, and will now describe. In an analysis of the waters of Askern, published in 1817, the author observes, "Nearly allied to the vegetable kingdom is a singular substance found in a pond at the south corner of the pool. This substance is a powder of a pink or rose colour, which forms a thin covering on the sand and mud at the bottom of the pond."—(*Brewerton.*)

On reading this, I immediately had recourse to the spot, and found the substance lying on the mud of the ditches near Askern, which are strongly impregnated with sulphuretted hydrogen. I at first thought it to be of vegetable origin, and sent some to Mr. Berkeley for the purpose of ascertaining his opinion. From the state in which I sent it he supposed it might be a species of *Protococcus*, at the same time putting to me the query whether it might not be of animal origin. At that time I had seen nothing to lead me to suspect this, unless it might have been the excretion or ova of a beautiful rotiferous animalcule resembling the *Philodina roseola* of Ehrenberg, which is very abundant in the waters of the pool at Askern. After having kept some specimens of the red substance in water exposed to the air, I observed the water one morning of a deep rose colour, and on examining it found it to contain an immense number of very minute animalcules. I now had a clue to the origin of the red substance, and from subsequent examinations found that the red colour of the water and the deposits depended on this animalcule; in

the same manner as water is found of a green colour and having green deposits, from the presence of the *Cercaria viridis*, the green matter of Priestley.

From this time I looked out more particularly for this red substance, and soon found that it occurred very extensively in the ditches and pools at and near Askern. Its appearance is however very fluctuating, sometimes covering a large surface of the bottom of the pool with the appearance of red velvet, at other times not a spot is to be seen. At first I did not suspect at all the connection of this animalcule with the sulphur springs, until I observed it most abundant in the water-courses that received the overflowings of the pumps and wells used for drinking and bathing. This induced me to examine the water or mud in which I afterwards found it to occur, and I invariably found, on dipping in a piece of silver coin, that it presented the usual action of sulphuretted hydrogen. So constantly has this been the case, that by this means I have detected sulphuretted hydrogen in spots where I should not have thought it existed. In the red colour before alluded to of the deposits around the sides of the wells at Harrowgate, I recognised the same substance as existed at Askern. Whilst at Knaresborough, I observed this rose-coloured matter in the mud of the water before it passes into the rock which forms the dropping-well; and on plunging a shilling into the mud, it came out presenting the usual discoloration from sulphuretted hydrogen.

The animalcule is very minute, not more than the ten thousandth of an inch in diameter. Its form is oblong, frequently presenting a contraction in the middle of its body, and presenting from two to ten or twelve stomachs. Its line of movement is straight, with a somewhat serpentine movement of the body.

On looking over Ehrenberg's great work on Infusoria, I have not been able to refer it to any of the genera there given, although from its size and the circumstance of its producing a red deposit, it would seem to be his *Astasia hæmatodes*. I cannot, however, distinguish in it a tail, which is a generic character of *Astasia*. The *A. hæmatodes* was discovered by Ehrenberg at the bottom of a lake in the steppe of Platow in Siberia.

I have frequently found another animalcule with this and sometimes alone, forming a deposit of a much lighter colour, having a whitish red or brickdust colour. It is a much longer animal, and has the motions of a *Vibrio*, but not its bead-like form. It possesses from ten to twelve stomachs.

Both these animalcules live in water artifically impregnated

with sulphuretted hydrogen; whilst I have found that other kinds are effectually destroyed by such treatment.

Besides the vegetable and animal forms above mentioned, the sulphur waters during their decomposition afford others, especially under the films that collect on the surface of the water.

XV.—*Remarks upon the Recent and Fossil Cycadeæ.* By J. Morris, Esq.

The Cycadeæ, originally placed by Linnæus and Jussieu among the Ferns, are an interesting family of plants, from their appearing to form an intermediate place between the Palms, Ferns and Coniferæ; resembling the first in their external habit, the second in the gyrate vernation of their leaves (a character not belonging to the whole family), and related to Coniferæ in the ovula being uncovered, or not furnished with any seed-vessel. The affinities of these families, although previously mentioned by C. Richard*, were, in this latter respect, finally determined by Mr. R. Brown in his researches into the structure of their reproductive organs, inserted in the Appendix of Capt. King's 'Voyage to Australia.'

The stems or trunks of Cycadeæ are generally simple, although some species of *Zamia* appear capable of dividing into two or three terminal buds. In *Cycas* the internal structure consists of a central pith surrounded by two or more circles of laminated vascular and cellular tissue alternating; in *Encephalartos* the central cellular tissue is divided from the external by only one circle of woody fibre†. "The stems are enclosed in no true bark, but have a thick case composed of the persistent scales which have formed the bases of fallen leaves; these, together with other abortive scales, constitute a compact covering that supplies the place of bark."—(*Buckland*‡.)

* 'Mém. sur les Conifères et Cycadées,' 1826, p. 183. "Il n'est aucune famille de plantes qui ait plus de rapports et de ressemblance avec les Conifères que celle des Cycadées. Ces rapports nous semblent si grands, que nous pensons qu'il est impossible de distinguer ces deux familles, ni par des caractères tirés de leurs fleurs, ni par des caractères puisés dans l'organisation de leurs fruits. Les seuls signes distinctifs qui existent réellement entr' elles consistent uniquement dans leur port et la structure anatomique de leur tige, qui en effet est fort différente dans l'un et l'autre groupe."

M. Richard, however, appears to have been unaware of the internal structure of *Cycas* being stratified; but describes it as similar to that of Palms: "*C. circinalis*, Arbor . . . ., ligno albicanti, molli uti in arboribus monocotyledonibus disposito."

† In a specimen of *E. spiralis*, for which I am indebted to the Messrs. Lee of Hammersmith, the external circle of cellular tissue is wanting.

‡ Some interesting observations on the structure of the tissues of Cycadeæ have appeared by D. Don, Esq., Libr. L.S. Mr. Don remarks, that "the

The family is diœcious. The inflorescence consists of a strobiliform spike, from the under surface of the scales of which the polleniferous thecæ proceed; in *Zamia* these thecæ are separated into two distinct masses, while in *Encephalartos* and *Cycas* they form a confluent mass.

The female inflorescence of *Zamia* and *Encephalartos* is similar to the male cones in form, having thick scales, each bearing on the superior surface two naked ovula; while in *Cycas* the naked ovula are seated in depressions on the edges of a frond but little altered from the ordinary structure.

The foliation of this family consists of pinnate fronds, the circinnate vernation of which, in a young state, has generally been considered a character belonging to all the genera; but a series of observations on the development of the frond which I have had an opportunity of making in several species of the three existing genera, have led me to an opposite conclusion, from which it is evident that even in *Cycas* itself the rachis is constantly straight in the early state; when however twelve or more fronds rise together, the outer ones become incurved at their extremities, apparently for the purpose of affording some protection to the more delicate fronds within, which remain perfectly straight: the only parts to which the term circinnate can be strictly applied, are the young segments or pinnæ. In the evolution of the fronds the development proceeds from the base upwards, each pair of pinnæ becoming unrolled as soon as that part of the rachis has attained its full degree of extension and size.

A correct figure of the young frond of *C. circinalis* is given in Rheede's 'Hortus Malabaricus,' vol. iii. t. 15. f. 2, 3, 4; and one of *C. revoluta* is figured in plate xi. fig. 4, 5, 'Mag. Nat. Hist.' 1840, from a specimen obtained from Mr. Anderson, of the Chelsea Botanic Garden.

The prefoliation of *Zamia* and *Encephalartos* presents but little difference from each other; the young rachis is slightly recurved at the apex, the two series of pinnæ being regularly imbricated, and applied to, or in contact with, each other by

great peculiarity of the Coniferæ, and which distinguishes them as well from Cycadeæ as from every other family, is the remarkable uniformity of their woody tissue, which consists of slender tubes, furnished on the sides parallel to the medullary rays with one or more rows of circular or angular dots; but in Cycadeæ no such uniformity is observable, their tissue, as in other phænogamous plants, consisting of two kinds of vessels, namely, of slender transparent tubes, without dots or markings, and of dotted, reticulated and spiral vessels, which are capable of being unrolled. The former are identical with the fibrous or woody tissue; whilst the latter, which form a part of each bundle, can only be compared to the strictly vascular tissue of other plants."—(Proc. Linn. Soc. Feb. 4, 1840.)

their anterior surface. See *E. horrida*, pl. 11. f. 2. and *Z. pygmæa* and *pumila*, f. 1, 3. 'Mag. Nat. Hist.' April 1840. I had made these observations on the prefoliation of this family, when examining the extensive collection of species belonging to the Messrs. Loddiges of Hackney (who kindly furnished me with any specimens I required), previously to my attention being called by Prof. D. Don to some remarks by M. Miquel on this subject; and as they appear to differ from my own, owing probably to the period at which the young frond was examined in both instances, I shall insert an abstract from M. Miquel's memoir, with a view of calling the attention of botanists to a further investigation of this subject.

"In *Encephalartos affinis*, Lehman, a bud is composed of young leaves foreshortened (raccourcis), the tops of which converge at the summit; and the pinnæ on each side of the rachis, in consequence of this foreshortening, are imbricated and placed in contact one with another by the anterior surface. The same curious fact is observable in *E. Altensteinii* and *horridus*, Lehm. In species of this genus the terminal bud generally develops itself at an interval of two or even more years; and in young plants or the lateral buds of large stems it is often only developed by a single frond, or by a very limited number at one time. The increase of the young fronds is produced by the extension of the rachis and pinna. *E. spiralis*, Lehm., presents exactly the same character. In the *Zamia*, Lehm., the fronds are developed in a totally different manner. In *Z. pumila* and *media*, in the bud, the young rachis is rolled into the form of a crozier; but the two series of pinnæ are imbricated on each side, and are joined one with another in such a manner that their tops are directed downwards, occasioned by the circinnate disposition of the rachis. In the young fronds of *Cycas circinalis* and *revoluta*, Thun., the rachis as well as the pinna are rolled in the form of a crozier; each having a peculiar line or axis of circinnation, the same as in Ferns*."

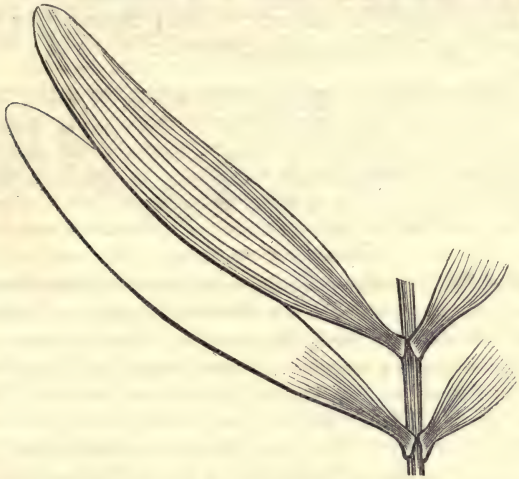
The remains of fronds supposed to belong to this family being rather numerous in a fossil state, and as the structural characters vary in the three recent genera, I shall give a slight description of the pinnæ and their mode of attachment, illustrated by a woodcut of each type.

Cycas.—Pinnæ linear, lanceolate, entire acute, having a single thick midrib† attached to the rachis by their whole base, the lower part of which is slightly decurrent.

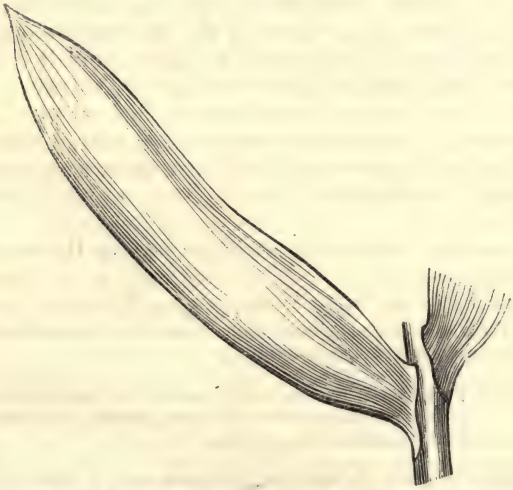
* Bulletin des Sciences Physiques de Néerlande, t. i. p. 129.

† In carefully examining the cellular substance of the pinnæ, small veins may be seen passing between the midrib and the margin.

Zamia.—Pinnæ ovatæ, lanceolate, attenuate, entire or dentate, having numerous fine equal veins parallel or slightly divergent, simple or sometimes forked. Pinnæ contracted towards the base, and articulated to the rachis by a whitish callosity.



Encephalartos.—Pinnæ varying in form, opposite or alternate, having simple or forked veins (thicker than in *Zamia*), and frequently terminating in spines or serrations towards the apex, attached by their whole base to the rachis.



The genera of this family differ in their geographical distribution. The five species of *Cycas*, viz. *C. circinalis, revoluta,*

squamosa, glauca, and *angulata,* are natives of China, India, Japan, the Molucca Islands and New Holland.

The nine species of *Zamia,* viz. *Z. angustifolia, tenuis, media, debilis, integrifolia, pygmæa, furfuracea, muricata* and *pumila,* are confined to the new world; their native habitats being the West Indies and the tropical regions of continental America.

The fifteen species of *Encephalartos,* viz. *E. pungens, cycadifolia, tridentata, longifolia, Caffra, lanuginosa, Lehmannis, Cycadis, horrida, latifolia, spiralis, prunifera, repanda, Frederici Gulielmi* and *Altensteinii,* belong to Southern Africa, only one species being found in New Holland*.

Fossil Cycadeæ.

Dr. Buckland, in the 'Geological Transactions,' first called the attention of geologists to the fossil stems of this family from the Isle of Portland, the analogy of which was pointed out by Mr. Brown; remains of the fronds had however been previously described by Count Sternberg in his 'Flora der Vorwelt,' and Ad. Brongniart also noticed them as occurring at Höer in Sweden†; the most abundant locality at the present time are the shales belonging to the oolitic series of Yorkshire: whether all the remains usually associated with this family really belong to it, may be difficult to decide, as many of them present characters very different from the existing species, which do not at the same time assimilate them to any other living genera. Ad. Brongniart, an authority on these subjects, has considered most of the simple pinnate fronds with parallel venation to belong to Cycadeæ; but it is much to be regretted, that the portion of his work ('Hist. des Vég. Foss.') which would comprehend this family is not yet published, so that we might have the full benefit of a continuation of the same masterly observations which have thrown so much light on the fossil Cryptogamia.

The classification in the following catalogue will be nearly the same as that adopted by most authors on this subject.

* The following observations are extracted from Lindley and Hutton ('Fossil Flora,' ii. p. 122), respecting the geographical position of *Encephalartos.* "They are not met with at Cape Town, where they would be exposed to the cold winds from the southern polar regions, but first appear far in the interior of the country, in the land of the Caffers, where the common Cape Flora of Proteas and Heaths is replaced by strikingly different races of plants. They prefer mountainous and wooded or bushy country, following the ranges of hills, but not straggling into the plains. They are generally met with in rocky places, almost 2000 feet above the level of the sea, higher than the region of Mimosas, and surrounded by bushes, arborescent succulent plants, Rhamneæ, Celastrineæ, and shrubby Leguminous species."

† Ann. des Sc. Nat. tom. iv.

Cycadeacites, *Presl.*

Cycadites, *Brown.*

Trunks exhibiting the usual structure of *Cycadeæ.*

Fronds pinnate; pinnæ linear, entire, adnate at the base, traversed by a single thick midrib.

Stems.

C. columnaris, Presl, Sternberg, Flora der Vorwelt, part 7, 8. t. 47. f. 1—6. Near Radnitz, Bohemia.

C. involutus, Presl, *l. c.* t. 51.

C. Bucklandi, Presl, *l. c.* p. 194. *Conites Buckl.,* Sternb., part 3, p. 39. t. 30. Oolite, Stonesfield.

C. cylindricas Mantellia, Brong. Prod., pp. 93 and 96. Lias, Luneville, Strasburg.

C. cyprinopholis, Mém. Agric. Soc. Lyons, ii. p. 129. t. 3. f. 1—5. C. M. Mines de Rive-de-Gier.

Fronds.

C. salicifolius, Presl, *l. c.* t. 40. f. 1, 2. Lignite, Altsattel, Bohemia.

C. angustifolius, Presl, *l. c.* t. 44. Lignite, Altsattel, Bohemia.

C. ? *Nilssonii*, Spadix* of, Hisinger, Let. Suec., t. 33. f. 4.

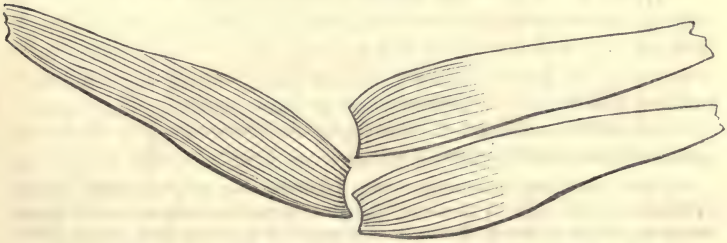
C. ? *Nilssonii,* Phillips, Geol. of Yorkshire, t. 7. f. 24. Oolite, Yorkshire.

Zamites, *Brong., Presl,* &c.

Fruit strobiliform, oval, pedunculate, with large imbricated scales spirally arranged. (Presl.)

Stems cylindrical or nearly spheroidal, without a distinct axis, covered by rhomboidal cicatrices. (Brong.)

Fronds pinnate; pinnæ sessile, distichous, entire or dentate, pointed; sometimes contracted, sometimes enlarged at the base.



Stems.—Cycadeoidea, Buckland, *Mantellia,* Brong.

Z. Cordæi, Presl, Sternb. Flor., part 7, 8. p. 196. t. 55. C. M. Radnitz, Bohemia.

* The portion of a frond figured by Hisinger under this name appears to belong to a *Fucus* with a central rib, by the club-shaped termination of which it may have been attached. I do not know how any worn or broken *Cycas* leaf could assume this form.

*Z. megalophyllus**, Presl, *l. c.* p. 196. *Cyc. meg.*, Buckl., *Mantellia nidiformis*, Brong. Prod. p. 96. Oolite, Isle of Portland.

Z. microphyllus, Presl, *l. c.* p. 196. *Cyc. micro.*, Buckl. Oolite, Isle of Portland.

Z. pygmæus, *Cycadites*, Lindl. and Hutt., 2. t. 143. Lias, Lyme Regis.

Z. ? *Brongniarti*, Presl, *l. c.* p. 196. *Endogenites echinatus*, Brong., Class. Veg. Foss., p. 43. t. 5. f. 2. Soissons.

Strobiles.

Z. crassa, Lindl. and Hutt., 2. t. 136. Wealden, Isle of Wight.

Z. macrocephala, L. and H., 2. t. 125. Greensand, near Deal.

Z. ovata, L. and H., 3. t. 226 *a*. Greensand ? Feversham.

Fronds.

Pinnæ contracted at the base.

Z. distans, Presl, *l. c.* p. 196. t. 41. f. 1. Keuper, Bamberg.

Z. lanceolatus, L. and H., 3. t. 194. Low. Ool. Shale, Haiburn Wyke, Yorkshire.

Z. undulatus, Presl, *l. c.* p. 197. *Odontop. undulatus*, Sternb., pt. 5. and 6. p. 78. t. 28. f. 1.

Pinnæ broad at the base.

Z. gigas, Lindl. and Hutt., 3. t. 165. Ool. Shale, Scarborough.

Z. ? *giganteus*, Hist. Let. Suec., t. 33. f. 5.

Z. ? *Schlotheimii*, Presl, *l. c.* p. 200. *Cyc. zamiafolius*, Sternb., pt. 4. p. 33. t. 43. f. 2. C. M. Mannebach. *Poacites zeæformis*, Schloth. Pet. t. 26. f. 1, 2.

Z. palmatus, *Cycadites*, Sternb., pt. 1—4. t. 40. f. 1.

Z. longifolius, Brong. Prod. p. 94. *Cycadites sulcicaulis*, Phillips, Geol. Yorkshire, pt. 1. t. 7. f. 21. *Ctenis falcata*, Lindl. and Hutt., 2. t. 103. Ool. Sh., Gristhorpe Bay.

Presl considers this to be a Fern.

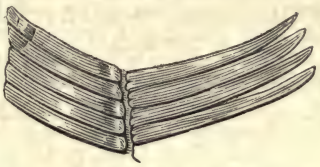
PTILOPHYLLUM.

Stem —— ? Fronds pinnate; pinnæ linear, closely approximated, more or less elongate; base variable in form, oblique, round, imbricate, sometimes auricled in the upper and sometimes in the lower part. Veins slender, equal, parallel†.

* Presl has placed these fossil stems with *Zamites*, to which they appear to have a greater affinity than to *Cycadites*, more especially since the interesting discovery by Mr. R. Brown of the existence of scalariform vessels without discs in the trunk of *Z. microphyllus*, a character in which they agree with the American portion of the recent order. Mr. Brown remarks, "that the order Cycadeæ presents but one genus in America, namely, the *Zamia*, on which this genus was originally founded, and to which it has been recently restricted; and that the coincidence in the structure of the scalariform vessels in the trunk of this *Zamia* of the new world, with that of the fossil *Cycadites* of Europe, is very remarkable." (Buckl. B. T. Sup. Notes.)

† I am indebted to Mr. Lonsdale, of the Geological Society, for first pointing out to me some fossils from Cutch, belonging to Col. Grant, in

This section has been proposed to include those species of fronds hitherto classed with *Zamites*, but from which they differ in the variable form of the base of the pinnæ and their imbricated character. Ad. Brongniart appears to have been aware of this structure (Prod. p. 91) and has referred them to *Zamites*, but this name ought to be restricted to those fossils agreeing more closely with the recent genus. The oblique attachment and auricled base are characters not well marked in any recent species; and whether attached by the whole or only a portion of the base, may be difficult to decide from the compressed state of the specimens,—an opinion that might be formed from inspecting casts obtained from pressed leaves of some of the Coniferæ (*Cunninghamia lanceolata*), in which the broad basal attachment (in the cast) would be very deceptive.



No specimens of this section have yet been found with the vernation of the young fronds, although, I believe, Ad. Brongniart considers he has discovered unequivocal evidence of the gyrate vernation of *Nilssonia*. This section is readily distinguished from *Pterophyllum* by the pinnæ being narrow and of nearly equal breadth throughout, a character in which they agree somewhat with the young state of *Encephalartos spiralis* and *E. cycadis*, and the broader ones resemble other forms of that genus; but it would be preferable to retain them here, although their affinity to *Zamites* is very evident, if the concave basal attachment of *Z. gigas* may be considered an intermediate form.

Pinnæ narrow.

P. acutifolium, Geol. Trans., 2nd series, vol. v. t. 21. f. 1, 2, 3. Ool., Cutch.

P. Cutchense, Geol. Trans., 2nd series, vol. v. t. 21. f. 4. Ool., Cutch.

P. Bucklandi, Z. Buckl., Presl, *l. c.* pt. 7, 8. p. 198.

P. æquale, Pterophyllum dubium, Ad. Brong. Prod. p. 95; Hist. Let. Suec., t. 33. f. 8. *Nilssonia æqualis*, Brong., Ann. des Sc. Nat. 4. t. 12. f. 6. Lias? Höer, Sweden.

P. pecten, Pterophyllum pecten, Lindl. and Hutt., 2. t. 102. *Cycadites pecten*, Phillips, Geol. Yorks., t. 7. f. 22. Gr. Ool., Gristhorpe Bay.

P. Jægeri, Pterophyllum Jægeri, Brong. Prod. p. 95. *Osmundites pectinatus*, Jæger. Keuper?

P. dubium, Cycadites plumula, Presl, *l. c.* pt. 7, 8. p. 195. *Filicites dubius*, Sternb., pt. 1—4. t. 33. f. 1. Oolite, Yorkshire.

This may only be a variety of the next species.

P. pectinatum, Zamia, Brong. Prod., p. 94. Lindl. and Hutt., 3. t. 172. *Filicites scolopendrioides*, Lindl. and Hutt., 3. t. 229. (excl. synon.) Stonesfield slate. *Ool. shale**, Saltwick, Yorkshire.

which these characters are well exhibited; they are figured in the 2nd part of vol. v. of the 'Geol. Trans.'

* Mr. Williamson, in a memoir published in the Geol. Trans. vol. v., considers most of the Yorkshire plants as belonging to the great oolite.

The *Filicites scolopendrioides* of Lindley (not of Brongniart, from which it is very distinct, Brongniart's figure representing merely the fructification of an entire leaf, Lindley's figure that of true pinnæ) has been placed as a synonym of *Z. pectinata*, although it differs in having the pinnæ wider apart and more obtuse at the apex, not important specific characters.

P. taxinum, Zamia taxina, Lindl. and Hutt., 3. t. 175. Stonesfield slate.

I am informed, from a recent communication of Prof. Phillips, that the fossils figured in his 'Geology of Yorkshire,' under the names of *Cycadites lanceolatus* (*Zamia Mantelli*, Br.), *C. gramineus* (*Z. elegans*, Br.), and *C. latifolius* (*Z. Youngii*, Br.), ought to be placed in the Otopteroid division of Ferns, the veins losing themselves in the upper margin. Seven or eight other species are named in Ad. Brong. 'Prodromus,' the characters of which are not given, viz. *Z. Feneonis, acuta, patens, lævis, Goldiæi, Buchanani, pennæformis.*

Pinnæ broad.

P. falcatum, Zamites, Presl, *l. c.* pt. 7, 8. p. 197. *Odontopteris falcatus,* Sternb., pt. 5. and 6. p. 78. t. 23. f. 1. Inf. Ool., Whitby.

P. Schmeidelii, Presl, *l. c.* p. 197. *Odon. Schmeidelii,* Sternb., pt. 5. and 6. p. 78. t. 25. f. 2. Hornstone, Baruth.

P. lanceolatum, Geol. Yorksh., Young and Bird, t. 3. f. 2. "The leaf with long lanceolate striated leaflets." Oolite, Yorkshire.

The peculiar character which distinguishes this section from *Zamites* may be easily remarked by comparing the attachment of the pinnæ in any of the above species with that of *Z. lanceolatus,* 'Foss. Flor.' 3. t. 194.

PTEROPHYLLUM, *Brong.*

Fronds pinnate; pinnæ sublinear, inserted by their whole base; apex truncate, sometimes acute; veins fine, equal, slender, parallel, but little marked.

Apex truncate.

P. majus, Brong., Ann. des Sc. Nat., 4. p. 219. t. 12. f. 7; Hist. Let. Suec., t. 33. f. 6.

P. minus, Brong., Ann. des Sc. Nat., 4. p. 219. t. 12. f. 8; Hist. Let. Suec., t. 33. f. 7; Lindl. and Hutt., t. 67. f. 2. Oolite, near Scarborough.

P. comptum, Lindl. and Hutt., t. 66. *Cycadites comptus,* Phillips, t. 7. f. 20. Oolite, near Scarborough.

P. Munsteri, Presl, *l. c.* p. 198. t. 43. f. 1. Keuper, Bamberg.

P. truncatum, Presl, *l. c.* p. 198. *Aspleniopteris Nilssoni,* Sternb. pt. 4. t. 43. f. 3—5. Höer, Sweden.

P. Nilssoni, Lindl. and Hutt., 2. t. 67. f. 1. *Aspleniopteris Nilssoni,* Phillips, Geol. Yorksh., t. 8. f. 4. Oolite, Scarborough.

P. filiciformis, Zamites filiciformis, Presl, *l. c.* pt. 7. and 8. p. 198. *Filicites dubius,* Sternb., pt. 4. p. 23. t. 47. f. 1.

P. obtusum, Odontopteris obtusa, Brong. Hist. Vég. Foss., t. 78. f. 4.

P. latifolius, O. latifolius, Sternb., pt. 5. and 6. p. 79. *Tæniopteris latifolius,* Brong., t. 82. f. 6.

Apex acute.

P. acuminatum, Zamites, Presl, *l. c.* p. 198. t. 43. f. 2. Keuper, Bamberg.

P. Brongniarti, Cycadites, Mantell, Geol. S.E. England, p. 238. Wealden, Sussex.

P. heterophyllus, Zamites, Presl, p. 199. t. 43. f. 4, 5. Keuper, Bamberg.

P. tenuicaulis, Cycadites, Phillips, pt. 1. t. 7. f. 19. Gr. Ool., Gristhorpe Bay.

P. difformis, Zamites, Presl, *l. c.* pt. 7, 8, p. 198. *Aspleniopteris difformis,* Sternb., pt. 4. p. 21 ; pt. 2. t. 24. f. 1. Bohemia.

The following species I have not seen :—

P. longifolium, Brong. Prod., p. 95. *Algacites filicoides,* Schloth. Nachtr., p. 46. t. 4. f. 2. Lias.

P. Meriani, Brong. Prod., p. 95. Lias.

P. Williamsonis, Brong. Prod., p. 95. Inf. Ool., Whitby.

P. enerve, Brong. Prod., p. 95. Variegated marl.

NILSSONIA, *Brong.*

Fronds pinnate ; pinnæ approximate, oblong, more or less elongate, apex rotundate, adhering by their whole base ; veins unequal, parallel.

N. brevis, Brong., Ann. des Sc. Nat. 4. p. 218. t. 12. f. 4 ; Hist. Let. Suec. Höer, Sweden.

N. elongata, Brong., *l. c.* t. 12. f. 3. *Zamites,* Presl, *l. c.* p. 198. Höer, Sweden.

N. proxima, Cycadites Nilssonii, Sternb., pt. 1—4. t. 47. f. 1.

The above is an outline of some of the characters in the recent and fossil Cycadeæ, the geological position of which is equally interesting with their recent affinities. A few species are found in the carboniferous beds of Bohemia and in the new red sandstone of Germany, and some have also been met with in the cretaceous series of Denmark and Sweden ; but their great development appears to have been during the Jurassic period, thirty species occurring in the oolitic formation of England, and three in that of India. Thus they seem to have formed the characteristic vegetation of that age, intermediate between the abundant Cryptogamic tribes of the carboniferous æra and the dicotyledonous flora of the tertiary series.

The great number of fossil species supposed to belong to this fa-

mily has probably suggested the remark by Prof. Don, that the recent species "constitute the remains of a class of plants which belonged to a former vegetation."

The interesting specimens of fossil fructification, apparently furnished with a stem, belonging to this family, which exist in the collections of the British Museum, Mr. Bean of Scarborough and Mr. Saull of London, etc., have not been alluded to in this paper; they probably constitute a new genus from being generally associated with fronds having a peculiar character, first pointed out to me by M. König; and I shall reserve any remarks on this subject until I have completed some observations on the internal structure of the stem and its affinity to *Zamites*.

XVI.—Carabideous *Insects collected by* Charles Darwin, Esq., *during the Voyage of Her Majesty's Ship Beagle.* By G. R. Waterhouse, Esq.

[Continued from vol. vi. p. 355.]

Genus Feronia.

Sp. 1. *Feronia Corinthia*, Dejean, Spécies général des Coléoptères, tom. iii. p. 304.

Molops Corinthia, Germ. Col. sp. nov. p. 21.

Of this species Mr. Darwin obtained many specimens at Maldonado, La Plata, and two specimens are labelled 'Monte Video.' It is the *Carabus striatulus* of Fabricius, the original specimen of which is contained in the Banksian collection. I speak without hesitation, having compared Mr. Darwin's specimens with the original, with Dejean's description, and also with three specimens sent from the continent by different parties, all bearing the same specific name.

The *Feronia Corinthia* is readily distinguished from all the *Feroniæ* of the southern portions of South America hitherto discovered, by its large size, and the elytra being deeply striated towards the suture and almost smooth externally. The *Feronia chalcea* of Dejean is closely allied to the present species, having very nearly the same general form and similar sculpturing to the elytra; but in size it is much inferior, *F. Corinthia* being 8 lines in length, whilst *F. chalcea* is only $5\frac{3}{4}$ to 6 lines in length; the former is brassy black, and the latter is of a brassy colour inclining to æneous.

Sp. 2. *Feronia chalcea*, Dejean, Sp. général des Coléop. tom. iii. p. 308.

Four specimens of this species were brought from Maldonado, La Plata, by Mr. Darwin.

Sp. 3. *Feronia cordicollis*, Dejean, Spécies général des Coléop. tom. iii. p. 306.

Seven specimens of this species occur in Mr. Darwin's collection, five of which are from Monte Video, and two from Maldonado, La

Plata. It is easily distinguished from other Patagonian *Feroniæ* hitherto discovered by its comparatively depressed form, the small size of its head, cordiform thorax, black colouring, and the want of wings. By candle-light the elytra display a beautiful iridescence (steel-blue being the prevailing colour), as in the *Pterostichus brunnipes* or *iridipennis* of Stephens; in size it very nearly agrees with that insect; but the *F. cordicollis* has a much smaller head and thorax, and the latter is more attenuated behind.

A specimen of this species has been sent to Mr. Hope with the specific name of *obsidianus*, but I have not yet found it described under that name.

Sp. 4. *Feronia Dejeanii.*

Fer. alata, nigra, nitida; thorace cordato, posticè foveis duabus impressis; elytris elongatis subparallelis, distinctè striatis, interspatiis aliquantò convexis.

Long. corp. $7\frac{1}{2}$ lin.; lat. $2\frac{1}{2}$ lin.

Hab. Monte Video.

This species resembles the *Feronia Corinthia* of authors, but is a trifle less than that insect; the thorax is less convex, and although considerably contracted behind, is less suddenly so than in *F. Corinthia*; the posterior foveæ are large and shallow, instead of being in the form of a deep longitudinal groove; the elytra are distinctly striated throughout, and not, as in the species last mentioned, obliterated on the outer portion of each elytron. The present insect, moreover, differs in being of a black colour—there is perhaps a slight trace of the æneous tint.

From *Feronia cordicollis*, which is found in the same locality, and which, in the somewhat depressed form of the thorax, it resembles, the *F. Dejeanii* may be at once distinguished by the comparatively large size of its head, its possessing wings, the thorax being rather less contracted behind, the posterior foveæ being broad, the elytra more elongate and of a more parallel form, the striæ impunctate, and the antennæ stouter; its size rather exceeds that of *F. cordicollis*, and consequently that of *F. chalcea*, *F. assimilis*, and *F. simplex* of Dejean.

Description.—Head large, but slightly narrower than the thorax; the eyes rather prominent; two longitudinal deep grooves are situated on the forepart of the head. Thorax truncated behind, the widest part very near the anterior angles, the sides not very much rounded, and the hinder part much narrower than the opposite extremity; the dorsal channel distinct, but not extending either to the anterior or posterior margins; the posterior fovea large, shallow, and impunctate, or at least very nearly so—some very minute punctures being discernible under a strong lens; these foveæ extend to the posterior angles, and occupy nearly two-thirds of the space between them and the dorsal channel. Elytra elongate, the sides nearly parallel, being very indistinctly dilated in the middle; the striæ are rather deep and impunctate, and the interspaces are slightly convex: two impressed points are observable on the second stria from the suture situated on the hinder half of the elytron, and there

is an impression on the third stria situated on the anterior half of the elytra. This insect is of a glossy black colour throughout—on the upper parts there is a very indistinct metallic gloss.

Mr. Darwin found but one specimen of this insect.

Sp. 5. *Feronia submetallica.*

Fer. alata, nigra, suprà nigro-ænea; thorace sub-cordato, posticè foveis duabus punctulisque impresso; elytris paulò elongatis, subparallelis, distinctè striatis, interspatiis levitèr convexis.

Long. corp. $6\frac{1}{2}$ lin.; lat. $2\frac{1}{3}$ lin.

Hab. Maldonado, La Plata.

This species is about equal in size to the *F. cordicollis* of the same country, and rather larger than the *F. macer* of Europe. In many respects it is intermediate between the *F. Corinthia* (or *striata*) and the *F. cordicollis*; the head is proportionately rather larger than in the latter, but considerably less than in the former species; in the sculpturing of the elytra it greatly resembles the *F. Dejeanii*, and differs from *F. cordicollis* in having the striæ impunctate, and from *F. Corinthia* in having these striæ distinctly continued throughout the surface of the elytra. The thorax is less attenuated behind than in either of these species, being *very nearly* of equal width in front and behind.

Description.—Head triangular in front of the eyes (which are tolerably prominent), suddenly contracted, and cylindrical behind the eyes, with two longitudinal irregular impressions in front: thorax rounded at the sides, and but slightly attenuated and truncated behind, the dorsal channel distinct; the anterior and posterior transverse impressions indistinct, and the posterior foveæ in the form of longitudinal grooves*, rather short and deep and minutely punctured. Elytra moderately long, and but slightly broader in the middle than near the extremities; the striæ moderately deep and impunctate, and the interspaces are slightly convex; two abbreviated striæ near the scutellum; on the second stria from the suture are two impressed points, situated on the hinder half of each elytron, and on the third are one or two similar impressions. The general colour of the upper surface of the body is brassy black; the under parts of the body, as well as the legs, antennæ and palpi, are black.

But two specimens of this species were brought home by Mr. Darwin; one is from Maldonado, La Plata, and the other from Monte Video.

Sp. 6. *Feronia assimilis*, Dejean, Sp. gén. des Coléop., Suppl., tom. v. p. 773.

A *Feronia*, agreeing well with Dejean's description of the above-mentioned species, was found by Mr. Darwin at Monte Video. It is about the same size as the *Feronia macer*, and, like *F. cordicollis*,

* None of the South American *Feroniæ* which I have seen, have more than one fovea on each side at the base of the thorax, and in this respect they differ from those European forms (such as *F. melanaria*) in which there are two channels on each side.

is of a black colour, but may be distinguished from that species by its smaller size, the thorax being almost as broad behind as before, and the palpi, basal joint of the antennæ and the tarsi being pitchy red.

Sp. 7. *Feronia* (*Pterostichus*) *Bonellii.*

Fer. aptera, atra; thorace cordato, posticè utrinque bistriato; elytris elongato-ovatis, striatis, striis obsoletè striatis; antennis ad basin piceis; palpis tarsisque rufo-piceis.

Long. corp. $5\frac{1}{2}$—$5\frac{3}{4}$ lin.; lat. $1\frac{9}{10}$—2 lin.

Hab. Ynche Island, Chonos Archipelago; Valdivia, and E. Chiloe.

This species is about the same size as the *Feronia oblongo-punctata,* and it also approaches that insect in form; the head is rather narrower, the thorax is narrower, longer, and more attenuated behind; the elytra are of the same ovate form, but a trifle more elongated; the antennæ are also longer. It has the general form and appearance of the species of Bonelli's genus *Pterostichus.*

The eyes are moderately prominent, and the frontal sulci are short and rather deep; the thorax is rather depressed, as long as broad, considerably attenuated behind, and the posterior angles are right angles; there is sometimes a slightly impressed transverse groove in front, and there is also, in some individuals, a transverse groove behind; the dorsal channel is not very distinct; the posterior fovea, on each side, is in the form of a narrow long groove, and is impunctate; the elytra are elongate-ovate, distinctly striated, and the striæ are generally faintly punctured, especially those nearest the suture and towards the base of the elytra; but this is not constant, in some specimens the striæ being impunctate; the elytra are slightly sinuated at the apex and have some distinct impressed points on this part; there are also one or two impressions on the third stria from the suture; the palpi and tarsi are pitchy red, and the three basal joints of the antennæ are pitchy.

The specimens from Ynche Island have the elytra more deeply striated than those from Valdivia; one of the Valdivia specimens is considerably broader than the others, and the elytra have a purplish hue.

Sp. 8. *Feronia ærea,* Dejean, Spé. gén. des Coléop. tom. iii. p. 279.

This appears to be a common species in the neighbourhood of Valparaiso. I have seen many specimens from that locality,—Mr. Darwin's collection contains five. It is very nearly equal in size to the *F. Corinthia,* and of the same brassy black colour; it differs however in having the thorax less convex, rather longer, not so narrow behind, and less suddenly contracted at this part; the elytra are rather deeply striated throughout and are impunctate.

The *Omaseus marginalis* of Curtis (Linn. Trans. vol. xviii. p. 191) I have compared, and found to agree with these specimens; they however appear to me to agree with Dejean's description of *F. ærea,* and in Mr. Hope's cabinet there is a similar insect bearing the same name.

Sp. 9. *Feronia Nebrioïdes, Omaseus Nebrioïdes,* Curtis, Linn. Trans. vol. xviii. p. 191.

In Mr. Darwin's collection are four specimens of this species, two of which are from E. Chiloe, one is from Valparaiso, and the fourth is from Concepcion.

F. Nebrioïdes greatly resembles *F. ærea* in colour, form, and sculpturing, but is not more than half its size. The *Feronia erratica* of Guérin (Mag. de Zool. pl. 226. fig. 3.) agrees very nearly with this species, but there is no mention of the brassy tint of the upper parts which is observable in the *F. Nebrioïdes*; in the figure there is an admixture of green in the colouring.

Sp. 10. *Feronia lucidus. Pterostichus lucidus,* Curtis, Linn. Trans. vol. xviii. p. 192.

This species greatly resembles the *F. chalcea* of Dejean; but in that insect the sides and apical portion of the elytra are almost smooth, the striæ being obliterated on those parts as in *F. Corinthia,* whilst in *F. lucidus* the striæ are distinct throughout the elytra.

Sp. 11. *Feronia meticulosa,* Dejean, Spé. général des Coléoptères, Suppl. tom. v. p. 762.

Three specimens of this species occur in Mr. Darwin's collection; they are from Valparaiso. This insect, no doubt, is allied to that division of *Feronia* called *Steropus,* but is remarkable for having the *second, third, fourth* and *fifth* striæ of the elytra less distinct than the sutural stria, and those on the outer margin; in one of the three specimens the intermediate striæ are almost obliterated, but in the others they are more distinctly marked.

Sp. 12. *Feronia* (*Steropus*) *marginata.*

This is a new species closely allied to the last, having the intermediate striæ of the elytra almost obliterated; those on the margin of the elytra are remarkably distinct, and give to the insect a peculiar appearance; it is less than half the size of *F. meticulosa,* which is about equal to the *F. octopunctatus.* In both species the elytra appear to be soldered together.

Fer. picea, vel nigra; antennis pedibusque rufo-piceis; thorace subquadrato, angulis posticis rotundatis; elytris oblongo-ovatis, striatis, striis intermediis obsoletis.

Long. corp. $3\frac{3}{4}$—4 lin.; lat. $1\frac{1}{3}$—$1\frac{1}{2}$.

Hab. Chile.

This species bears a considerable resemblance to the *Taphria vivalis.* The head is somewhat rounded in front, and the eyes are but little prominent; the frontal grooves are scarcely discernible. The thorax is about one-third broader than the head, about equal in length and breadth, somewhat convex, a little broader before than behind, and the anterior and posterior angles are rounded; the dorsal channel and posterior foveæ are indistinct. The elytra are of an oblong-ovate form, not very much broader than the thorax, and slightly sinuated at the apex; the sutural stria is distinct but not deep, and impunctate; the four following striæ are almost

obliterated, and on the second of these, or the third from the suture, are two distinct, impressed points, the foremost situated towards the base of the elytra, and the other near the middle; on the outer margin of each elytron are three distinct striæ; that nearest the margin has numerous impressed points, and these impressions become more near to each other as they approach the apex of the elytra. The antennæ are rather shorter than the head and thorax taken together, testaceous red at the base, and becoming paler towards the tip, and the palpi are of the same colour; the legs are pitchy red, and the thighs are pitchy; the outer margins of the elytra are pitchy beneath.

Mr. Darwin found numerous specimens of this species both at Valparaiso and Concepcion; they vary a little in the form of the thorax; most of the Valparaiso specimens are a trifle smaller, and have the thorax rather narrower than those from Concepcion; but there are others from Valparaiso, which perfectly agree with the Concepcion specimens, and some which are intermediate.

Sp. 13. *Feronia* (*Pœcillus*) *Peruviana*, Dejean, Spé. gén. des Coléop., tom. iii. p. 233.

The collection contains several specimens from Callao.

Sp. 14. *Feronia* (*Pœcillus*) *Chaudoirii*, Guérin, Mag. de Zool. pl. 227. fig. 3. ?

An insect brought by Mr. Darwin agrees very well with Guérin's description of *F. Chaudoirii*; it is closely allied to the *F. unistriatus* of Dejean, but, judging from his description (for I unfortunately have no specimens for comparison), it differs in having the frontal sulci well marked, the mandibles pitchy red, and in being rather larger, viz. $5\frac{1}{4}$ lin. etc.; but upon turning to Guérin's fig. 3. of pl. 227, I find an insect represented which does not at all agree with the description of *Chaudoirii*. I should imagine the figure to be that of some other genus; it is very like a species of *Melanotus*: there must be some mistake.

Sp. 15. *Feronia* (*Pœcillus*) *Guerinii*.

Fer. nigra, nitida; thorace subquadrato, sulco dorsali mediocri impresso, nec non posticè foveis duabus, punctulisque; elytris distinctè striatis, striis subpunctatis; antennis, palpis tarsisque piceis.

Long. corp. 5 lin.; lat. 2 lin.

Hab. Patagonia ?

But one specimen of this species was found by Mr. Darwin, at sea, about sixty miles from the nearest land (but much further in the direction of the wind), Rio de la Plata. In size it is intermediate between the *F. Peruviana* and the *F. unistriata*, and it is easily distinguished from both these species by its elytra being distinctly striated throughout, the striæ being punctured, and there being small scattered punctures on the hinder portion of the thorax, between the posterior foveæ; compared with *Pœcillus cupreus*, it presents the following differences: size a trifle smaller, general form rather nar-

rower, head and thorax decidedly narrower, the latter with the posterior foveæ more marked, and the elytra rather more distinctly striated.

Head narrow, eyes moderately prominent, frontal sulci not deep; thorax subquadrate, the sides slightly rounded; dorsal channel distinct; posterior foveæ in the form of narrow grooves, and rather deep; the space between these foveæ is punctured, but the punctures are not very numerous, and the space between the foveæ and the outer angles of the thorax is impunctate: elytra oblong-ovate, distinctly striated; the striæ punctate, but the punctures are not very distinct: antennæ with the three basal joints blackish in the middle, but with the extremities red; the remaining joints brown: palpi pitchy red: legs pitchy black; the tarsi pitchy red. The upper parts of this insect are black, but I fancy I can trace some slight shades of blue, and think it probable it is a dark variety of a species having metallic colouring like the *F. unistriatus.*

I have named this species after M. Guérin-Méneville, whose works have done much towards the elucidation of the various branches of Natural History, and more especially the entomological department.

Sp. 16. *Feronia* (*Pœcillus*) *depressa.*

Fer. subdepressa, nigra, suprà cuprea vel æneo-cuprea; thorace subquadrato, posticè utrinque striato; elytris elongatis, subparallelis, distinctè striatis; antennis palpisque fuscis, his atque illis ad basin rufescentibus; pedibus nigris, tibiis piceo-rubris.

Long. corp. $5\frac{1}{3}$—$5\frac{3}{4}$; lat. $1\frac{3}{4}$—2 lin.

Hab. Monte Video.

This species is a trifle less than *Pœcillus lepidus,* and of a more depressed form, and the striæ on the elytra are not quite so deep.

Head rather large and obtuse in front; eyes very prominent, the frontal sulci very deep; thorax but slightly convex, nearly square, the sides but slightly rounded, and the fore part somewhat contracted; both anterior and posterior angles rather obtuse; dorsal channel tolerably distinct; posterior foveæ in the form of narrow and tolerably long impunctate grooves, and situated about midway between the dorsal channel and the outer margin of the thorax: elytra somewhat depressed, and having the sides nearly parallel; distinctly striated thoughout, the striæ impunctate; an impressed point on the second stria from the suture towards the base of the elytra, and two similar impressions on the stria situated on the hinder half of the elytra: antennæ shorter than the head and thorax, and rather thick; the three basal joints testaceous, and the remainder brown: palpi testaceous, the apical joints somewhat pitchy: legs black; anterior tibiæ pitchy red; tarsi and posterior tibiæ pitchy.

The above description is drawn up from three specimens from Monte Video.

The following species belong to the sub-genus *Argutor*:—

Sp. 17. *Feronia* (*Argutor*) *Patagonica.*

Fer. alata, nigra; thorace subquadrato, sulco dorsali mediocri,

foveisque duabus, impresso; elytris piceo-nigris, distinctè striatis, striis impunctatis; antennis, palpis, pedibusque piceo-rubris; abdomine ad apicem rufescente.

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

Hab. Maldonado, Monte Video, Sta Fé, etc.

This species may possibly be the *F. oblita,* or perhaps the *F. Bonariensis* of Dejean; but that author has not described those insects with his usual care, and after much trouble I have been unable to satisfy myself on this point. In all the specimens before me (eleven) the elytra are more or less pitchy, the margin is distinctly pitchy red beneath, and the terminal segment of the abdomen is of the same colour, as well as the legs, palpi and antennæ. In Dejean's account of the two species above-mentioned, they are described as *black,* with pitchy red legs.

Fer. Patagonica is about the same size, or a trifle less than *Argutor vernalis,* but the head and thorax are narrower, and the latter is more contracted behind; the elytra are rather more ovate, and the frontal sulci are more distinct.

Eyes moderately prominent, frontal sulci short and moderately deep; thorax about equal in length and breadth, rather narrower behind than before; the sides form a gentle and even curve from the anterior, almost to the posterior angle, and the outer margin meets the posterior margin so as to form nearly a right, or slightly obtuse, angle; the dorsal channel is distinct, and the posterior foveæ (one on each side) are in the form of narrow grooves; there are no punctures on the thorax: elytra considerably broader than the thorax, and of an oblong-ovate form; the striæ moderately deep and impunctate; a short rudimentary stria is observable on each side near the scutellum.

In some of the specimens the body and thorax are red beneath, but most commonly these parts are of a pitch colour; the terminal segment of the abdomen is always paler than the other parts. The specimens, moreover, vary somewhat in the form of the thorax, the posterior angles being sometimes almost acute, and in one or two of the specimens there is a distinct transverse impression on the hinder part of the thorax; a specimen from Monte Video has no wings. Notwithstanding these differences, I am convinced, after a careful examination, that they are all the same species.

Sp. 18. *Feronia* (*Argutor*) *Brullei.*

Fer. alata, piceo-nigra; thorace subquadrato, posticè striis punctulisque impresso; elytris subparallelis, profundè punctato-striatis; antennis palpisque testaceis; pedibus piceo-rubris.

Long. corp. $3\frac{1}{4}$ lin; lat. $1\frac{1}{5}$ lin.

Hab. Sta Fé, Buenos Ayres.

This species very nearly agrees in size with the *Argutor vernalis,* but is of a narrower form, and the antennæ are proportionately longer, reaching, when extended backwards, considerably beyond the base of the thorax. The general colour of the upper parts of the body is black, slightly inclining to pitchy; the suture of the

elytra and outer margins are suffused with pitchy red; the under parts of the body are pitchy black; the mandibles and legs pitchy red, and the thighs assume a deeper hue in the middle; the antennæ and palpi are testaceous. Eyes moderately prominent, frontal sulci small and not deep; thorax subquadrate, slightly attenuated behind, the lateral and posterior margins forming a right angle on each side at their junction; dorsal channel moderately distinct, the posterior fovea on each side in the form of a long narrow groove, which extends to the posterior margin; the space between these foveæ is punctured, but the punctures are not very numerous: elytra considerably broader than the thorax, and with the lateral margins nearly parallel, deeply punctate-striated—no abbreviated striæ near the scutellum.

But one specimen of this insect was brought home by Mr. Darwin; it is easily distinguished from the preceding species by its distinctly punctate striæ. I have named it in honour of one of the authors of the 'Histoire Naturelle des Insectes' now in course of publication.

Sp. 19. *Feronia* (*Argutor*) *Audouini.*

Fer. alata, nigra; thorace subquadrato, angulis posticis subrotundatis, linea transversa striisque duabus impresso; elytris paulò elongatis, profundè striatis, striis impunctatis; antennis palpisque testaceis; pedibus rufo-piceis.

Long. corp. 4 lin.; lat. $1\frac{1}{2}$ lin.

Hab. Sta Fé, Buenos Ayres.

This species is rather larger than *Argutor vernalis*; the antennæ are proportionately longer and more slender; the thorax is almost precisely the same form, excepting that the posterior angles are somewhat rounder; the elytra are considerably longer. Eyes but moderately prominent, and having two rounded and somewhat deep foveæ between them: thorax broader than long, the anterior and posterior parts of equal width, and with the anterior and posterior angles slightly rounded; dorsal channel distinct, and extending from the anterior to the posterior margins; posterior foveæ in the form of long narrow grooves, which extend to the base of the thorax, and are connected by a tolerably distinct transverse groove; there are no punctures on the thorax: elytra elongated, and rather deeply striated; the striæ impunctate.

Sp. 20. *Feronia* (*Argutor*) *apicalis.*

Fer. alata, nigra; thorace subquadrato posticè angustiore, angulis posticis obtusis, striisque duabus impresso; elytris nigris vel piceo-nigris ad apicem et marginem externum piceo-rubris; antennis palpisque testaceis; pedibus rufo-piceis.

Long. corp. $4\frac{1}{2}$—4; lat. $1\frac{2}{5}$—$1\frac{1}{2}$ lin.

Hab. Maldonado, La Plata.

Three specimens of this species, from the locality just mentioned, are contained in the collection; they all have a distinct pitchy red patch at the tip of the elytra, a character which suggested the name.

Head ovate, eyes but little prominent, two foveæ in front joined by a transverse impression; thorax nearly equal in length and

breadth, rather narrower behind than before, the posterior angles obtuse; dorsal channel indistinct, the posterior fovea on each side in the form of a long narrow groove, which extends to the hinder margin; no punctures on the thorax: elytra elongate, striated, the striæ impunctate, those nearest the suture the most deep, the others rather faint: antennæ scarcely reaching beyond the hinder margin of the thorax, and of a red colour, as well as the palpi; legs pitchy red; mandibles pitchy. In one specimen, the thorax is pitchy black, and the elytra pitchy; in the other two specimens, the thorax, as well as the head, is black; in all the specimens the outer margins of the elytra are pitchy, and the reflected portion is pitchy red.

This species is considerably larger than either of the preceding, being equal in size to the *Calathus piceus*.

Sp. 21. *Feronia* (*Argutor*) *Chilensis*, Dejean, Spé. gén. des Coléop., tom. iii. p. 251.

Of this species there are three specimens, two of which are from Valparaiso, and the third is from S. Chiloe.

[To be continued.]

XVII.—*Observations on a Keratose Sponge from Australia.* By J. S. Bowerbank, Esq., F.G.S.

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

Gentlemen,

I am not aware that modern naturalists have published the results of any examination of the structure of the Keratose or Horny Sponges while in that state of perfect preservation, such as they would be if alive, or immediately after their removal from their native element. The skeletons of these curious animals are familiarly known to every naturalist, but in this state they have undergone decomposition of the softer parts of their substance; and the descriptions handed down to us by former writers, based upon the examination of such specimens, have unavoidably led to the propagation of erroneous ideas of their true nature and structure. In a paper read before the Microscopical Society, January the 27th, 1841, I have shown that even in this state they possess a much higher and more complex form of organization than they had hitherto been supposed to exhibit, and that, contrary to received opinions, they are furnished with siliceous spicula, which are imbedded in considerable abundance in some of the larger fibres of their solid horny skeletons.

Since the publication of these facts, I have had the opportunity afforded me by the kindness of Mr. J. E. Gray, of examining a specimen of this class of Sponges which was

brought home from the Swan River, Australia, by that indefatigable naturalist Mr. Gould, preserved in spirit immediately after it was taken from the sea. It is a young specimen of a well-known Australian species, of which I have several specimens, and is represented of its natural size at fig. 1. Pl. III. It is elevated on a short foot-stalk, which, like the body of the sponge, is of a compressed form. In the specimen figured, the greatest breadth of the body of the sponge is but little more than equal to its height; but in the other specimens in my possession it has attained a much greater height, and in one case rather exceeds thirteen inches, including the foot-stalk, which is about two inches long. The height of the body in this adult specimen is to the breadth as three to one.

When removed from the spirit, the sponge has a dense, opake and fleshy appearance, and feels weighty and solid to the touch. Upon taking some very thin slices from about the centre of one of the broadest surfaces of the sponge, and examining them with a power of 120 linear as transparent objects, they presented a highly interesting view of the structure. The horny fibre of the sponge, agreeing exactly in appearance with that of the specimens in my own possession, was seen ramifying in every direction in the form of an amber-coloured network, the interstices of which were filled up with a fleshy substance very similar to that which occurs in such abundance in the freshwater Spongilla and in many other similarly constructed marine sponges, which are inhabitants of the seas of the western and northern coasts of England; and throughout the whole of this fleshy structure siliceous spicula were dispersed in great abundance, as represented in fig. 2. Plate III.

In Spongilla and in the marine sponges of Dr. Fleming's genus *Halichondria,* the spicula are united systematically into bundles so as to form a framework or skeleton, upon which the softer parts of the animal are supported; but in this Australian species they do not appear to assume any definite arrangement, but are dispersed in all directions through the substance of this cellular or fleshy part of the animal. The spicula are transparent and hollow, like those of *Halichondria,* but vary extremely both in size and form. Some of them terminate by a regular bifurcation, fig. 3. Plate III., and thus assume the character of the triradiate calcareous spicula of Dr. Fleming's genus *Grantia*; while in others the bifurcated terminations recurve and assume the form of an anchor with short flukes, without palms, as represented in fig. 4. Plate III.; others assume very much the appearance of the prevailing form of spiculum that is to be seen in many species of *Hali-*

chondria, the curved, double-pointed, needle-formed spiculum, fig. 5. Plate III. The variation in their diameters is exceedingly great, one of the smallest measuring but the seven thousand one hundred and sixtieth of an inch, while the fragment of a large one imbedded near it (fig. 6. Plate III.) was the seven hundredth of an inch in diameter. There are numerous grains of sand and other extraneous matters imbedded in the fleshy substance along with the spicula.

Upon examining with a power of five hundred linear the outer surface of the small portions of the sponge which I had removed from the specimen, I observed patches of a very fine reticulated structure, which is beautifully and faithfully represented by the artist Mr. Aldous, at fig. 7. Pl. III. It is composed of a very minute fibre, imbedded in a transparent membrane. The interstices are somewhat irregular hexagons in the piece represented in the figure; but in another part of the same small piece of sponge, which did not exceed the eighth of an inch in length, some of them were nearly square, while others were elongated to such an extent as to assume the form of nearly regular oblong areas. The fibre of this cuticular network has every appearance of being solid; it is extremely minute, not exceeding the ten thousandth part of an inch in diameter. The average diameter of the interstices of the reticulations figured is the two thousandth of an inch, while the fibre of the mass of the sponge varies from the three hundredth to the three thousandth of an inch in diameter; and the smallest spiculum I could find was, as before stated, the seven thousand one hundred and sixtieth of an inch at its greatest diameter. From the whole of these circumstances, there is little doubt that this delicate reticulated membrane is the true cuticle of the sponge. Upon examining a small slice from near the base of the body of the sponge, I had the satisfaction of observing the group of gemmules, or eggs of the sponge, represented by fig. 8. Pl. III.; but I could not, from the cutting in my possession, satisfactorily determine whether they were attached to the fleshy substance of the sponge, or to the fibrous skeleton; although in several of them, which had apparently been disturbed by the removal of the thin slice from the sponge, the point of attachment of the gemmule was very apparent when viewed with a power of five hundred linear. The diameters of the gemmules varied considerably; the largest I could find measured the three hundred and fifty-fifth part of an inch, and the smallest the one thousand one hundred and forty-third of an inch in diameter.

Upon examining another species of keratose sponge in a similar state of preservation, which is in the collection at the

British Museum, I found precisely the same mode of structure to prevail. The horny fibres were completely enclosed in a fleshy or cellular structure, in which numerous slender siliceous spicula were imbedded.

From the nature of the structures exhibited in both of these keratose* sponges, and the prevalence of siliceous spicula in such abundance in the fleshy or cellular structure which surrounds the horny fibres, there is very strong reason to suspect that the fibre of the sponges of commerce will prove, in its natural state, to be surrounded by a similar fleshy matter, and that spicula will be found in a like manner to those I have described as existing in the two species mentioned in this paper.

DESCRIPTION OF THE PLATE.

Fig. 1. The sponge of its natural size.

Fig. 2. The interior of the sponge, as seen with a power of 120 linear; *a*, the horny fibre, surrounded by the fleshy substance; *b*, *b*, spicula imbedded in the fleshy substance.

Figs. 3, 4, 5 and 6. Various forms of spicula found imbedded in the fleshy substance of the sponge.

Fig. 7. A view of the cuticle of the sponge, as seen with a power of 120 linear.

Fig. 8. A view of the interior of the sponge, with the gemmules imbedded in the fleshy substance, seen with a power of 120 linear.

XVIII.—*Notices of European Herbaria, particularly those most interesting to the North American Botanist*†.

The vegetable productions of North America, in common with those of most other parts of the world, have generally been first described by European botanists, either from the collections of travellers or from specimens communicated by residents of the country, who, induced by an enlightened curiosity, the love of flowers, or in some instances, by no inconsiderable scientific acquirements, have thus sought to contribute, according to their opportunities, to the promotion of botanical knowledge. From the great increase in the number of known plants, it very frequently happens that the brief descriptions, and even the figures, of older authors are found quite insufficient for the satisfactory determination of the particular species they had in view; and hence it becomes necessary to refer to the herbaria where the original specimens are preserved. In this respect, the collections of the early authors possess an importance far exceeding

[* The term *keratose* seems objectionable, though sanctioned by authority; since *ose* is not a proper termination for adjectives from the Greek; and analogy would require the κ in κεραις to be expressed by a *c*, as in centaur, not kentaur, &c. Would not *ceratine*, or *corneous*, be better?—Ed.]

† Communicated to Silliman's American Journal by the Author, probably Dr. Gray.

By Louis Aldous, from Zino.

Day & Haghe, Lith.rs to the Queen.

their intrinsic value, since they are seldom large, and the specimens often imperfect.

With the introduction of the Linnæan nomenclature, a rule absolutely essential to the perpetuation of its advantages was also established, viz. that the name under which a genus or species is first published shall be retained, except in certain cases of obvious and paramount necessity. An accurate determination of the Linnæan species is therefore of the first importance; and this, in numerous instances, is only to be attained with certainty by the inspection of the herbaria of Linnæus and those authors upon whose descriptive phrases or figures he established many of his species. Our brief notices will therefore naturally commence with the herbarium of the immortal Linnæus, the father of that system of nomenclature, to which botany, no less than natural history in general, is so greatly indebted.

This collection, it is well known, after the death of the younger Linnæus, found its way to England, from whence it is not probable that it will ever be removed. The late Sir James Edward Smith, then a young medical student, and a botanist of much promise, was one morning informed by Sir Joseph Banks, that the heirs of the younger Linnæus had just offered him the herbarium, with the other collections and library of the father, for the sum of 1000 guineas. Sir Joseph Banks, not being disposed to make the purchase, recommended it to Mr. Smith; the latter, it appears, immediately decided to risk the expectation of a moderate independence, and to secure, if possible, these treasures for himself and his country; and before the day closed had actually written to Upsal, desiring a full catalogue of the collection, and offering to become the purchaser at the price fixed, in case it answered his expectations*. His success, as

* The next day Mr. Smith wrote as follows to his father, informing him of the step he had taken, and entreating his assistance:—

"Honoured Sir: You may have heard that the young Linnæus is lately dead: his father's collections and library, and his own, are now to be sold; the whole consists of an immense hortus siccus, with duplicates, insects, shells, corals, materia medica, fossils, a very fine library, all the unpublished manuscripts; in short, everything they were possessed of relating to natural history and physic: the whole has just been offered to Sir Joseph Banks for 1000 guineas, and he has declined buying it. The offer was made to him by my friend Dr. Engelhart, at the desire of a Dr. Acrel of Upsal, who has charge of the collection. Now, I am so ambitious as to wish to possess this treasure, with a view to settle as a physician in London, and read lectures on natural history. Sir Joseph Banks, and all my friends to whom I have entrusted my intention, approve of it highly. I have written to Dr. Acrel, to whom Dr. Engelhart has recommended me, for particulars and the *refusal*, telling him if it was what I expected, I would give him a very good price for it. I hope, my dear sir, you and my good mother will look on this scheme in as favourable a light as my friends here do. There is no time to be lost, for the affair is now talked of in all companies, and a number of people wish to be purchasers. The Empress of Russia is said to have thoughts of it. The manuscripts, letters, &c. must be invaluable, and there is, no doubt, a complete collection of all the inaugural dissertations which have been published at Upsal, a small part of which has been republished under the title of 'Amœnitates Academicæ,' a very celebrated and scarce work. All these dissertations were written by Linnæus, and must

soon appeared, was entirely owing to his promptitude, for other and very pressing applications were almost immediately made for the collection; but the upright Dr. Acrel, having given Mr. Smith the refusal, declined to entertain any other proposals while this negotiation was pending. The purchase was finally made for 900 guineas, excluding the separate herbarium of the younger Linnæus, collected before his father's death, and said to contain nothing that did not also exist in the original herbarium; this was assigned to Baron Alstrœmer, in satisfaction of a small debt. The ship which conveyed these treasures to London had scarcely sailed, when the king of Sweden, who had been absent in France, returned home and despatched, it is said, an armed vessel in pursuit. This story, though mentioned in the Memoir and Correspondence of Sir J. E. Smith, and generally received, has, we believe, been recently controverted. However this may be, no doubt the king and the men of science in Sweden were greatly offended, as indeed they had reason to be, at the conduct of the executors, in allowing these collections to leave the country; but the disgrace should perhaps more justly fall upon the Swedish government* itself and the University of Upsal, which derived its reputation almost entirely from the name of Linnæus. It was however fortunate for science that they were transferred from such a remote situation to the commercial metropolis of the world, where they are certainly more generally accessible. The late Professor Schultes, in a very amusing journal of a botanical visit to England in the year 1824, laments indeed that they have fallen to the lot of the "*toto disjunctos orbe Britannos*;" yet a journey even from Landshut to London may perhaps be more readily performed than to Upsal.

After the death of Sir James Edward Smith, the herbarium and other collections, and library of Linnæus, as well as his own, were purchased by the Linnæan Society. The herbarium still occupies the cases which contained it at Upsal, and is scrupulously preserved in its original state, except that, for more effectual protection from the black and penetrating dust of London, it is divided into parcels of convenient size, which are closely wrapped in covers of strong paper lined with muslin. The genera and covers are numbered to correspond with a complete manuscript catalogue, and the collection, which is by no means large in comparison with modern herbaria, may be consulted with great facility.

In the negotiation with Smith, Dr. Acrel stated the number of species at 8000, which probably is not too low an estimate. The

be of prodigious value. In short, the more I think of this affair the more sanguine I am, and earnestly hope for your concurrence. I wish I could have one half hour's conversation with you, but that is impossible."—*Correspondence of Sir James Edward Smith, edited by Lady Smith*, vol. i. p. 93.

The appeal to his father was not in vain; and did our limits allow, we should be glad to copy, from the work above cited, the entire correspondence upon this subject.

[* Equal disgrace attaches to the British Government, which on the death of Sir J. E. Smith refused to contribute anything towards the purchase of the collection, which might thus have been lost to the country had it not been bought by the Linnæan Society.—Ed.]

specimens, which are mostly small, but in excellent preservation, are attached to half-sheets of very ordinary paper, of the foolscap size* (which is now considered too small), and those of each genus covered by a double sheet in the ordinary manner. The names are usually written upon the sheet itself, with a mark or abbreviation to indicate the source from which the specimen was derived. Thus those from the Upsal garden are marked *H. U.*, those given by Kalm, *K.*, those received from Gronovius, *Gron.*, etc. The labels are all in the handwriting of Linnæus himself, except a few later ones by the son, and occasional notes by Smith, which are readily distinguished, and indeed are usually designated by his initials. By far the greater part of the North American plants which are found in the Linnæan herbarium were received from Kalm, or raised from seeds collected by him. Under the patronage of the Swedish government, this enterprising pupil of Linnæus remained three years in this country, travelling throughout New York, New Jersey, Pennsylvania and Lower Canada: hence his plants are almost exclusively those of the Northern States†.

Governor Colden, to whom Kalm brought letters of introduction from Linnæus, was then well known as a botanist by his correspondence with Peter Collinson and Gronovius, and also by his account of the plants growing around Coldenham, New York, which was sent to the latter, who transmitted it to Linnæus for publication in the 'Acta Upsalensia.' At an early period he attempted a direct correspondence with Linnæus, but the ship by which his specimens and notes were sent was plundered by pirates‡; and in a letter sent by Kalm, on the return of the latter to Sweden, he informs Linnæus that this traveller had been such an industrious collector, as to leave him little hopes of being himself further useful. It is not probable therefore that Linnæus received any plants from Colden, nor does his herbarium afford any such indication§. From

* Upon this subject, Dr. Acrel, giving an account of the Linnæan collections, thus writes to Smith:—"Ut vero vir illustrissimus, dum vixit, nihil ad ostentationem habuit, omnia vero sua in usum accommodata; ita etiam in hoc herbario, quod per XL. annos sedulo collegit, frustra quæsiveris papyri insignia ornamenta, margines inauratas, et cet. quæ ostentationis gratia in omnibus fere herbariis nunc vulgaria sunt."

† Ex his Kalmium, naturæ eximium scrutatorem, itinere suo per Pennsylvaniam, Novum Eboracum, et Canadam, regiones Americæ ad septentrionem vergentes, trium annorum decursu dextre confecto, in patriam inde nuper reducem læti recipimus: ingentem enim ab istis terris reportavit thesaurum, non conchyliorum solum, insectorum, et amphibiorum, sed herbarum etiam diversi generis ac usus, quas, tam siccas quam vivas, allatis etiam seminibus eorum recentibus et incorruptis, adduxit.—*Linn. Amœn. Acad.*, vol. iii. p. 4.

‡ Vid. Letter of Linnæus to Haller, Sept. 24, 1746.

§ The *Holosteum succulentum* of Linnæus (*Alsine foliis ellipticis carnosis* of Colden) is however marked in Linnæus's own copy of the 'Species Plantarum' with the sign employed to designate the species he at that time possessed; but no corresponding specimen is to be found in his herbarium. This plant has long been a puzzle to American botanists; but it is clear from Colden's description, that Dr. Torrey has correctly referred it, in his

Gronovius Linnæus had received a very small number of Clayton's plants, previous to the publication of the 'Species Plantarum;' but most of the species of the 'Flora Virginica' were adopted or referred to other plants on the authority of the descriptions alone.

Linnæus had another American correspondent in Dr. John Mitchell*, who lived several years in Virginia, where he collected extensively; but the ship in which he returned to England having been taken by pirates, his own collections, as well as those of Governor Colden, were mostly destroyed. Linnæus however had previously received a few specimens, as, for instance, those on which *Proserpinaca, Polypremum, Galax,* and some other genera, were founded.

There were two other American botanists of this period, from whom Linnæus derived, either directly or indirectly, much information respecting the plants of this country, viz. John Bartram and Dr. Alexander Garden, of Charleston, South Carolina. The former collected seeds and living plants for Peter Collinson during more than twenty years, and even at that early day extended his laborious researches from the frontiers of Canada to Southern Florida, and to the Mississippi. All his collections were sent to his patron Collinson†, until the death of that amiable and simple-hearted man

'Flora of the Northern and Middle States' (1824), to *Stellaria media,* the common Chickweed. Governor Colden's daughter seems fully to have deserved the praise which Collinson, Ellis, and others have bestowed upon her. The latter, in a letter to Linnæus (April 1758), says: "Mr. Colden of New York has sent Dr. Fothergill a new plant, described by his daughter. It is called *Fibraurea,* gold-thread. It is a small creeping plant, growing on bogs; the roots are used in a decoction by the country people for sore mouths and sore throats. The root and leaves are very bitter, etc. I shall send you the characters as near as I can translate them." Then follows Miss Colden's detailed generic character, prepared in a manner which would not be discreditable to a botanist of the present day. It is a pity that Linnæus did not adopt the genus with Miss Colden's name, which is better than Salisbury's *Coptis.* "This young lady merits your esteem, and does honour to your system. She has drawn and described 400 plants in your method: she uses only English terms. Her father has a plant called after him *Coldenia*; suppose you should call this (alluding to a new genus of which he added the characters) *Coldenella,* or any other name that might distinguish her among your genera."—*Ellis, Letter to Linnæus, l. c.*

* To him the pretty *Mitchella repens* was dedicated. Dr. Mitchell had sent to Collinson, perhaps as early as in the year 1740, a paper in which thirty new genera of Virginian plants were proposed. This Collinson sent to Trew at Nuremberg, who published it in the 'Ephemerides Acad. Naturæ Curiosorum' for 1748; but in the mean time most of the genera had been already published, with other names, by Linnæus or Gronovius. Among Mitchell's new genera was one which he called *Chamædaphne*: this Linnæus referred to *Lonicera*; but the elder (Bernard) Jussieu, in a letter dated Feb. 19, 1751, having shown him that it was very distinct both from *Lonicera* and *Linnæa,* and in fact belonged to a different natural order, he afterwards named it *Mitchella.*

† Mr. Collinson kept up a correspondence with all the lovers of plants in this country, among whom were Governor Colden, Bartram, Mitchell, Clayton, and Dr. Garden, by whose means he procured the introduction of

in 1768; and by him many seeds, living plants, and interesting observations were communicated to Linnæus, but few, if any, dried specimens. Dr. Garden, who was a native of Scotland, resided at Charleston, South Carolina, from about 1745 to the commencement of the American Revolution, devoting all the time he could redeem from an extensive medical practice to the zealous pursuit of botany and zoology. His chief correspondent was Ellis at London, but through Ellis he commenced a correspondence with Linnæus; and to both he sent manuscript descriptions of new plants and animals, with many excellent critical observations. None of his specimens addressed to the latter reached their destination, the ships by which they were sent having been intercepted by French cruisers; and Linnæus complained that he was often unable to make out many of Dr. Garden's genera for want of the plants themselves. Ellis was

great numbers of North American plants into the English gardens. "Your system," he writes to Linnæus, "I can tell you obtains much in America. Mr. Clayton, and Dr. Colden at Albany, on Hudson's River, in New York, are complete professors, as is Dr. Mitchell at Urbana, on Rapahanock River, in Virginia. It is he that has made many and great discoveries in the vegetable world." . . . "I am glad you have the correspondence of Dr. Colden and Mr. Bartram. They are both very indefatigable, ingenious men. Your system is much admired in North America." Again: "I have but lately heard from Mr. Colden. He is well; but what is marvellous, his daughter is perhaps the first lady that has so perfectly studied your system. She deserves to be celebrated." . . . "In the second volume of 'Edinburgh Essays' is published a Latin botanic dissertation by Miss Colden; perhaps the only lady that makes profession of the Linnæan system, of which you may be proud." From all this, botany appears to have flourished in the North American colonies. But Dr. Garden, about this time, writes thus to his friend Ellis: "Ever since I have been in Carolina, I have never been able to set my eye upon one who had barely a regard for botany. Indeed I have often wondered how there should be one place abounding with so many marks of the divine wisdom and power, and not one rational eye to contemplate them; or that there should be a country abounding with almost every sort of plant, and almost every species of the animal kind, and yet that it should not have pleased God to raise up one botanist. Strange indeed that this creature should be so rare!" But to return to Collinson, the most amusing portion of whose correspondence consists of his letters to Linnæus shortly after the publication of the 'Species Plantarum,' in which (with all kindness and sincerity) he reproves the great Swedish naturalist for his innovations, employing the same arguments which a strenuous *Linnæan* might be supposed to advance against a botanist of these latter days. "I have had the pleasure," Collinson writes, "of reading your 'Species Plantarum,' a very useful and laborious work. But, my dear friend, we that admire you are much concerned that you should perplex the delightful science of botany with changing names that have been well received, and adding new names quite unknown to us. Thus botany, which was a pleasant study, and attainable by most men, is now become, by alterations and new names, the study of a man's life, and none now but real professors can pretend to attain it. As I love you, I tell you our sentiments."—*Letter of April* 20, 1754. "You have begun by your 'Species Plantarum'; but if you will be for ever making new names, and altering old and good ones, for such hard names that convey no idea of the plant, it will be impossible to attain to a perfect knowledge in the science of botany."—*Letter of April* 10*th*, 1755; *from Smith's Selection of the Correspondence of Linnæus, &c.*

sometimes more fortunate; but as he seems usually to have contented himself with the transmission of descriptions alone, we find no authentic specimens from Garden in the Linnæan herbarium.

We have now probably mentioned all the North American correspondents of Linnæus; for Dr. Kuhn, who appears only to have brought him living specimens of the plant which bears his name, and Catesby, who shortly before his death sent a few living plants which his friend Lawson had collected in Carolina, can scarcely be reckoned among the number*.

The Linnæan Society also possesses the proper herbarium of its founder and first president, Sir James E. Smith, which is a beautiful collection, and in excellent preservation. The specimens are attached to fine and strong paper, after the method now common in England. In North American botany, the chief contributors are Menzies, for the plants of California and the north-west coast; and Muhlenberg, Bigelow, Torrey and Boott, for those of the United States. Here also we find the cryptogamic collections of Acharius, containing the authentic specimens described in his works on the Lichens, and the magnificent East Indian herbarium of Wallich, presented some years since by the East India Company.

The collections preserved at the British Museum are scarcely inferior in importance to the Linnæan herbarium itself, in aiding the determination of the species of Linnæus and other early authors. Here we meet with the authentic herbarium of the 'Hortus Cliffortianus,' one of the earliest works of Linnæus, which comprises some plants that are not to be found in his own proper herbarium. Here also is the herbarium of Plukenet, which consists of a great number of small specimens crowded, without apparent order, upon the pages of a dozen large folio volumes. With due attention, the originals of many figures in the 'Almagestum' and 'Amaltheum Botanicum,' &c., may be recognized, and many Linnæan species thereby authenticated. The herbarium of Sloane, also, is not without interest to the North American botanist, since many plants described in the 'Voyage to Jamaica,' &c., and the 'Catalogue of the Plants of Jamaica,' were united by Linnæus, in almost every instance incorrectly, with species peculiar to the United States and Canada. But still more important is the herbarium of Clayton, from whose notes and specimens Gronovius edited the 'Flora Virginica†.' Many Linnæan spe-

* In a letter to Haller, dated Leyden, Jan. 23, 1738, Linnæus writes: "You would scarcely believe how many of the vegetable productions of Virginia are the same as our European ones. There are Alps in the country of New York, for the snow remains all summer long on the mountains there. I am now giving instructions to a medical student here, who is a native of that country, and will return thither in the course of a year, that he may visit those mountains, and let me know whether the same alpine plants are found there as in Europe." Who can this American student have been? Kuhn did not visit Linnæus until more than fifteen years after the date of this letter.

† 'Flora Virginica, exhibens plantas quas J. Clayton in Virginia collegit.' Lugd. Bat. 8vo, 1743.—Ed. 2. 4to, 1762. The first edition is cited in the 'Species Plantarum' of Linnæus; the second, again, quotes the specific phrases of Linnæus.

cies are founded on the plants here described, for which this herbarium is alone authentic; for Linnæus, as we have already remarked, possessed very few of Clayton's plants. The collection is nearly complete, but the specimens were not well prepared, and are therefore not always in perfect preservation. A collection of Catesby's plants exists also in the British Museum, but probably the larger portion remains at Oxford. There is besides, among the separate collections, a small but very interesting parcel, selected by the elder Bartram from his collections made in Georgia and Florida almost a century ago, and presented to Queen Charlotte with a letter of touching simplicity. At the time this fasciculus was prepared, nearly all the plants it comprised were undescribed, and many were of entirely new genera; several, indeed, have only been published very recently, and a few are not yet recorded as natives of North America. Among the latter we may mention *Petiveria alliacea* and *Ximinea Americana*, which last has again recently been collected in the same region. This small parcel contains the *Elliottia*, Muhl., *Polypteris*, Nutt., *Baldwinia*, Nutt., *Macranthera*, Torr., *Glottidium*, *Mayaca*, *Chaptalia*, *Befaria*, *Eriogonum tomentosum*, *Polygonum polygamum*, Vent., *Gardoquia Hookeri*, Benth., *Satureia* (*Pycnothymus*) *rigida*, *Cliftonia*, *Hypericum aureum*, *Galactia Elliottii*, *Krameria lanceolata*, Torr., *Waldsteinia* (*Comaropsis*) *lobata*, Torr. and Gr., the *Dolichos? multiflorus*, Torr. and Gr., the *Chapmannia*, Torr. and Gr., *Psoralea Lupinellus*, and others of almost equal interest or rarity, which it is much to be regretted were not long ago made known from Bartram's discoveries.

The herbarium of Sir Joseph Banks, now in the British Museum, is probably the oldest one prepared in the manner commonly adopted in England, of which, therefore, it may serve as a specimen. The plants are glued fast to half-sheets of very thick and firm white paper of excellent quality (similar to that employed for merchants' ledgers, etc.), all carefully cut to the same size, which is usually $16\frac{1}{2}$ inches by $10\frac{3}{4}$, and the name of the species is written on the lower right-hand corner. All the species of a genus, if they be few in number, or any convenient subdivision of a larger genus, are enclosed in a whole sheet of the same quality, and labelled at the lower left-hand corner. These parcels, properly arranged, are preserved in cases or closets, with folding doors made to shut as closely as possible, being laid horizontally into compartments just wide enough to receive them, and of any convenient depth. In the Banksian herbarium, the shelves are also made to draw out like a case of drawers. This method is unrivalled for elegance, and the facility with which the specimens may be found and inspected, which to a working botanist with a large collection is a matter of the greatest consequence. The only objection is the expense, which becomes very considerable when paper worth at least ten dollars per ream is employed for the purpose, which is the case with the principal herbaria in England; but a cheaper paper, if it be only sufficiently thick and firm, will answer nearly as well. The Banksian herbarium contains authentic specimens of nearly all the plants of Aiton's 'Hortus Kewensis,' in which many North American

species were early established. It is hardly proper, indeed, that either the elder or younger Aiton should be quoted for these species, since the first edition was prepared by Solander, and the second revised by Dryander, as to vols. i. and ii., and the remainder by Mr. Brown. Many American plants from the Physic Garden at Chelsea, named by Miller, are here preserved, as also from the gardens of Collinson, Dr. Fothergill (who was Bartram's correspondent after Collinson's death), Dr. Pitcairne, etc. There are likewise many contributions of indigenous plants of the United States, from Bartram, Dr. Mitchell, Dr. Garden, Fraser, Marshall, and other early cultivators of botany in this country. The herbarium also comprises many plants from Labrador and Newfoundland, a portion of which were collected by Sir Joseph Banks himself; and in the plants of the northern and arctic regions, it is enriched by the collections of Parry, Ross, and Dr. Richardson. Two sets of the plants collected by the venerable Menzies in Vancouver's voyage are preserved at the British Museum, the one incorporated with the Banksian herbarium, the other forming a separate collection. Those of this country are from the north-west coast, the mouth of the Oregon river, and from California. Many of Pursh's species were described from specimens preserved in this herbarium, especially the Oregon plants of Menzies, and those of Bartram and others from the more southern United States, which Pursh had never visited, although he often adds the mark *v. v.* (*vidi vivam*) to species which are only to be met with south of Virginia.

The herbarium of Walter still remains in the possession of the Fraser family, and in the same condition as when consulted by Pursh. It is a small collection, occupying a single large volume. The specimens, which are commonly mere fragments, often serve to identify the species of the 'Flora Caroliniana,' although they are not always labelled in accordance with that work.

The collections of Pursh, which served as the basis of his 'Flora Americæ Septentrionalis,' are in the possession of Mr. Lambert, and form a part of his immense herbarium. These, with a few specimens brought by Lewis and Clark from Oregon and the Rocky Mountains, a set of Nuttall's collections on the Missouri, and also of Bradbury's, so far as they are extant, with a small number from Fraser, Lyon, etc., compose the most important portion of this herbarium, so far as North American botany is concerned. There is also a small Canadian collection, made by Pursh subsequently to the publication of his Flora, a considerable number of Menzies's plants, and other minor contributions. To the general botanist, probably the fine herbarium of Pallas, and the splendid collection of Ruiz and Pavon (both acquired by Mr. Lambert at a great expense), are of the highest interest; and they are by no means unimportant in their relations to North American botany, since the former comprises several species from the north-west coast, and numerous allied Siberian forms; while our Californian plants require, in some instances, to be compared with the Chilian and Peruvian plants of the latter.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Monographie des Libellulidées d'Europe. Par Edm. De Selys Longchamps, Membre de plusieurs Sociétés savantes.

We do not know a more noble tribe of Insects than the Dragon-flies—the wonderful œconomy, perfect organization, exquisite structure, beautiful colouring and unusual magnitude of these Insect-hawks combine to render them worthy the attention of the philosopher as well as of the naturalist. In the earlier stages of their existence they live as larvæ and nymphæ, entirely in the water, where they are actively engaged in entrapping other insects to satisfy their cruel appetites, possessing, contrary to the greater portion of this class of animals, the power of locomotion in their pupa state, and being furnished with a remarkable mask, which is projected at will to seize their victim. When they emerge from their aquatic habitation and assume the perfect state, to soar along the banks, or skim over the surface of a stream, in search of insect prey, the evolutions of the larger species are very remarkable; they dart forward, halt or wheel with the most perfect precision, whether it be in sportive play or in the pursuit of other insects, which they capture and devour in their flight, not sparing their kindred species of equal size.

On examining living specimens of the larger kinds, the volume of their compound eyes will be found to exceed that of any other insect, and the beauty and perfection of these organs is scarcely to be equalled: their powers of vision must be wonderful; for they can, no doubt, take in the whole surrounding field of vision at once, and in all probability to a very great distance: their exquisite wings rival the most beautiful lace-work, and their bodies are generally painted with Nature's liveliest colours, which unfortunately fade after death; otherwise nothing could be more beautiful than a collection of Libellulidæ arranged in a cabinet; this misfortune is however in a measure mitigated by emptying and stuffing the thorax and bodies as soon as they are killed. Their enormous mouths and powerful organs of manducation are well adapted to their predatory habits; and such is their ferocity, that when under restraint they have been known to satisfy their inordinate appetites by devouring their own bodies! From some unknown causes, the Dragon-flies, like various other insects, occasionally increase to excess, when they migrate in clouds like the Locust, travelling hundreds of miles in search of food, their route being guided by the nearest stream, and following the current they pursue their course in countless myriads.

Greatly as naturalists and scientific men are indebted to DeGeer and Röesel for their valuable researches relating to these insects, volumes might still be written in the investigation of their œconomy without entering upon their specific distinctions; it is not therefore surprising that so interesting a subject should have engaged the attention of many authors who have lately undertaken to characterize the genera and identify the species. It is to be regretted that the

value of such labours is not duly appreciated in this country; yet it is an incontrovertible fact, that until differences are accurately defined we cannot record even facts with certainty; and unless we submit to a careful investigation at least of the external anatomy, the greatest errors may be committed. But until Natural History is considered worthy to form a class in our schools, it is to be feared that little attention will be paid to Entomology, although it is one of the most important branches of Zoology.

Amongst the authors alluded to is Vander Linden, who in 1825 published at Brussels his 'Monographia Libellulinarum Europæarum Specimen,' which, although a limited production, was very acceptable; in the same year the 'Horæ Entomologicæ' of Toussaint de Charpentier put us in possession of a more extensive Monograph of the Libellulidæ of Europe, with a 4to plate exhibiting specific characters from the structure of the anal appendages, and this led to the production of the best work that has yet appeared upon the family, the 'Monographie des Libellulidées d'Europe,' par M. De Selys Longchamps, which was preceded in 1837 by a 'Tableau des Libellulines de la Belgique,' containing a systematic list of the species with their localities, and the characters of two new ones, *Petalura flavipes* and *Agrion aurantiaca*.

The 'Monograph' exhibits a general view of the external anatomy of the Dragon-flies, in order to refer correctly to the relative position of the various members; but one of the most useful parts is the series of Synoptic Tables: the first gives the genera, comprising *Libellula, Libella, Cordulia, Lindenia, Gomphus, Cordulegaster, Æschna, Anax, Calepteryx, Lestes, Sympecma* and *Agrion*, of which the three following are not generally known.

Libella, *De Selys*, distinguished from *Cordulia* by the anal border of the inferior wings being rounded in *both* sexes.

Lindenia, *De Haan*, is characterized by an elevated tubercle before the eyes, which are globose, whereas in *Gomphus* the space is flat and the eyes compressed.

Sympecma, *Charp.*, is separated from *Lestes* by its wings being elevated in repose, and from *Agrion* by its elongated parastigma.

There are also three synoptic tables exhibiting the essential characters of all the species, amounting to 61, of which there are likewise more ample descriptions, with the synonyms, localities, etc.

The dimensions of all the species of the Libellulidæ in a tabular form is also a novel feature, and adds to the facility of identifying a form, as this family varies less in the size of the sexes and of individuals of the same species than most others.

A disquisition follows upon the discoidal triangular cells in the wings, which vary in the different groups; they were first noticed by M. Vander Hoeven, and this section embraces some exotic genera.

The 'Conspectus Specierum,' in which Charpentier's genus *Platycnemis* is characterized, to receive the species *platypoda*, is drawn up with great care, and completes M. De Selys's work; and there are

four plates in which the genera are illustrated by magnified figures of the terminal segments of the abdomen with the anal appendages.

The zeal with which M. De Selys has prosecuted his studies, by inspecting the collections of France and England, as well as by his researches in Germany, Switzerland and Italy, leads us to hope that he may be induced to extend his labours to the fine exotic species of this family, which are very numerous, (being distributed over every portion of the globe) and offer an almost untrodden field of investigation.

In perusing the memoir, two or three things presented themselves connected with the works of British authors; and although not very important, it will be as well to rectify them, othewise they may lead to incorrect impressions.

P. 56. *Libellula rubicunda* is not noticed by Mr. Stephens; indeed this Linnæan species was not known in England until Mr. Curtis described and figured it in his 'British Entomology.'

P. 69. It was Mr. Dale who *first* discovered *Cordulia Curtisii*, and his friend Mr. Curtis subsequently captured it. Mr. Stephens never saw it alive, but is indebted to Mr. Dale for his specimens.

P. 84. Mr. Stephens took only *one* specimen of *Gomphus pulchellus*, which was most probably transported from the opposite coast.

P. 108. Dr. Shaw published a figure and description of *Æ. varia* in 1806.

P. 114. *Æ. rufescens* is exceedingly rare in England, and was *first* discovered by Mr. Dale, after whom Dr. Leach named it, but unfortunately neglected to publish his description.

P. 160. Mr. Stephens published a description of *A. xanthopterum* in his 'Illustrations' in 1836, which Mr. Curtis seems to have overlooked when he described it in the 16th volume of 'British Entomology,' under the name of *Agrion rubella.*

It is with pleasure we notice the honourable and gentlemanly feeling which has guided M. De Selys through his labours: instead of being influenced by a narrow and pernicious principle of superseding the names by which species are already known, he has endeavoured to do justice to his predecessors by adopting names according to their right of priority; an honest example, which we hope, for the welfare of science, to see followed by all our other continental neighbours.

PROCEEDINGS OF LEARNED SOCIETIES.

ENTOMOLOGICAL SOCIETY.

May 4th, 1840.—The Rev. F. W. Hope, President, in the Chair.

Mr. Yarrell exhibited some *larvæ* of *Tipula oleracea*, which had proved very destructive to the grass in Golden Square, London. Mr. Hope stated that lime-water, as well as water from the gas manufactories, was very beneficial in destroying them.

Mr. Newport exhibited the specimen of *Geophilus* mentioned by

him at the last meeting, and which was nearly two inches long. The same gentleman exhibited a specimen of the pupa of *Sphinx Ligustri*, the head-case of which he had repeatedly disturbed during its change from the larva to the pupa state, and in consequence of which, as it appeared to him, the tongue-case was not developed, so that the pupa resembled that of a *Smerinthus* instead of *Sphinx*.

Mr. Hope exhibited a new species of *Phyllium* from the Neilgherries, which he proposed to name *P. Robertsonii* after Mr. Robertson, who had presented a large collection of insects from that country to the Society at the last meeting.

Mr. Shuckard having read some extracts from his memoir on the family *Dorylidæ*, since published in the Annals of Natural History, Mr. W. W. Saunders stated that one of his specimens of *Dorylus orientalis* had been captured in the sunshine, but that the other had entered a lighted room in the evening. Mr. Westwood also objected to several of the views entertained by Mr. Shuckard. (See his Memoir on *Typhlopone*, since published in the Annals of Natural History.)

Mr. Westwood also read some "Notes on African Entomology," amongst which the almost complete absence of *Homopterous* insects on that continent, and the general uniformity of the insects throughout the entire continent, and the resemblance of many of them to Indian forms, were especially dwelt upon. The Rev. F. W. Hope also entered into a detail of the reasons which had induced him to reject the plans which had been proposed for the geographical distribution of insects, and to consider the subject as primarily divisible according to the respective hemispheres. He however considered that the northern parts of America and of the old world formed but one entomo-geographical region, which he would call Boreal. The other parts of each hemisphere exhibit a secondary division. The entomology of Africa was well characterized by its uniform character, although that of North Africa resembled that of South Europe, and that of South East Africa that of Asia. Mr. Waterhouse also made a variety of observations on the same subject, considering the two hemispheres as primarily distinct.

June 1st.—The Rev. W. Kirby, M.A., F.R.S., Honorary President, in the Chair.

Mr. Samuel Stevens exhibited a new British genus of *Carabideous Coleoptera* allied to *Pterostichus*, captured by Mr. Leplastrier near Dover.

Mr. Ingpen, A.L.S., exhibited a mass of minute cylindrical cocoons arranged close together like a piece of honey-comb in miniature, being formed by a small species of *Ichneumonidæ* (*Hemiteles* —?), the upper end of many of which had an aperture, whilst in others the aperture was at the opposite end. They were found on the surface of the ground in his garden at Chelsea.

The Rev. F. W. Hope exhibited several new and rare *Coleoptera* and *Diptera* from New Holland.

Mr. W. Saunders exhibited the larva of a species of *Oiketicus* from the East Indies.

Mr. Frederick Smith exhibited the sexes of six species of *Andrena*, which he had observed *in copulâ*, thus proving the specific identity of the different sexes in these species of this troublesome genus; amongst them was *Andrena fulva*, which was proved to be the female of *Andrena armata*, and *A. Clerckella*.

Mr. Westwood exhibited a specimen of *Myrmecocystus mexicanus*, Wesm., a species of ant, some of the neuters of which are of the ordinary form, whilst in others the abdomen is immensely swollen and globular: these latter individuals are described as never quitting the nest, and as making a kind of honey. He also observed upon the different kinds or degrees of development noticed among *Hymenopterous* insects, especially the several kinds of neuters of the hive-bees, called by Huber, &c. black-bees, nurser-bees, wax-workers, &c. Messrs. Waterhouse and Newport doubted however whether there were any real distinctions between these kinds of individuals, as they had never been able to discover any specimens according with such descriptions. Mr. Shuckard also stated his opinion that there was never more than one kind of neuter among the ants. Mr. F. Smith on the contrary stated that he had constantly found two kinds of neuters in the nest of the *Formica sanguinea*.

The following memoir was read.

Description of a subgenus of Coleopterous insects closely allied to Carabus. By G. R. Waterhouse, Esq.

The insect here described agrees in the majority of its characters with *Carabus*, but differs in having the thorax smooth and convex, without reflected margins, and *foveæ* at the posterior angles, the antennæ incrassated in the middle, with the 3rd joint long, the head large and nearly as broad as the thorax, the elytra depressed and the legs long; although destitute of the velvet-like soles to the fore tarsi which distinguish the male *Carabi*, the anterior tarsi are not dilated. The name proposed for this insect is

Aplothorax Burchellii, W. *Niger, thorace cordiformi anticè et posticè truncato, angulisque anticis et posticis rotundatis, suprà lævi et convexo; elytris punctato-striatis, striis punctisque crebris at non profundis; inter strias* 3 *et* 4 *et* 7 *et* 8 *punctis majoribus cum illis striis confluentibus*. Long. corp. lin. 15½. Inhabits St. Helena. W. Burchell, Esq. In Mus. D. Hope.

July 6th.—The Rev. F. W. Hope, President, in the Chair.

The President exhibited part of a splendid collection of *Coleoptera* received by him from Mexico.

Mr. Westwood exhibited portions of the branches of an apple tree bored into by the larva of *Zeuzera Æsculi*, communicated by Dr. Lindley.

Mr. Raddon exhibited a beautiful *Lamia* from the Gold Coast of Africa, as well as a species of *Noctua* and *Cerura* which he had obtained from Mr. Bradford, of Bewdley, and which he believed to be new to the British lists of insects. He also stated that *Lamia textor* had recently been taken at Walham Green.

Mr. Marshall stated that Mr. Doubleday had informed him that

Sesia Bombyliiformis on emerging from the pupa has the transparent part of the wings entirely clothed with scales.

A paper was read by Mr. Westwood consisting of suggestions for making collections of insects abroad, especially with reference to their physiological and œconomical peculiarities, which led to an extended discussion, in which Messrs. Hope, Waterhouse, Marshall, Raddon, and others, took part, and by whom the following suggestions were made.

In packing insects captured abroad, where there might not be convenience for pinning them, it is preferable to use thin layers of linen rag instead of cotton wool, the latter catching the ungues of the insects, and requiring very great care in unpacking. Sand in bottles is also objectionable, for if the bottles were not quite full, or any holes were accidentally made in the cork, whereby the sand partially escaped, the remainder by shaking about would damage the insects. Moss or bits of paper were also a good substitute for cotton wool. Camphor, or pepper as its substitute, should be placed in the bottles or boxes of dried insects. Such hard insects as beetles, &c., should be killed by being placed in a bottle and immersed in boiling water, which preserves their colours much better than by placing them in spirits. The leaves of laurel, or some other plant of the same nature, when bruised and placed in a box of insects, would also immediately kill them, but this process hardened the muscles. *Lepidopterous* insects may safely be preserved by folding their wings together, with the antennæ turned back between them, and then lapped up in a piece of paper folded flat in the shape of a triangle. Considerable collections had been received in this manner. The spines of the *Acacia* were a good substitute for pins. Tin canisters should be used instead of wooden boxes where practicable, in order to prevent the attacks of the white ants and cock roaches : when filled, the tops should be resined down. Soda-water bottles were found to be of a much more commodious form than square spirit bottles. Rum and arrack, on account of their saccharine qualities, ought not to be used. It was also better to place layers of tow between the insects in spirits, and to put but few of the latter together, as when much shaken they easily broke to pieces.

August 3rd.—The Rev. F. W. Hope, President, in the Chair.

The President exhibited various new exotic *Coleoptera*, including a new species of *Trochoideus* and one of *Chiasognathus*, both from New Granada.

Mr. A. White exhibited several interesting insects from Sta Fé de Bogota, including new species of *Labidus*, *Pelecinus*, &c.

Mr. Westwood stated that he had recently observed a great number of the empty cocoons of the small garden ant sticking upon the leaves of a nectarine tree trained against a wall, at a considerable height from the ground, there being nests of the same species at the foot of the wall.

The following memoirs were read :—

Observations on the genus *Typhlopone*, and descriptions of several

other genera of ants. By J. O. Westwood, F.L.S., since published in the Annals of Natural History.

On a new species of *Dynastes* and other *Coleoptera*. By the Rev. F. W. Hope.

Dynastes Jupiter, H. *Scutellatus, thoracis cornu medio maximo et incurvo subtus barbato, cornubus duobus lateralibus thoracis longitudine, rectis ; thoracis dorso in cornu longissimo absque dente in medio producto, cornu capitis porrecto recurvo, dimidio antico suprà multidentato.* Long. corp. unc. 4. lin. 10. Inhabits New Granada. Allied to *D. Neptunus*, Sch.

Hexaphyllum Westwoodii, H. *Nigrum, antennarum clava brunnea, thorace profundè rugoso-sulcato, elytris carinatis interstitiis reticulatis.* Long. corp. lin. 6⅓. Inhabits New Granada.

Pelidnota Victorina, H. *Flavo-viridis, thorace fusco-aurantio, suturâ scutelloque concoloribus ; elytris pallidè viridibus maculis fusco-aurantiis aspersis, corpore subtùs saturatiore, sterno trochanteribus geniculis tarsisque nigro-bronzeis.* Long. corp. lin. 10. Inhabits Mexico.

Pelidnota Adelaida, H. *Viridis, scutello aurato nitido, elytris fusco-bronzeis, lineis viridi-auratis alternantibus, colore bronzeo-ochraceo inquinatis.* Long. corp. lin. 14. Inhabits Mexico.

Pelidnota auripes, H. *Tota prasina, pedibus auratis.* Long. corp. lin. 12. Inhabits Mexico.

A Letter was read from Alexander Burn, Esq., dated Kaiva, Gujerat, December 6th, 1839, addressed to the president of the Entomological Society, accompanying a box containing two Indian species of blister-flies which abound at Gujerat, and which he had found to be equal as vesicants to the Spanish fly: indeed when used fresh a *liquor Lyttæ* of greater strength and activity can be obtained from them. The writer had called the attention of the Bombay Government to these insects as objects indigenous to India, which might be worthy of attention as articles of commerce. The first, *Lytta gigas*, Fab., appears early in the season of the monsoon (August and September), creeping along the ground, seldom using its wings, and feeding on the young tender shoots of grasses. The other species, *Mylabris pustulata*, Blbg. flies about all day and feeds on the flowers of various plants, especially the esculent *Cucurbitaceæ* and *Hibiscus esculentus* and *cannabinus*, abounding in some seasons to such an extent as to prove extremely destructive to the plants, hardly a single blossom escaping them. To the market gardeners they are therefore a great nuisance, and as the objection to destroy animal life is extremely rank in this part of India, the only plan adopted to get rid of them is picking them with the hand from the plants into large earthern vessels, and sending them to a distance of a mile or two to be set free in any wild or uncultivated spot.

In reference to the above letter Mr. G. Newport stated that he had ascertained that *Meloë Proscarabæus*, the common English species, was highly diuretic, and it was suggested that as the two species of

Indian *Cantharidæ* possessed very powerful medicinal properties and were extremely abundant, it would be advisable that they should be collected in quantities and imported into England, so as to supersede the use of the common blister-fly.

September 7th.—Thomas Marshall, Esq., in the Chair.

In addition to the donations of entomological works, a collection of insects from New South Wales was presented to the Society by J. S. Bowerbank, Esq.

Mr. Smith exhibited specimens of *Miscus campestris* and *Ammophila vulgaris*, which had been taken *in copulâ*, and whence he was led to consider the former only as a variety of the latter species. He also exhibited a new British species of *Nomada*, and various rare British *Andrenæ*.

Mr. Walton exhibited three new British species of the *Curculionideous* genus *Magdalis*.

October 5th.—J. Walton, Esq., V.P. in the Chair.

Mr. Sells exhibited a number of illustrations of the natural history of various species of insects, including nests of the *Osmia cœrulescens*, numerous kinds of galls formed by *Cecidomyiæ*, &c., with their parasites; *Chlorops pumilionis*, in various states, the larvæ of which had proved very destructive this year near Kingston, and had entirely destroyed several acres of rye.

Mr. Westwood exhibited a remarkable gall brought from Manilla by Mr. Cuming, the outer covering of which consisted of exceedingly fine filaments, which crumbled to powder on being touched, and the inhabitant of which was a species of *Cynips*; also a cocoon made by a large *Saturnia*, the chrysalis of which was still inclosed and filled with eggs, although the antennæ-cases were so broad as to lead to the supposition that the specimen was a male.

Mr. Ingpen exhibited the cocoon of *Cetonia aurata*, the larva of which he had then recently found at the root of a tree, containing a living imago; likewise another mass of the cocoons of the *Hemiteles* sp.? found attached to a lilac branch.

Mr. Smith exhibited various species of British ants of the different sexes, showing the two distinct kinds of neuters of *Formica sanguinea*, in the nest of which he had also found *Formica fusca*, *F. cunicularia*, and *Myrmica rubra*: also a piece of the stump of an oak tree burrowed into in all directions and inhabited by *Formica rufa*.

Mr. Stephens mentioned a remarkable instance of the occurrence of the autumnal disease of flies, having observed that a great number of the blades of a tall grass (*Sesleria cœrulea*) growing at the sides of the path leading through Ongar Park Wood in Essex, for about fifty yards were covered with hundreds of dead specimens of *Cheilosia gracilis*, many of which he exhibited still attached to the stems of the grass: he also observed one of the flies fly languidly down, settle on the grass, and die.

Mr. Westwood exhibited drawings of the veins of the wings of various genera of British butterflies, commenting upon the modifica-

tions to which they are subject, and which he had found to afford a very satisfactory character for determining the limits of several of the genera, not only in these insects, but also among the *Homoptera*, in which order they had not hitherto been employed.

The commencement of a paper by J. O. Westwood, F.L.S., entitled "Observations on the Linnæan species of *Staphylinidæ*," was read.

In this memoir the author reviews the opinions which have been expressed by the various writers upon this family of beetles relative to the different species of rove-beetles described by Linnæus, and also, guided by the Linnæan Collection itself in the possession of the Linnæan Society, determines the modern genera to which the species respectively belong, and corrects their synonyms. The following is an abstract of the latter part of these observations :—

Sp. 1. *Staphylinus hirtus* is the *Emus hirtus*, Leach.

Sp. 2. *St. murinus* is *Staphylinus* (*Trichoderma*, Steph.) *nebulosus*, Fabr., Steph., &c.

Sp. 3. *St. maxillosus*. Under this name Linnæus united *Creophilus maxillosus*, K. and *Goerius olens*, Leach.

Sp. 4. *St. erythropterus* is the *St. erythropterus*, Fabr. (*cæsareus*, Cederh. and Erichs.), not the *St. castanopterus*, Grav.

Sp. 5. *St. politus*. Several species confounded together, but the typical specimen is the *Staph. æneus*, Grav., Gyll.

Sp. 6. *St. rufus* is *Oxyporus rufus*, Fabr.

Sp. 7. *St. lunulatus* is *Bolitobius lunulatus* of Panzer and Zetterstedt (*B. atricapillus*, Fabr., &c.).

Sp. 8. *St. riparius* is *Pæderus riparius*, Fab.

Sp. 9. *St. obtusus* is a *Tachyporus* specifically identical with *T. analis*, Fab., which is a variety of it.

Sp. 10. *St. lignorum* is a *Tachinus* of the size of *T. subterraneus*.

Sp. 11. *St. Silphoides* is identical with *Tachinus suturalis*, Grav.

Sp. 12. *St. subterraneus* is *Tachinus subterranneus*, Grav.

Sp. 13. *St. flavescens*. No specimen of this doubtful species exists in the Linnæan cabinet.

Sp. 14. *St. elongatus* is identical with *Lathrobium elongatum*, Erichs.

Sp. 15. *St. biguttatus* is a small *Stenus*.

Sp. 16. *St. bipustulatus*. No specimen of this evident species of *Stenus* exists in the Linnæan cabinet.

Sp. 17. *St. cantharellus*. Ditto. Probably a *Malthinus*.

Sp. 18. *St. littoreus* is identical with *Oxyporus* (*Conurus*, Steph.) *cellaris*, Fab.

Sp. 19. *St. sanguineus* is an *Aleochara* closely allied to *A. fuscipes*.

Sp. 20. *St. caraboides* is *Lesteva caraboides*, Grav. (*testaceus*, Bdv. and Lacord.)

Sp. 21. *St. chrysomelinus* is *Tachyporus chrysomelinus*, Auct.

Sp. 22. *St. flavipes* is *Tachyporus hypnorum*, Fab.

Sp. 23. *St. fuscipes* is identical with *Gyrohypnus lentus*, Grav.

Sp. 24. *St. rufipes* is identical with *Tachinus pullus*, Grav.

Sp. 25. *St. piceus* is *Oxytelus piceus*, Gyll.

Sp. 26. *St. boleti* is *Gyrophæna minima*, Erichs.

November 2nd.—J. Walton, Esq., V.P. in the Chair.

Mr. Westwood gave an account of several recent observations made by him relative to the development of the *Myriapoda*, exhibiting specimens and drawings of some minute individuals of *Lithobius forcipatus*, which differed from each other in the number of limbs, one having only eight pairs of feet, another ten, another eleven, whilst one, which was a quarter of an inch long, had gained fifteen pairs. In the former individuals there were several pairs of extremely minute appendages arising at the sides of the rudimental terminal segments of the body; but in the last-mentioned specimen the terminal segment of the long hind pair of feet were fully developed. He also exhibited a full grown *Lithobius*, one of the penultimate legs of which was very short, and which he considered was the result of an arrest of development, and not the reproduction of the limb. He would also explain in the same manner the cause of the minute size of one of the feet of several specimens of *Scolopendra* which had been exhibited at former meetings of the Society, in all which it was one or other of the hind feet which was of a diminished size. He also exhibited a small slender white wingless insect, one sixth of an inch long, captured running on the ground, possessing six feet and two very long anal filaments, thus resembling the larva of a *Staphylinus*, but having multiarticulate antennæ, and broad 4-dentate mandibles; the abdominal segments were also furnished at the sides beneath with very minute short filaments. Hence as this insect would not accord with the larvæ of any known group of insects, he deemed it possible that it might constitute a new genus of *Myriapoda* in an undeveloped state.

The following memoirs were read.

Notice of a simple method of entrapping and destroying Wasps. By the Rev. F. W. Hope. This plan, which is very serviceable in protecting wall fruit, consists in placing pieces of the fruit or bits of meat under a hand glass raised an inch or two above the ground, having one of the top panes taken out or a small hole made at top, with another hand glass placed on the top of the lower one; the insects being attracted to the food fly upwards into the upper glass, and are easily destroyed by introducing a few lighted matches into the upper glass. This plan is mentioned by Mr. Ingpen in his instructions for collecting, and Mr. Marshall stated that he had also known it used for collecting nocturnal *Lepidoptera*, a light being used under the glass to entrap the moths. Mr. Bainbridge also mentioned that by hanging dead birds or pieces of flesh in front of wall-fruit trees the fruit would be left untouched.

The continuation of Mr. Westwood's memoir on the Linnæan *Staphylinidæ* was also read.

December 7th.—The Rev. F. W. Hope, President, in the Chair.

Mr. Evans exhibited a specimen of *Paussus Burmeisteri*, and a new species of *Chiron*, which he had recently received from South Africa.

Dr. Calvert presented some living larvæ of one of the species of *Noctuidæ*, which he had found exceedingly destructive to his wheat crops in the north of Yorkshire, the larvæ ascending the stems and devouring the grain at the end of September. The land upon which the crops attacked were sown was reclaimed moor land, and it was considered that it was owing to the lateness of the ripening of the crop that it was subject to these attacks, earlier crops in more southern parts of the country escaping. It was further suggested that it would be desirable to plough up the soil several times to a considerable depth, whereby the larvæ or chrysalides in the winter or spring would become exposed, and would be greedily devoured either by the rooks or by ducks, which might be turned into the fields for that purpose.

The following memoirs were read.

Observations on the Migrations of certain Butterflies in British Guiana. By Robert Schomburgk, Esq., Corr. Memb. E.S., &c.

In this memoir the author notices that several species of *Callidryas* are often observed in the months of September and October, settling in prodigious numbers on the wet sand banks, and which, when alarmed, presented a brilliant spectacle in the display of the different shades from deep orange to the palest sulphur colours. The Indians, when they observed a number hovering over a particular spot, said that they were come to celebrate a marriage dance, whilst such as were settled with their long spiral tongues unrolled, and resting on the moist sand bank, were compared to paiwori drinkers. On the morning of the 10th October 1838, while ascending the river Essequibo, he observed myriads of these butterflies coming from the south-west and flying to the north-east, always crossing the river in that direction, flying over the tops of the forest trees, but descending nearly to the surface of the river when they had to cross it: the distance which the boat had travelled during the day was nine miles, and the butterflies continued an uninterrupted column from 8 o'clock A.M. till half-past 5 P.M., so that their numbers must have been incredible. It was supposed that they came from the extensive savannahs along the Pacaraima mountains, and were flying toward those which extend between the rivers Berbice and Corentyn. The Accawai Indians at the upper river Demerara sometimes collect large numbers of caterpillars, which they use as food: indeed their numbers are so great that whole baskets-full are gathered, after which they are roasted and mixed with the flour prepared from the root of the cassava (*Jatropha manihat*), and baked into cakes; the caterpillars are also sometimes mixed with turtle eggs, which constitutes a great delicacy. The Accawai Indians in Mr. Schomburgk's company asserted that the butterflies there seen deposited their eggs in the plants from which the caterpillars used as food are collected.

Mr. Gould also stated that he had observed a species of caterpillar in vast profusion in the interior of New South Wales, distinct from the bugong, upon which the natives fed, and which was also devoured by a species of hawk and the ibis.

There was also read a memoir by J. O. Westwood, F.L.S., con-

sisting of descriptions of the following exotic Hymenopterous insects belonging to the family *Sphegidæ* :—

TRIROGMA W. *Antennæ ♂, ferè corporis longitudine filiformes. Caput tuberculo frontali. Mandibulæ mediocres dente interno latissimo. Labrum minimum. Metathorax utrinque angulariter productus. Abdomen* 3-*annulatum*, ♂. *Tarsi simplices. Ungues bifidi.* Dolichuro *affinis.*

Trirogma cærulea, W. *Tota cærulea, punctata, griseo-villosa, antennis tibiis tarsisque nigris, alis hyalinis.* Expans. alar. lin. 9½. Inhabits Northern India. Mus. W. W. Saunders, F.L.S.

APHELOTOMA, W. *Caput latum, anticè parùm productum. Mandibulæ crassæ dente interno acuto. Thorax anticè et posticè valdè attenuatus. Alæ breves. Cellula marginalis* 1, *haud appendiculata ;* 4 *submarginales,* 1ma *appendiculata. Pedes inermes. Tarsi simplices* ♀. Ampulici *affinis.*

Aphelotoma Tasmanica, W. *Nigra, pedibus rufis, alis fuscis, anticis fasciâ mediâ albâ.* Expans. alar. lin. 6. Inhabits Van Diemen's Land. D. Ewing. Mus. Westwood.

CHLORION (*Latr.* AMPULEX, *Jur.*) cyanipes, W. *Nigro-cærulea, rudè punctata, mesothoracis dorso in medio haud longitudinaliter impresso, pedibus cyaneis, alis fuscescenti-hyalinis, nubilâ subapicali obscuriori.* Expans. alar. lin. 5½. Inhabits the Capeo Good Hope. Mus. Westwood.

ZOOLOGICAL SOCIETY.

July 14, 1840.—William Yarrell, Esq., Vice-President, in the Chair.

A letter from Sir Robert Heron, Bart., dated July 8, 1840, was read. It related to a young Kangaroo, which had crawled out of the pouch of the parent long before the proper time, and was consequently unable to return; its body was marked all over by the mother in her attempts to get it back into the pouch. In a second letter Sir R. Heron states that this young Kangaroo was quite naked, and unable to move. It was some hours before he could find the keeper, and when he arrived the little animal was scarcely alive. The keeper took it home, gave it milk, and by careful treatment it quite revived, and was restored to the pouch of the mother, where it has remained for five days, appears to be perfectly well, and frequently protrudes its nose. The mother never left it, and was evidently under great anxiety.

Some specimens, displaying the different stages of the *Rana Paradoxa*, were also exhibited. These specimens were brought from Demerara by Capt. Warren, who presented them to the Society.

Mr. Fraser exhibited and pointed out the characters of the following new species of birds from the collection of the Earl of Derby :

TURDUS GIGAS. *T. nigrescenti-olivaceus ; subtus fuscescenti-cinereus ; hôc colore apud gulam crissumque obscuriore, caudâ et capite fuliginosis ; gutturis plumis strigâ obscurâ et oblongâ notatis ; rostro, pedibusque flavis.*

Long. tot. 14 unc.; *rostri*, $1\frac{1}{8}$; *alæ*, $6\frac{1}{2}$; *caudæ*, $6\frac{1}{2}$; *tarsi*, $1\frac{1}{2}$.
Hab. Sta. Fé de Bogota.

This bird may at once be distinguished from any other American species with which I am acquainted by its much greater size.

Psittacus chalcopterus. *P. nigricans, nitore submetallico; plumis capitis, cœruleo, et nec non viridi lavatis; illis dorsi sub-fuliginosis, tinctura viridi; illis corporis subtus cœruleo suffusis; alarum tectricibus æneo-viridibus, hic et illic ochreo tinctis; primariis, uropygio, caudâque intensè cœruleis; tectricibus caudæ paululùm virescentibus, crisso rubro; plumis femorum gutturisque rubro variegatis; alis subtus virescenti-cœruleis, tectricibus inferioribus intensè cœruleis; rostro flavo.*

Long. tot. $11\frac{1}{2}$ unc; *rostri*, 1; *alæ*, $8\frac{3}{8}$; *caudæ*, $3\frac{1}{2}$; *tarsi*, $\frac{1}{2}$.
Hab. Sta. Fé de Bogota.

Very closely approximates to the *Psittacus purpureus*, Gmel., but may at once be distinguished by its beak being entirely yellow; the absence of the red spot in front of the eye; its blue rump; the feathers on the legs, throat and chest being variegated with red; the darker colour of the abdomen, and also in the colouring of the upper and under surfaces of the wings.

Picus elegans. *P. coccineus, fasciâ per genas excurrente, et abdomine, flavis; mento, guttureque nigro flavidoque variegatis; plumis pectoris et uropygii rubello, flavido, et nigro fasciatis; caudâ nigrâ, primariis fuscescenti-nigris, extus olivaceis.*

Fœm. *differt gutture, capiteque supernè nigris.*

Long. tot. 12 unc.; *rostri*, $1\frac{1}{2}$; *alæ*, $5\frac{3}{4}$; *caudæ*, $4\frac{1}{2}$; *tarsi*, $\frac{7}{8}$.
Hab. Sta. Fé de Bogota.

Head, neck, back, wings, and moustache, blood-red; a stripe, commencing at the nostril, passing through the eye, and extending on to the ear-coverts, together with the abdomen, under surface of the tail, and wing-coverts, yellow; chin black, each feather having a narrow bar of yellow, which becomes more distinct on the throat and chest, which are tinged with red; the feathers of the rump and upper tail-coverts are similarly marked with those on the chest, but more obscurely; primaries olive; tail, beak and feet black.

The female only differs from the male in having the upper surface of the head and moustache black; all the colours are less brilliant.

This bird appears nearly related to *Colaptes campestris* (*Picus campestris*, Licht.).

The three species above described are from the collection of the Earl of Derby.

Mr. Fraser also exhibited some specimens of the true *Pteroglossus Azaræ* of Wagler and Vieillot, and pointed out the differences between that species and the bird figured by Mr. Gould, in his Monograph of the family of Toucans, under that name.

"This bird differs from the *Azaræ* of Gould, in having the broad dusky dash along the upper mandible (having seen about twenty specimens of this species, of all ages and sexes, I can safely say that it is not a sign of immaturity, or caused by decomposition, as Mr. Gould was led to suppose, but really a specific difference), the *very*

broad black belt, and the *very* narrow band of scarlet across the abdomen, as may be seen by a comparison of the figure given by Gould in his Monograph, and the one by Vieillot in his *Galérie des Oiseaux*, tom. ii.

"The specimen now before me, of the *Azaræ* of Wagler, was brought from British Guiana by R. H. Schomburgk, Esq., Corr. Memb. Zool. Soc., and presented by him to this Society. In the Earl of Derby's collection there is a specimen of the bird figured by Gould, for which I propose the name of *Pteroglossus flavirostris*, from the uniform colouring of its beak. M. Natterer informs me the latter species is from Rio Janeiro."

July 28.—Professor Owen in the Chair.

Mr. Cuming exhibited some specimens of Quadrupeds, which he had procured during his stay at Malacca; they consisted of two specimens of *Semnopithecus obscurus*, which species, Mr. Cuming states, is subject to great variation in its colouring, one specimen of *Felis marmorata*, and one of *Rhizomys Sinensis*.

Mr. Cuming's notes relating to the last-mentioned animal state that the specimen was a male, and before it was skinned afforded the following dimensions: length from the tip of the nose to the root of the tail, 15 inches; of tail, 6 inches; girth behind the shoulders, 8 inches. The animal lives on the roots of bamboos, under which it burrows; the eyes are very small, and of a black colour.

Mr. Blyth read a paper entitled "An Amended List of the Species of the genus *Ovis**."

The paper was illustrated by numerous drawings; and the horns of the Rass of Pamîr, from the Museum of the Royal Asiatic Society, and two pairs of those of the *Shà* of Little Thibet, and one of the Nahoor Sheep, or *Snà* of Great Thibet, brought by G. T. Vigne, Esq., were exhibited.

Mr. Blyth also exhibited various other coloured drawings and specimens collected chiefly in Little Thibet by Mr. Vigne, among the former of which were several figures of the Yak (*Bos grunniens*), a highly-finished portrait of the Jharal† of Mr. Hodgson, another of the *Ovis Vignii*, some sketches of the *Ursus isabellinus*, (or *Syriacus* of Ehrenberg?) and of Buffaloes of the same breed as that of Italy

* The paper will be given in a future number.

† "This animal is mostly known as the *Tehr*, *Thaar*, or *Thar*, to the westward of Nepâl, a name applied by Mr. Hodgson to a very different animal, which is usually called *Surow*, or *Surrow*. The first of these names, as suggested to me by Col. H. Smith, is clearly a modification of the Teuton *Thur*, ramifying into *Thier*, *Deer*, &c. &c. &c. *Surow*, or *Surrow*, again passes into various other names, applied to different Himalayan Ruminants; as *Jerow* or *Jerrow* for the *Cervus Aristotelis*, *Serow* and *Chirew* (pronounced with a soft 'Ch') for the *Panthalops chiru*, Hodgson, &c. Then we have *Jharal*, *Goral*, *Goorul*, *Baral*, *Boorul*, *Burrhel*, *Boorhoor*, *Nayoor*, *Nahoor*, and even the Persian *Maral* may be derived from the same root. These names, too, are all severally applied to different animals, whence it often requires much caution in endeavouring to ascertain what species is intended." —E. B.

and Hungary, with the long tail, &c., that were drawn from life at Hurriana. This race was more esteemed for the quantity of milk it yields than the ordinary Indian Buffalo, with long horns, a shorter tail, &c., and is doubtless the same, in the opinion of Mr. Blyth, as the Guzurat race indicated in Dr. Buchanan's 'Journey through Mysore,' &c., which that author, however, observed at Seringapatam. It appears to be scantily diffused throughout India, becoming rarer to the eastward.

Among the specimens was the horn of a Stag, from Kashmir, which Mr. Blyth suspected would prove to be the *C. Wallichii* of Duvaucel, or a closely allied species, a description of which may be expected from Dr. Falconer. The specimen exhibited was 44 inches long, and 8 inches round above burr: it had a brow, a bez, and royal antlers, the bez a foot in length, and longest of the three, and it terminated in a bifurcating crown, precisely as in the *Cervus Elaphus* of the Sâl forest of Nepâl, figured by Mr. Hodgson, and supposed by Mr. Ogilby to be *C. Wallichii*, an opinion in which Mr. Blyth coincided. The general character of this horn was intermediate to that of the *Wapiti* and European Stag, but agreeing more nearly with the latter in its kind of granulated surface.

There were also three pairs of horns of the *Markbur* of Kabul, or *Rawacki* of Little Thibet, a race of feral common Goats (in the opinion of Mr. Blyth), remarkable for their large size, and also that of the horns, which last are more or less twisted, varying from the curvature of those of the Koodoo, only in an opposite direction, to the tense spiral of the Caffrarian Impoof's horns, as shown by the specimens then exhibited. It was remarkable that no tame Goats observed by Mr. Vigne in the same countries at all approached this feral race in stature, nor was it known to occur in Persia, or in Nepâl. From the circumstance of the twist alone of the horns of this animal, Mr. Blyth argued that it was not an aboriginal species; for whereas an inward spirature, or at least a tendency to it at the tips, was all but invariably observable throughout the endlessly diversified races of domestic Goats, neither the wild *Capra Ægagrus*, nor any other of the numerous distinct species of wild *Capræ* known to Mr. Blyth, exhibited this spirature in the least degree; besides which, it appeared to be alike in no two specimens of the *Markbur*. This animal, however, as he was informed, did not vary in colour, which resembles that of an ordinary brown domestic Goat. A description and figure of it have been published in Mr. Vigne's narrative of his travels in Kabul.

Finally, were exhibited the skull and horns of a magnificent specimen of the Himalayan Ibex, being the second skull and third pair of horns of this species examined by Mr. Blyth, all of which accorded with each other in the several particulars in which they differed from the Swiss Ibex. The animal is very closely allied to the latter, having a similar rudimental beard, and colouring, so far as he could learn; but the horns are much longer, considerably less divergent (a constant distinction in both species), and resemble those of the Egyptian Ibex in curvature: excepting towards the base, they are less massive than the horns of the Swiss Ibex, the middle part being narrower; and

the tips, which incline more abruptly somewhat forward and inward, are much more attenuated, or drawn out. The splendid pair exhibited, which were in their twelfth year of growth, and all but fully developed, measured $4\frac{1}{4}$ feet over the curvature, and $10\frac{1}{2}$ inches round at base; diverging to 23 inches asunder, measuring outside, at nearly three-fourths of their length from the base, and the tips returning to 16 inches apart, at a distance of 20 inches from the base inside. They are 4 inches deep at base, $2\frac{1}{4}$ inches broad anteriorly, and 2 inches at a foot distance from the base, bearing 26 prominences, and numbering, as before remarked, 12 years of growth, which successively give 16, 7, 5, 4, 5, 4, $3\frac{1}{2}$, $2\frac{1}{2}$, 2, $1\frac{1}{2}$, and the last (incomplete) $\frac{1}{2}$, inches. The extreme length of skull is 12 inches, or $18\frac{1}{2}$ inches over the curves, from tip of intermaxillary to occipital *foramen*; breadth across of orbits posteriorly 7 inches, and total length of bony palate $6\frac{1}{4}$ inches. The dimensions of the largest pair of horns of the Swiss Ibex examined by Mr. Blyth, and which were of the same age as the preceding, are given as follows. Length $3\frac{1}{2}$ feet over the arch, having a span of 2 feet from base to tip inside; the points $2\frac{3}{4}$ feet asunder, and basal circumference $10\frac{3}{4}$ inches; number of prominences above 20, several being comprised within the first 8 inches. They diverge quite regularly, and somewhat spirally, more outward to the tip.

"The Himalayan Ibex," continues Mr. Blyth, "is the *Skyn* or *Skeen*, *Sakeen* or *Sikeen* (as variously written) of different parts of its range, and is numerous, according to Mr. Vigne, in Little Thibet, where it is designated *Skyn*. In Kashmir it bears the name of *Kyl*. Mr. Moorcroft informs us that in Ladakh the male is termed *Skyn*, and the female *l' Danma**: he describes it to inhabit the most inaccessible crags of the mountains; and other authors notice its habits as entirely resembling those of its Alpine congener†. In Kashmir, as I am informed by Mr. Vigne, its *poshm* (or under-fleece of delicate silky wool), which in all the true massive-horned Ibices is amazingly copious in winter, is highly prized, 'that of one large Ibex being equal to the produce of three Shawl Goats, besides being softer and finer. I have some beautiful cloth,' continues that gentleman, 'made from the *poshm* of the Ibex. The animal is of a sepia-brown colour.' It may be further noticed, that in the 'Journal of the Asiatic Society of Bengal,' vol. v. p. 242, it is stated that Major Kennedy had a pair of these animals, stuffed, at Suhatu, in Kunawar. A skull and horns which I saw at Mr. Leadbeater's was received from Nepâl, where, however, the species does not yet appear to have been noticed by Mr. Hodgson. Dr. Falconer has probably named it.

"*Himalaya Ibex. Capra* Ibici Helvetico simillima, sed cornibus magis prolongatis, semper minùs divergentibus, apicibus attenuatioribus et ad antrorsùm abruptiori-curvatis,—sic ut in plurimis speciebus hujus generis, at vix in *Caprâ Ibice* verâ."

* Travels, i. 311.

† Vide 'Journal of a Trip through Kunawar,' published in the 'Journal of the Asiatic Society of Bengal' for 1839, p. 928.

ROYAL BOTANICAL SOCIETY OF EDINBURGH.

The Society met on Thursday evening (March 11th) in the Royal Institution, Dr. Greville in the chair.

Mr. Edward Forbes read a communication on the specific value of the appendages of the anthers in the genus *Viola.*

Mr. Forbes commenced by stating, that in some plants a particular form of the leaf or other appendage might be the same in all the species, while in other plants this form might only be similar in a few species. In the case of the genus *Viola,* the antherine appendages or nectaries have generally been regarded as of generic importance only. By comparing the nectary of a Pansey with that of a Dog-violet, a difference will be observed of specific, or at least sectional importance. In order to ascertain the value of this character, he had examined above seventy species of Violets, chiefly from the herbarium of Dr. Greville. He found three different forms of nectaries. The most common is lancet-shaped, which prevails among the allies of *Viola canina* and *Viola odorata.* The next is of a linear form, and prevails chiefly amongst the Pansies, *V. lutea,* etc. The third is rotund, a rare form, but which may be seen in the *Viola palustris.* These nectaries are to be found in the spur of the flower, which varies in form according to the shape of the nectary. When the nectary is lancet-shaped, the spur is generally thick in proportion to its length, and very blunt, being shortest in those species which have the nectaries broadest. The rotund nectary is generally associated with a short round spur, and the linear with a slender spur, often of great comparative length. The colours of Violets have also some relation to the forms of the nectaries. In this genus, blue, yellow, purple and white are the colours seen. The blue may again be divided into purple-blue and sky-blue, each passing into white. The purple may also pass into white, but the sky-blue never does. These distinctions are of importance in the investigation of nearly allied species, such as *Viola canina* and *Viola montana.* In the one case the yellow passes into pink, and in the other into purple. White is rarely the normal colour of a Violet. The lancet-shaped nectary is chiefly associated with blue flowers, sometimes with the yellow passing into white; but never with the yellow passing into purple, they having always linear nectaries. The Violets which are normally white derived from blue have always lanceolate or rounded appendages. Mr. Forbes also pointed out the relation of the nectary to the leaf, to the bractea or stipula, and also to the stem. By considering these, along with the colour and geographical distribution, he thought a very natural arrangement of this extensive genus might be made, and which would greatly facilitate the distinction of species.

The next paper was upon the botanical characters of the British Oaks, by Dr. Greville. The author stated that he had paid great attention to the distinctive characters of the oaks for the last three years, and his investigations had led him to believe that the usual specific distinctions were not correct. Thus he found that the *Quercus sessiliflora* in one situation might have a very short flower-stalk, and in another a very long one; and the same was the case

with other species, so that the distinction here indicated by the name is incorrect. The difference between *Quercus Robur* and *sessiliflora* could not be ascertained by the botanical characters, but it was well known that a great difference existed between the wood of these two species. The former was called the white oak, and the latter the red, and in some districts the white was considered of double the value of the red as a timber. He offered these observations merely to draw the attention of botanists to this genus, and to endeavour to find some new characters by which they might be distinguished. It was of great value to this country that the best oak should always be planted, and he hoped that some characters would be ascertained by which to distinguish them. Dr. Greville had not examined specimens from any district south of Cumberland and Westmoreland. The terms "red and white oak" have been applied evidently by various authors, sometimes to one, sometimes to the other; and the redness described by some writers is evidently a disease, not a specific difference, in the timber. The whole subject requires a careful and strict examination.

Communications were also read from Mr. George Gardner, dated Rio de Janeiro, December 3rd, 1840, with some account of his recent collections in Brazil; and a notice of *Lecanora rubra* (of which specimens were presented), found near Richmond, Yorkshire, by Mr. James Ward.

Thursday being the night of the anniversary, a large number of the members and their friends sat down to supper in the Hopetoun Rooms, Professor Graham in the chair, and Dr. Neill acting as croupier for Dr. Christison, who was absent from indisposition.

WERNERIAN NATURAL HISTORY SOCIETY OF EDINBURGH.

At the meeting of this Society, held on the 20th ult., Professor Traill read a Memoir of the Life and Writings of the Rev. George Low, minister of Birsay, in Orkney, author of 'Fauna Orcadensis,' and the friend and correspondent of Sir Joseph Banks and Mr. Pennant. This memoir will appear in the next part of the Society's Transactions.

At the same meeting, Mr. Goodsir described a new species of *Gymnorhynchus,* and exhibited specimens and drawings of the animal. The most interesting circumstance in the history of this Entozoon is the manner in which it is enclosed in a firm cyst, although armed with powerful toothed jaws.

At the meeting held on the 6th of March, a paper was read by Mr. Torrie, on the recent 'Travels in Turkey' of Dr. Boué, the geologist; in which a summary was given of the observations and discoveries made by him during the last four years in the geography, geology, botany and zoology of the more remote portions of that comparatively little-known country.

At the same meeting, a communication was read by the Secretary from Professor Fleming, of King's College, Aberdeen, on a new species of the Ray family, or Skate tribe, discovered by him last summer on the coast of Aberdeen, and which he proposes to place

under a new generic title by the name of *Cheiroptera abredonensis.* Illustrative drawings of the fish were exhibited. This skate was taken in July last, and was about eighteen inches in length. From the drawings it appeared to belong to the genus *Cephaloptera*; but we hope the Professor will lose no time in publishing a figure and description of this interesting fish.

MISCELLANEOUS.

Mr. Gray's 'Genera of Birds.'—In my review of Mr. Gray's work I accidentally omitted to state that the various errors in the orthography of the generic names there pointed out are not attributable to Mr. Gray, but to the respective authors from whose works he adopted those names.—H. E. Strickland.

Birds of Kent.—Our correspondent Mr. Stephen Mummery, of Bath road, Margate, informs us of the capture in a wood near Canterbury of a species of Cuckoo, of which he has sent a description, which we must examine more at leisure. He is engaged in preparing a list of birds found in Kent, arranged under heads, as Residents, Periodical Visitants and Stragglers, with their times of arrival and departure, and places where found.

METEOROLOGICAL OBSERVATIONS FOR FEB. 1841.

Chiswick.—Feb. 1. Snowing. 2. Snow-showers. 3. Frosty: dry and cold: very severe frost at night. 4. Frosty: overcast. 5. Dry cold haze: windy at night. 6. Boisterous. 7. Boisterous: hazy and cold. 8—11. Hazy and cold. 12. Dense fog: very fine: rain. 13. Overcast: rain. 14. Rain: cloudy. 15. Cloudy: slight rain. 16, 17, Hazy. 18. Fine. 19. Rain: cloudy and fine. 20. Cloudy and fine: rain. 21. Overcast and fine. 22. Dense fog. 23. Hazy: rain. 24. Hazy and cold. 25. Cloudy and cold: rain. 26. Rain. 27. Cloudy: rain. 28. Very clear: cloudy and fine.

Boston.—Feb. 1. Cloudy: snow A.M. and P.M. 2. Fine: snow early A.M.: snow P.M. 3. Cloudy: snow early A.M. and P.M. 4, 5. Cloudy. 6, 7. Stormy. 8. Cloudy: snow P.M. 9, 10. Cloudy. 11—13. Cloudy: rain P.M. 14. Cloudy. 15. Cloudy: rain P.M. 16. Cloudy. 17. Rain. 18, 19. Cloudy. 20, 21. Fine. 22, 23. Foggy. 24. Rain. 25. Cloudy: rain P.M. 26. Rain: rain P.M. 27. Rain. 28. Fine.

Applegarth Manse, Dumfries-shire.—Feb. 1, 2. Sprinkling of snow: frost P.M. 3. Snow-showers: frost. 4. Frost: fair but cloudy. 5. Frost: sprinkling of snow. 6. Frost: occasional snow-showers. 7. Frost: severe and cold. 8, 9. Frost: cold and withering. 10. Frost, but giving way. 11. Thaw and heavy rain: sleet. 12. Fog: rain: fine thaw. 13. Rain all day. 14. Rain in the evening: mild. 15. Rain all day. 16, 17. Fair but cloudy. 18. Wet all day. 19. Clear and cold. 20. Fine. 21, 22. Fine, but cloudy. 23. Rain A.M.: moist P.M. 24. Clear and cold. 25. Cloudy and threatening rain. 26. Cloudy with high wind. 27. Frost in the morning. 28. Frost in the morning with snow on the hills.

Sun shone out 19 days. Rain fell 8 days. Frost 11 days. Snow 6 days.

Wind north 1 day. North-east 8 days. East-north-east 2 days. East 2 days. East-south-east 1 day. South-east 4 days. South 4 days. South-west 2 days. West 1 day. North-west 1 day. North-north-west 2 days.

Calm 6 days. Moderate 11 days. Brisk 4 days. Strong breeze 4 days. Boisterous 3 days.

Mean temperature of the month	36°·50
Mean temperature of February 1840	36 ·78
Mean temperature of spring-water	42 ·60
Mean temperature of spring-water, Feb. 1840	44 ·16

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. Roberton; *by* Mr. Thompson *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. Veall *at Boston, and by* Mr. Dunbar *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1841. Feb.	Barometer.						Thermometer.								Wind.				Rain.				Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dumfries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Self-register. Min.	Max.	Min.		Max.	Min.									
1.	30·358	30·346	30·268	30·12	30·42	30·47	30·7	42·0	29·7	31	23	32	35	32	N.	NE.	calm	NE.	·116	...	...	...	30
2.	30·072	30·093	29·931	29·90	30·25	30·10	27·7	32·4	25·8	31	18	28·5	33	26½	N.	NE.	calm	NE.	...	...	...	...	24
3.	30·000	30·020	29·977	29·80	30·07	30·01	22·2	29·7	21·6	28	14	25·5	33	27½	N.	E.	calm	ENE.	...	...	...	...	20
4.	29·760	29·803	29·670	29·62	29·87	29·77	25·7	25·7	22·2	30	22	27	34	27	E.	NE.	E.	NE.	...	...	...	...	21
5.	29·682	29·722	29·688	29·55	29·78	29·85	25·7	30·0	24·6	30	26	29·5	34	30½	NE.	NE.	E.	NE.	...	...	...	...	22
○ 6.	29·648	29·661	29·609	29·56	29·80	29·78	27·3	29·8	25·2	28	24	28	30½	26½	NE.	E.	E.	E.	...	...	...	...	24
7.	29·480	29·500	29·443	29·46	29·65	29·58	23·8	28·8	23·8	27	24	23·5	28½	27½	NE.	E.	E.	ENE.	...	...	...	0·05	20
8.	29·372	29·442	29·395	29·24	29·50	29·57	26·7	26·7	24·0	29	26	26	31½	27	N.	NE.	E.	NE.	...	...	...	...	23
9.	29·636	29·952	29·645	29·47	29·70	29·87	27·4	29·3	27·2	30	27	28·5	32½	28½	N.	NE.	E.	NE.	...	...	...	...	24
10.	30·014	30·017	29·959	29·76	29·80	29·68	28·3	30·2	27·0	32	27	27·5	33	27	SE.	SE.	calm	NE.	...	·04	...	...	25
11.	29·850	29·866	29·657	29·58	29·53	29·38	36·7	37·2	27·0	41	37	33	39	29	SE.	S.	calm	E.	...	·04	...	...	28
12.	29·672	29·745	29·640	29·33	29·40	29·48	41·7	42·5	35·6	51	38	38	40	36	S.	SW.	calm	S.	...	·04	·58	...	36
☾ 13.	29·672	29·659	29·313	29·30	29·28	29·02	44·8	49·0	41·4	51	44	41	45	37½	SSE.	S.	calm	SE.	...	·01	·10	...	39
14.	29·180	29·288	29·157	28·82	28·94	28·87	47·3	48·3	45·0	52	41	43	45½	41	S.	SW.	calm	SE.	·022	...	·09	2·06	42
15.	29·274	29·263	29·071	28·89	28·95	28·85	43·4	51·4	42·4	49	42	43	45	38	SSE.	S.	calm	ESE.	...	·15	...	...	42
16.	29·076	29·141	29·086	28·73	29·00	29·19	45·7	49·2	42·5	51	39	42	46	39½	E.	SE.	calm	SE.	·091	·11	·15	...	43
17.	29·268	29·584	29·584	28·97	29·30	29·34	40·3	50·0	40·8	46	36	36·5	46½	41	NW.	W.	calm	SE.	·125	·01	·06	...	41
18.	29·642	29·614	29·490	29·26	29·24	29·26	43·3	45·4	40·7	53	38	40	45	38	SE.	S.	calm	S.	...	·04	·02	...	41
19.	29·672	29·744	29·601	29·22	29·44	29·43	46·8	51·4	43·0	50	35	44	45	41	S.	SW.	calm	SW.	·088	·02	...	...	46
20.	29·846	29·977	29·808	29·33	29·51	29·85	46·7	50·0	40·4	56	40	42	48	40	S.	S.	SE.	S.	·033	·11	...	...	45
● 21.	30·198	30·296	30·162	29·77	30·05	30·15	45·3	52·2	44·7	56	29	36	46	38½	NW.	NE.	calm	S.	·063	...	·15	1·56	44
22.	30·390	30·345	30·323	29·93	30·18	30·19	40·3	50·2	40·2	42	38	32	46	38	NW.	NE.	calm	SW.	...	...	...	...	42
23.	30·356	30·323	30·298	29·98	30·24	30·28	38·6	43·7	38·6	44	32	38	48½	41	NE.	NE.	calm	NE.	...	...	...	...	41
24.	30·328	30·304	30·298	29·95	30·39	30·45	34·7	41·3	33·8	40	36	36	46	37	N.	NE.	E.	N.	...	·01	·07	...	36
25.	30·336	30·308	30·076	29·98	30·33	30·04	38·8	41·5	33·8	42	35	38	45	31½	N.	NE.	calm	W.	...	·07	...	...	37
26.	29·378	29·872	29·638	29·47	29·80	29·67	43·7	44·5	38·7	48	35	41·5	48	41	WNW.	NW.	calm	NW.	·108	·04	·07	...	42
27.	29·756	29·730	29·368	29·36	29·80	29·87	39·7	47·7	37·0	45	32	38	43½	34	NW.	N.	N.	NNW.	·100	·07	·24	...	37
☽ 28.	29·880	29·874	29·681	29·52	29·76	29·47	36·9	43·3	35·0	47	32	35	43½	28½	WNW.	NW.	calm	NNW.	·044	...	·05	0·11	34
Mean.	29·778	29·833	29·708	29·49	29·713	29·695	36·4	40·8	34·0	41·42	31·78	34·7	40·5	33·2					Sum. ·790	·76	1·58	3·78	Mean. 34

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 43. MAY 1841.

XIX.—*On the Alteration which the Atmosphere undergoes during the Development of Heat in the Spadix of* Colocasia odora. By Professors G. Vrolik and W. H. De Vriese.

[Communicated by the Authors.]

Having communicated last year to the first class of the Royal Institute of the Netherlands our experiments regarding the influence of the spadix of *Colocasia odora* on the surrounding atmosphere, we have, in repeating the experiments, constantly obtained the same results with the flowers of this species. Thus convinced that our researches have risen in scientific value, we now subjoin the final result of them.

We used for this experiment the apparatus already described and delineated*, but we did not employ water for closing the gas jar, but mercury, as was also the case with the experiments communicated last year.

We placed the flowers in this apparatus, having previously cut away the greatest part of the spatha, and having varnished the remaining part in such a manner that all evaporation or absorption was prevented, and the green surface could not thus exercise any influence.

We determined the degree of heat in the usual way, but we have not kept our notes on this as fully as before; it not being now so much the object to make this known, as to consider the development of heat, in connexion with the alteration, which, during it, the atmosphere undergoes. For the same reason no account has been given of all the experiments which we have made.

July 9th, 1839.—*Experiment with a plant planted in the open ground in a hot-house.* An idea can scarcely be formed of the vigorous development of the plant treated in this way. Most of the leaves had a petiole of 1·60 Dutch ell (metre) in length. From the union of the petiole with the stem to the apex of the middle nerve, the length was 0·66—0·80 D. ell;

* Tijdschrift voor Nat. Gesch. en Phys. Deel V., p. 139, pl. V.—Ann. des Sc. Nat., 2nde Sér., Fevr. 1839.

the breadth at the longest diameter was 0·68. The spadix was nearly as large again as usual.

We must avail ourselves of this opportunity to observe, that we have already (in 1835) declared our opinion regarding the identity of *Colocasia odora* with *Arum cordifolium*, briefly described by Bory de St. Vincent*. This learned gentleman has confirmed in every respect the opinion which we gave in 1835, in our first treatise on the elevated temperature of *Colocasia odora*. Our opinions on that subject were fully given in the French translation of the treatise, which was sent to the Editors of the 'Annales des Sciences Naturelles.' If thus *une faute d'érudition botanique* has taken place, by whomever it may have been, it has not been committed by us†. In Froriep's 'Notizen' of 1836, our treatise was inserted from the 'Tijdschrift voor Natuurlijke Geschiedenis;' and there also the conviction may be obtained, that we had not from the beginning any doubt of the identity of *Colocasia odora* with *Arum cordifolium*. Perhaps at some future period we shall revert to this subject.

After this short digression, we now subjoin the table of our observations on the 9th of July, 1839:—

Hour of Observation.	Temperature of the Spadix.	Temperature of Gas Jar.
A.M. $9\frac{5}{4}$	18° C.	18° C.
11	21	$18\frac{1}{5}$
$11\frac{1}{2}$	,,	,,
$11\frac{3}{4}$	$21\frac{1}{5}$	,,
P.M. $12\frac{1}{2}$	22	,,
$1\frac{1}{4}$	$23\frac{4}{5}$	,,
$1\frac{3}{4}$	,,	,,
$2\frac{1}{2}$	$23\frac{1}{5}$	18
3	22	,,
4	21	,,

On that day the development of heat gradually decreased, and even on the following day at noon it was scarcely observable for half an hour. The air in the jar was then chemically analysed; oxygen was not found in it, but it was proved that this gas had been replaced by carbonic acid gas.

It is a most remarkable phænomenon, that while the increase of heat had generally been observable for three days, it now nearly ceased on the first day. In our opinion, the disappear-

* Voyage dans les quatres grandes îles de la mer d'Afrique, fait en 1802, II. Paris, 1804, p. 66.

† Vid. l'Institut, Mai 30, 1839, No. 283, p. 184; Sept. 5, 1839, No. 297, p. 312.

ance of oxygen, and its being replaced by carbonic acid gas, was the cause of this; the quantity of oxygen gas in the jar being once absorbed, the development of heat, losing the stimulus which is indispensably requisite for its existence, must necessarily discontinue.

Judging that by this experiment we have nearly arrived at the right explanation, we think that our former experiments, especially the one of 1838*, concerning the influence of nitrogen on the spadix of the species here alluded to, must be brought into connexion with it. There was *then* no development of heat whatever, the oxygen gas being wanting; *here* it had entirely ceased after a few hours, because all the oxygen gas was absorbed from the atmosphere. On considering this phænomenon, the question readily presents itself,—does the oxygen liberating caloric combine with the carbon contained in the plant to form carbonic acid, and is thus the development of heat, combustion? We are inclined to think so; for when the development of heat has reached its maximum, which is the case in the middle of the day, then also the alteration which the enclosed air undergoes is greatest, as was proved by an experiment we purposely made on the 27th of last June. With this view, we placed at that time in the apparatus, in which a spadix was enclosed, some potash, in order to absorb the carbonic acid in the same ratio in which it was produced. During the time the absorption was taking place, we saw the mercury rise several inches within the space of one hour.

As yet we had made these experiments with the same sort of thermometer we had previously used; but we wished to repeat them with a thermo-electrical apparatus: for this purpose we procured one of M. Becker, philosophical instrument maker in Groningen, who last year, after the flowering of our Colocasias, constructed a most excellent and delicate instrument of this description, with the physiological needles of Becquerel appended to it.

On making these and other experiments, we found, that although the increase of temperature was not quite imperceptible on the second day, yet it was too trifling to attach any particular value to it. On this ground we think we may state, that on the first day all the oxygen gas had not been completely absorbed.

The experiments with the thermo-electrical apparatus, and also all the former ones, were taken in a room of nearly an equal temperature. Either in the dark or in the light the

* Vid. Tijdschr. voor Nat. Gesch. en Physiologie, Deel V., p. 222.

results presented scarcely any remarkable difference. The physiological needle was stuck in the spadix to the depth of one millimetre, which for this purpose was introduced through a copper ball fixed at an opening made in the jar, and moveable in all directions; which apparatus was made with the utmost accuracy by M. E. Wenkebach, philosophical instrument maker at Amsterdam.

The analysis of the atmosphere produced the same results as in the former experiments, viz. the replacing of oxygen gas by carbonic acid gas.

As soon as an opportunity presents itself for the repetition of these experiments, we shall endeavour to maintain the usual proportion of the gases from the atmosphere in the jar, by supplying oxygen gas in the same ratio as it will be found to be absorbed from the enclosed air, and by removing the newly-formed carbonic acid gas.

We do not doubt, that by this mode of proceeding, the elevation of temperature in the spadix of *Colocasia odora* can be kept up the second and third day, and perhaps even to a longer period.

Amsterdam, August 13th, 1840.

XX.—*Note on the Occurrence of the Genus* Diphya *on the Coast of Ireland.* By G. C. Hyndman, Esq., Member of the Natural History Society of Belfast.

Whilst dredging in Belfast Bay on the 6th October, 1838, I had the pleasure of taking in a small towing-net, along with a number of Beroes, a specimen of the remarkable genus *Diphya*, Cuv., the occurrence of which in the British seas is hitherto unrecorded.

With Cuvier's definition of the genus the specimen exactly agreed, as it did with that of Blainville, except that there were no teeth round the aperture of the swimming cavity, as described by the latter author. This appearance instead arose from the extension of the acute ridges by which the body of the animal is formed, and which is indeed shown by the figures in Pl. V. of his 'Actinologie.' Referring for the species to this work, to Eschscholtz's 'System der Acalephen,' to Comte's and to Guérin's 'Illustrations of Cuvier's Règne Animal,' and to Jones's 'Outlines of the Animal Kingdom,' the only works in which I have had the opportunity of seeing the genus represented, I find that my specimen differs in species from all in its more elongated form; I should therefore propose to name it

Diphya elongata.

Spec. Char. Both portions of similar form and nearly equal size; the swimming cavity of each likewise similar, and, as well as the nutritive organ, extending the whole length of the body.

The animal or animals when first taken were united, as shown in the sketch, the whole body being of a most beautiful transparency; so much so, that it was extremely difficult to distinguish it in the clear sea-water. The only coloured part was the long tentacular appendage, which was of a light reddish colour, and only to be seen in the larger individual. The motion of the *Diphya* through the water was caused by the contraction of an elongated cavity having an open round aperture fringed with what had the appearance of a soft membrane without any ciliæ, by which contraction the animal was rapidly propelled through the water with the pointed end foremost in a series of jerks, agreeing with the motion attributed to the genus by Eschscholtz. At other times, when lying undisturbed, there was no appearance of animation except a very slight movement of the tentacula, nor was the circulation perceptible under a strong lens; but on examination under a powerful microscope, a circulation was discovered commencing in the canal which originates at the base of the tentacular appendage, and continuing throughout the nutritive organ.

In removing the *Diphya* for examination in the microscope the two bodies separated, when each appeared quite a distinct animal, capable of precisely similar motions; the only difference between them being, that the smaller one was destitute of the tentacular appendage, and the pointed end was furnished with a lamina, as in sketch.

Of the nature of the connexion between the two individuals, or of the functions of the tentacular appendage, I was unable to satisfy myself during the short period allowed me for their examination; the smaller one having died the day after its separation, and the larger one having remained in a languid state, with its tentacula contracted, until the third day after its capture, before which time I had not the means of examining it under a good microscope.

I have delayed this communication so long in the hope of being able to procure further specimens, but as yet I have been unsuccessful; although the probability is, that the animal may not unfrequently be met with on this coast, as Mr. Thompson lately pointed out to me a dried specimen of another individual of the same species, which I had picked up

on the coast near the Giant's Causeway in July 1837, and not being able to determine, had handed over for his investigation.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1. A highly magnified view of the base of the tentacular appendage and part of the nutritive organ. *b*, *b*. Groups of opake particles in motion at these places, the circulation going on throughout the divisions of the oblong vessel *c*.

Fig. 2. The two animals united, as first taken.

Fig. 3. The larger individual with the tentacular appendage.

Fig. 4. The smaller individual.

When viewed under a lens, the ridges of the body are seen to be serrated along the edge.

XXI.—*Report of the Results of Researches in Physiological Botany made in the year* 1839. By F. J. Meyen, M.D., Professor of Botany in the University of Berlin*.

[Continued from vol. vi. p. 429.]

M. Unger, in a treatise on the organs of fructification of *Riccia glauca*†, has made a few but very important remarks on the present question concerning the sexuality of Phanero-

* Translated from the German, and communicated by Henry Croft, Esq.

† Linnæa von 1839, pp. 15-17.

gamous plants. His researches on the stigma are by no means favourable to the theory of M. Endlicher, according to which the moisture of the stigma is the fertilizing substance; and he moreover states, that there is just as little foundation for the theory of M. Schleiden, according to which the embryo-sac effects the fertilization. M. Unger gives the question quite another direction, and one which, as he believes, corresponds better with the nature of the subject. He says: What important objection could be made to the supposition, that the pollen grains, when they arrive on the stigma, are already fecundated? Does not analogy lead us to suppose that their formation is a work of fertilization? In this case, the male organs of plants must be sought in the anthers or the neighbouring parts, etc. M. Bernhardi * has expressed new doubts concerning the general idea, that the formation of the seed, in Phanerogamic plants, depends solely and alone upon sexual contact; he brings forward observations which are unfavourable both to the old and the new theory of fecundation. Bernhardi calls the followers of the old theory the Animalculists, and those of the new, who seek the germ of the future plant in the contents of the pollen, the Pollenists. Against the doctrines of the Pollenists he brings forward the observations of Gærtner, namely, that many seed-bearing hybrids, by being continually grown from seeds, return into the primitive form; for this cannot be otherwise explained than by the assumption that in this case the female parent had a greater share in the formation of the embryo than the male. The only means of escape left for the Pollenists, is to ask whether these observations are quite correct or not. The most important part of M. Bernhardi's work, however, treats of the observations, according to which seeds perfectly capable of germinating have been formed in the ovaries of several plants without previous contact with pollen; in this case, therefore, the female alone was sufficient for the formation of the seeds: the observations of different botanists are here mentioned, and moreover, in order to render such a production less incredible, many statements—according to which animals, as insects, salamanders, etc., have produced young without previous fecundation—are brought forward. The numerous experiments which M. Bernhardi has made with all possible care with the hemp plants, and their results, are circumstantially described. In April 1811 he sowed thirty seeds, and obtained twenty-one plants, nine male, twelve female. From

* Ueber Bildung von Saamen ohne vorhergegangne Befruchtung.—Otto's und Dietrich's Allgemeine Gartenzeitung 1839, No. 41, 42.

two female plants which were allowed to stand he obtained twenty-eight seeds, which, sowed in 1812, produced twenty plants, ten male and ten female. Two of these females produced twenty seeds, and from these were obtained, in 1813, fifteen plants, eight male, seven female. From these, thirty seeds were produced, which gave, in 1814, nineteen plants, twelve male, seven female; and thirty-two seeds from these produced, in 1815, twenty-one plants, sixteen male, five female; only two of these females were allowed to stand, from which were obtained twenty-five seeds, which produced, in 1816, fifteen male and two female plants. In these experiments the male plants were destroyed in a very early stage, while they had perfectly undeveloped anthers; only two females were allowed to remain, in order that it might be easier seen whether some male flowers had not been produced between the female ones. The most curious result of these observations is, the formation of mature seeds without fecundation, for this could not be observed; and moreover it is very remarkable, *that the proportion of male plants to the female ones increased regularly*: the plants were cultivated on a rather poor soil. As far as concerns the first result, I consider that it is by no means proved by these new observations, that in the case of the hemp plant, or other Phanerogams, seeds are produced without fecundation; it may be asked whether these experiments are perfectly correct. However, observations made by such trustworthy men as M. Bernhardi cannot be put aside without sufficient reasons, and it is therefore advisable that these experiments be repeated next summer with all the care which such a subject requires. I have observed the formation of pollen in such very unusual places in other plants, that something similar might perhaps be supposed to take place in the cases above mentioned.

Mr. J. Smith* made a communication to the Linnæan Society concerning a new plant from New Holland, which had been sent to England by Cunningham in 1829, and had flowered every year in the garden at Kew, and borne ripe fruits, although the flowers were all females; no trace of polliniferous organs could be seen. The plant forms a new genus of the Euphorbiaceæ.

I have also been obliged to publish a small work†, in which are discussed the phænomena I have observed during the

* Annals of Natural History, September 1839, p. 68.

† Meyen, Noch einige Worte über den Befruchtungsakt und die Polyembryonie bei den höheren Pflanzen. Mit 2 Steintafeln in quarto, Berlin, 1840.—[A translation of this work will appear in the forthcoming Part of Taylor's Scientific Memoirs.—Ed.]

actual fecundation, namely, on the conjunction of the pollen-tube with the embryo-sac, and at the entrance of the pollen-tube into the cavity of the nucleus. The greater part of these observations is already published in the third part of my 'Physiology,' but here all the facts which have reference to this subject are arranged together, and indeed more clearly than at first, for many points have become more evident to me by continued observation. An eminent physiologist has stated, that it appeared from my experiments that the embryo was produced by the injection of the fovilla, or fertilizing substance of the pollen-tube, into the embryo-sac, but I never had such a view of the act of fecundation of plants; and in the above-mentioned treatise the meaning of the observations is explained more clearly. In some species of *Mesembryanthemum* I have been able to observe the union of the pollen-tube with the embryo-sac much more accurately than before, particularly the curious lateral junction of the apex of the pollen-tube with the side of the summit of the embryo-sac in the case of *M. pomeridianum.*

In consequence of this junction, in which the act of fecundation consists, there is formed at the summit of the embryo-sac, directly under the point of junction, a little bladder, the so-called germinal vesicle (Keimbläschen), from which the suspensor and the embryo-bladder are produced, which is described and delineated. I never saw a larger embryo-sac than in this *Mesembryanthemum*, in which the ovulum is half curved, and is twisted back by a bend in the umbilical cord. In the case of *M. linguæforme*, the junction of the pollen-tube with the embryo-sac takes place exactly at the extremity; and after the germ-bladder is formed, the end of the pollen-tube enlarges considerably, and remains so for a very long time; while in perfectly similar species the pollen-tube disappears directly after fertilization, etc.

M. Decaisne* has laid before the Academy of Paris a very interesting research on the development and structure of the flowers of *Viscum album*, and MM. Mirbel, Jussieu, and Ad. Brongniart have given a report of the results, of which we can here mention only the most important.

The cells of the anthers and of the calyx-leaves, with which the former are grown together, do not exhibit in their form any difference, except that the latter are filled with a green substance, whereas the former are colourless. Five

* Dévelopement du pollen dans le Gui; changemens que présentent ses ovules et ceux du Thesium.—Comptes Rendus de 1839, 11 Fevrier, p. 201. —[Translated in the Annals of Natural History for May 1841, p. 185.—Ed.]

months before blossoming the cellular tissue of the anthers is uniform, and is divided into small cavities with green sides or walls. These cavities increase, and their cellular contents vanish in order to make room for other cells of large size, which are called "les utricules polliniques" (so-called primitive or mother-cells, Mutterzellen), and for one or two nuclei mixed with an infinite number of very small globules; the nuclei are the commencement of the pollen-grains; these "utricules" thicken, become opake, and exhibit concentric, more or less regular, layers in their circumference; and finally in each tube (Mutterzelle! M.) there are enclosed four yellowish nuclei, which are more or less rounded, and have in the centre a bright spot. Afterwards, the substance which caused the thickening of the "utricules polliniques" deposits itself between each of the four nuclei which were contained therein, and produces cavities having the form of the nuclei (this is the formation of the special primitive cells, Specialmutterzellen, M.); and finally this substance disappears, and the pollen-grains are found lying free in the cavity of the anther. In this matured state they exhibit small papillæ on their surface; and when the nucleus which they previously contained has disappeared, an inner membrane is also to be seen. The anthers of *Viscum album* do not possess those retiform cells which are seen in so many other plants.

From the first appearance of the flower, the ovarium, as well as the anthers, coheres with the calyx, and it consists of a green, uniform, cellular mass, in which no cavities are to be distinguished. Some time after the blossoming one observes two small holes, which are formed in the circumference of the ovarium, and in the centre of the cellular tissue. After fertilization these cavities increase, and on their junction they represent the cavity of the endocarpium. In Paris the Misseltoe blossoms in March or April, and the ovulum appears at the end of May or in the beginning of June. About this time it makes its appearance as a pulpy wart, fastened to the base of the endocarpium; it is generally accompanied by two fine filaments, which are the rudiments of two abortive ovula.

As no ovulum-tunics (eyhüllen) were observed, M. Decaisne concludes that the ovulum is here in its simplest form, and consists solely of a nucleus; but from observations I have made, it is evident that the embryo-sac, with the contained albuminous body and the embryo, were mistaken for the naked ovulum or simple nucleus: the following statements are therefore to be corrected; the proofs of the above will appear hereafter in a research by myself. The report

proceeds thus: When the seeds of *Viscum* contain more than one embryo, it is to be explained by the development or cohesion of two ovula, of which one is generally abortive, etc. The green vascular covering which is seen on the ripe seed, constitutes, according to M. Decaisne, a part of the fruit, and is the endocarp. This will however be seen to be incorrect.

M. Schleiden* has published some remarks on the flowers of the Loranthaceæ, and particularly of *Viscum album*; he draws attention to the fact that this form of flower is probably the simplest which can exist, for it consists of two pairs of leaves placed in a circle, which in the male flowers are metamorphosed into anthers, and in the females have more the nature of a calyx. Between these sits the straight, naked nucleus, and the embryo-sac is said to be formed in the pith of the stalk (pedunculus). The grains of pollen appear on the top of the nucleus, enter into it several together, and thus produce the Polyembryony. M. Schleiden considers the berry to be the pedunculus, which has become succulent, and whose tissue is metamorphosed into that harder and firmer kind which forms the skins of the seeds. The regular form of the anthers of *Viscum album* is usually bilocular and four-celled, but each cell is divided into several compartments by partitions, and regular anthers seldom occur on account of monstrosity. In *Viscum verticillatum* the spike consists of three pairs of bracts; the upper pair has only one flower, and each of the others three, which afterwards form a "*Verticillus spurius*," while the end flower is wanting. In *Loranthus* the point of the naked nucleus is lengthened so as to assume the appearance of a style. At the end M. Schleidan observes, that the Loranthaceæ, in a parasitic form, represent the intervening step between the Coniferæ and the higher families.

I have also published some observations on the formation of the seeds of *Viscum album*†. The Polyembryony so often observed in the seeds of this plant is caused by the appearance of several embryo-sacs together, only one of which, however, usually becomes fully developed, while the others are abortive; I could not observe anything confirmatory of the statement of M. Decaisne, viz. that the embryo in this plant consists of several single embryos grown together. It is by no means seldom that several embryo-sacs contained in the same nucleus are fertilized, but six or eight weeks afterwards only one of them comes to perfect development;

* Botanische Notizen. In Wiegmann's Archiv, etc. v. 1839, i. 211-214.
† Noch einige Worte, etc. etc., pp. 39-50.

and therefore the doubling or trebling of the radicular end of the embryo of *Viscum* cannot be explained as owing to the cohesion of several embryos.

The structure of the female flower of *Viscum* is very simple; it consists of a single bottle-shaped nucleus, which is surrounded by a calyx-like organ, from which, at a later period, the white fleshy and gummy matter is produced which encloses the seeds and represents the pericarpium. In this calyx are inserted the leaves which may be held for petals; in the male flowers they are metamorphosed into anthers. In *Viscum* the nucleus is always situated on the apex of the principal or collateral axis; the end of it receives the pollen, and therefore takes the place of the micropyle; but in the base of the nucleus is formed the embryo-sac, which grows upwards into the cavity which has been formed in the nucleus; and therefore the embryo-sac is not developed in the point of the stalk, as M. Schleiden has stated, but just as usual, in the interior of the nucleus. I could never observe the fecundation by means of pollen-tubes; but directly after fecundation the embryo-sac becomes divided by means of partitions into a number of large cells, in which, at a later period, the albuminous body is formed. The embryo remains four or five weeks in the first stage of development in form of a small vesicle in the top cell of the embryo-sac, and when almost all the cells have produced albumen, it increases with great rapidity, and breaks through all the partitions of the embryo-sac from the top downwards. A series of drawings is annexed to the Memoir, and will give the requisite explanation.

Towards the end of the year I was fortunate enough to find a specimen of misseltoe which had two embryos in almost every one of the numerous seeds, which germinated very well when laid on the moist window-frame. There were the same number of rootlets as of perfect embryos in the seed, and the embryos were generally a little conjoined at their cotyledon end, but a complete cohesion never took place. The curious position which the embryos in the misseltoe seeds assume when there are several together, may be explained by the growing together of the albuminous bodies and by their peculiar form. Each embryo is formed in the axis of its own albuminous body, which at the micropyle end becomes ten or fifteen times thicker than at the lower end; and therefore, when their edges grow together, their axes must form an angle with each other, which varies from 40° to 60°.

I have also made some remarks on the different circumstances under which Polyembryony appears.

M. Horkel* read a treatise in the Academy of Sciences of Berlin concerning the Polyembryony of the Coniferæ; his own researches on this subject agreed perfectly with those of Robert Brown. In 1819 he had observed the small cavities which appear in the end of the albumen of *Abies excelsa*; and in the seed of *Pinus Cembra* he observed, together with the embryo, two abortive rudiments. In *Abies excelsa* M. Horkel observed the rudiments of the ovula assume that form in which Robert Brown has called them "Funiculi;" they lay in the middle of the great cavities of the albumen, parallel to each other, generally three together, seldom four; but M. Schleiden has observed six rudiments in *Pinus echinata.* In *Taxus baccata* M. H. never saw fewer than two rudiments, but generally three; but sometimes there is only one cavity in the apex of the albumen. In the Cupressineæ M. Horkel always found only one cavity for the formation of the embryo, lying in the axis of the albumen, but always two or four pollen-tubes entered the cavity; the Polyembryony of these plants may therefore be ranked with that of *Citrus*; it is, however, not so accidental, but belongs more to their nature.

M. Decaisne† has published some interesting researches on the structure and fecundation of the ovulum of "Thesium," which confirm the opinion I gave of Griffiths's description of the structure of the seeds of *Santalum album* (former Report, p. 33). A short time after fecundation has taken place a tube (Schlauch) is seen to proceed out of the ovulum; this tube connects itself with another very fine one which descends into the cavity of the ovulum from above. After the combination of these two has taken place, the tube swells and assumes the form of a bladder, the lower part becomes filled with cells. This tube is the embryo-sac, in the top part of which the embryo is formed in shape of a small round bladder; and what is most remarkable is, that it is quite naked, and therefore lies outside the nucleus (we have already shown that this is also the case with Leguminosæ, where however the embryo-sac is enclosed in tunics (Eyhüllen, M.)); and that the seed is also naked, only covered by the thin membrane of the embryo-sac. During this formation of the embryo one observes that a simple tube is formed, which is digitate at the bottom and swollen at the apex; the column pierces this bag, in the centre of which it is enclosed, towards the point of insertion of the impregnated ovulum, and places

* Berichte über die Verhandlungen der Academie der Wissenschaften zu Berlin, aus dem Jahre 1839, p. 92.

† De l'ovule du Thesium.—Compt. Rend. 1839, No. 6, p. 203.

itself with its swollen end (in the form of a retort) over one of the apices of the sac of the neighbouring embryo. M. Decaisne considers this peculiar tube to be a nutritive vessel, which replaces at the same time the chalaza; and I myself believe (although I have not examined the subject) that this tube is either directly produced out of the end of the pollen-tube, as in the case of *Mesembryanthemum linguæforme*, or that it is a peculiar formation of the embryo-supporter, as in *Ceratophyllum*, etc.

M. Emil Kratzmann*, in his inaugural dissertation, has treated of the seeds of plants; and although he remarks in the introduction, that his work is only a compilation and does not pretend to originality, still I cannot but recommend this carefully compiled and complete paper to all those who have not access to the larger botanical works. The treatise is divided into five parts; namely, of the præformation-stadium of the seed, of its production and formation, its evolution (ripening), then of the structure of the ripe seed, etc., and lastly of the circumstances under which the germination of the seed takes place.

M. Adrien de Jussieu† has published a very interesting research on the embryos of the Monocotyledons: after an historical introduction he gives the general characters of the monocotyledonous embryos, and then proceeds to the enumeration of the peculiarities exhibited by the embryos of the different genera. The most common form of the monocotyledonous embryo is either that of a cylinder with rounded ends, or of a more or less lengthened ellipsoid. Sometimes the cotyledon end is broader; sometimes, and indeed more frequently, the radicular end is enlarged; often the small blunt point on the radicular end, at which the suspensor terminates, remains, but before the ripening of the embryo it always projects. The position of the bud (Knöspchen) is determined by that of the rootlet; it appears as a small prominence at one side of the circumference; this projection is seen in the cotyledonar fissure. In rare cases this cleft is opened its whole length, and its sides allow the first leaflets of the bud to be visible throughout their whole length, as in the case of *Ouvirandra*. In other cases the sides of the clefts touch in the middle, and separate both upwards and downwards; and in this case the apex of

* Die Lehre vom Saamen der Pflanzen. Mit 4 lithographeiten Tafeln. Prag. 1839. 8.

† Sur les Embryons monocotylédones.—Lu à l'Académie des Sciences dans le séance du 1 Juillet 1839; Ann. des Sciences Naturelles, Part. Bot. 1839, i. 341—361.

the blossom comes out through one of the openings (the upper one), as in *Aponogeton distachys*, etc., or as in *Sparganium ramosum, Commelina tuberosa*, etc., where no trace of it is seen. In most cases the sides of the cleft are connected the whole length, and the cleft appears then as a line, which is either straight or curved; a transverse section then shows the position of the edges of the cleft. All these cases are fully explained by a series of beautiful delineations. The little bud appears in the form of a small wart at the bottom of a circular, oval or lozenge-shaped frame (Einfassung); in *Amaryllis carnea* the edges of the cleft are open only above, and the rest of their length they are grown together. The cleft appears horizontal (*Veratrum*), and when the edges become lengthened it acquires the appearance of a divided or even of a simple ligula, according as the inner edges are more or less perfectly connated. In *Rajania hastata* and *Tamus communis* the inner edges remain free. Finally, says M. de Jussieu, the destruction of the continuity in the cotyledon end of the embryo can sink to a mere point, as is very frequently the case in the Gramineæ and Cyperaceæ, or this point may entirely escape observation; however, all these modifications are only different degrees of the same organization. As one may draw a conclusion concerning the position of the bud from the position of the cleft, one soon observes the relation existing between the cotyledon and the radicle end; the former is often much larger than the latter.

M. de Jussieu then proceeds to the examination of Lindley's theory, according to which the monocotyledonous embryo may be considered as a dicotyledonous, from which one cotyledon has disappeared, and the other has wound itself round the plumula and grown together at the edges. M. de Jussieu brings forward a number of interesting observations in opposition to this theory, and arrives at the result that the monocotyledonous embryo, as far as regards its cotyledon part, may be perfectly compared to a bud. Finally, the variable forms which the monocotyledonous embryos assume are considered; and the author concludes, that the stem of some monocotyledonous embryos has a disproportionate excrescence on one side, which has to a certain extent the appearance of a cotyledon, and performs its functions, particularly in such cases where the true cotyledon is imperfect, and reduced to the state of a mere case or sheath. It is to be expected, that this subject, treated of by M. de Jussieu, will shortly receive its perfect solution; it is however a gigantic work to examine the genesis of all the above-mentioned monocotyledonous embryos, particularly as it appears that the formation of the cotyledon is

different in various families. I here refer to what I have observed of its formation in *Maïs.*

In the Botanical Society of Edinburgh* Mr. Giraud read a treatise on the structure and function of the pollen, from which it appears that he has arrived at the same results as have been published in the modern German works on this subject. In *Crocus vernus* Mr. Giraud saw three pollen tunics; and on the surface of the pollen grains of *Polemonium cœruleum* he found small opake particles, which exhibited a peculiar motion as soon as put into water. The grooves which are found on some spherical and ellipsoidal pollen grains do not appear to Mr. Giraud to be clefts in the outer membrane. The chemical examination of pollen showed the presence of potash in the pollen of *Antirrhinum majus*, as also of acicular crystals of phosphate of lime, etc., etc. Mr. Giraud found also that warmth assists the formation of the pollen-tubes.

In the 'Botanical Register' † is a note on the appearance of amylum on the surface of the pollen grains of *Polemonium cœruleum*, the formation of which is derived from the primitive cells (Mutterzellen). [The presence of amylum, if it be really true, can only be considered as an exception to the rule and as unimportant, for it is by no means general.—*Meyen.*]

At the meeting of Naturalists at Freiburg M. A. Braun ‡ made known his observations on the arrangement in the bursting of the anthers; he proved that the order in which the anthers open agrees only in few cases with the genetic succession of the stamina, indeed is sometimes just the contrary; but in most cases where a real succession takes place, it stands in no relation to the genesis. From a great number of observations M. Braun draws the following cases, in which the order of the opening of the anthers appears:—

I. Simultaneous opening of all the anthers. II. Cyclous-successive opening, and either in centripetal or centrifugal succession. III. One after the other (gliederweise) successive opening; this takes place, 1. in spiral succession, (*a.*) centripetal or progressive, (*b.*) centrifugal or regressive, (*c.*) from the central region, passing either forwards or backwards, and (*d.*) in a determinate spiral, etc., or, 2. the opening does not take place in spiral succession. Here it passes regularly from one side of the flower to the other, or in an apparently irregular but still constant succession.

By a communication in M. Mussehl's 'Praktischem Woch-

* Annals of Natural History, April 1839, p. 127.
† 1839, p. 52. ‡ Flora von 1839, p. 302.

enblatte des Neuesten und Wissenswürdigsten für Landwirthschaft,' etc., 1839, No. 41, my attention was drawn to an article in M. Riecke's Journal, on "Twofold Ennobling" of fruit-trees. Under this name is understood the ennobling of stems or twigs which have been produced from already ennobled stocks, by which means the excellence of the fruit is said to be greatly increased.

Treffz is said to have made known several instances of this "twofold ennobling" in the 'Taschenbuch für Natur- und Gartenfreunde' for 1803, from which it appeared that apple-trees which had been twice ennobled were distinguished from trees of the same kind by the excellence of their fruit. Currants and gooseberries gave excellent fruit after the first, but more especially after the third and fourth ennobling. More striking is the effect of such an ennobling in the case of the apricot and quince: the apricot, which has a dry flesh, was planted on a green Reineclaude; the quince, which in its raw state is not eatable, was put on an excellent autumnal bergamot pear. Treffz relates of the apricot, that the branch, on account of its excessive luxuriance, only bore fruit in the fifth year; but one as juicy as the Reineclaude, of a more reddish yellow colour and more delicate taste. The quince bore fruit in the third year, which became ripe in the beginning of September, and whose flesh, even in this first double ennobling, was much more tender, and free from hard parts.

I hereby bring this subject forward, and hope that more experiments may be instituted, and that those that have been already made may become more generally known. The above observations do not prove the usefulness of the double ennobling, but appear to prove that the nature of the graft is changed by the subject; for bad fruits were grafted on good ones (which is not generally the case), and better fruit was obtained.

[To be continued.]

XXII.—*Notes on Birds.* By T. C. Eyton, Esq., F.L.S., &c.

No. 2.

Bizeura lobata, Shaw.

Integuments very thick and strong. Tongue large, broad and thick, with an appendage at the tip, such as is generally found in Ducks; a deep groove down the centre, and two others placed so that their points meet towards the tip, and diverge as they continue backwards, forming a chevron; a lunate groove placed transversely near the middle of the tongue; the horns turned backwards. The

whole length of the lateral margins furnished with feeble bristles intermixed with a few small spines; a little posterior to the centre is a row of strong spines placed transversely. The region of the glottis and upper part of the œsophagus are also studded with spines.

Trachea of large and nearly uniform diameter throughout, slightly contracted immediately above the inferior larynx; rings forming it large and strong, furnished with the usual sterno-tracheal muscles, which are rather strong: a second pair branch from them to the last ring of the trachea, between which and the upper ring of the bronchiæ is stretched a membrane, which these muscles give the bird the power of rendering tense: bronchiæ of moderate length; lungs very large.

Œsophagus smallest at the upper extremity and gradually expanding to the proventriculus, where it is double the diameter of the upper end: proventriculus scarcely perceptible: stomach of moderate size; the epithelium presents a hard and granulated appearance; a few fragments of shells mixed with pebbles were found in the stomach.

The intestinal canal is of moderate size and length, and has its exit from the stomach very near the œsophagus. The cæca are long, largest and rounded at the extremities; cloaca small; liver bilobed; gall-bladder large.

	ft.	in.
Length of intestine, from stomach to cloaca	5	10
Length of cæca	0	6
Length of rectum	0	5
Length of stomach	0	2
Breadth of stomach	0	1½
Greatest diameter of œsophagus near the proventriculus	0	1
Least diameter of œsophagus at the upper extremity	0	0½

Skeleton very strong and heavy, particularly the bones of the head. Sternum of moderate size, very convex on its lower surface; the posterior margin indented by two moderate-sized lateral fissures; the processes forming their exterior margins continued backwards beyond the central portion of sternum, which has a slight indentation opposite to the extremity of the keel. The keel shallow, not continued: the posterior margin of the sternum, the inferior edge slightly arched, anterior edge scolloped; the inferior extremity, to which the os furcatum is attached, slightly produced forwards beyond the other portions of the sternum.

Coracoids of moderate length, strongly articulated with the sternum.

Os furcatum arched anteriorly, the rami much flattened transversely.

Pelvis long, narrow, broadest posteriorly. Dorsal line nearly straight. The posterior extremities of the os pubis turned abruptly downwards from their junction with the ischium and bent slightly towards each other. Obturator and ischiadic foramina very large and oval, the former the longest and narrowest.

Ribs strong, broad, continued far backwards, seven true and three false; one false one placed anteriorly, the other two posteriorly.

Vertebræ short, strong, the lateral processes of the caudal ones much lengthened.

Cer. 15. Dor. 6. Sac. 19? Caud. 9.

The three anterior sacral vertebræ have ribs attached; the posterior caudal one is pointed at the extremity.

Remarks.—The anatomy of the above bird, as might have been expected from its external appearance, presents a strong resemblance to the Toti-palmate division of Water-birds. The trachea is precisely that of a Cormorant, and is also furnished with the same muscles of voice.

The tongue and digestive organs resemble those of the sea- or shell-feeding Ducks of the genera *Clangula*, *Melanitta*, and *Nyroca*. I suspect, however, that they will be found to come more nearly to *Micropterus*, King, than any other genus; but there at present being no published account of the anatomy of this bird, of course it is merely conjecture.

The skeleton may be said generally to resemble the Cormorants and Gannets, with the exception of the head, which approaches very nearly in form to that of *Clangula*.

The posterior margin of the sternum resembles that of *Sula*; but in being much broader posteriorly than anteriorly, it resembles the *Fuligulinæ*. The remainder of this bone resembles very closely that of the Common Cormorant; nearly the only distinction being, that the anterior edge of the keel is not much produced forwards, as in that bird, in which respect it agrees with *Melanitta*.

The pelvis, with the exception of its being rather broader posteriorly in proportion to its length, is precisely that of a Toti-palmate bird.

The coracoids, in not being so long as among the Cormorants, the os furcatum, the wings and leg-bones, resemble in every particular those of the Sea-ducks.

XXIII.—*Notices of European Herbaria, particularly those most interesting to the North American Botanist*.*

[Concluded from p. 140.]

Besides the herbaria already mentioned, there are two others in London of more recent formation, which possess the highest interest as well to the general as to the American botanist, viz. that of Professor Lindley, and of Mr. Bentham. Both comprise very complete sets of the plants collected by Douglas in Oregon, California, and the Rocky Mountains, as well as those raised from seeds or bulbs, which he transmitted to England, of which a large portion have, from time to time, been published by these authors. Mr. Bentham's herbarium is, probably, the richest and most authentic collection in

* Communicated to Silliman's American Journal by the Author, Dr. Asa Gray.

the world for Labiatæ, and is perhaps nearly unrivalled for Leguminosæ, Scrophularineæ, and the other tribes to which he has devoted especial attention: it is also particularly full and authentic in European plants. Professor Lindley's herbarium, which is very complete in every department, is wholly unrivalled in Orchidaceous plants. The genus-covers are made of strong and smooth hardware paper, the names being written on a slip of white paper pasted on the lower corner. This is an excellent plan, as covers of white paper in the herbarium of an active botanist are apt to be soiled by frequent use. The paper employed by Dr. Lindley is 18½ inches in length, and 11½ inches wide, which, as he has himself remarked, is rather larger than is necessary, and much too expensive for general use.

The herbarium of Sir William J. Hooker, at Glasgow, is not only the largest and most valuable collection in the world, in the possession of a private individual, but it also comprises the richest collection of North American plants in Europe. Here we find nearly complete sets of the plants collected in the Arctic voyages of discovery, the overland journeys of Franklin to the polar sea, the collections of Drummond and Douglas in the Rocky Mountains, Oregon, and California, as well as those of Professor Scouler, Mr. Tolmie, Dr. Gairdner, and numerous officers of the Hudson's Bay Company, from almost every part of the vast territory embraced in their operations, from one side of the continent to the other. By an active and prolonged correspondence with nearly all the botanists and lovers of plants in the United States and Canada, as well as by the collections of travellers, this herbarium is rendered unusually rich in the botany of this country; while Drummond's Texan collections, and many contributions from Mr. Nuttall and others, very fully represent the flora of our southern and western confines. That these valuable materials have not been buried, nor suffered to accumulate to no purpose or advantage to science, the pages of the 'Flora Boreali-Americana,' the 'Botanical Magazine,' the 'Botanical Miscellany,' the 'Journal of Botany,' the 'Icones Plantarum,' and other works of this industrious botanist, abundantly testify; and no single herbarium will afford the student of North American botany such extensive aid as that of Sir William Hooker.

The herbarium of Dr. Arnott of Arlary, although more especially rich and authentic in East Indian plants, is also interesting to the North American botanist, as well for the plants of the 'Botany of Captain Beechey's Voyage,' etc., published by Hooker and himself, as the collections of Drummond and others, all of which have been carefully studied by this sagacious botanist.

The most important botanical collection in Paris, and indeed perhaps the largest in the world, is that of the Royal Museum, at the Jardin des Plantes or Jardin du Roi. We cannot now devote even a passing notice to the garden and magnificent new conservatories of this noble institution, much less to the menagerie, the celebrated museum of zoology and anatomy, or the cabinet of mineralogy, geology and fossil remains, which, newly arranged in a building recently erected for its reception, has just been thrown open to the public.

The botanical collections occupy a portion of this new building. A large room on the first floor, handsomely fitted up with glass cases, contains the cabinet of fruits, seeds, sections of stems, and curious examples of vegetable structure from every part of the known world. Among them we find an interesting suite of specimens of the wood, and another comprising the fruits or nuts of nearly all the trees of this country, both collected and prepared by the younger Michaux. The herbaria now occupy a large room or hall, immediately over the former, perhaps 80 feet long and 30 feet wide above the galleries, and very conveniently lighted from the roof. Beneath the galleries are four or five small rooms on each side, lighted from the exterior, used as cabinets for study and for separate herbaria; and above them the same number of smaller rooms or closets, occupied by duplicate and unarranged collections. The cases which contain the herbaria occupy the walls of the large hall and of the side rooms. Their plan may serve as a specimen of that generally adopted in France. The shelves are divided into compartments in the usual manner; but instead of doors, the cabinet is closed by a curtain of thick and coarse brown linen, kept extended by a heavy bar attached to the bottom, which is counterpoised by concealed weights, and the curtain is raised or dropt by a pulley. Paper of a very ordinary quality is generally used, and the specimens are attached, either to half sheets or to double sheets, by slips of gummed paper, or by pins, or sometimes the specimen itself is glued to the paper. Genera or other divisions are separated by interposed sheets, having the name written on a projecting slip.

According to the excellent plan adopted in the arrangement of these collections, which is due to Desfontaines, three kinds of herbaria have been instituted; viz. 1. The general herbarium. 2. The herbaria of particular works or celebrated authors, which are kept distinct, the duplicates alone being distributed in the general collection. 3. Separate herbaria of different countries, which are composed of the duplicates taken from the general herbarium. To these, new accessions from different countries are added, which from time to time are assorted and examined, and those required for the general herbarium are removed to that collection. The ancient herbarium of Vaillant forms the basis of the general collection: the specimens, which are all labelled by his own hand, are in excellent preservation, and among them plants derived from Cornuti or Dr. Sarrasin, may occasionally be met with. This collection, augmented to many times its original extent by the plants of Commerson, Dombey, Poiteau, Leschenault, etc., and by the duplicates from the special herbaria, probably contains at this time thirty or forty thousand species. Of the separate herbaria, the most interesting to us is that made in this country by the elder Michaux, from whose specimens and notes the learned Richard prepared the 'Flora Boreali-Americana.'

Michaux himself, although an excellent and industrious collector and observer, was by no means qualified for authorship; and it is to L. C. Richard that the sagacious observations, and the elegant, terse, and highly characteristic specific phrases of this work are entirely due.

There is also the very complete Newfoundland collection of La Pylaie, comprising about 300 species, and a set of Berlandier's Texan and Mexican plants, as well as numerous herbaria less directly connected with North American botany, which we have not room to enumerate. Here, however, we do not find the herbaria of several authors, which we should have expected. That of Lamarck, for instance, is in the possession of Professor Rœper at Rostock, on the shores of the Baltic; that of Poiret belongs to Moquin-Tandon of Toulouse; that of Bosc, to Professor Moretti of Pavia; and the proper herbarium of the late Desfontaines, which, however, still remains at Paris, now forms a part of the very large and valuable collections of Mr. Webb. The herbarium of Mr. Webb, although of recent establishment, is only second to that of Baron Delessert; the two being by far the largest private collections in France, and comprising not only many older herbaria, but also, as far as possible, full sets of the plants of recent collectors. The former contains many of Michaux's plants (derived from the herbarium of Desfontaines), a North American collection, sent by Nuttall to the late Mr. Mercier of Geneva, a full set of Drummond's collections in the United States and Texas, etc. The latter also comprises many plants of Michaux, derived from Ventenat's herbarium, complete sets of Drummond's collections, etc. But a more important, because original and perhaps complete set of the plants of Michaux, is found in the herbarium of the late Richard, now in the possession of his son, Professor Achille Richard, which even contains a few species that do not exist in the herbarium at the Royal Museum. The herbarium of the celebrated Jussieu, a fine collection, which is scrupulously preserved in its original state, by his worthy son and successor, Professor Adrien Jussieu, comprises many North American plants of the older collectors, of which several are authentic for species of Lamarck, Poiret, Cassini, etc.

The herbarium of DeCandolle at Geneva, accumulated throughout the long and active career of this justly celebrated botanist, and enriched by a great number of correspondents, is surpassed by few others in size, and by none in importance. In order that it may remain as authentic as possible for his published works, especially the 'Prodromus,' no subsequent accessions to families already published are admitted into the general herbarium, but these are arranged in a separate collection. The proper herbarium, therefore, accurately exhibits the materials employed in the preparation of the 'Prodromus,' at least so far as these were in Professor DeCandolle's own possession. As almost twenty years have elapsed since the commencement of this herculean undertaking, the authentic herbarium is of course much less rich in the earlier than in the later orders. The Compositæ, to which seven years of unremitted labour have been devoted, form themselves an herbarium of no inconsiderable size. It is unnecessary to enumerate the contributors to this collection (which indeed would form an extended list), since the author, at least in the later volumes of the 'Prodromus,' carefully indicates, as fully as the work permits, the sources whence his materials have been derived. The paper employed is of an ordinary kind, some-

what smaller than the English size, perhaps about fifteen inches by ten; and the specimens are attached to half-sheets by loops or slips of paper fastened by pins, so that they may readily be detached, if necessary, for particular examination. Several specimens from different sources or localities, or exhibiting the different varieties of a species, are retained when practicable; and each species has a separate cover, with a label affixed to the corner, containing the name, and a reference to the volume and page of the 'Prodromus' where it is described. The limits of genera, sections, tribes, etc. are marked by interposed sheets, with the name written on projecting slips. The parcels which occupy each compartment of the well-filled shelves are protected by pieces of binder's board, and secured by a cord, which is the more necessary as the cases are not closed by doors or curtains.

The royal Bavarian herbarium at Munich is chiefly valuable for its Brazilian plants, with which it has been enriched by the laborious and learned Martius. The North American botanist will, however, be interested in the herbarium of Schreber, which is here preserved, and comprises the authentic specimens described or figured in his work on the Grasses; the American specimens mostly communicated by Muhlenberg. The Gramineæ of this and the general herbarium have been revised by Nees von Esenbeck, and still later by Trinius. It was here that the latter, who for many years had devoted himself to the exclusive study of this tribe of plants, and had nearly finished the examination of the chief herbaria of the Continent, preparatory to the publication of a new 'Agrostographia,' was suddenly struck with a paralysis, which has probably brought his scientific labours to a close.

The imperial herbarium at Vienna, under the superintendence of the accomplished Endlicher, assisted by Dr. Fenzl, is rapidly becoming one of the most valuable and extensive collections in Europe. The various herbaria of which it is composed have recently been incorporated into one, which is prepared nearly after the English method. It however possesses few North American plants, except a collection made by Enslin (a collector sent to this country by Prince Lichtenstein, from whom Pursh obtained many specimens from the Southern States), and some recent contributions by Hooker, etc. There is also an imperfect set of the plants collected by Hænke (a portion of which are from Oregon and California), so far as they are yet published in the 'Reliquiæ Hænkeanæ' of Presl, in whose custody, as curator of the Bohemian museum at Prague, the original collection remains.

The herbarium of the late Professor Sprengel still remains in the possession of his son, Dr. Anthony Sprengel, at Halle, but is offered for sale. It comprises many North American plants, communicated by Muhlenberg and Torrey. The herbarium of Schkuhr was bequeathed to the University of Wittemberg, and at the union of this university with that of Halle was transferred to the latter, where it remains under the care of Professor Von Schlechtendal. It contains a large portion of the *Carices* described and figured in Schkuhr's

work, and is therefore interesting to the lovers of that large and difficult genus. The American specimens were mostly derived from Willdenow, who obtained the greater portion from Muhlenberg.

The royal Prussian herbarium is deposited at Schöneberg (a little village in the environs of Berlin), opposite the royal botanic garden, and in the garden of the Horticultural Society. It occupies a very convenient building erected for its reception, and is under the superintendence of Dr. Klotzsch, a very zealous and promising botanist. It comprises three separate herbaria, viz. the general herbarium, the herbarium of Willdenow, and the Brazilian herbarium of Sello. The principal contributions of the plants of this country to the general herbarium, garden specimens excepted, consist of the collections of the late Mr. Beyrich, who died in Western Arkansas while accompanying Col. Dodge's dragoon expedition, and a collection of the plants of Missouri and Arkansas, by Dr. Engelmann, now of St. Louis; to which a fine selection of North American plants, recently presented by Sir William Hooker, has been added. The botanical collections made by Chamisso, who accompanied Romanzoff in his voyage round the world, also enrich this herbarium; many are from the coast of Russian America and from California; and they have mostly been published conjointly by the late Von Chamisso and Professor Schlechtendal in the 'Linnæa,' edited by the latter.

The late Professor Willdenow enjoyed for many years the correspondence of Muhlenberg, from whom he received the greater part of his North American specimens, a considerable portion of which are authentic for the North American plants of his edition of the 'Species Plantarum.' In addition to these, we find in his herbarium many of Michaux's plants, communicated by Desfontaines, several from the German collector Kinn, and perhaps all the American species described by Willdenow from the Berlin garden. It also comprises a portion of the herbarium of Pallas, the Siberian plants of Stephen, and a tolerable set of Humboldt's plants. This herbarium is in good preservation, and is kept in perfect order and extreme neatness. As left by Willdenow, the specimens were loose in the covers, into which additional specimens had sometimes been thrown, and the labels often mixed; so that much caution is requisite to ascertain which are really authentic for the Willdenovian species. To prevent further sources of error, and to secure the collection from injury, it was carefully revised by Professor Schlechtendal while under his management, and the specimens attached by slips of paper to single sheets; and all those that Willdenow had left under one cover, as the same species, are enclosed in a double sheet of neat blue paper. These covers are numbered continuously throughout the herbarium, and the individual sheets or specimens in each are also numbered, so that any plant may be referred to by quoting the number of the cover and that of the sheet to which it is attached. The arrangement of the herbarium is unchanged, and it precisely accords with this author's edition of the 'Species Plantarum.' Like the general herbarium, it is kept in neat portfolios, the back of which consists of three pieces of broad tape, which, passing through slits near each edge of the

covers, are tied in front; by this arrangement their thickness may be varied at pleasure, which, though of no consequence in a stationary herbarium, is a great convenience in a growing collection. The portfolios are placed vertically on shelves protected by glass doors, and the contents of each are marked on a slip of paper fastened to the back. The herbaria occupy a suite of small rooms distinct from the working rooms, which are kept perfectly free from dust.

Another important herbarium at Berlin is that of Professor Kunth, which is scarcely inferior in extent to the royal collection at Schöneberg, but it is not rich or authentic in the plants of this country. It comprises the most extensive and authentic set of Humboldt's plants, and a considerable number of Michaux's, which were received from the younger Richard. As the new 'Enumeratio Plantarum' of this industrious botanist proceeds, this herbarium will become still more important.

For a detailed account of the Russian botanical collections and collectors, we may refer to a historical sketch of the progress of botany in Russia, etc. by Mr. Bongard, the superintendent of the Imperial Academy's herbarium at St. Petersburgh, published in the 'Recueil des Actes' of this institution for 1834. An English translation of this memoir is published in the first volume of Hooker's 'Companion to the Botanical Magazine.' A. G.

XXIV.—Excerpta Botanica, *or abridged Extracts translated from the Foreign Journals, illustrative of, or connected with, the Botany of Great Britain.* By W. A. Leighton, Esq., B.A., F.B.S.E., &c.

No. 6. *On the Development of the Reproductive Organs of the Misseltoe* (Viscum album, *Linn.*). By M. Decaisne. (Ann. des Sci. Nat. n. s. xiii. p. 292.)*

The male flower of the Misseltoe begins to be visible for nearly a year before its expansion. The anther is then not distinguishable from the green calyx by which it is embraced, except by the absence of colour, being formed of cellular tissue, the meshes of which are of similar form and dimensions. Somewhat later, in this interior and colourless portion, are formed many lacunæ, which apparently result from the destruction of the cellular tissue over these points, and which become filled with a mucilaginous fluid. A little later still, this mucilage is observed to be composed of utricules, with soft, very thin and transparent walls, considerably larger than the utricules of the adjacent parts, and connected solely by a viscous fluid. At this time the anther is constituted of three kinds of cellules; viz. the primi-

* [Prof. Meyen's remarks on this paper will be found at p. 169 of the present Number.—Ed.]

tive colourless cellules, which still form the greater portion of the mass; other cellules, of a grey or yellow colour, in the vicinity of the lacunæ, of which they constitute the walls, and chiefly remarkable by the presence of a central nucleus; and those larger cellules which fill the lacunæ, and which are identical with the utricules termed *polliniferous* by Mirbel.

These transparent utricules soon become obscured by the presence of numerous granules, in the midst of which are observed one or two bodies, likewise granular, but considerably larger, which we shall term nuclei (*noyaux*). These granules become gradually collected into a single mass in the centre of the utricule, which is thus rendered more opake in the centre, though still transparent through the increased thickness of its circumference. This mass may with care be abstracted entire from the cavity in which it is enclosed, when the nuclei will be found united, and at the end of some days four may be distinguished.

After the lapse of some time we perceive nothing more than these nuclei, the absorbed granules having disappeared. The nuclei are only separated by matter which at first is fluid, but subsequently becomes solidified, and their form is that of so many separate cells. During this same time, this matter becomes equally solidified on the interior walls of the utricule, so as to form a thickening, which is apparently the result of many successive layers, and its transparence becomes altered. Such is the state of the anther about four months after the appearance of the bud, when it exhibits on its internal face a considerable number of small cells, which are merely closed by the epidermis which extends over their apertures. In each of these cells are pollinic utricules, with thick succulent walls, marked with concentric zones, their internal cavity divided by thinner walls into four still smaller cavities, containing as many granular nuclei, which, on the rupture of their envelope under water, escape.

These latter nuclei continue to grow, become round and invested with a yellow papillose integument, and with their growth the walls and divisions of the utricules gradually diminish and finally disappear, when the nuclei of the different utricules are found all free together in the common cavity previously occupied by the polliniferous utricules; in short, they become so many grains of pollen in one of the cells of the anther. From this time these grains assume that external appearance which they ever afterwards retain, although not yet arrived at their complete development, which still goes forward in their interior. If by a slight pressure we burst one of them, the nucleus issues forth, together with

numerous scattered granules, from the external envelope, which is bristled over with minute asperities. When the grain is completely matured, a similar pressure causes the protrusion, from the same envelope, of a vesicle, which, on being itself burst, emits a multitude of granules; but there is no appearance of a nucleus.

On reviewing the above series of changes, we perceive that the formation seems generally to proceed from the exterior towards the interior, seeing that the vesicles are organized and filled with granules, in the midst of which are observed many centres (*moules*), which, to the number of four, associate or absorb the rest of the granules; that these vesicles become thickened by the formation of successive layers more and more internal, and are divided by their interposition between the granular centres; that these centres are invested with a primary envelope, which is finally lined on the inside by a final membrane, which immediately encloses the granules. These different parts are not co-existent, the older ones disappearing first, and probably furnishing the materials for the more recent, of which, in other respects, they do not constitute a part.

These observations accord both with those which are considered the most complete and certain on the formation of tissues, as well as with those which relate more particularly to the formation of pollen. To this latter phænomenon they contribute many new facts: such as the presence of these nuclei, the primary germs of the pollinic grains; the deposition of many successive layers on the walls of the mother utricule, and the instantaneous formation of divisions to which they themselves conduce; the origin of the proper envelope of the pollen.

In most other plants, when pollen arrives at maturity, some peculiar change takes place in the cellules constituting the internal walls of the cell, whose zones become thickened, and are finally divided into elastic filaments, whose play determines the dehiscence of the anther. Nothing similar to this takes place in the Misseltoe, whose anther can be scarcely said to be dehiscent, inasmuch as its cells are externally open. Moreover, the cellules composing its wall continue in the state above described, their component membrane being persistent, and of uniform thickness.

Nearly at the same time when the pollen has attained perfect maturity, the female flower is expanded, and the pollinic action is then for the first time able to take effect upon the newly-disclosed stigma. Nevertheless, the most delicate observation has failed to detect the ovulum either at this period

or for a long time after; in the minute flower, the tissue of the calyx, and that of the ovary in the centre agglutinated to it, being only visible, and a little later, in the interior of this ovary, at first plain, two small lacunæ are seen, which finally enlarge, unite, and form one cell with contiguous walls.

It is not until more than three months later that there is perceived at the bottom of this compressed cavity a very small, cone-shaped, pulpy body, accompanied by one or two still smaller club-shaped filaments. These are so many erect ovula, in two of which there is generally the commencement of abortion. They are composed of utricules superposed in circles, which in the ovulum to be developed are few in number, and in the abortive ovula are even reduced to a single one. In these utricules are a nucleus, and very numerous and minute grains of fecula.

The ovulum, on its appearance, increases rapidly, and after some days a small spot is detected towards its summit, which indicates the embryo. The development of this embryo, from its first appearance to maturity, has been observed by M. Decaisne, and is similar to that of other Dicotyledons.

It is different, however, with the body surrounding the ovulum. In general, as is well known, the ovulum is formed of many envelopes, enclosed one within the other, one or two of those most exterior being open at their summits, and the two innermost perfectly closed.

But M. Decaisne has been unable to discover in the ovulum of the Misseltoe any corresponding opening at the summit, and he has been led to conclude that the exterior envelopes (primine and secundine) are absent, and that the ovulum is a naked nucleus. He has moreover ascertained this nut to be composed of a homogeneous tissue throughout its whole thickness, which immediately embraces the embryo, and hence deduces the non-existence of a quintine or embryonic sac. It is in reality an ovulum reduced to its simplest expression, a sac enclosing the embryo. This sac thickens and solidifies as it grows, and forms a perisperm, the colour of which, being green, is unique among the families of plants. M. Decaisne has followed the progress of this colouring, which extends progressively from the base to the summit; he has seen, in the cellules of the nut, besides the nucleus and the grains of fecula by which at first it was exclusively filled, numerous green granules, which mingle with, but do not cover, the others; and he has thus observed this to be the process of the green tint in the vegetable tissues.

Another anomaly in the seed of Misseltoe is the plurality of embryos. This plurality is not rare in a great many

plants, being accidental in the greater number, though always constant in some. Ordinarily it occurs in seeds destitute of perisperm; but when this perisperm is also present, the embryos are pressed together at the same height, or at slightly different heights. This, however, is not so in the Misseltoe; for the embryos, two, or more rarely three in number, all touch each other by their lower extremities, and diverge at their upper or radicular extremities, which are distant, and separated by a portion of the perisperm, from which they slightly project.

M. Decaisne's discovery of many ovula in the bottom of each ovary leads to the most natural explanation of this phænomenon. In a great number of cases, two of these ovula are abortive, and then a single embryo only is found in the mature seed; but in other instances, two, or even three ovula, being fertilized, are developed and united by their bases, and then we have so many embryos diverging at their summits.

The results of this theory are, that it reduces the many apparent anomalies of the Misseltoe to a single real one, the unity of the ovular envelope, and thus restores the development of its seeds to known laws. It also effaces in part the difference between the ovular covering in the European Misseltoe and that of the Indian species noticed by Mr. Griffith, and in which three ovula are detected in each cell on a central support. Our Misseltoe thus forms a transition between them and *Loranthus,* in which the ovulum is really single and erect.

M. Decaisne has added to his memoir an examination of the anatomical structure of the stem. A young branch exhibits in its centre a green pith, surrounded by a case formed of woody bundles, generally eight in number. In these bundles we find no tracheæ; but nearly in the situation which they should occupy, only annular vessels. These, together with the elongated and pointed, or reticulated cellules, and the fibres analogous to those of the liber, constitute the whole vascular system of the plant, which is besides composed of utricules, in which abound, together with granules of starch, granules of green matter. Outside, and opposite to the woody bundles, are as many smaller ones, formed exclusively of fibres of liber, and which may therefore be termed *cortical.* The woody bundles are continued from one branch into another, whilst the cortical bundles are interrupted, after being attenuated, at each joint, whence results the facility with which the branches are disarticulated.

XXV.—*On the Origin of some of the Lower Forms of Vegetation.* By Mr. Henry Oxley Stephens.

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

Gentlemen,

No one ever directed his attention to the œconomy of the lower forms of vegetation without soon arriving at the highly interesting but perplexing problem of their origin and reproduction. No question in vegetable physiology is of higher moment than this, none surrounded by greater difficulties, and in none is the inquirer more prone to error than in attempting conclusions from the negative facts (if the term is admissible) with which he has to deal. The obscurity in which, from its very nature, the subject is involved, is so dense, that many physiologists avoid it altogether as hopeless, considering it to be beyond human intelligence; whilst, on the other hand, some rash speculators, drawing inferences which the doubtful premises cannot warrant, descend at once into the profound of materialism *, and do not hesitate to intrude with unholy footsteps within the sacred precincts of forbidden ground. Nevertheless, the origin of the lower tribes of Fungi (for it is to these alone this paper refers) is a question as open to discussion, and as fit for investigation, as any other point of Natural History. There is no perfect Fungus which is not furnished in some part with an apparatus which bears certain minute bodies called sporidia, having some degree of resemblance to the reproductive bodies (sporules) of Ferns, Mosses and Hepaticæ, which last are well known to produce their like kinds by a process analogous to the germination of seeds. It has been assumed (and indeed generally admitted, though I am not aware directly proved) that these sporidia are the seeds of Fungi, producing by cryptogamic germination the same species as the parent plant; whilst other physiologists, admitting the sporidia to be capable of continuing the species, do not consider this to be the only method, or as indeed at all adequate to account for the production of Fungi in certain situations.

This is the question we are about to discuss. It is argued in behalf of propagation by spores, that these bodies, which are produced in such numbers as to be beyond all estimate, must have a definite office to perform, and that from their peculiar lightness, they are, as soon as shed from the hymenian of the parent plant, wafted through the air, and thus

* [It does not seem clear in what sense our Correspondent employs this term.—Ed.]

distributed to almost any distance. Whilst I admit the spores to be the reproductive bodies, I dissent from the latter conclusion, which seems very doubtful, as far as observation will carry us in this difficult subject. I am inclined to think the spores of Agarics at least are not generally disseminated far from the spot on which the plant which produced them grew.

I have always found Agarics which bear spores of a colour easily seen, the *Leucosporidia* for instance, shed them underneath the pileus; and that the grass, &c. is covered with the spores only immediately around and beneath the plant, to which they adhere, and are not blown away as soon as shed. It will be said this must necessarily depend upon the atmosphere, whether the air is still or not; but the generality of Agarics lie very close to the ground, and the expansion of the pileus, extended like an umbrella, must, I think, even in windy weather, prevent any great current of air from passing under it. Perhaps this will be thought over-refined reasoning, but the following facts seem to countenance it. Particular species appear annually on the same spot of ground, and do not wander away from it; thus *Ag. nebularis*, Batsch, grows every autumn at one corner of Leigh Down, and does not spread from this locality. *Ag. personatus*, Fries, I have seen every autumn in the same situation for several years. *Ag. oreades* grows in eccentric circles, one circle exteriorly to that of last season, which would scarcely be the case if the sporules of this species were scattered about by the wind; but single individuals do occasionally occur: no doubt *Ag. oreades* is propagated in these circles by underground mycelia, but this circumstance does not affect the argument. The stump of a tree immediately under a plant of *Polyporus igniarius* will be seen densely dusted with sporules, showing that these fall near the spot occupied by the parent plant. It would be easy to multiply instances of the regularity with which Fungi appear in the same spot, but these are enough; and from them I infer that the dissemination of the spores of Fungi through the medium of the atmosphere has been greatly over-estimated. Taking into account the number of species of Fungi, and the great quantity of sporidia which each plant gives out, it seems to me the atmosphere must contain so many, that they would certainly be detected in it before this time, and yet none have ever been observed. The method of making what is called mushroom-spawn is too well known to need description, and every exhausted hot-bed will produce plants of *Ag. campestris*: how did the germs of these plants get there? It is answered, through the air: this has been considered before; besides, the mycelia will be found in the com-

post, several feet below the surface. But the spores were introduced with the horse-dung; true, but this is produced by stabled horses fed on hay, and the *Ag. campestris* does not grow in mowing grass, nor in the hay-making season, and the hay could scarcely contain such abundance of spores; besides, is it probable such minute and delicate bodies would pass through the digestive process of the animals' intestines entirely unaltered? It may be answered, oats frequently do; but the two cases are not alike. There is every reason for believing Fungi are produced from spores: the circumstance of exotic species appearing in foreign mould, *e. g. Aseroe rubra*, La Billardière, in earth from New Holland, seems to prove this; but to conclude they are invariably so produced, appears to me to be assuming much more than we really know, and that in the face of circumstances which render the reverse very probable.

In support of the hypothesis of the invariable origin of Fungi from spores, it is stated that wheat selected from specimens infected with *Uredo caries*, when sown, produces a bunty crop. This is scarcely a satisfactory argument, for such wheat may possess the tendency to this disease without being actually impregnated with the spores, just as we know the finest samples of wheat from hot climates produce mildewy crops when sown in our more cold and changeable latitude; besides, the experiments of Sir J. Banks with wheat sprung from sources infected with *Puccinia graminis* led to an opposite conclusion. It may be advanced, that wheat growing near Barberry bushes is rendered mildewy by infection from the parasitic Fungus frequently abounding on those trees; but the Barberry parasite is an *Æcidium*, whilst the plagues of wheat are always *Pucciniæ* or *Uredines*. The greatest difficulty is in the erumpent Fungi; how could they reach the situations in which they vegetate? It may be said precisely the same question arises in Zoology, and the arguments which apply to *Entophytes* will apply to *Entozoa*; this is only advancing a counter-difficulty, and the solution of one problem would probably explain the other. *Entophytes* must have their origin in one of the following methods: their spores must be introduced into the parent plant, and there, finding a suitable nidus and circumstances favourable for their growth, commence their proper vegetation; or the structures in which they grow must, under favourable conditions, have the power or quality of originating them out of their own organization.

There are difficulties in the way of both these theories. Of the first, the question arises, how are they introduced into the parent plant? There appears to be only two ways,

either by the spongioles of the roots, or through the stomates of the leaves. As far as our knowledge of the physiology of the spongioles extends, it seems improbable that they have the power of absorbing solids (for earths, etc., as silica, are absorbed in a state of solution), even when as minute as sporidia; nor does our imperfect acquaintance with the course of the sap enable us to say, that along with it innumerable spores can pass the long journey from the roots of an oak or pine tree to the leaves; this would be altogether an unproved assumption.

Besides, if these sporidia passed through the vascular tissue of plants, of late years these structures have been examined with such scrupulous and scrutinizing care through the most powerful microscopes, I should have conceived a stray spore must have been observed before this time, and yet none have ever been seen, simply, I presume, because there are none there to see. But they may be absorbed through the stomates into the leaves, and carried down along with the woody fibres, which, according to the theory of Du Petit Thouars, the leaves annually form. It is first necessary to prove the openings of the stomates are large enough to allow the sporidia to pass through them. If a sporidium of *Uredo* or *Puccinia* is a single plant reduced to the most simple condition, and not admitting of further subdivision, it is too large to find access to the external structure of the leaf through the orifices of the stomates; but it may be said the grumous contents of the sporidia of *Puccinia* and *Uredines* are prolific, and can pass through the stomata. In our present state of ignorance on this obscure subject, we can neither prove nor disprove this point, and I would wish to state every argument as fairly as I am able. Evergreens, which have thick coriaceous leaves and a horny cuticle, are well known to be very scantily supplied with stomates, and yet such leaves are prolific of entophytous Fungi, *e. g.* the leaves of Lauro-cerasus, holly and ivy; this is a negative argument against the introduction of spores through the exhalent orifices.

It is easy to produce some erumpent Fungi; you have only to break a living twig of oak so as to cause it to wither and die, leaving it attached to the tree, and *Cenangium quercinum* will appear beneath the bark. Now if this Fungus arises from spores already contained in the tree, and only waiting for the death of the twig to assume an active state of vegetation, the whole of the branches of the tree must be impregnated with countless multitudes of the spores of *Cenangium* (not to say of many other Fungi), which is an assumption

for which we have not the slightest shadow of evidence. There is scarcely a stick that died in the autumn, which is not, on the approach of winter, densely covered with *Tubercularia vulgaris*; there is no proof, when the stick was living, that the spores of this plant remained dormant within its cellular tissue.

It must be recollected that, admitting the hypothesis of the absorption of spores, the earth or air must be impregnated with them in countless myriads, and these most delicate globes or cells must possess a most extraordinary power of resisting putrefaction; and in the case of *Cenangium* preserve their vitality through an incredible space of time when imprisoned in the solid structure of the oak-tree; and yet the origin of Fungi, which are parasitic upon Fungi, according to the theory of their invariable production from spores, is still more inexplicable. The elegant little *Ag. Loveanus*, Berk., has its origin within the substance of the pileus of *Ag. nebularis*, Batsch, and bursts through the cuticle of the pileus of the latter plant. Now the parent plant is altogether cellular, having neither vessels or tubes of any kind through which we can suppose the spore, which gave origin to the *Ag. Loveanus*, could be transmitted.

I do not know how this can be explained according to the theory of absorption of spores contained in the earth.

The other theory is, that the structures which contain erumpent Fungi must, under certain favourable circumstances, have the power or quality of originating these plants out of their own organization. Inclined as I am to suppose some of the lower forms of vegetation may obtain their existence out of the ruins of the higher, according to certain definite laws imposed by the great Author of all things, which laws are to us altogether unknown, I should be sorry to be thought to be an advocate of the doctrine of what is called spontaneous generation; in plain language, things making themselves; it is too absurd to need disproof; or of equivocal generation, for nature emerged too perfect from the hands of her Creator to have anything doubtful or equivocal in any of her processes. These processes may *seem* doubtful or equivocal to us, simply because they are beyond our comprehension. Of the truth of the last theory of production of imperfect plants, it must be admitted there is no direct proof; it must rather be inferred from the difficulties and objections which have been advanced against the former. It is generally assumed by those who accept the latter theory, that out of the departing vitality of some higher organized vegetable (for I have considered the question throughout as referring to

vegetable life only) a lower degree of life and organization may arise, like the fabled Phœnix, from ashes, and thus the simpler forms of vegetation may derive their origin from the upper; but it must be admitted there are objections to this assumption, and those not of theory and speculation, but of fact and experience. Many erumpent Fungi have not their origin in dying vegetable matter, but in substances which have long lost all vitality, and therefore can part with none to the parasites which infest them;—*Sphæria entypa*, for example, which grows within the substance of wrought wood, such as posts and rails, the origin of which cannot be explained satisfactorily according to the latter theory of the production of imperfect vegetables. The whole subject is as interesting as obscure; and it is possible that an observer who had time and leisure for tracing, with the assistance of a microscope of sufficient power, the growth of some Fungus of the lowest organization, such as *Tubercularia*, might arrive at the ultimate point of its origin, and be enabled to decide whether it had its being from a metamorphosis of the organized structure of the parent plant, or sprung from a spore, and derived its nutriment only from the material in which the germ of the parasite was previously deposited.

HENRY OXLEY STEPHENS.

Terrell Street, Bristol, March 12, 1841.

XXVI.—*An Amended List of the Species of the Genus* Ovis. By EDWARD BLYTH, ESQ.*

THE arrival of various spoils of different species of wild sheep, since my memoir upon this genus of animals was read before the Society, enables me now to clear up several points which I formerly left as doubtful, as well as to include some additional species in the catalogue, and to indicate still more as probably distinct, and therefore desiderata to which the attention of travellers and others should be directed.

1. *Ovis Polii*, nobis (the Pamîr Sheep). In the narrative of the celebrated Venetian traveller, Marco Polo, we read (in Marsden's edition, p. 142) that upon the elevated plain of Pamîr, eastward of Bokhara, and which is 16,000 feet above the sea-level, "wild animals are met with in great numbers, particularly sheep of a large size, having horns three, four, and even six palms in length. The shepherds form ladles and vessels of them for holding their victuals.

* Read before the Zoological Society, July 28, 1840. The notes, bringing the subject up to the present state of information, are now added by the author for publication in this work.

They also construct fences for enclosing their cattle, and securing them against the wolves, with which they say the country is infested, and which likewise destroy many of the wild sheep or goats (*moutoni v. becchi* or 'boucs')." More recently, an animal called the *Rasse* was indicated, from report, in Sir Alexander Burnes's 'Travels in Bokhara,' ii. 208, and its horns have since been transmitted to the Royal Asiatic Society by Lieut. Wood, of Sir A. Burnes's party, through the medium of G. T. Vigne, Esq.* In this magnificent specimen of a frontlet I recognize (though with some hesitation) the *Ovis sculptorum,* formerly described by me from a horn in the Museum of the Royal College of Surgeons; but as the characters of that specimen, as originally drawn up by me, have not hitherto been published; as its flexure, too, which suggested the appellation of *sculptorum,* would appear to form a less extended spiral than is

* This pair of horns was labelled "*Rass,* or *Roosh*;" and Sir A. Burnes writes—"I heard of an animal called *Rasse* by the Kirghizes, and *Kooshgar* by the inhabitants of the low countries;" but Lieutenant Wood (in the narrative of his 'Journey to the Source of the Oxus,' p. 368) distinguishes between the "*Rass*" and "*Kutch-gar*;" the former "having straight spiral horns, and its dun colour being of a reddish tinge." Mr. Vigne is of opinion that this animal is no other than the *Markbur* (p. 155), which he tells me is found upon the hills of Budukshan, and which I consider to be a feral race of domestic Goats of remarkably large size, but otherwise not essentially differing from the Shawl Goat of the same countries. Of a specimen of the "*Kutch-gar,* or Wild Sheep," Lieut. Wood remarks—"It was a noble animal, standing as high as a two-year old colt [Kirghiz Pony?], with a venerable beard and two splendid curling horns, which, with the head, were so heavy as to require a considerable exertion to lift them. Though in poor condition, the carcass, divested of its offal, was a load for a baggage-pony. Its flesh was tough and ill-tasted; but we were told that in autumn, when the animal is in prime condition, no venison is better flavoured. The *Kutch-gar* is gregarious, associating in herds of several hundreds. They are of a dun colour, the skin more resembling the hide of a cow than the fleece of a [tame] sheep. A skeleton of this animal, and several complete crania, were deposited, I believe, at Indiana." This traveller confirms the statement of Marco Polo, mentioning that—"We saw numbers of horns strewed about in every direction, the spoils of the Kirghiz hunter. Some of these were of an astonishingly large size * * *. The ends of these horns, projecting above the snow, often indicated the direction of the road; and whenever they were heaped up in large quantities, there our escort recognized the site of a Kirghiz summer encampment." This was at 14,400 feet above sea-level. It is curious that the Kirghizes shoe their horses with, and make stirrups from, the horns of this animal. "The shoes are nothing more than a semicircular piece of horn placed on the fore part of the hoof. When the horse is in constant work, it requires renewal at least once a week." Burnes "was told that the *Rasse* is larger than a cow and less than a horse; of a white colour, with pendent hair under the chin * * *. The flesh is much prized by the Kirghizes, who hunt and shoot the animal with arrows. It is said to delight in the coldest climates, and a common-sized specimen will require two horses [Kirghiz Ponies] to bear its flesh from the field." The appellation *Rasse,* it may be remarked, is likewise bestowed on a small species of Civet, the *Viverra Rasse,* Horsfield, or *V. Indica,* Is. Geoff., but not of British authors.—E. B.

probably normal, and the habitat also proves to be different from that anticipated,—namely, the Taurus, which I have still reason to suspect contains a large undescribed species of this genus;—I here propose to dedicate the present splendid animal to the illustrious Venetian traveller of the thirteenth century, by the name of *Ovis Polii*.

As compared with the Rocky Mountain Sheep of North America, the *Rass* or *Roosh* of Pamîr differs in having the horns considerably less massive, but more prolonged, approaching more in character to those of the domestic *O. Aries*, but differing again from the latter, not only in their very superior size, but in having their two front angles about equally developed. As in the Rocky Mountain species, and I believe also the *O. Aries* normally, the pair at first diverge backward, and then descend and gyre round at a parallel with the axis of the body, inclining, as they again spire backwards, more outward to the tip. The horns described were in their seventh year of growth, and measure 4 feet 8 inches in length, following the curvature, and $14\frac{1}{4}$ inches round at base, having the tips, which are continued round till they point obliquely backwards, 45 inches apart. The width of their upper plane is $3\frac{1}{2}$ inches at base, $2\frac{3}{4}$ inches at the distance of one foot from the base, and $2\frac{1}{2}$ inches at 2 feet distance from the base; the depth of the base inside is 5 inches, and distance apart of the pair, measured outside, where they gyre forward at a parallel, 21 inches. The years of growth are successively $15\frac{1}{2}$, $10\frac{1}{2}$, 13, 8, 5, 3, and the last (incomplete) 1, inches. The College of Surgeons' specimen, a single horn, was in its eighth year of growth, but measures only 4 feet 4 inches round the curvature; its depth towards the base is 6 inches, and greatest width, about the middle, $2\frac{3}{4}$ inches. The successive annual growths are $12\frac{1}{2}$, 9, 8, 8, 7, 5, $3\frac{1}{2}$, and the incipient eighth 1, inches. It is curved in a spiral involution, and scarcely outwards for three-fifths of a circle, when it gradually inclines more so to the tip, the horn describing one circle and about a third. When upon the head, it must accordingly have gyred considerably inward, instead of descending at a parallel with the other, as indeed is almost invariably the case with the domestic *O. Aries*. Both specimens are of a pale colour, and indented with rugged transverse striæ, in general half an inch apart. Of the animal nothing further is yet known. Considering, indeed, the differences of the two specimens, it is by no means improbable that they will yet prove to be of allied rather than of the same species, in which case my former name of *O. sculptorum* might be retained for that to which it was applied.

2, 3, and 4. The museums of Western Europe do not, that I can learn, contain any portion of the Siberian Argali, *Ovis Ammon* of Pallas, that might serve for comparison with the Rocky Mountain Sheep of North America, *O. montana* of Desmarest; but as the Kamtschatka Argali is described as a distinct species, *O. nivicola*, by M. Eschscholtz in his 'Zoologischer Atlas,' (differing from the two preceding in its inferior size, and in wanting, it would appear, the pale disc surrounding the tail, so conspicuous in both the others,) the probability is thus enhanced, that the Siberian and Rocky Mountain

species are not the same, however closely they may resemble. The descriptions of *O. Ammon* would seem to apply in every particular to the *O. montana*, though it is still probable that actual comparison of specimens would lead to the detection of some discrepancies, as generally, but not always, happens in like cases. I may notice, that while Mr. Drummond affirms that the horns of old rams of *O. montana* "attain a size so enormous, and curve so much forwards and downwards, that they effectually prevent the animal from feeding on level ground*," the same had previously been remarked by Strahlenberg of the Argalis of Siberia†, and no doubt is equally observable in the *Rass* of Pamîr. The finest specimen of a head of the Rocky Mountain animal, of seven heads of adult males examined, is in the collection of this Society, and gives the following admeasurements: horns 3 feet 5 inches over the front ridge, and 17¼ inches round at base, where the front angles are 4¾ inches apart. They number nine years of growth, which successively give 9, 7½, 6½, 5, 4½, 4, 2¼, 1¼, and 1, inches. They are nearly equilaterally triangular, but bulge a little between the angles, having the inner or front angle obtusely prominent, the posterior double, or forming a second plane at a slight angle with the superior one, and the inferior angle (if such it can be called) much rounded off: the greatest depth of the horn is about 6 inches; from base of front angle to tip they measure 11 inches; and the tips apart 26 inches. They are everywhere strongly furrowed across, more particularly in front, the intervals between the grooves swelling out considerably; and they gradually become, as in all the rest of the genus, more compressed to the extremity.

Of the *O. nivicola* of M. Eschscholtz, that naturalist writes: "The specimen described is a male in winter garb, measuring 5 feet (French?) in total length, and 2 feet 5 inches high. Its outer coat is of a yellowish grey colour, brighter on the under parts, and inclining to straw-yellow on the head and neck; the markings in front of the limbs are of a rust-colour: horns equilaterally triangular, 3 inches thick at base, and gyring outwards to form one complete spiral circle, 10 inches in diameter, and having their points directed outwards and forwards; the upper and posterior portions of the horn are level, and marked with deep annual indentations, which successively measure 7, 6, 5, 4, 3, 2, 2, and 1½, inches, making eight years of total growth; besides which, there are numerous minor indentations or ordinary cross-striæ, but no protuberant intervals." From the figure they would seem not to bulge between the angles, as is usual, though not invariably the case, with the Rocky Mountain species; as also to be somewhat more tensely spiral, as if pulled a little outward. The appearance both described and figured at the base of the fore-limbs externally, I suspect to be nothing more than the *axilla*, that had been twisted outwards in the mounting of the specimen. M. Eschscholtz describes this animal to be very nume-

* *Fauna Americana-borealis.*

† Description of the northern parts of Europe and Asia.—Eng. Transl., p. 332.

rous on the mountains of Kamtschatka, residing upon the snow-clad heights in summer, and descending to the lower regions in winter. A notice of its chamois-like agility occurs in the narrative of Kotzebue's Voyage from 1823 to 1826.

In the 18th volume of the 'Asiatic Researches,' part ii., Mr. Hodgson, of Nepâl, gives a figure of a horned female of the Nahoor Sheep, and also of the skull and horns of a young ram, which he erroneously refers to that species, as since described by him. He also mentions having once possessed a pair of the horns, which he "could only lift from the ground with a considerable effort;" but it is necessary to observe, that the description which he gives in the volume adverted to, of the mutilated skin of a young wild ram, procured in mid winter, refers evidently to the Nahoor, and not to the species with horns having a triangular section, which is the subject of the present notice. According to Mr. Hodgson, the horns of this young specimen are "equilaterally triangular," as the figure likewise represents; whereas the Rocky Mountain species would at the same age have much compressed horns, far from attaining to an equilateral triangle. Should a true species be here indicated, as is not improbable, distinct from *O. Ammon*, I propose that it be dedicated to that assiduous investigator of Nepalese zoology, and be accordingly termed *O. Hodgsonii.*

5. *O. Californiana*, Douglas. The Jesuit missionary Venegos observed in California "a kind of wild sheep, the size of a calf of one or two years old, with extraordinarily thick horns, resembling those of a common ram, *and tail shorter than that of a stag*," whence it would appear that the Rocky Mountain species, or a near ally, is here alluded to. Mr. Douglas describes the Californian Argali to have a tail 18 inches long (*vide* Zoological Journal, iv. 332). Its length, he observes, from nose to base of tail, is 5 feet 10 inches; height of the shoulder 2 feet 8 inches; girth behind the shoulders 6 feet: head 16 inches long, 7 [to] between the eyes, and 9 [to] between the horns: ears erect, $1\frac{1}{2}$ inch [$4\frac{1}{2}$ inches?] long, obtuse. The horns deposited in the museum of this Society bear a general resemblance to those of the Rocky Mountain species, but are smoother, and form a much more open spiral: the terminal third is very much compressed; the medial intermediate, and the basal very thick and triangular: they were only in their fifth year of growth, and would doubtless have attained to much greater dimensions. Their length is 32 inches, measured over the front ridge, and girth at base $14\frac{1}{2}$ inches, having a span of $12\frac{1}{2}$ inches from base to tip inside: from the tip to first annual depression they measure $12\frac{1}{2}$ inches, and then successively $6\frac{1}{4}$, $5\frac{1}{2}$, $4\frac{3}{4}$, and the incipient fifth year's growth 2 inches. They do not bulge between the angles, which are rather obtuse, and, as usual, are transversely striated. Approximate distance of the tips apart 33 inches.

"From the testimony of the Indian tribes about the Great Falls of the Columbia River," writes Mr. Douglas, "this species appears to inhabit the subalpine regions of Mounts Wood, St. Helen's, and Vancouver, but is more numerous in the mountainous districts of the interior of California. The only good skin that ever came under

my observation was in lat. 46° 14′ 55″, and long. 121° 17′ 0″." Forbes, in his recent work on California, appears to allude to it by the name of *Berindo*, which in Mexico is applied to the *Antilocapra furcifera*. He quotes, however, the description by Venegos, including the statement that it has a short tail, and remarks, that "they still abound in the plains at the foot of the mountains, and are always found in large herds." It does not, from the context, appear to me that the prong-horned animal is intended.

From these we might proceed, through the domestic *Aries*, to the species generally typified by the Moufflon of Corsica; but I shall interpolate a small group from the Himalaya, and apparently Caucasus, distinguished by having smooth and sub-cylindrical horns, that form a bold arc outwards at nearly right angles with the axis of the body, and have the tip turned backward. Such is

6. *O. Nahoor*, Hodgson; the *Nahoor* or *Nervati*, and *Snà* (not *Shà*) of Thibet. Size of the larger breeds of tame sheep, with pale horns, and general colour dull brownish grey in old animals, with the ordinary dark markings on the face, breast, and limbs, more or less developed. Younger specimens, more particularly, have their coat, when renovated, tipped with a light fulvous tint, deeper along the middle of the back; the tail is bushy, and conspicuously white, its medial portion generally dark. Length, as given by Mr. Hodgson, 4 feet from nose to base of tail, and height of the back 32 inches. A female was 3 feet 4 inches from nose to tail, and stood 29 inches high at the shoulder. From nose to between the horns a male measured 8½ inches; the ears 4½ inches; and tail 4 inches, or 7 inches to the end of the hair. A pair of horns in the museum of this Society, which are far from having attained their full growth, measure 12 inches in circumference at base, and 20½ inches long over the curvature, having their tips 27 inches asunder: their successive annual growths were respectively 6½, 4, 3, 2¾, 2½, and 1¾, inches. Mr. Hodgson mentions a pair that were each 32 inches long. Those of a very old female in the British Museum have precisely the same curvature as in the male, only that the tips do not turn so much backwards; they are, however, much compressed, and measure 9¾ inches long, 4½ inches round, with the tips 14 inches apart. Another female, in the collection of this Society, is entirely destitute of horns. The latter, and a young male which I formerly examined at Mr. Leadbeater's, accorded perfectly with the description of Mr. Hodgson, having pale slaty-blue hairs, deeper on the back, and tipped with a rufous tint, more particularly on the back, which caused the animal to appear of a pale fulvous or isabelline hue. An old male in the museum of the Linnæan Society*, and the aged female in the British Museum, together with another skin which I have seen, have not only no trace of this colour in their present state of *pelage*, but I doubt whether they showed much of it when their coat was new: the colour of all three is a dingy grey-brown, not easy to express in words.

* Mistaken for *Ovis Ammon* in the 'Fauna Americana-borealis,' vol. i. p. 274, and for a second specimen of *O. Burrhel* in Part 6, p. 79, for July 10th, 1838, of these 'Proceedings.'

The horns of the Nahoor differ but little in flexure from those of the next species, but may nevertheless be distinguished by many differences, in general strongly pronounced: as their superior size; the greater proportional thickness of the basal half, beyond which they narrow somewhat abruptly; the flatness of their dorsal aspect, with a much more acutely raised ridge along its middle; and by the comparative sharpness of all the angles, together with the existence, generally, of some traces of cross striæ, more particularly towards their compressed tips; whereas the horns of the Burrhel Sheep are much less angular, of a deep rufous-brown colour, and quite smooth. Those of the female Nahoor described were entirely destitute of cross furrows, but all have the marks of annual growth conspicuously indented.

This species, according to Mr. Hodgson, "inhabits the Kâchar region of Nepâl, northward of the habitat of the Jharal Goat, amid the glaciers of the Himalaya, and both on the Indian and Thibetan sides of that range." Mr. Vigne informs me that it is plentiful in Great, but not in Little Thibet. I suspect that it is never found at so considerable an altitude as the next species.

[To be continued.]

XXVII.—*Flora of Central Norfolk.* By S. P. Woodward, Esq.

Addenda to Mr. Mann's List of Norwich Plants.

Upon comparing the list of Norwich Plants given by Mr. R. J. Mann, in the August number of the 'Magazine of Natural History' (vol. iv. p. 390), with my own, I found many interesting plants and localities had been omitted; and as it is not to be expected that one observer should, in a few years' investigation, discover all his district contains, I cannot but regret that Mr. M. did not avail himself more extensively of the information of other collectors. For the omitted localities there is no remedy, and for the plants time only allows me to give what are recorded on my lists in addition to those just published. Mr. Wigham, of Norwich, could, I believe, supply many others which his long residence has made him familiar with. In the Mosses and Hepaticæ much remains to be done ere our list will vie with that of Yarmouth, published by Mr. Paget; the freshwater Algæ of this district have been entirely neglected; and the Lichens, no one, that I am aware of, could catalogue. Mr. Paget's list, which gives the result of the labours of Mr. Dawson Turner and other indefatigable botanists, must represent all that is known at present of the distribution in Norfolk of these extensive and intricate classes. Mr. Stock of Bungay, who has for some years collected the minute parasitic Fungi with great perseverance and success, will, it is to be hoped, some day publish a detailed list; in the other

classes the Norfolk Flora is probably as extensive and varied, and as well investigated, as that of any English county.

I have ventured to introduce—*in brackets*—some plants which are a few miles beyond the *ten mile circuit*, because I believe they may be found within it; and a few which are considerably beyond, because they are either omitted in the published floras, or their recent occurrence in the spots indicated is not well known.

Of those plants for which I have given authorities, I have, with few exceptions, received specimens; those in Roman are generally considered only varieties.

EXOGENÆ.

Clematis Vitalba. Hedges and thickets, Eaton, Long Stratton, Brooke, Hockering.
Ranunculus arvensis. Corn-fields, Stoke Holy Cross, Armeringhall.
——— *auricomus.* Lakenham Hall Wood.
——— *parviflorus.* Armeringhall.
——— pantothrix, circinnatus. Ditches: common.
Adonis autumnalis. Waste ground, Lakenham.
Papaver hybridum. Lanes and borders of fields, Lakenham.
——— *dubium.* Ditto: abundant.
Corydalis lutea. Old walls: frequent.
*Lepidium Smithii**. Lanes, Eaton and Lakenham.
Thlaspi arvense. Lakenham, near the Hall Farm.
Nasturtium amphibium. Lakenham Marshes.
Brassica Napus. Fields and waste places.
Viola flavicornis. Mosswold.
—— arvensis. Fields: frequent.
—— *suavis.* Thorpe, Horstead.
Helianthemum vulgare. Westfields, Eaton.
Sagina apetala. Banks: frequent: St. Faith's, &c.
Cerastium aquaticum. Lakenham Marshes.
——— *semidecandrum.* Borders of Drummond's Grove
Sedum rupestre. Bracondale Hall Wood.
—— (*album.* Walls, Dereham.)
Chrysosplenium oppositifolium. Stoke Holy Cross.
——— *alternifolium.* Ditto, Poringland.
Ulex nanus. St. Faith's Heath.
Vicia angustifolia. Lanes and chalk-pits.
Lathyrus sylvestris. Brundall.
Lotus tenuis. Dry chalky pastures.
Trifolium ochroleucum. Poringland, Long Stratton.
——— *fragiferum.* St. Faith's; near Dereham; in Aclé.
——— *procumbens.* Fields and hedges.
Rubus Kœhleri. Hedges and woods: frequent.
Rosa tomentosa. St. Faith's Wood.
Pyrus torminalis. Lakenham Hall Wood.
—— *Aria.* Woods and plantations.

* *L. campestre* I have not seen nearer Norwich than Dereham or Bungay.

Circæa lutetiana. Armeringhall Wood.
Ribes Grossularia. Lakenham Hall Wood.
Sison Amomum. Chalky pastures towards Dereham, Long Stratton, Bungay-road.
Silaus pratensis. Long Stratton, &c.
Peucedanum palustre. Horning.
Galium parisiense. Carhoe Abbey.
Campanula Rapunculus. Lakenham, Brooke.
——— *hybrida.* Corn-fields: abundant: Eaton, &c.
Dipsacus pilosus. Loddon ; near Dereham.
Scabiosa columbaria. Hedges and copses, Lakenham, Keswick, &c.
Lactuca virosa. Carhoe Abbey, Whitlingham (St. Benedict's Abbey).
Bidens tripartita. St. Faith's, &c. : frequent.
Onopordum Acanthium. Borders of fields : frequent.
Carlina vulgaris. Bramerton Heath.
Conyza squarrosa. Strumpshaw, &c., Mr. Wigham.
Cnicus acaulis. Horning (Neatherd Moor and Scarning Fen, Dereham).
Myosotis cæspitosa. Lakenham, St. Faith's.
Lithospermum arvense. Postwic Crag-pits.
Cuscuta europæa. (Burston near Diss, C. B. Prentice ; Cromer.)
Oxyococcus palustris. Stoke Holy Cross, Mr. Bayfield ; Horning.
(*Pyrola rotundifolia.* Bogs by Upton Broad, 1840, S. P. W.)
Chlora perfoliata. Armeringhall, Mr. Wigham.
*Gentiana campestris**. St. Faith's Common, 1837, J. W. E. and S. P. W.
——— (*amarella.* Scarning Fen, Dereham.)
Vinca minor. Thickets and copses.
Verbascum Lychnitis. Borders of fields and waste ground.
——— *nigrum.* Lanes, Lakenham, Bungay-road.
Datura Stramonium. Waste ground and chalk-pits.
(*Atropa Belladonna.* Toft trees near Fakenham.)
Utricularia minor, vulgaris. St. Faith's Bogs, B. B. W. (Roydon near Diss.)
Digitalis purpurea. Plantations and woods, Keswick, Sprowston.
Melampyrum arvense. Costessy.
(*Linaria minor.* Near Dereham, B. B. W.)
Orobanche minor. Lakenham, &c. : frequent.
(*Scrophularia vernalis.* Langham, 1840, Mr. G. Clowes.)
Mentha sylvestris. Meadows near Harford Bridges.
Acinos vulgaris. Keswick Hall grounds, Eaton.
Galeopsis versicolor. Hethersett.
Stachys arvensis. Fields and lanes, Lakenham.
Aristolochia Clematitis. Carhoe Abbey.
Rumex palustris. Felthorpe, &c.
——— *aquaticus.* Marshes : abundant.
——— *sanguineus, β.* Armeringhall.
Polygonum Bistorta. Lakenham, Brooke, Sizeland.
Euphorbia Lathyris. Road-sides and waste places.

* *G. amarella* of Mr. Mann ?

Salix Caprea, cinerea, stipularis. Ozier-holts and woods: frequent.
Populus canescens. Banks of the Yare and Tees.
Castanea vulgaris. Woods and plantations.
Taxus baccata. Hockering: small trees frequent.
Pinus sylvestris. Keswick Hall: small trees frequent.

ENDOGENÆ.

(*Stratiotes aloides.* Ditches, Aclé, Barton Broad, &c.)
Sparganium fluitans. Ponds on St. Faith's Common.
Potamogeton pusillus. Yare, by Lakenham.
——— *gramineus.* Yare, Norwich.
——— (*prælongus.* Waveney, by Bungay, Mr. Stock and Mr. C. Babington.)
Iris fœtidissima. Armeringhall Wood. (Bath Hills, Bungay.)
(*Gymnadenia conopsea.* Scarning Fen, Dereham.)
——— (*viridis.* Fields near Bungay.)
Habenaria chlorantha. Armeringhall Wood.
——— (*bifolia.* ? St. Faith's, see Mr. Mann's list; Upton, near the Broad.)
Ophrys muscifera. Stoke Holy Cross.
Listera Nidus avis. Armeringhall Wood, Mr. J. W. Ewing.
Liparis Læselii. St. Faith's Bogs.
Convallaria multiflora. Lakenham Hall Wood.
Ornithogalum umbellatum. Postwic Churchyard (St. Benedict's Abbey).
Tulipa sylvestris. Bracondale, Mr. Bayfield; Trowse, Kirby Bedon, fields and chalk-pits: rare.
Scilla nutans. Woods: everywhere.
Muscari racemosum. City walls.
Paris quadrifolia. Bunwell Wood, Mr. G. E. Bolingbroke: Costessy.
Acorus Calamus. Moat, Cringleford Hall (St. Benedict's Abbey): flowering freely, 1840.
Luzula pilosa. Armeringhall Wood.
Scirpus setaceus. St. Faith's Bogs.
Rhyncospora alba. Felthorpe.
Eleocharis multicaulis. St. Faith's Bogs.
Carex divulsa. Bixley, Lakenham Hall Wood.
—— *remota.* Armeringhall, ditches and woods.
—— *stellulata.* Lord Roseberry's grounds, Bixley.
—— (*divisa.* Meadow by Aclé Bridge, 1836, S. P.W.)
—— *fulva.* Lakenham Marshes.
—— *Œderi.* Poringland.
—— *filiformis.* Surlingham, near the Broad.
—— *pulicaris.* Cringleford Marshes.
—— *teretiuscula.* St. Faith's Bogs.
—— (*pendula.* Scarning Fen, Dereham, B. B.W.)
—— (*dioica.* Scarning Fen, B. B.W., Ellingham Fen.)
Aira flexuosa. St. Faith's Bogs.
Poa bulbosa.* Old walls, Horsefair, Norwich.
—— *nemoralis.* Lakenham Hall Wood.
Calamagrostis lanceolata. Lakenham Marshes.

* Mr. D. Turner has seen this: it was found by Mr. Mann.

Hordeum pratense. Meadows : frequent.
Avena fatua. Corn-fields.
—— (*pubescens.* Fields, Dereham.)
Bromus asper. Borders of fields : frequent.
——— *secalinus.* Wheat-fields, Lakenham (Smalburgh).
——— *racemosus.* Pastures : frequent.
——— *giganteus.* Woods : frequent.

CELLULARES.

Filices.

Cystopteris fragilis. Old wall, Norwich, 1835.
Polystichum lobatum. Lakenham, Long Stratton (Dereham).
——— *angulare.* Brundall (Fakenham, Mundesley).
——— (*aculeatum.* Near Fakenham.)
Lastræa dilatata. Drummond's Grove, Thorpe ; Stoke Holy Cross, Cringleford.
——— (*spinulosa.* Holt Heath, Fritton Heath, Bawsey.)
——— (*cristata.* Edgefield Heath, near Holt ; Fritton Heath, near Yarmouth ; Bawsey, near Lynn ; Mr. J. W. Ewing, 1840.)
——— *Thelypteris.* St. Faith's, Felthope (Scarning, Filby, Upton).
——— (*Oreopteris.* Near Cromer, Mr. J. W. Ewing, 1840.)
Athyrium Filix fœmina. Horning (Scarning, Filby, Fritton, Belton, Upton).
Asplenium Ruta muraria. Lakenham and Eaton Bridges (Dereham and Hasboro' Churches).
——— *Trichomanes.* Aylsham, Eaton, Lakenham (Fakenham Churchyard) ; old walls, tombs, lanes, &c.
(*Ceterach officinarum.* Heydon Church, Mr. Stock.)
Ophioglossum vulgatum. Lakenham Hall Wood, Whitlingham Wood, Armeringhall Wood, Horning (Upton, Ellingham).
Botrychium lunaria. Stratton Strawless.

Musci.

Phascum cuspidatum. Clayey banks, Lakenham.
——— *crispum.* Clayey banks, Bixley.
——— *rectum.* Clayey banks near Harford Bridges.
——— *axillare.* Moist ground, Lakenham.
——— (*muticum.* Belton, near Yarmouth, hedge-banks.)
Sphagnum squarrosum. St. Faith's Bogs, &c.
Bartramia fontana. Bramerton. (Scarning, B. B. W.)
Gymnostomum truncatulum, fasciculare, pyriforme. Shady banks, Bixley, Lakenham.
Splachnum ampullaceum. (Barren.) Upon animal excrement in bogs : not unfrequent.
Weissia lanceolata. Hedges, Lakenham.
Didymodon purpureus. Mosswold, &c., dry banks : abundant.
Dicranum scoparium. Mosswold, &c., dry banks : abundant.
——— *adiantoides.* St. Faith's, boggy ground : frequent.
——— *taxifolium.* Bixley Church Lane.
——— *glaucum.* St. Faith's, &c. : abundant in bogs.
Tortula unguiculata. Lakenham and Bixley, on hedges.

Polytrichum juniperinum. St. Faith's Heath (Scarning Fen).
——— (*urnigerum.* Gillingham.)
Orthotrichum cupulatum. Trees, Lakenham.
——— (*Hutchinsiæ.* Ruins of the Garianonum, near Yarmouth.)
Anomodon viticulosum. Armeringhall Wood.
——— (*curtipendulum.* Fakenham Heath.)
Bryum argenteum. Walls and moist ground everywhere.
——— *nutans.* Hedge-banks: rather rare.
——— *roseum.* Mosswold, Bramerton.
——— *hornum.* Drummond's Grove, Thorpe, Lakenham.
——— *cuspidatum.* Drummond's Grove, moist lanes: frequent.
Buxbaumia aphylla. Sprowston, Sir W. J. Hooker.
Leucodon sciuroides. Lakenham, on trees and walls.
Daltonia heteromalla. Lakenham, on trees.
Fontinalis antipyretica. The Yare and Wensum.
Hypnum complanatum. Hawthorn fences.
——— *lutescens.* Bramerton.
——— *albicans.* Mosswold.
——— *alopecurum.* Armeringhall.
——— *proliferum.* Armeringhall, Lakenham Hall Wood.
——— *stellatum.* Bogs and marshes.
——— *triquetrum.* Heaths and woods: abundant.
——— *squarrosum.* Lanes and woods: frequent.
——— *palustre.* Marshes.
——— *scorpioides.* Marshes and bogs.
——— *molluscum.* Markshall, hedge-banks.
——— (*dendroides.* Fakenham.)

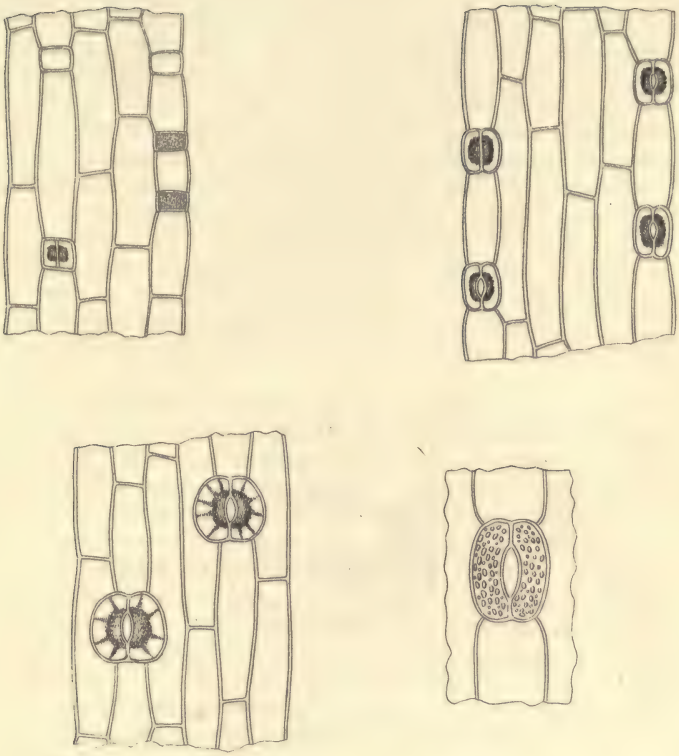
HEPATICÆ.

Riccia crystallina. Banks at Bixley and Armeringhall, turnip- and clover-fields: frequent.
Sphærocarpus terrestris. Banks at Bixley and Armeringhall, turnip- and clover-fields: frequent.
Marchantia polymorpha, conica, hemisphærica. Walls and banks, river-side, &c.: frequent.
Jungermannia bicuspidata. Damp lanes and woods: frequent.
——— *complanata, dilatata.* Trees: frequent.
——— *connivens.* Bogs, among Bryums.
——— *pinguis.* Ditches and bogs: frequent.
——— (*asplenioides, tamarisci.* Ruins of the Garianonum, near Yarmouth.)

XXVIII.—*On the Formation of the Stomata.* By HUGO MOHL. (Linnæa, 1838, p. 544, with a Plate.)*

M. MIRBEL is the only person, so far as I know, who, in his memoir on *Marchantia polymorpha,* has published any

* From the translation in the Annales des Sciences Naturelles, April 1840, p. 222.



Developement of Stomata.

Cyanea coccinea.

New Helix.

researches on the development of stomata. He has shown that they are developed in two different modes. First, there is found, in the epidermis, at the period of formation of a stoma, a little cavity, the bottom of which is occupied by an epidermal cell, which is surrounded by four other cells. By the absorption of this central cell the opening of the stoma is produced. This is the usual mode of development on the foliaceous expansions of the *Marchantia.* Upon the floral peduncles, on the contrary, the development generally takes place in an entirely different manner. The bottom of the cavity is formed by from three to five wedge-shaped cells, which touch each other at the centre, and which at a later period separate in such a manner as to show an opening in the form of a star. The cells always contract more towards the exterior, being transformed into an obturator ring, whilst the epidermal cells placed around form the margin of the stoma.

There is evidently a defect in this explanation of the development of the stomata, as it is not explained how the same form of stomata can originate in two such different ways. Indeed, in the first case, we cannot conceive how the porous cells, which constitutes what Mirbel calls the *anneau obturateur,* are formed. If the stoma is formed in consequence of the absorption of the epidermal cell, and the surrounding epidermal layers form the margin, the stoma would be formed only of a simple opening. This however is not met with in nature; for inwardly, at the margin, two or more cells (porous cells) are seen, which enclose the stoma itself. The origin of these porous cells is explained by the second manner of development described by Mirbel, but it is not in the first case.

I have endeavoured to solve the question by examining the *Marchantia polymorpha,* but I have not been successful, because in this plant the examination of the epidermis in its youngest state presents very great difficulties, as it can only be taken off by means of a scalpel, and does not therefore admit of being separated free from the subjacent parenchyma. In this way some of the subjacent parenchymatous cells are always removed with the epidermis, and prevent our recognizing with the necessary precision the slight changes which take place in the stomata at the moment of their production.

Respecting these researches, I shall confine myself therefore to merely stating, that I have seen the stomata originate on the frond of the *Marchantia* in the second mode pointed out by Mirbel, but I have not succeeded in seeing any stomata originate from the absorption of a cell.

To make amends, I think that I have observed with sufficient precision the formation of the stomata on the leaves of the *Hyacinthus orientalis.* I chose these leaves, not only because their stomata are of considerable size, but because by their growth from above downwards, it is easy to observe, on the same leaf, all the series of facts which the stomata present in their development. These organs, indeed, are already perfectly developed on the higher and oldest part of the leaf; whilst, in the lower part, newly formed and still enclosed in the bulb, they do not yet exist.

It is in this lower part of the leaves and between the epidermal cells that smaller quadrangular cells may be observed, the transverse diameter of which is a little longer than the longitudinal. (Pl. II. fig. 1, *a*, *a*.) These cells, as well as those of the epidermis, are colourless. Sometimes they contain nothing, and sometimes they enclose a slightly granular mass.

Higher up, towards the apex of the leaf, this granular substance is met with collected in a round mass, which frequently however is not clearly defined. At the same time a partition forms in the middle of the cell and in the longitudinal direction of the leaf. At the beginning this partition is but slightly indicated (Pl. II. fig. 1, *b*); but soon the lines that limit them are as clearly drawn as those which mark the lateral walls of the cells (fig. 2, *a*).

This partition now begins to double; thus the first trace of a stoma establishes itself, and the cell, originally simple, divides and forms the two cells of the pores.

In the course of the development, the cells which surround the pore enlarge, and the central slit enlarges in a still greater proportion. The grumous mass is always found accumulated on the inner walls of these cells, and communicates with the other walls of the cells by means of filiform processes (fig. 3.)*.

Lastly, in the perfectly developed stoma (fig. 4.), the grumous mass contained in the cells which form the border of the pore is equally distributed in their interior, where the grains of chlorophylle are likewise formed.

The development which I have just described takes place very regularly in each stoma, but the same part of the leaf does not always exhibit stomata at the same stage of development. Certain stomata frequently outstrip others close beside them.

* These threads, which unite a mucous mass situated in the cellular cavity with the cellular partitions, are met with not only here, but they are often found elsewhere; for example, in the hairs of the young stalks of Gourds, and in the articulations of *Zygnema*.

I have not yet made observations with a view to decide if the above description of the development of the stomata agree with all cases, or whether in other plants it presents essential modifications in the process of this operation; but it is probable enough that the first method of development indicated by Mirbel in no case presents itself in an isolated manner, but that it is only the commencement of the second mode; that there is no absorption of the central cell; and that this, in the *Marchantia*, divides into four, as it separates into two in the *Hyacinthus orientalis*.

BIBLIOGRAPHICAL NOTICES.

The Natural History of South Devon. By J. C. Bellamy, Surgeon. Plymouth, 1839. 8vo. pp. 456.

It is only by collecting diligently facts from every part of a country, that we can expect to arrive at those general principles which regulate the distribution of plants and animals over its surface. In this respect every work that contributes to the information we already possess ought to be hailed as the omen of progress in our knowledge of the natural history of the earth. We have already had many able attempts at giving complete views of the distribution of animals and plants in many districts of our own island, and we have now to add another to the list. Mr. Bellamy has produced an interesting volume with regard to the delightful county in which he dwells, which will not only be read with pleasure by those who reside on the spot, but will be welcomed by the naturalist as an accession to British natural history.

Mr. Bellamy's work is divided into three parts. The first part is divided into five chapters, and treats of the geological character of South Devon and the nature of its climate. The structure of the strata in this district is minutely described, and several new and interesting fossils are described and figured. The second part is occupied with lists of the vertebrate and invertebrate animals of the district, with the exception of the insects, and with various observations of the author on the animals of South Devon. The third part is devoted to "Remarks on numerous subjects of Natural History, but more particularly on Birds." A great number of these remarks are original, and are made in such a manner as cannot fail to interest the general reader.

In this volume Mr. Bellamy has introduced to our notice four additions to the British Fauna. These are respectively named *Arvicola hirta*, *Mus intermedius*, *Sylvia neglecta* and *Helix subvirescens*. We cannot however pronounce upon the accuracy of the descriptions, nor the value that ought to be attached to them, because we have not the specimens before us. We hope, however, that the approaching meeting of the British Association will enable some of our eminent

zoologists to examine Mr. Bellamy's specimens, and report upon their title to be recorded as new species.

The name of the volume might lead some of our readers to suppose that every branch of the natural history of South Devon was treated on; but we think it only right to state, that the author has not given any lists of the plants or insects of the district. In a second edition we should advise that this hiatus be filled up; and we think that the author, on reconsidering some parts of the work, would find that this might be done without at all increasing the size of the volume.

Memorie della Reale Accademia delle Scienze di Torino. Second Series. Vol. I. 1839.

The following are the papers relating to Natural History in the last two volumes of the Turin Transactions:—

Programma di Botanica,—with Prize offered for the best Monograph of a tribe of Italian Cryptogamous Plants.—Geological and Mineralogical Observations on the Mountains lying between the Valleys of Aosta and Susa in Piedmont; by Prof. A. Sismonda.—De quibusdam Insectis Sardiniæ novis aut minus cognitis: Fasc. II.; auctore Jos. Gené.—Notices of two Fossils found in the Hills of St. Stefano Roero; by Prof. A. Sismonda.—Memoir on six new Species of Cephalopods found in the Mediterranean at Nice; by J. B. Verant.—On the structure and position of the organs of Hearing and Sight in the principal Genera of Mammifera; by C. F. Bellingeri, M.D.—Description of a new Cetacous Fossil; by G. D. Bruno, of the Zoological Museum of the University.—Investigations respecting some variations observable in univalve freshwater and land Mollusca; by C. Porro.—Synopsis Reptilium Sardiniæ indigenorum; auctore J. Gené.—Primitiæ Hepaticologiæ Italicæ; auctore Jos. De Notaris.—Essay on the employment of Animal Charcoal for the extraction of the Bitter Principle of the Camepiteos, and on the action of the same upon the Sulphate of Quinine and of Cinchonina; by V. Griseri.

Vol. II.

On the Earthquakes felt in the province of Maurienne from Dec. 1838 to March 1840; by Monseigneur Al. Billiet.—Mineralogical and Geological Observations made with a view to the formation of a Geological Map of Piedmont; by Prof. A. Sismonda.—Description of a new Sardinian Falcon, *Falco Eleonoræ** ; by Prof. G. Gené.—Observations by Dr. P. Savi on the Structure and Existence of the Stomata in certain Plants, in a letter to Prof. Amici.—Florula Caprariæ, sive Enumeratio Plantarum in insula Capraria vel sponte

* So called in honour of Queen Eleonora, by whom was promulgated the very ancient code for the preservation of the Falcons for which Sardinia was celebrated, from which the following extract is given:—"Constituimus et ordinamus qui nexiunu homine non depiat bogare Astore neu Falcone dae nidu, et icussu qui lu det bogare siat obligadu lu Curadore de sa Curadoria (an officer of justice) d'unde det essere su homine, de tenerlu et batirelu a nois, cum pena de pagare su Curadore libras quimbe."—*Carta de logu*, c. 88.

nascentium vel ad utilitatem latius excultarum; auct. Jos. Moris et Jos. De Notaris.—Amphibia Europæa ad Systema nostrum Vertebratorium ordinata; auct. Car. L. Bonaparte, Muxiniani Principe. —Microscopic Observations on the Movements of Vegetable Globules suspended in a Menstruum; by Prof. J. D. Botto.

PROCEEDINGS OF LEARNED SOCIETIES.

MICROSCOPICAL SOCIETY.

Feb. 17.—A paper was read by Mr. Owen, "On the Microscopic Structure of certain Fossil Teeth from the Old Red Sandstone near Elgin."

The fossils were from the middle or cornstone division of that formation, and are interesting from the extreme rarity of organic remains referrible to vertebrated animals in such formation. The microscopic structure of these teeth, which Mr. Owen described in detail, is quite peculiar and characteristic of the teeth in question, so as to justify the indication of a distinct genus of animals, for which the name of *Dendrodus* was proposed.

Four species of these teeth were described, viz. *Dend. bifurcatus, D. strigatus, D. hastatus* and *D. sigmoideus,* and the modifications of the Dendritic structure pointed out in each.

Upon the whole, the characters of the microscopic structure resemble those of the teeth of certain fishes, as the Shark, Sphyræna, etc., but with modifications that approximate it to the peculiar structure of the teeth of the extinct Batrachian genus *Labyrinthodon,* from the new red sandstone.

Mr. Owen concludes, therefore, that the *Dendrodus* was a fish, but that it might have approached more nearly than the rest of the class to the Labyrinthodont group of *Batrachia.* The teeth resemble in external form and longitudinal striation those of the *Labyrinthodon*; and should other remains raise the *Dendrodus* to that order, it will be the first vertebrate animal higher than fish that has been found in the old red sandstone.

Sections of the teeth described and diagrams were exhibited in illustration of the paper.

Mr. Owen next proceeded to give an account of his examination of the microscopic structure of the teeth of the *Lepidosiren annectens.*

Although almost the whole organization of this species is known, there is as much doubt in the minds of many naturalists respecting the class of Vertebrata to which it really belongs, as may be entertained regarding the *Dendrodus,* of which only the teeth have been examined.

Mr. Owen referred to the grounds on which he had concluded the *Lepidosiren* to be essentially a fish (Linnæan Trans., xviii. p. 350), and to the subsequent anatomical description of the animal by Dr. Bischoff, who considers it to be a reptile; and he then proceeded to describe the microscopic structure of the teeth of the species from the Gambia, and to show, according to this additional test of its affi-

nities, that it must be regarded as a true fish. The body of the tooth consists of a coarse dentine traversed by numerous large anastomosing medullary canals, without any trace of Purkinjian corpuscles: this is coated by a thin layer of dense dentine, traversed by fine calcigerous tubes continued from the peripheral loops of the medullary canal.

This structure agrees with that modification which is most characteristic of the class of Fishes, and has not been found in the teeth of any of the Perennibranchiate Reptiles. The cumulative evidence of this fact, with the ichthyic type of the microscopic structure of the ossified parts of the skeleton; the disposition of these parts, forming double superior and inferior spinous processes, a pre-opercular bone, and their green colour; the gelatino-cartilaginous vertebral style; the many-jointed ray of the rudimentary fin; large cycloid scales; the intestinal spiral valve; six pairs of branchial arches, with gills concealed and protected by an operculum; the blind nasal plicated sacs: these, receiving the additional evidence from the intimate structure, as before from the form, number and attachment of the teeth, must outweigh the argument for its amphibious character, which is supported only by the lung-like structure of its divided air-bladder,—a structure which some Malacopterygious Sauroid fishes possess in common with the *Lepidosiren*.

Professor Ehrenberg of Berlin, and Professor Purkinje of Breslau, were elected Honorary Members, and Daniel Cooper, Esq., an Ordinary Member of the Society.

March 17.—George Loddiges, Esq., in the Chair.

A paper was read by George Busk, Esq., of the hospital-ship Dreadnought, "On the Anatomy of *Tricocephalus dispar*," in which the author directs attention to certain points in the anatomy of that Entozoon, upon which all helminthologists appear to have erred.

The author, after describing minutely the structure and arrangement of the digestive and generative systems, arrives at the following conclusions:—1st. That the *Tricocephalus* has a distinct vulva, and that the generative and digestive tubes do not communicate at a cloaca, nor terminate at a common orifice, as described by all writers on the subject. 2nd. That in the presence and situation of the vulva this Entozoon obviously very closely resembles the *Strongylus* and most other nematoid worms, and thus an apparently great anomaly in the arrangement of this class is removed. 3rd. That the alimentary canal is not so simple as is commonly supposed. 4th. That the *Tricocephalus* is in all probability simply oviparous, and that the ova become perfectly formed only a short distance from the orifice, perhaps from being there only within reach of the male fluid.

BOTANICAL SOCIETY OF EDINBURGH.

March 25, 1841.—Dr. James Macaulay in the Chair.

The following communications were read:—

1. Notice of *Carum bulbocastanum*, Koch, from two English localities, by Mr. Isaac Brown, Hitchin, Herts. Mr. Brown pointed

out the chief differences between this plant and *Bunium flexuosum*, Sm. (*denudatum, DeC.*), with which it appears, by English authors, to have been confounded. Specimens gathered in July last, between Dunstable and Barton, and others from near Baldock, were exhibited.

2. Notes on *Physospermum cornubiense*, and an account of its discovery near Tavistock, in Devonshire, by the Rev. W. S. Hore, Stoke, Devonport. Mr. Hore, in collecting this plant at Bodmin, in Cornwall, its original and only known English locality, observed, that it was chiefly in oak coppices that it seemed to be found. In August last he noticed a single specimen of it in a hedge-row between Newbridge and Tavistock, and being induced to enter a neighbouring oak coppice in search of it, he there found it in considerable abundance. The root, he observes, fits it admirably to contend with the brambles and brushwood amongst which it grows.

3. Notice of a curious variety of *Scolopendrium vulgare*, found near Arbroath, by Mr. W. C. Trevelyan. Specimens were presented having the midrib prolonged in a remarkable manner nearly an inch beyond the termination of the frond.

4. An attempt to ascertain the true *Hypericum quadrangulum* of Linnæus, by Mr. Charles C. Babington. Mr. Babington was led to make the present inquiry in consequence of specimens collected by the Rev. T. B. Bell, in Arran, having been distributed by the Botanical Society, named *Hypericum dubium*, which appeared different from the English plant so called. Much confusion has arisen regarding this species, from its appearing from the Linnæan Herbarium that *two* species have been included by Linnæus under the name of *quadrangulum*, viz. *H. dubium* of Leers, and *H. quadrangulum* of Smith. Mr. Babington, after a careful examination of specimens and reference to numerous authorities, proposed that the following names should be adopted:—1. *H. quadrangulum*, Linn. (Hort. Cliff.); English Bot., tab. 370, &c., being the plant named *H. tetrapterum* by Mr. Babington in his *Primitiæ Floræ Sarnicæ*, and in Leighton's Flora of Shropshire. 2. *H. dubium*, Leers; English Bot., tab. 296, &c., being the plant from Arran before alluded to. 3. *H. maculatum*, Crantz (Flora Austr. ed. alt.), being the *H. delphinense* of Villar's Fl. Delph.; *H. quadrangulum* of Leighton's Flora of Shropshire, and the plant usually considered *H. dubium* by English botanists.

5. On the Geographical Distribution of British Ferns, by Mr. Hewett Cottrell Watson. In the outset of this paper Mr. Watson remarks that, "excepting some spots of small extent, whence they are banished by local peculiarities of surface, Ferns may be said to range over the whole of Britain, from south to north, from east to west, and from the shores of the sea almost to the summits of the loftiest mountains; from which latter situation they are probably absent rather in consequence of the bleak exposure to wind, than of the diminished temperature incidental to the height of any of our mountains." Assuming 40 as the medium number of the species of British Ferns, and 1400 as that of the Flowering Plants, it appears that 1 to 35 is the proportion which the former

bear to the latter. Then follows a table showing the proportions which they hold in several neighbouring islands and continental districts, ranging from 1 to 25 to 1 to 67. A similar comparison is instituted with regard to 20 of our most complete Local Floras, showing nearly the same results. A subsequent table exhibits the frequency of occurrence of each of the British species of Ferns throughout the 20 Local Floras above mentioned, and 24 local lists communicated by correspondents in various parts of England and Scotland and the adjacent islands.

Several donations were presented, amongst which may be noticed —1. An old Herbarium, which, from the handwriting, and the references to Parkinson's Herbal, appears to have been made in England during the latter part of the seventeenth century; from David Laing, of the Writers to the Signets' Library. 2. A Catalogue of 235 species of Flowering Plants, found in the Shetland Islands, by Mr. Thomas Edmondston, Jun. 3. A Catalogue of Plants found near Audley End, Essex, by the Rev. J. E. Leefe.

LINNÆAN SOCIETY.

December 15, 1840.—Mr. Forster, V.P., in the Chair.

Read, an "Account of two new Genera of Plants, allied to *Olacineæ*." By George Bentham, Esq., F.L.S.

The two new genera on which this paper is founded are *Pogopetalum*, Benth., collected by Mr. Schomburgk in British Guiana; and *Apodytes*, named but not described by Prof. Ernst Meyer, among the South African plants collected by Drège. A third genus, *Leretia* of Vellozo, figured in the 'Flora Fluminensis,' is also characterized for the first time.

After noticing the opinions of various authors as to the affinities of *Olacineæ*, and enumerating the genera hitherto referred to that family, Mr. Bentham enters into a detailed examination of its characters and of their modifications in the different genera, the most important of which he condenses into the following character of the Order.

Ord. OLACINEÆ.

Calyx parvus, liber v. basi adnatus, truncatus v. denticulatus, fructifer persistens immutatus v. auctus. *Corollæ* petala 4, 5, v. 6 hypogyna v. subperigyna, subcoriacea, æstivatione valvata, libera v. per paria connexa v. basi in tubum coalita. *Stamina* definita, cum petalis inserta, iis coalita v. libera, numero petalorum dupla v. æqualia fertilia rariùs asymmetrica, alterna sæpe sterilia difformia. *Antheræ* introrsæ, biloculares, loculis rimâ longitudinali dehiscentibus. *Ovarium* toro nunc parvo, nunc incrassato et interdum cum calyce concreto insidens, 1-loculare (nunc spuriè et incompletè 3—4-loculare) v. rariùs excentricè 3-loculare. *Ovula* in loculo 2, 3 v. 4 collateralia, rariùs solitaria, ab apice placentæ liberæ v. ovario v. dissepimentis spuriis connatæ pendula, anatropa. *Stylus* erectus, simplex, stigmate nunc truncato tenui, nunc incrassato 2—3—4-lobo. *Drupa* calyce immutato stipata v. ampliato cincta, velata v. adnata, pericarpio tenui carnoso v. exsucco, putamine crustaceo v. osseo, abortu 1-spermo, rariùs 2—3-spermo. *Semen* inversum, v. sæpiùs placentâ cum illo a basi concretâ spuriè erectum, umbilico lato basilari affixum. *Embryo* in axi albuminis copiosi carnosi, rectus, apici fructûs proximus, nunc brevissimus, rariùs dimidio albu-

minis longior, radiculâ apicem fructûs spectante brevissimâ, cotyledonibus semiteretibus, plumulâ inconspicuâ. *Arbores* v. frutices erecti v. interdum scandentes, inermes v. ramis axillaribus spinescentibus armati, glabri v. parcè pubescentes. *Folia* alterna, simplicia, integerrima, exstipulata, glandulosa. *Flores* hermaphroditi, v. abortu polygami, nunc axillares distinctè v. irregulariter racemosi, spicati v. cymosi, nunc terminales cymoso-paniculati, rariùs solitarii laterales v. axillares. *Bracteæ* squamæformes, sæpiùs minutæ, rariùs juniores imbricatæ. *Bracteolæ* parvæ in cupulam connatæ v. nullæ.

Mr. Bentham distinguishes three tribes characterized as follows:

Trib. I. Olaceæ. *Ovarium* basi dissepimentis spuriis (rariùs evanidis) 3—4-loculare, apice 1-loculare, placentâ centrali dissepimentis spuriis basi adhærente supernè liberâ. *Ovula* tot quot loculi spurii ex apice placentæ pendula. *Semen* erectum. *Inflorescentia* axillaris, racemosa, racemis rariùs ad florem unicum reductis.

Trib. II. Opilieæ. *Ovarium* a basi 1-loculare. *Ovulum* (saltem per anthesin) unicum, minimum, ab apice placentæ liberæ centralis pendulum. *Stylus* centricus. *Semen* erectum. *Inflorescentia* axillaris, racemosa.

Trib. III. Icacineæ. *Ovarium* a basi 1-loculare, v. excentricè et completè 3-loculare. *Ovula* in quoque loculo duo, ab apice placentæ hinc ovario adnatæ collateraliter affixa, pendula, in loculo superposita, placentâ alterâ elongatâ. *Stylus* excentricus. *Semen* pendulum. *Inflorescentia* cymosa, axillaris v. terminalis.

To the first tribe Mr. Bentham refers *Heisteria*, L., *Ximenia*, L., *Olax*, L. (including *Spermaxyrum*, Labill., and *Fissilia*, Comm.), and *Schœpfia*, L.; to the second, *Opilia*, Roxb. (including *Groutia*, Guill.), and *Cansjera*, Lam.; and to the third, *Gomphandra*, Wall., *Icacina*, A. Juss., *Apodytes*, *Leretia* and *Pogopetalum*.

He considers *Schœpfia* to be far removed from *Loranthaceæ* by the structure of its ovary, while it differs from *Symplocos* in the æstivation of its corolla and the incomplete division of its ovary,—two points in which it agrees remarkably with *Olax* and *Ximenia*. He describes the greater part of its ovary as well as the margin of its calyx as free, and states that an adherence almost as complete exists in some species of *Olax*. The gamopetalous corolla he regards as a character of little consequence in orders where the æstivation is valvate, and as existing to a considerable degree in *Olax* itself. In *Schœpfia* the stamens are more closely adherent to the corolla, but the filaments are filiform and prominent from the base of the latter, and are not confounded with its substance.

He states *Cansjera* to differ from *Thymeleæ*, to which it is usually referred, in the nature of the floral envelopes, in the position of the stamens, and in the structure of the ovary and of the fruit; and adds, that in all these points it agrees with *Opilia*, from which it differs only in the adherence of its petals.

The genera *Apodytes*, *Leretia* and *Pogopetalum* are characterized as follows:

APODYTES.

Flores hermaphroditi. *Calyx* parvus, immutatus. *Petala* 4, 5. *Stamina* totidem, iis alterna, sterilia nulla. *Ovarium* 1-loculare. *Fructus* ovato-

reniformis, subcompressus, hinc appendice carnosâ auctus. *Inflorescentia* terminalis.

LERETIA.

Flores hermaphroditi, v. abortu masculi. *Calyx* parvus, immutatus. *Petala* 5, intùs villosa. *Stamina* totidem, iis alterna, sterilia nulla. *Ovarium* 1-loculare. *Fructus* (ex icone Fl. Flum.) depresso-globosus. *Inflorescentia* axillaris, laxa.

POGOPETALUM.

Flores hermaphroditi. *Calyx* parvus (fructifer parùm auctus?). *Petala* 4, 5, intùs villosa. *Stamina* totidem, iis alterna, sterilia nulla. *Ovarium* 3-loculare. *Fructus* depresso-globosus? *Inflorescentia* axillaris, densa.

Of the latter genus two species are characterized:

P. orbiculatum, foliis ovato-orbiculatis obtusissimis subtùs ramulisque incanis, ovario hispido.—A shrub ten or twelve feet in height, found in dry Savannahs on the Padawire River, *Schomburgk.*

P. acuminatum, foliis ovatis oblongisve acuminatis subtùs vix pallidioribus, ovario glabro.—A tree of about thirty feet high, growing on the high banks of the Rio Negro, *Schomburgk*, n. 970.

Mr. Bentham suggests that the three tribes above characterized may perhaps, when better known, be considered as distinct orders. He thinks, however, that the species of *Olax* in which the dissepiments of the ovary are almost entirely obliterated form a transition to *Opilieæ*; that *Gomphandra* connects *Opilieæ* with *Icacineæ*; and that *Pogopetalum* is in many respects equally allied to *Olaceæ* and to *Icacineæ*. He states that *Olaceæ* approach most nearly to the polypetalous orders with which *Olacineæ* have been compared; but he cannot admit of the supposed affinity between them and *Aurantiaceæ*. *Humiriaceæ* are, he thinks, among Dichlamydeous plants, those which come nearest to *Olacineæ*; and he considers *Styraceæ* (including *Symploceæ* and *Halesiaceæ* of Don) to be very near both to *Humiriaceæ* and *Olacineæ*. *Corneæ* and some other albuminous orders have also, in his opinion, some relation to them, but much more distant.

He considers the nearest approach to *Santalaceæ* to occur in the tribe *Opilieæ*, where the calyx is reduced to little more than a dilatation of the torus; and if it be admitted that there are true Santalaceous genera with a superior ovary, and if he is right in supposing that, in the young buds of *Opilia* and *Cansjera*, there is more than one ovule, these two genera become so nearly intermediate, in his opinion, between *Olaceæ* and *Santalaceæ*, as to have nearly as much claim to be associated with the latter as with the former.

Lastly, he states that *Icacineæ* recede from the two other tribes in the adherence of the placenta to one angle of the ovarium, and in the seed being consequently pendulous and not erect; a circumstance which would have led him to propose it as a distinct order, were it not for the remarkable resemblance in the floral parts to some true Olacineous genera, and the absence of any other distinctive character of importance.

In the notes to the paper Mr. Bentham characterizes several undescribed species of *Olax* in the following terms:

O. nana (Wall. Cat. Herb. Ind. n. 6783.) suffruticosa? glabriuscula, ramis erectis parcè ramosis, foliis subsessilibus oblongis lanceolatisve obtusis vix mucronulatis, pedicellis axillaribus solitariis 1-floris, calyce libero, staminibus sterilibus bifidis.—Napalia? *Wallich.*

O. acuminata (Wall. *l. c.* n. 6781.), fruticosa scandens? glabra, ramis angulatis, foliis ovato-lanceolatis acuminatis, racemis brevibus distichis paucifloris, calyce toro incrassato basi breviter adnato, staminibus sterilibus bifidis.—Sillet, *Wallich.*

O. macrophylla, glaberrima, foliis ovato-lanceolatis acuminatis inæquilateris, racemis axillaribus brevibus distichis, calycibus glabris ovarii basi adnatis: margine libero truncato, staminibus sterilibus integris v. vix emarginatis, ovario glabro.—In Monte Padawan Guianæ Anglicæ, *Schomburgk.*

O. pauciflora, foliis ovatis junioribus ramulis pedicellisque puberulis, pedunculis axillaribus 1—3-floris, calycibus molliter pubescentibus ovarii basi adnatis: margine libero brevissimo truncato, staminibus sterilibus longè bifidis, ovario villoso.—Serra Acurua Provinciæ Bahiensis Brasiliæ; *Blanchet*, n. 2795.—An huc *Dulacia singularis*, Vell. Fl. Flum.?

January 19, 1841.—Mr. Forster, V.P., in the Chair.

Mr. Mann, F.L.S., exhibited a specimen of *Sedum Telephium*, which had been preserved for two years in his Herbarium, and still continued to send forth buds.

Mr. Babington, F.L.S., exhibited some Fir-cones taken from beneath about ten feet of solid peat at Burrishoole, near Newport, co. Mayo, where they were accompanied by nuts of *Corylus Avellana.* He stated that the trees in that part of Ireland had all been destroyed for about 200 years, and that no individuals of either species now occur within very many miles, except a few planted of late years and far from this locality. Professor Don remarked, that the Cones differed from either of the varieties of *Pinus sylvestris* at present found in Scotland; and that they so entirely resembled those of the alpine form of that species, figured by Jacquin under the name of *Pinus Mughus*, as to leave but little doubt of their identity. He added, that he regarded *Pinus Pumilio* as only another form of the same species.

Read, "A Description of a new genus of *Lineæ*." By Charles Cardale Babington, Esq., M.A., F.L.S.

This genus, which Mr. Babington regards as assisting to establish more fully the relationship of *Lineæ* to *Malvaceæ*, is stated to differ from the usual structure of *Lineæ* by its imbricated and not contorted petals, which are also not unguiculate, although slightly attenuated below, and by the remarkably thick coats of its one-seeded, perfectly closed carpels. Its essential character is given as follows:

CLIOCOCCA.

Sepala 5, integra. *Petala* 5, in æstivatione imbricata. *Stamina* 5. *Capsula* 10-locularis; *loculis* clausis indehiscentibus.

The plant on which the genus is founded was raised in the Cambridge Botanic Garden from seeds gathered in the interior of New

South Wales by Mr. Melluish, and has flowered there during three successive years.

Read also, "Extracts of Letters from Wm. Griffith, Esq., F.L.S., to R. H. Solly, Esq., F.L.S."

In the first of these letters, dated from Olipore, April 8th, 1840, Mr. Griffith states that he had recently examined two species of *Ephedra*, and had no doubt that the ovulum is, as described by Mr. Brown, naked. The first of these species has a very siliceous stem, without stomata, unless certain discs blocked up with some hard matter (silex ?) are to be so considered; which he believes to be the correct view, inasmuch as the other species, which has no siliceous deposit, has stomata of the ordinary structure arranged in a similar manner.

He had also examined the ovaria of some Orchideous plants, in which he found, in conformity with Mr. Brown's observations, that the cords sent down to the placentæ and subdividing into branches, one of which passes on each side of each placenta, do not exist before impregnation. He adds, that the size of the cords is certainly in proportion to the degree of solution of the pollinia by the stigmatic action.

In another letter, dated April 23rd, Mr. Griffith describes the ovule of the outer cell of *Callipeltis* ? (that of the inner being always abortive) as deriving its membranous covering from the inner layer of the ovarium. The ovulum itself he states to be reduced to its nucleus, but otherwise exactly to resemble those ovula which have their foramen near the hilum. The same structure, he adds, exists in the two species of *Galium* found in the neighbourhood; the seed having no proper covering except the albumen and embryonary sac, its proper coat adhering intimately with the free inner layer of the ovary, and this again adhering slightly with the calycine layer of that organ.

In another letter, dated from Cabul, July 23rd, 1840, Mr. Griffith alludes to the mode of attachment of *Cuscuta* and *Orobanche*. *Cuscuta*, he says, differs in this respect but little from *Loranthus*: the suckers stop at the first completely-formed wood, and never penetrate further, and both the cortical and ligneous systems pass into the stock. In *Orobanche*, which, however, he has only slightly examined, the attachment seems to him to be made only by a bundle of ducts derived from the outer part of the central system, which spread out into a disc over the surface of the first completely-formed wood they meet. He states the *Cuscuta* examined to be a gigantic species in extent, infesting willows, poplars, a species of *Elæagnus* and the *Alhagi Maurorum*. It also preys, he says, extensively on itself; and one of its intricate masses, half covering a willow-tree twenty or thirty feet high, presents a remarkable spectacle.

February 2.—Mr. Forster, V.P., in the Chair.

Read a paper "On a peculiar kind of Organs existing in the Pitcher of *Nepenthes distillatoria*." By Prof. Don, Libr. L.S.

These organs, named by Prof. Don 'clathrophores,' occupy the lower half of the inside of the pitcher, and have been described by

Treviranus, Meyen and Korthals. Doubts still exist as to their precise function; but it appears to him probable either that they are the mouths by which the fluid is poured out into the pitcher, or that they are connected with the function of respiration.

He thinks with M. Morren that the pitcher originates from the lamina of the leaf, the margins of which become united at an early period; while he regards the operculum as formed upon the plan of the cucullate sepal and petals of *Aconitum*, and derived from the apex of the leaf. He regards the pitchers of *Sarracenia* as formed upon the same principle; but compares those of *Cephalotus* to the labellum of *Cypripedium*, the modified leaf being produced anteriorly into a pouch, and the operculum being posterior, and not anterior, as in *Nepenthes*.

The cuticle of the upper surface of the expanded part of the petiole of *Nepenthes distillatoria* is described as destitute of stomata; that of the under surface as being furnished with numerous oval, or nearly orbicular stomata, composed of two semicircular cellules with rectilinear faces. That of the outer surface of the pitcher is also without stomata, but covered, especially in the young state, with long subulate hairs, frequently dichotomous, or furnished with a spur-like process at their base. The outer surface of the operculum is sparingly furnished with stomata, and clothed with hairs which are frequently branched and fasciculate; the inner has no stomata, but is furnished with clathrophores and clothed with hairs, which are often fasciculate, but mostly simple.

In *Sarracenia purpurea* the cuticle of the pitchers is described as consisting of sinuously-lobed and somewhat stelliform cellules, with numerous small, oval, closed stomata. The fibrous bundles are stated to be composed entirely of long pleurenchyma, the parenchyma adjacent to which consists of beautiful spiral cellules. The hairs of the inner surface of the operculum are simple, hollow, reflexed, subulate, and marked with numerous longitudinal parallel lines or striæ; they proceed from a somewhat elevated base. In the pitchers of *Cephalotus* the stomata are large, oval and closed; the spiral vessels smaller than in *Nepenthes*, and containing only a single fibre; and the hairs which form the fringed border are simple, obtuse and transparent.

Read also "A Descriptive Catalogue of the *Gramineæ* and *Cyperaceæ* contained in the Indian Herbarium of Dr. Royle." By C. G. Nees von Esenbeck, M.D., F.M.L.S., President of the Imperial Leopoldino-Caroline Academy Naturæ Curiosorum.

The following are the characters of the new genera described in this paper.

Trib. SACCHARINEÆ.

LEPTATHERUM, *Nees.*

Spiculæ in rachi ad articulos barbâ cinctâ geminæ, homogamæ, hemiologamæ, alterâ sessili, alterâ pedicellatâ, utrâque setigerâ. *Glumæ* duæ, herbaceo-membranaceæ, acutæ; inferior dorso canaliculata, quadrinervis; superior carinata trinervis. *Flosculi* univalves membranacei; inferior neuter, muticus; superior linearis, canaliculatus, apice trans-

iens in setam longam capillarem apice subcirrhosam non genuflexam. *Lodiculæ* 2, obconicæ, plicatæ, truncatæ, ovario breviores, membranaceæ. *Stamina* 3, filamentis capillaribus. *Styli* basi conjuncti, graciles; stigmata villosa. *Caryopsis* libera, lanceolata, acuta. *Inflorescentia: Spicæ*, rachi continuâ, triangulari, glabrâ, solis spicularum insertionibus barbulatis, fasciculatæ, laxæ.—*Herba*, habitu Panici Sectionis Digitariarum. *Culmus* racemosus, adscendens. *Vaginæ* longæ. *Folia* lanceolata, acuta, plana, lætè viridia, nervo albo. *Ligula* nulla.

L. Royleanum, Nees.

Batratherum, *Nees.*

Spiculæ in rachi articulatâ geminatæ, heterogamæ, alterâ sessili hemigamâ, alterâ pedicellatâ neutrâ. *Glumæ spiculæ* perfectæ 2, subæquales, herbaceo-chartaceæ, acutæ, apiceve acutè bidentatæ, in aliis superior apice setacea; inferior plana, 2—6-nervis; superior carinata, complicata, 1—3-nervis, a dorso plicata, canalem struens, in quo seta flosculi continetur, margine tenui simpliciter connivente. *Flosculi* membranacei, glumis breviores, nunquam saltem longiores; inferior neuter, 1-valvis, muticus; superior bivalvis; valvulâ inferiori acuminatâ apice minutè bidentatâ propè a basi emittente setam in medio geniculatam infernè tortam; superiori exiguâ lineari-subulatâ bidentatâ quandoque nullâ. *Lodiculæ* latæ, membranaceæ, truncatæ, dentatæ, plicatæ, in semicirculo singulæ singulum floris latus ambientes. *Stamina* 3. *Stigmata* villosa. *Styli* discreti. *Spicula* pedicellata angustior, subuniglumis. *Gluma* plana acuta nervosa, margine subtiliùs serrulata; superior gluma et flosculi rudimentum minuta, rotundata, squamiformia. *Inflorescentia: Spica* parcè dichotoma, ad genicula magis minùsve barbata. *Pedicelli spicularum sterilium* ciliati.—*Gramina* repentia, ramosa, foliis brevibus amplexicaulibus. *Stipulæ* membranaceæ, exsertæ.

B. micans, Nees.

APOCOPIS, *Nees.*

Spiculæ in rachi angustâ barbulatâ subgeminæ muticæ, alterâ rudimentali pedicellari, alterâ polygamâ sessili. *Glumæ* truncatæ; inferior lata, plana, obovato-conica, coriaceo-chartacea, 8—9-nervis, lævis, apice minutè bidentata et inter denticulos subciliolata, basin versus firmior et colorata; superior ovata, apice angustior denticulataque, chartacea, marginibus inflexa, lævis, quinquenervis. *Flosculi* 2, membranacei, bivalves, mutici; inferior masculus valvulis æqualibus, apice truncatis denticulatis, dentibus aliquot magis distantibus. *Stamina* 3, antheris angustis, fulvis. *Lodiculæ* exilissimæ, quandoque omninò nullæ quandoque denticuliformes acutæ. *Flosculus* superior hermaphroditus, vel potiùs hermaphrodito-femineus. *Valvula* inferior paulò firmior reliquis et colorata, apice truncato-bi-tri-denticulato; superior brevior, latiùs truncata, ciliolato-denticulata. *Lodiculæ* nullæ, aut forsan, ut in masculo, exilissimæ. *Stamina* 3, eo tempore quo flosculi masculi stamina antheris perfectissimis filamentisque nondum elongatis intra valvulas adhuc latent, *jam* maximè extenuatis filamentis antheris autem nullis residuis extra valvulas prominentibus, conspicua. *Ovarium* lanceolatum, in stylum simplicem, mox bifidum, transiens. *Stigmata* longa, linearia, brevi-villosa. *Spiculæ neutrius vestigia* produntur pedicello, spiculæ fertili adjecto, ciliato, mutilo. *Inflorescentia*: *Spica* bifida aut geminata; articulis trigonis ciliato-hirsutis ad genicula longiùs barbulatis.—*Gramen* tenerum, gracile, ramosum. *Nodi* glabri. *Vaginæ* arctæ. *Folia* plana, lineari-acuta.

A. Royleanus, Nees.

Trib. STIPEÆ.

Orthoraphium, *Nees.*

Spiculæ unifloræ. *Glumæ* duæ convexæ, chartaceo-membranaceæ, plurinerves. *Flosculus* collo barbato hinc depresso-plano insertus, bivalvis, chartaceus. *Valvula* inferior plurinervis, convoluta, apice attenuata in subulam continuam non articulatam neque contortam; superior brevior, binervis, dorso convexa. *Lodiculæ* 3, membranaceæ; duæ anteriores lanceolatæ, ovarium æquantes, basi callo insertæ; posterior lanceolato-linearis, ovario duplò longior. *Stamina* 3, antheræ flavæ, apice barbatæ aut nudæ. *Ovarium* sessile, apice calloso-incrassatum. *Styli* breves, basi contigui. *Stigmata* plumosa. *Caryopsis* libera. *Inflorescentia*: *Panicula* angusta, ramis paucifloris.—*Gramina* foliis angustis rigidis, caudâ aristæformi spicularum mediocri rigidulâ scabrâ.

O. Roylei, Nees.

Trib. CHLORIDEÆ.

Melanocenchris, *Nees.*

Spiculæ sesquifloræ aut subtrifloræ, flosculo extremo rudimentali, in rachi propriâ brevi alternæ quidem, sed adeò approximatæ ut capitulum involucratum exhibeant; superiores rachillæ imperfectæ. *Glumæ* in infimis duæ, æquales, in superioribus quandoque in omnibus una (supera), bracteæformes, subulatæ, rigidæ, hirsutæ, flosculis longiores, basi membranaceo-marginatæ. *Flosculi* perfecti duo, ubi gluma singula residet quasi axillares in angulo glumæ et rachillæ; quorum alter rachillæ propior, hermaphroditus, perfectus, sessilis; alter masculus vel neuter pedicellatus; tertius, ubi adest, rudimentalis, clavatus, nudo pedicello seu rachillæ apice indicatus. *Valvulæ* duæ, membranaceo-herbaceæ; inferior trinervis, apice bifida, laciniis æqualibus lineari-subulatis, vel bifida cum setâ interjectâ; superior æquè longa, plana, binervis, apice bifida. *Flosculus* superior conformis, sed minor. *Lodiculæ* breves, subquadratæ, bidentatæ, glabræ. *Stamina* 3. *Antheræ* luteæ. *Ovarium* oblongum, compressum, læve, truncatulum. *Styli* longi, latè discreti, filiformes. *Stigmata* angusta, dissitè brevi-puberula. *Caryopsis* libera. *Inflorescentia*: *Spicæ* partiales, formâ involucrorum Cenchri aut Penniseti, in rachi communi flexuosâ alternæ, secundæ, paucæ, nutantes racemulum exhibent.—*Gramina* perennia, parva, polyphylla, ramosa. *Folia* brevia, rigidula. *Ligula* nulla. *Racemus* exsertus, gracilis, secundus, laxus. *Setæ* flosculorum coloratæ.

1. *M. Royleana*, Nees.
2. *M. Rothiana*, Nees.

Pomereulla monoica, *Roth.*

Trib. FESTUCEÆ.

PLAGIOLYTRUM, *Nees.*

Spicula multiflora. *Glumæ* duæ, spiculâ breviores; inferior minor amplectens, obliquè acutata, altero latere subpræmorsa; superior bidentata, et inter dentes brevi-subulata, subulâ dentes æquante, e nervi dorsalis geminati apice unito ortâ. *Flosculi* in axi gracili ad genicula barbulata imbricati, bivalves. *Valvula* inferior ovata, lateribus incurva, herbacea, trinervis, apice bilaciniata laciniis muticis, setis tribus strictis, e nervo medio duobusque lateralibus proficiscentibus interjectis; superior oblonga, magis membranacea, sursùm plana, in apice obtusiusculo bifida, inferiùs convoluta, referens flosculum ligulatum Synan-

thereæ, subquadrinervis, nervis duobus marginibus proximis distinctis, mediis obsoletis. *Lodiculæ* 2, coloratæ, conicæ, truncatæ, glabræ, angustæ. *Stamina* 2 (?). *Filamenta* capillaria. *Ovarium* cylindricum, glabrum. *Styli* filiformes, distantes. *Stigmata* laxè villosa. *Caryopsis* elongato-cylindrica, compressiuscula, truncato-bidenticulata. *Inflorescentia*: *Spica* simplex, disticho-subsecunda.—*Gramina* erecta, foliis angustis, ligulâ brevi.

1. *P. calycinum*, Nees.
   Dineba calycina, *Hb. Wight.*
2. *P. filiforme*, Nees.
3. *P. unidentatum*, Nees.

Many new species belonging to genera previously established are also characterized and described.

February 16.—The Bishop of Norwich, President, in the Chair.

Read "Observations on some new or little-known species of *Polyparia*, found in the supercretaceous strata of Italy." By Signor Giovanni Michelotti of Turin.

March 2.—Mr. Forster, V.P., in the Chair.

Read a "Description of a new genus of Plants from Brazil." By John Miers, Esq., F.L.S.

The following are the characters of the new genus described :—

TRIURIS.

Flores dioici. *Perianthii foliola* 3, obovata, infra apicem processu longo instructa. ♂ *Antheræ* 3? sessiles, loculis disjunctis, imo androphoro magno carnoso centrali insertæ. ♀ *Pistilla* numerosissima, aggregata, supera. *Styli* simplices, subulati. *Fructus* ignotus.—Planta *pusilla hyalina*, foliis *paucis bracteiformibus.*

T. hyalina.

Hab. in humidis Serra dos Orgãos Provinciæ Rio de Janeiro.

Mr. Miers observed this minute plant only in a single locality, and was unable to find ripe fruit. He perceived, however, in each pistillum what appeared to him to be a solitary ovule, but so minute and indistinct as to be evident only by the appearance of a darker oval form in the centre. He has consequently no positive evidence whether it is Monocotyledonous or Dicotyledonous; but is induced by various considerations to refer it to the former class. He notices the points in which it appears to him to bear some resemblance to different Monocotyledonous families, and suggests that, as it cannot be distinctly referred to any of them, it may probably be taken as the type of a distinct order, holding a place between *Burmanniaceæ* and *Fluviales*.

The processes which are noticed in the character as arising from below the apices of the divisions of the perianthium, are described as capillary tubes three times as long as the segments, within which they are coiled up during æstivation, their apices exhibiting at the apex of the bud three minute pore-like apertures open externally.

GEOLOGICAL SOCIETY.

March 11, 1840.—A paper was read, "On the Siliceous Bodies of the Chalk, Greensand and Oolites;" by Mr. Bowerbank, F.G.S.

The author commences by stating, that naturalists and geologists have long considered the form of tuberous masses of flint found in the upper chalk to be due to alcyonia or sponges, but that he is not aware of this opinion having been proved to be correct. It was Professor Ehrenberg's observations on siliceous bodies which first induced him to obtain thin slices of flint with the intention of procuring specimens of Xanthidium. In the examination of these slices, he was struck with the frequent occurrence of patches of brown, reticulated tissue, spicula and Foraminifera, and he was induced to infer, that the patches of tissue were the remains of the organized body, possibly a sponge, to which the flint owed its form. With this belief, he commenced his inquiries by examining thin slices of flints obtained from various localities, and he found in all of them a perfect accordance in the structure and proportion of reticulated tissue, in the number of spicula, and in the occurrence of Xanthidia and Foraminifera. The following are the general appearances which the slices of flint exhibit when mounted upon glass.

With a power of about 120 linear, the slice presents the appearance of a stratum of a turbid solution of decomposed vegetable or animal matter containing Foraminifera, spicula, Xanthidia, and frequently fragments of the brown tissue. In a specimen from Northfleet the mass of the spongeous portion exhibited numerous cylindrical contorted canals, which from their uniformity and minuteness of diameter, Mr. Bowerbank considered to be the incurrent canals of the sponge; and other orifices of greater diameter to be the excurrent. Very frequently, when little of the reticulated substance of the sponge remains, its former presence, the author says, is indicated by the siliceous matter resembling a congeries of gelatinous globules, moulded by the tissue amid which it was deposited; and the globules, when traced to the edges of the patches of spongeous texture, were found to agree in size and form with the orifices of the supposed incurrent canals. In cases where no traces of the sponge can be detected, Mr. Bowerbank thinks, that the mode in which the spicula, Foraminifera and other extraneous matters are dispersed equally in all parts, and not precipitated to one portion of the flint, indicates that the organized tissue in which they were entangled, retained its form and texture sufficiently long to allow of the fossilization of these remains in their original places; and that the nature and position of these bodies strongly indicated the former spongeous nature of the flint.

When the chalk is carefully washed from the exterior of a flint, and a portion examined as an opake object with a power of about fifty linear, it exhibits a peculiar saccharine appearance, with deep circular excavations, having fragments of extraneous matters partly imbedded or adhering to them. If the surface be further cleansed by immersion in diluted muriatic acid, till effervescence ceases, spicula may be detected on the sides of the deep circular cavities; and if,

again, a piece a quarter of an inch in diameter, presenting the roughest aspect, be examined under a power of 120 linear, illuminated by a Lieberkuhn, the surface, under favourable circumstances, will present a complex mass of small, contorted tubuli, occasionally furnished at the apex with a minute perforation.

The structure and other characters of the tabular flints are stated to accord perfectly with those of the nodular masses, except that the under surface has a still more marked spongeous aspect, and that spicula and Foraminifera are more abundant. The absence of any apparent base or point of attachment in the great mass of nodular chalk flints, the author says (considering them undoubtedly of spongeous origin), may be accounted for by supposing that the gemmule was originally attached to some minute fragment of a shell or other substance, and that its further development took place while recumbent on the mud or silt.

The perpendicular and oblique veins of flint between Brighton and Rottingdean, are reported to present exactly the same internal characters as the tabular and nodular flints, and to agree externally with the former. The occasional existence of a fissure filled with chalk, in the centre of the vertical layers, Mr. Bowerbank conceives, may indicate that the sponge had grown from the two sides of the crevices, but had not in all places been able to unite. The sides of these flint veins are not studded with Foraminifera in a manner similar to that of the tabular horizontal layers.

Mr. Bowerbank next examined the flint with which Echinites and shells of the chalk are often entirely or partially filled and enveloped, and he states, that the results were the same, both with reference to the exterior and the interior of the flint. In those cases in which the Echinite is only partially filled, he infers that the portion so occupied was originally a sponge, because its surface is uneven; for had the flint been deposited in an empty shell or Echinite, it would present an uniformly flat surface. Again, he states, that the projecting of the flint through the two openings of the Echinite, with an extension to a greater or less distance, is owing to the sponge having grown outwards through these orifices; and the envelopment of an organic body by a tabular mass of flint, he explains by reference to the habit of recent sponges to invest testacea or other marine bodies. In some cases, he has found minute but deep depressions on the surface of flints filling Galerites, and immediately opposite to the ambulacral pores; and he ascribes the origin of the depressions to streams of water drawn in through the orifices to supply the wants of the living sponge.

Mr. Bowerbank was afterwards induced to extend his examination to the flints which invest the zoophytic bodies of the Wiltshire chalk. By carefully cleaning the interior of some of these flints, he discovered spicula projecting from all parts, however different the character of the inclosed body; and the spicula appeared to have no reference to it, none of them being found on its surface. Under the microscope, the investing flint presented in every respect the same appearance as that exhibited on the lower surface of the tabular flints, ha-

ving fragments of minute corals and small shells attached to the inner surface. A thin slice exhibited the usual organic contents of the common flint. He, therefore, infers that the tabular flint which incloses the zoophytes, owed its origin also to a sponge which invested the organic nucleus.

A comparison of the characters presented by the spongeous remains of the flint, with a collection of recent sponges, has induced Mr. Bowerbank to conclude that the fossils cannot be referred to any of the established divisions of existing sponges.

On examining the cherts of the greensand of Fovant in Wiltshire in the same manner, he found that the only differences between them and chalk flints, existed in the coarser texture of the spongeous fibre, the greater size of the interstices of the network, and the larger dimensions of the imbedded extraneous bodies. The cherty nodules of the upper greensand of Shaftesbury afforded similar appearances. A black, semi-transparent nodule, with an outer coat resembling agglutinated sand, was found under the microscope to contain numerous contorted canals of various sizes, and a considerable number of beautiful green spicula. Two chert casts of Spatangi from Shaftesbury afforded results analogous to those obtained from chalk Echinites.

Slices from a great variety of the greensand cherts of Lyme Regis presented characters which agreed with the cherts of Fovant. A specimen of flint from the Portland stone of Tisbury, and another from Portland, gave a greater quantity of cellular structure than any of the previously noticed cases, and the texture bore a greater affinity to that of the freshwater sponge, than is exhibited in the flints of the chalk or the cherts of the green sand.

With respect to the causes of the deposition of the flint, Mr. Bowerbank objects to the supposition, that it was influenced by the siliceous spicula of the sponges, because the flint is in no case limited or determined by their immediate presence, but is, in all instances, bounded by the extent of the animal matter of the sponge. He has frequently observed that the large excurrent canals in the chalk-flint spongites are not filled with silex, and that the spicula projecting into them have not the slightest incrustation of siliceous matter upon their surface; while on the contrary, wherever a single tube or a thin layer of tubes has been projected from the mass into the chalk, the silex has been attracted to it. He conceives also, that the retention of the spicula and extraneous matters in all parts of the flint, may be accounted for, by supposing that the animal matter was the attractive agent, acting equally throughout the whole body of the sponge. In support of his argument he adduces the siliceous shells of Blackdown, and the siliceous corals of the Tisbury oolite and the mountain limestone, which contain no spicula, and in which it cannot be supposed that previously existing siliceous matter was the attractive agent. Lastly, the pyritous fossils of the London, Kimmeridge, Oxford and other clays, are also mentioned as examples of animal and vegetable substances having exercised an attractive influence.

ZOOLOGICAL SOCIETY.

August 11, 1840.—R. C. Griffith, Esq., in the Chair.

A paper entitled "Description of Shells collected and brought to this country by Hugh Cuming, Esq.," by W. J. Broderip, Esq., F.R.S., etc., was read.

"Mr. Cuming," observes the author, "the fruits of whose western voyage are so well known, left England on the 26th of February, 1836; he proceeded to the Philippine Islands, by the permission of the Queen Regent of Spain, and aided by powerful recommendations from her government, which opened to him the interior of the islands, and caused him to be received with a noble hospitality, equalled only by the warm interest which facilitated his pursuits wherever he arrived and made himself known.

"Mr. Cuming visited the whole group. His longest stay was in the island of Luzon, fifteen provinces of which were well ransacked by him. In the islands Mindoro, Negros, Panay, Siquijod, Zebu, Bohol, Camiguing, Mindanao, Leyte, Samar, Capul, Ticao, Masbate, Burias, Temple, Marinduque, Maracavan, and Ramblon, he reaped a fine harvest. He left the Philippines in November, 1839, proceeded thence to Sincapore and Malacca, and returned to England in June, 1840, bringing with him, besides the living animals which he has liberally presented to this Society, a grand collection of zoological and botanical specimens, including more than three thousand species and varieties of shells, the greater part of which appear to be new to science, and among them are several new genera. The smaller islands were particularly rich in the pulmoniferous mollusca, which were found by Mr. Cuming principally in deep forests. We commence a notice of the labours of this active and zealous collector, with an attempt to describe a few of these terrestrial species. Mr. G. B. Sowerby, who liberally gives up his valuable time to assist in laying before the public the novelties of this part of the collection, will also begin his share of the task, by describing another branch of the same numerous family; and it is intended to submit descriptions to the Society from time to time till the whole of Mr. Cuming's stores are exhausted.

"Before, however, we commence our task, I must, in justice to him who has placed the materials in our hands, observe, that, to say nothing of the variety of new forms which he has been the means of bringing to light, those who cultivate this branch of zoology so highly interesting to the geologist, as well as the physiologist, owe him a large debt of gratitude, for information on a point of no small zoological importance. It is not very long since, that the localities ascribed to shells could in very few instances be depended upon. The cupidity of dealers, some years ago, not unfrequently prompted them wilfully to deceive those who gave extravagant prices for new shells on this point, and carelessness was generally the order of the day. Mr. Cuming, by his accurate notes, and the open publication of the places where every one of the multitudinous species and varieties collected by him was found, has mainly assisted in making a

complete revolution in this department of the science, and has done more towards giving us data for the geographical distribution of the testaceous mollusca than any person who has yet lived.

"HELICIDÆ.

"When we consider what the genus *Helix* was when Linnæus wrote, and what it now is, we must be struck with the flood of new species which has been poured in upon us of late years. Already the vocabulary has been so drawn upon, that the mere finding names for the new species is attended with no small embarrassment, whilst the limits of each species are daily more difficult to fix. When a few forms only in a great natural group are known, they are easily defined. It is where multitudes are placed before the zoologist, marked with every variation that food and temperature and locality can impress upon them, that it becomes no longer easy to solve the problem, 'Which is a species and which is a variety?' Then it is that the pregnant question 'What *is* a species?' comes home to the mind. But our business now is to define, as well as we can, those forms which have been laid before us, and which, to us at least, are new. When the whole of the additions to this great tribe existing in Mr. Cuming's collection have been studied, we shall perhaps have materials for something like a complete natural arrangement of the group."

Genus BULINUS*.

BULINUS MINDOROENSIS. *Bul. testâ ovatâ, ventricosâ, subpronâ, anfractibus sex, ultimo longè maximo, lineis incrementi obliquè striatâ, aperturâ subrotundâ, columellâ latâ, labio expanso.*

Var. *a. valdè ventricosa, sordidè brunnea strigis irregularibus longitudinalibus varia; aperturâ subalbidâ; labio nigro-brunnescente.*

Hab. ad Puerto Galero in insulâ Philippinâ Mindoro dictâ.

Legit H. Cuming in sylvis.

Var. *b. Pallidior, coloribus distinctioribus, fasciâ suturali brunneâ interruptâ; anfractu ultimo fasciâ brunneâ strigis longitudinalibus interruptâ cincto; labii margine castaneo-rufescente.*

Hab. ad Mansilai in insulâ Mindoro.

Legit H. Cuming in sylvis.

Var. *c. Gracilior, longitudinaliter brunneo et flavo sordido striata.*

This comes very near in colouring, and approaches somewhat in the shape of the aperture, to the two first varieties of *Bul. chrysalidiformis.* The markings of the young shell remind the observer of the eggs of some of the Plovers, and the shape assists the delusion.

Hab. ad Puerto Galero in insulâ Mindoro.

Legit H. Cuming in sylvis.

Var. *d. Sordidè flavescens creberrimè longitudinaliter corrugata et strigata.*

* "I have elsewhere (Zoological Journal, vol. iv. p. 222) given my reasons for writing Bul*i*nus instead of Bul*i*mus. Adanson's *Bulin* was a *Physa*, and the word, however written, is very inapplicable to the forms to which Bruguière, Lamarck and authors generally have applied it."

A brilliant *chatoyant* reflection, like Labradorite, is to be observed on the polished surface of the dark brown reflected part of the outer lip in fresh specimens.

Var. *e. Subnana, gracilior, strigis et coloribus distinctioribus, clarioribus.*

Hab. ad Puerto Galero.

Legit H. Cuming in sylvis.

This variety was the most abundant, and Mr. Cuming informs me that he detected it in the act of depositing its eggs on the leaves of trees in the forest where it was feeding. The eggs, which are white, oblong, and covered with a hard, granular shell, were attached to the leaves by a gummy substance. They are half an inch long, and nearly four-twelfths across in their widest part.

Var. *f. Anfractu ultimo nigrescente, anticè flavo subsordido strigata vel maculata, fasciâ nigrescente basali.*

Hab. ad Puerto Galero.

Legit H. Cuming in sylvis.

In this variety, the abrupt termination of the yellowish markings toward the basal portion of the body-whorl leaves the dark colour almost uninterrupted, in the shape of a dark band.

Var. *g. Strigis distantibus, anfractu basali erga basin cincturâ moniliformi, interruptâ, albidâ vel flavescente ornato.*

Hab. ad Mansalai in insulâ Mindoro.

Legit H. Cuming in sylvis.

Var. *h. Pallida, strigis latis, anfractu ultimo fasciâ pallidiori subbasali cincto.*

Hab. ad Mansalai.

Legit H. Cuming in sylvis.

Var. *i. Strigis irregularibus, angulatis, frequentibus tota picta.*

Hab. ad Mansalai.

Legit H. Cuming in sylvis.

Var. *k. Cinereo-subvirescens, strigis pallidis angulatis, distantibus, brunneo-marginatis obscurè ornata, anfractu basali fasciâ brunneo-rufescente subbasali cinctô.*

Hab. ad Puerto Galero.

Legit H. Cuming in sylvis.

Near the *umbilicus*, the *epidermis*, in those specimens of var. *k.* which I have seen, is worn off, exposing the rich red-brown ground colour of the shell. Indeed in all the varieties the dark colour generally appears to reside in the shell itself, and the lighter-coloured markings, with few, if any exceptions, in the *epidermis*. In the largest variety (*a*) here described, the effect of the detrition of the *epidermis* is well shown. Var. *k.* comes very close upon var. *c.* of *Bulinus chrysalidiformis*. The length of this species is 6 inches and under, and the breadth from about 1 to $1\frac{1}{8}$th of an inch.

Bulinus chrysalidiformis. *Bul. testâ valdè productâ, subpupiformi, subcylindricâ, lineis incrementi obliquè rugosâ; aperturâ subauriculiformi, distortâ; columellâ subrectâ, amplâ, complanatâ;*

peristomate interrupto; labio interno expanso, labio externo expanso, subrecurvo, sæpiùs subconstricto; umbilico subobsoleto.

Var. *a. Subgracilis, anfractibus 7 subventricosis, ultimo vix subventricosiori; pallidè castanea vel brunnescens strigis longitudinalibus, irregularibus sordidè flavis picta; aperturâ intus subalbidâ; labio nigro-purpurascente.*

This variety is curiously marked. In the young shells the colours are more pure and distinct, but as the animal becomes aged they are more confused, and run into each other. In both states the upper whorls are transparent, and the two last opaque.

Var. *b. Pallidior, labio haud constricto, ex albido dilutè purpurascente.*

Hab. ad Puerto Galero.

Legit H. Cuming in sylvis.

The distortion and a shade of the constriction may be traced in the mouth of this variety.

Var. *a.* et *b.* habitant ad Puerto Galero.

Legit H. Cuming in sylvis.

Var. *c. subflava, anfractibus ventricosioribus, fasciâ suturali albidâ et subpurpureâ tessellatâ; aperturâ amplâ, albâ, labii margine castaneo-purpurascente.*

The shells of this variety are much less thick than those of the two first, and are nearly transparent throughout; but it must be remembered that all which I have seen of this variety appear to be younger shells: the body-whorl is also much more ventricose in proportion.

Var. *d. Tota flavescens, labio albo.*

This variety, as well as the last, when held against the light, shows shadings of the longitudinal stripes.

Var. *c.* et *d.* habitant ad Mansalai.

Legit H. Cuming in sylvis.

*** *Bulinus chrysalidiformis* of G. B. Sowerby (Zool. Proc. 1833, p. 37) is a faded shell of var. *c.* or *d.* It is without *epidermis*, and entirely white, except the margin of the lip, which is brownish. The length of this species varies from $2\frac{7}{8}$ths inches to $2\frac{2}{8}$ths, and the breadth from $1\frac{5}{8}$ths to $1\frac{1}{8}$th.

"The shells which I have here attempted to describe were collected by Mr. Cuming in deep and dark forests of thick foliage, some upon, and others beneath, the leaves of trees. There were no palms in these forests.

"I cannot quit this group without acknowledging that I am not without doubts as to the specific difference of *Bul. chrysalidiformis* and *Bul. Mindoroensis*. If the shells at the greater intervals be taken, they appear to be distinct, but there are gradations in these numerous and motley Mindoro snails, that at least closely approximate the two sections into which I have divided them."—W. J. B.

Mr. Cuming exhibited the various species and varieties of shells described in the foregoing paper, and also a series to illustrate the

memoir of G. B. Sowerby, Esq., which was next read: it is entitled "Descriptions of new species of the family of *Helicidæ*, collected by Mr. H. Cuming in the Philippine Islands."

Helix (Cochlogena De F.) polychroa. *Hel. testâ obovatâ, tenui, nitidâ, anfractibus quinque, primis præsertim, ventricosis, obliquè lineis incrementi, striatis, ultimo majori, cæteris duplò longiori, fasciâ diversicolore, plerùmque albâ, prope suturam: aperturâ suborbiculari, peristomate plerumque albo, extus reflexo; columellâ albâ, rectiusculâ, anticè subcallosâ, subsinuatâ.* Long. 1·9, lat. 1·3 poll.

H. virido-striata, Lea secund. Jay.

Hab. in foliis arborum ad insulam Temple dictam Philippinarum.

One of the most beautiful, as well as one of the most variable species in colour. In its general form it is very near var. *b.* of Lamarck's *Helix galactites* (*H. mirabilis*, De F. Hist. Nat. Gen. et Part. des Mollusques terr. et fluv. t. 31. f. 4 to 6), which has been called *H. Philippinarum*, but from which it may easily be distinguished by attention to the above characters. The following seven varieties in colour have been brought by Mr. Cuming: viz. var. *a.* bright green, with darker, longitudinal, oblique, slightly undulated lines and bands, and a white band at the suture: var. *b.* the same, with the addition of a narrow, very darkly coloured brown band immediately below the white sutural band, and a broad spiral dark brown basal band: var. *c.* the same, with two additional dark brown bands on the last volution: var. *d.* bright light brown, with green, slightly undulated oblique longitudinal bands, and a white sutural band: var. *e.* the same as var. *a.*, but having the sutural band of a light and dark brown colour varied: var. *f.* of chestnut brown, with a white sutural band: var. *g.* of a dark chestnut brown, with a light orange brown sutural band.

This species is *Helix virido-striata* of Lea, according to Dr. Jay; I know not if that name be published or not. I hope not, because it cannot be adopted, neither being consonant with the rules of nomenclature, nor with classic purity.

Helix (Cochlogena De F.) florida. *Hel. testâ obovatâ, tenuiusculâ, haud nitente, anfractibus quinque ventricosis, tenuissimè obliquè striatis, ultimo majori, cæteris ferè duplò longiori; suturâ minutissimè crenulatâ, albâ; aperturâ suborbiculari peristomate latiusculo, reflexo, rotundato, albo; columellâ albâ, subincurvâ.* Long. 1·6, lat. 1·1 poll.

Hab. in foliis arborum prope Munsolai ad insulam Mindoro Philippinarum.

This, like the last, is a very beautiful species, and it is also subject to much variation in colour; its varieties, nevertheless, are not so numerous. It is principally remarkable for its surface being dull like the bloom upon green plums or grapes. The following varieties are exhibited by Mr. Cuming: viz. var. *a.* of an uniform green, becoming paler toward the apex, where it is white: var. *b.* green, with a brown band close to the white sutural band, and the apex of a

reddish brown: var. *c.* green, with a dark brown band near the sutural band, and a dark brown spiral band close to the *columella*: var. *d.* the same, with two intermediate brown bands, both of which, however, are not continuous: var. *e.* brown, with a dark brown band next to the sutural white band, and the dark brown spiral band surrounding the *columella*. In all these varieties the narrow white sutural band is constant, and the anterior part of the last volution within the aperture is yellower than the outer surface.

Helix (Cochlogena De F.) hydrophana. *Hel. testâ obovatâ, tenuiusculâ, nitidulâ, anfractibus quinque ventricosis, obliquè tenerrimè striatis, ultimo majori, cæteris duplò longiori, omnibus plùs minùsve epidermide hydrophanâ indutis; aperturâ suborbiculari, peristomate albo, rotundato, reflexo; columellâ subarcuatâ, anticè in tuberculum indistinctam productâ.* Long. 1·35, lat. 1·05 poll.

Hab. prope Puerto Galero ad insulam Mindoro Philippinarum.

The ground colour of this extraordinary species is brownish yellow, and it has two, three, or four broader or narrower very dark brown spiral bands. A rather thinner variety, with three bands, is found in the island of Corregidor, in the Bay of Manilla. The most remarkable circumstance in its natural history is that it is more or less covered with a very thin, opaque, white *epidermis*, which becomes transparent on being wetted; the dark brown bands are then seen brilliantly contrasted with the yellowish brown general colour of the shell.

Helix (Helicostyla De F.) cepoides. *Hel. testâ suborbiculari, tenui, spirâ subdepresso-conicâ; anfractibus senis, ventricosis, posticè depressiusculis, lineis incrementi striatis; suturâ distinctâ; aperturâ semilunari, peristomate posticè tenui, subreflexo, tùm crassiori, reflexo; columellâ in dentem obtusum producto.* Long. 1·8, lat. 2·2 poll.

H. cepoides, Lea, M.S. secund. Jay.

Hab. ad insulam Luban Philippinarum.

This species most nearly resembles *H. unidentata*, Lam. Anim. sans Vert. VI. pt. 2, p. 74, from which it may easily be known by its more ventricose volutions, and its much narrower aperture. It differs also in colour, the *unidentata* being usually of a dark chestnut brown, while in the *Dolium* the spire and more than the upper half of the last volution are of a light brown, and the remainder lighter coloured still, and between the darker and lighter colour is a band of nearly white. The *epidermis* in this species is very thin and pale-coloured, and it has alternating darker marks close to the suture. A variety occurs of a nearly uniform pale brownish yellow colour, though in other respects similar.

I gladly adopt Lea's manuscript name of *cepoides*.

Helix (Helicostyla? De F.) arata. *Hel. testâ ovatâ, subcylindricâ, crassiusculâ, rufo-fuscescente, fasciâ antemedianâ albidâ; anfractibus senis, subventricosis, obliquè exaratis, subrugosis; suturâ distinctâ, crenulatâ; aperturâ ferè circulari, intùs albâ,*

peritremate expanso, subreflexo, fusco; columellâ albâ; umbilico mediocri. Long. 1·7, lat. 1·1 poll.

Hab. ad insulam Tablas Philippinarum.

Variat testâ omninò pallidè lutescente, aperturâ peritremateque albis.

The two varieties of this remarkable species differ so much in colour that they might at first sight be regarded as distinct species; I do not, however, discover any real difference in their conformation, and therefore am compelled to unite them as varieties. The ridges between the furrows vary greatly in their distance from each other; they appear to be more and more frequent as the shell increases in age.

Helix (Helicostyla? De F.) ADUSTA. *Hel. testâ oblongâ, subcylindricâ, castaneâ, lævigatâ, tenuissimè lineis incrementi striatâ, fasciâ antemedianâ pallidiori; anfractibus senis subventricosis; suturâ distinctâ; aperturâ ferè circulari, intùs albicante; peritremate leviter expanso, reflexo, fusco; columellâ pallidâ; umbilico parvo.* Long. 1·8, lat. 1· poll.

Hab. ad insulam Tablas Philippinarum.

This species resembles the last in form as well as colour; it differs, however, in its general proportions, as well as in being entirely free from the numerous and deep oblique grooves so remarkable in that species; its *umbilicus* also is smaller.

Helix (Helicostyla? De F.) BRACHYODON. *Hel. testâ ovato-subcylindricâ, tenui, castaneâ, fasciâ anticâ pallescente; anfractibus quinque ad sex subventricosis, lineis incrementi tenuitèr obliquè striatis; suturâ distinctâ, levitèr crenulatâ; aperturâ suborbiculari, intùs albicante; dente obtuso, antico, albo; peritremate subincrassato, reflexo, subexpanso, internè inter columellam dentemque sinuato; columellâ albâ, obtusâ; umbilico parvo.* Long. 1·95, lat. 1·3 poll.

Hab. in foliis arborum prope Puerto Galero ad insulam Mindoro Philippinarum.

Variat testâ breviori, colore saturatiori, striisque fortioribus. Long. 1·35, lat. 1·2 poll.

I have named this species *Brachyodon*, from a short white tooth placed at the inner and anterior part of the lip, and which appears to be constant, I do not hesitate to regard the shorter specimens as merely a variety, though they differ greatly in their proportions from the typical variety. A single nearly colourless specimen is intermediate in its proportions.

Helix (Cochlogena De F.) PULCHERRIMA. *Hel. testâ orbiculari, subglobosâ, tenuiusculâ, haud nitente, spirâ plerùmque subdepressâ, anfractibus 4½, ventricosis, lævibus, striis solùm incrementi tenuissimis insculptis, coloribus pulcherrimè ornatis, ultimo maximo, cæteris quadruplò longiori; suturâ distinctè impressâ; aperturâ rotundato-semilunari, intùs albâ, peristomate latiusculo, rotundato, reflexo, extùs ad basin columellæ subsinuato; columellâ dilatatâ, subplanulatâ.* Long. 1·5, lat. 2· poll.

Hab. prope St. Jaun in provinciâ Cagayan insulæ Luçon Philippinarum.

The usual ground colour of this very pretty shell varies from a pale yellowish brown, through orange brown, to dark chestnut brown; some of its varieties are of a nearly uniform colour, others are very elegantly varied, with narrower or broader, and more or less numerous interrupted bands of opaque white *epidermis* (which are transparent when wetted), and which gives them a very brilliant and captivating appearance, to which it is indeed impossible in words to do justice.

This species is usually about the same size as *Helix Pomatia*, differing from that, however, very greatly in form and proportions, and varying, moreover, greatly in size. It is nearly orbicular, somewhat globose, with a slightly depressed obtuse spire. It is of a thin substance, and its surface is dull. Its volutions are four and a half, of which the first is rounded, and the last is very large, being four times as long as the rest, and very ventricose; they are smooth, being closely covered with the very slender lines of growth; the suture is very distinct, inasmuch as that the posterior part of the next volution is nearly horizontal, and the anterior part of the last volution nearly perpendicular to it. The aperture is large (not so large in proportion as Deshayes's *Helix Cailliaudi*, Mag. de Zool., 1839, 'Mollusques,' Pl. 5.), of a rounded semilunar form, and white within: the peristome is rather broad and thick, rounded and reflected; in some varieties it is quite white, in others it is delicately coloured of a rose tint, and sometimes of a brownish red: the *columella* is dilated and rather flattened, usually quite white, though occasionally tinged with rose.

The following are the twelve principal varieties which have occurred to Mr. Cuming, viz.

Var. *a*. General colour dark chestnut brown; apex brownish scarlet; edge of the peristome purplish crimson; body covered with broader and narrower white interrupted bands, set nearly close together.

Var. *b*. The same, only not having so many of the white bands, the ground colour is seen in broader bands.

Var. *c*. General colour dark chestnut brown, with numerous interrupted bands of light brown *epidermis*; apex brownish scarlet; edge of the peristome purplish brown.

Var. *d*. Ground colour orange brown, with numerous white interrupted bands; peristome white.

Var. *e*. Dark chestnut brown, with only three or four light-coloured interrupted bands, so that the dark brown ground colour appears in broad bands.

Var. *f*. Light yellowish brown, with the apex red, and the edge of the peristome rose colour; numerous close-set, interrupted, nearly white bands ornament this variety.

Var. *g*. The same ground colour as the last, with a light buff-coloured edge to peristome, and a single white scarcely interrupted band, forming the circumference of the shell.

Var. *h*. With a chestnut brown ground colour, a red apex, and orange-coloured edge to the peristome, and one white band, forming the circumference.

Var. *i.* With a chestnut brown ground, a red apex, and an orange-coloured edge to the outside of the pink-edged peristome, and without any white band but a slender white sutural line.

Var. *k.* With a yellowish brown ground colour, the apex and the back of the peristome bright orange-red; peristome and columella rose-coloured; without a band, but with a slender white suture line.

Var. *l.* Of an uniform yellowish brown, with white peristome.

Var. *m.* Of an uniform pale brownish yellow, with white peristome.

The most beautiful varieties are most abundant on the leaves of bushes and young trees at St. Jaun, where also all the other varieties are found. Some of the lesser painted varieties are also found at Abulug in the same province. The species has not been found in any other part of the Philippine Islands.

Since this paper was read two other varieties have been found by Mr. Cuming in his packages; they are

Var. *n.* Of a very rich dark chestnut brown, with a scarlet apex, four very narrow interrupted white bands of *epidermis*, a white suture, and orange-coloured outer edge to the white peristome.

Var. *o.* Of a rich light brown colour, with a yellowish band forming the circumference of the shell, and another band of the same yellowish colour in front, near the *columella*; peristome white, its edge pink, and back of the lip orange-yellow.

MISCELLANEOUS.

ZOOLOGICAL OBSERVATIONS MADE IN THE NEIGHBOURHOOD OF TENBY. BY J. F. DAVIS, M.D. WITH A PLATE.

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

Bath, Oct. 23rd, 1840.

Gentlemen,—During a temporary sojourn at Tenby in August last, I was induced to see a large fish in the possession of a publican and fisherman named Cadwallader, which he had taken in Tenby Bay the preceding autumn, while employed in the capture of herrings. It had been tolerably well-preserved and was kept for exhibition, being by no means destitute of attraction. It measures ten feet in length and six feet in girth, between the eyes two feet and a half, and has the appearance of belonging to the Sharks; but its most remarkable feature is the head, which, as Cuvier remarks of the Hammer-headed Shark, is unlike to anything in the whole animal kingdom besides. It is a female, and when opened was found to contain a considerable number of young ones about eighteen inches long, one of which is stuffed and exhibited with the mother. Upon my return to Bath in September I had an opportunity of referring to Mr. Yarrell's late work on British Fishes, where there is the following notice of this animal as an occasional visitant of our coasts. "The genus of Sharks next in order, according to Cuvier's arrangement in the 'Règne Animale,' is that of *Zygæna* or Hammer-headed Sharks, of which a single specimen is recorded by Messrs. C. and J. Paget, in their 'Sketch of the Natural History of Yarmouth,' p. 17, to have been taken there in October 1829, the head of which is now preserved in

the Norwich Museum." He adds in a note, "the specific name of the example taken and here referred to has not, I believe, been determined. A reference to a paper by M. Valenciennes in the ninth volume of the 'Mémoires du Muséum', which supplies detailed descriptions of four species of the genus, would probably settle this point. A representation of the most common species, *Zygæna malleus*, Val., is here given as a vignette to draw the attention of observers to the subject." Upon inspection of the vignette the Tenby specimen was instantly recognized*, and its identity with *Zygæna malleus*, Val., completely established by a subsequent reference to the 'Mémoires.' The owner of the fish would be very glad to dispose of it.

Amongst the variety of animals which we had opportunities of seeing during our stay at this charming marine watering-place, none afforded greater interest than a small Medusa belonging to the genus *Cyanæa*, Cuv. It cannot, I think, be referred to any known species†, for it differs from all the figures of the smaller Medusæ in the 'Zoologia Danica,' the 'Tableau Encyclopédique,' and 'Règne Animale,' and likewise from those illustrative of Dr. Macartney's paper in vol. c. of the 'Philosophical Transactions,' chiefly in the depth of the bell or disc and length of the tentacula.

Having been discovered by Mrs. Davis, who had likewise the best opportunity of watching its motions during several weeks that she kept it in a glass of sea-water at Tenby and afterwards here, whither it was conveyed in a phial of the same, and lived three weeks after its arrival, I will state the history of this "thing of light and life" in her own words: "One morning, while pouring some sea-water into the vessels containing my Actiniæ, I observed two small objects, which I took for the young of these animals, and as quickly as possible raised them in a spoon out of the basin and placed them in a tumbler of clean sea-water. They resembled *tiny* bell-glasses. Four transverse rays were perceptible on their sides, and a minute red body, with four white arms forming a cross, was suspended in the water. Around the edge of the bell or disc appeared a delicate white fringe, which was lengthened or shortened at the pleasure of the animal. The contraction was sometimes so great as to give to the fringe the appearance of being knotted up to the edge of the bell or disc. It was highly interesting to watch their movements in the water as they ascended from the bottom, the bell or disc contracting and dilating alternately until the animal arrived near the surface of the water. This motion was particularly conspicuous at the edge of the disc, and the fringe or tentacula became shortened as the animals rose in the water; but when they descended again the tentacula lengthened, sometimes to a great degree, after which the animals sunk gradually, and without any visible effort. At the end of a fortnight one of my pets turned itself inside outwards, and remained in this state for some time, when it died and left only a few flocculent particles at

* See also Suppl. to British Fishes, Part II. p. 61.

† Perhaps it may be a species of *Oceania*, allied to *O. cacuminata* of Eschscholtz, and which has not before been noted as British.—Ed.

the bottom of the vessel. The other lived more than two months longer, and even bore a voyage to Bath in a closed phial of sea-water, and remained active and vigorous during the space of three weeks, when it likewise shrunk, died and disappeared like the former, but without the previous eversion. As a species it may perhaps be thus characterized: *Cyanæa coccinea,* minute, campanulate, translucent, with four faint rays. In the centre a red ball with four white arms forming a cross; at the margin of the disc numerous tentacula, being sometimes as long as the disc, at others shortened, as if knotted up to the margin of the disc."

See Pl. II. fig. 1, natural size, as it appeared in sea-water; fig. 2. magnified, with tentacula expanded; fig. 3. ditto, with tentacula contracted.

"During our stay at Tenby the sea was often very luminous; and whenever this happened, the sea-water brought in daily for some Actiniæ and other marine animals which I kept alive in basins, exhibited the phænomenon when in motion, but never while at rest. Even breathing upon it when viewing the animals which it contained was sufficient to excite its luminous appearance. Being anxious to ascertain the cause of the luminosity, I night after night examined carefully the water, taking up sometimes what seemed to be sparks of fire in a spoon or glass, without discovering anything more than small bubbles, which instantly burst and vanished. Could these be the *Medusa scintillans* of Macartney, 'Phil. Trans.' vol. c.? I had no opportunity of examining them with glasses of high power. The weather was hottest at the time when the sea was most luminous, and it was the opinion of persons on the spot who made use of the water, that it was salter when luminous than at other times. Dr. Macartney, in his 'Observations upon Luminous Animals,' in the 'Phil. Trans.,' mentions *Pholas Dactylus* amongst others as exhibiting the phænomenon; but that animal never appeared luminous to me, although I kept it alive and in a vigorous state many weeks. In the course of my observations I saw no reason to attribute the luminosity of the sea to any animal."

I am, Sir, your most obedient servant,
J. F. Davis, M.D., F.L.S.

MR F. M. JENNINGS ON EELS KILLED BY FROST, IN A LETTER TO W. THOMPSON, ESQ.

Cork, March 18th, 1841.

Dear Sir,—I send you the following account of a phænomenon which took place in the river Lee, about six miles below Cork, in some respects similar to that which occurred in the river Lagan (see p. 75 of the present volume). I much regret not having heard of the circumstance until nearly a month after it had occurred, and then I was not able to glean any information except from the boatmen in the vicinity; the remembrance was however fresh in the minds of all, and the testimony of those I consulted agreeing in every particular, I am confident that the following account must be true.

During the 5th, 6th and 7th of February, the ground being covered with snow and the weather intensely cold, the boatmen in the vicinity of Passage, Monkstown and Carrigaloe captured considerable numbers of the Conger Eel (*Anguilla Conger*, Linn.), of all sizes, varying from a foot to five and six feet in length. Many of them were left on the strand as the tide receded, some dead, but the greater number alive; others were followed in boats as they swam near the surface of the water and killed with sticks, whilst many committed suicide by swimming up on the strand. In a similar way they were caught from Hop Island to Ringaskiddy, a distance of five miles on the west side of the Lee, and from Smith Barry's Bay to the limekiln opposite Monkstown (about three miles) on the east side; those which were taken on Hop Island seem to have been washed up by the tide, as they were dead.

It appears strange, that a fish like the eel, usually found at the bottom of the river, should be affected by the cold, when one reflects, that the depth of the river varies in some of these places from forty to sixty feet—the water here, though not quite so salt as the sea, is yet very salt.

One individual caught as many as thirty-seven; but it would be impossible to form any idea of the numbers taken, as immense quantities were picked up by the boatmen and others as they walked along the strand. As such a long time elapsed before I heard of the circumstance, I had no opportunity of seeing any of them, but there can be no doubt that they were the Conger Eel.

Dr. Scott of Cove was kind enough to give me, from his meteorological journal, the temperature and the direction of the wind about and during the time of the event.

Feb. 1841.	Max.	Min.		Wind at 9 AM.
3.	29	27	Snowy.	East.
4.	28	25	Snowy.	East.
5.	30	27	Snowy.	East-south-east.
6.	31	28	Snow-gale.	East.
7.	30	27	Snowy.	East.
8.	38	34	No snow-falls.	East.
9.	40	33	No snow-falls.	North-east.

Believe me, Sir, yours truly,
FRANCIS M. JENNINGS.

William Thompson, Esq., Belfast.

ON THE OCCURRENCE OF *ANEMONE RANUNCULOIDES*.

BY THE REV. W. HINCKS, M.A., F.L.S.

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

GENTLEMEN,—Wishing to add to my herbarium a truly wild specimen of the very rare *Anemone ranunculoides*, I lately devoted a day to an excursion with a friend to the neighbourhood, where alone, I believe, in these islands, it is now reported to be found wild.

Hudson gives the station "near King's Langley, Herts;" Mr. Geo.

Anderson, "near Abbot's Langley." Proceeding by the Birmingham railroad to the King's Langley station, I first examined the neighbourhood of that village and made some fruitless inquiries. I then proceeded to Abbot's Langley, examining carefully some woods on the way. At length, in passing through the village of Abbot's Langley, I observed the plant growing under a tree on the lawn before a house not far from the church. Having found out the gardener, I learned from him that it is reputed wild in this situation; that it has never been known to be planted, and comes up yearly, sometimes in one spot, sometimes in another, in considerable abundance; but he does not believe that it grows in other places in the neighbourhood. He obliged me with several specimens, which I presume are as wild as any found in England, and I have little doubt of this being the very station referred to both by Mr. Hudson and Mr. Geo. Anderson; though if it be true that the plant is found nowhere else in the surrounding country, its being entirely within the enclosure of one gentleman's grounds must lead to a suspicion that it has at some time been introduced.

Believe me to be, dear Sirs, very truly yours,
WILLIAM HINCKS.

Torrington Square, April 20, 1841.

On the Irish localities for Dianthus plumarius.—The *Dianthus plumarius* has no claim to a place in the Irish Flora, being evidently an outcast from gardens where it has been found; as, for example, at Blackrock, which abounds in gardens, and on the cliffs of Hop Island, immediately over which there is a flower-garden; it was also said to have been found on an old castle near Kinsale, since pulled down. I have searched all these places in vain for the plant.

The only *Dianthus* found near Cork is *Dianthus deltoides*, which occurs very sparingly in a dry hilly pasture near Dunscomb Wood. I met with it in June 1836, and specimens from that locality are in the possession of J. T. Mackay, Esq.—WM. T. ALEXANDER.

Naval Hospital, Plymouth, March 11, 1841.

[The *Dianthus plumarius* and *Caryophyllus* have as little claim to a place in the English Flora, for they are scarcely ever naturalized in the stations recorded for them.—EDIT.]

Suicidal powers of Luidia.—"The wonderful power which the *Luidia* possesses, not merely of casting away its arms entire, but of breaking them voluntarily into little pieces with great rapidity, approximates it to the Ophiuræ. This faculty renders the preservation of a perfect specimen a very difficult matter. The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite unconscious of its suicidal powers, I spread it on a rowing-bench, the better to admire its form and colours. On attempting to remove it for preservation, to my horror and disappointment I found only an assemblage of rejected members. My conservative endeavours were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by an armless disc and a discless arm. Next time I went

to dredge on the same spot, determined not to be cheated out of a specimen in such a way a second time, I brought with me a bucket of cold fresh water, to which article Starfishes have a great antipathy. As I expected, a *Luidia* came up in the dredge, a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce *Luidia* to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision. Young specimens are by no means so fragile as those full-grown; and the five-armed variety seems less brittle than that with seven arms. Like other Starfishes, it has the power of reproducing its arms."—*From Mr. Forbes's interesting and beautiful work on the 'British Starfishes,'* p. 138.

METEOROLOGICAL OBSERVATIONS FOR MARCH 1841.

Chiswick.—March 1. Cloudy. 2. Frosty: rain. 3. Fine: cloudy. 4. Clear and fine: rain. 5. Overcast: slight rain. 6. Clear and very fine. 7, 8. Very fine. 9—12. Foggy in the morning: very fine throughout the day: evening clear. 13. Slight haze: foggy. 14. Foggy: very fine: dense fog at night. 15, 16. Foggy: very fine. 17. Cloudy and showery. 18. Cloudy. 19. Overcast: showery. 20. Fine: stormy with rain. 21. Very fine: slight rain at night. 22. Rain: fine. 23. Fine. 24—26. Very fine. 27. Showery: clear. 28—30. Cloudy and fine. 31. Clear: fine but windy: rain at night.

Boston.—March 1. Cloudy: rain P.M. 2. Fine: rain P.M. 3, 4. Fine. 5. Fine: rain A.M. and P.M. 6. Fine. 7. Fine: beautiful morning. 8. Foggy. 9—13. Fine. 14. Cloudy. 15. Fine: three o'clock P.M. thermometer 65°. 16. Fine: two o'clock P.M. thermometer 65°. 17. Cloudy. 18—21. Windy. 22. Rain: 23. Windy. 24, 25. Fine. 26. Fine: rain P.M. 27. Cloudy. 28. Fine. 29. Cloudy: rain early A.M.: rain P.M. 30. Fine: rain P.M. 31. Fine.

N.B. This is the warmest month of March since March 1830.

Applegarth Manse, Dumfries-shire.—March 1. Cold and clear: snow on hills melting. 2. Rain all day. 3. Slight frost. 4. Frost harder: snow. 5. Heavy rain: snow gone. 6. Fine A.M.: rain P.M. 7. Fine throughout. 8. Fine spring day: rain A.M. 9. Fine spring day: fair. 10. Growing day: fog P.M. 11. Beautiful day. 12. Fine A.M.: raw fog P.M. 13, 14. Fine throughout. 15. Fog A.M.: cleared up. 16. Fine throughout. 17, 18. Fine A.M.: rain P.M. 19. Rain and hail. 20. Heavy showers. 21, 22. Rain P.M. 23. Cloudy and threatening. 24, 25. Showery and foggy. 26. Showers A.M.: cleared and fine. 27. Showers A.M. 28, 29. Showers P.M. 30. Fair A.M.: rain and wind P.M. 31. Boisterous and wet.

Sun shone out 23 days. Rain fell 18 days. Frost 2 days. Snow 1 day. Fog 3 days.

Wind East 1 day. South-east 4 days. South-south-east 1 day. South 4 days. South-south-west 1 day. South-west 13 days. West-south-west 2 days. West 3 days. North-north-west 1 day.

Variable 1 day. Calm 11 days. Moderate 8 days. Brisk 5 days. Strong breeze 5 days. Boisterous 2 days.

Mean temperature of the month	44°·07
Mean temperature of March 1840	39 ·35
Mean temperature of spring-water	45 ·60
Mean temperature of spring-water, March 1840	42 ·60

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. Roberton; *by* Mr. Thompson *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. Veall *at Boston, and by* Mr. Dunbar *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1841. March.	Barometer.						Thermometer.								Wind.				Rain.				Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dum-fries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Self-register. Min.	Max.	Min.		Max.	Min.									
1.	29·614	29·693	29·585	29·24	29·46	29·57	39·3	42·6	36·9	41	27	37	45	33	SE.	S.	calm	NNW.	...	·10	...	...	36
2.	29·688	29·685	29·393	29·30	29·35	29·10	37·4	43·2	35·0	49	37	34	45	32	SW.	SW.	W.	SW.	·025	·30	·08	...	37
3.	29·324	29·665	29·315	28·89	29·24	29·63	42·4	46·7	37·3	50	29	42	45	37½	NW.	SW.	W.	SW.	·283	·02	·23	...	39
4.	29·912	29·904	29·818	29·48	29·75	29·60	36·8	48·3	35·2	46	33	36	41	26½	NW.	W.	NW.	SW.	...	·08	...	...	36
5.	29·876	29·857	29·299	29·39	29·42	29·10	42·0	45·4	36·2	50	36	39	41½	32	S.	S.	calm	SW.	·083	·22	...	...	40
6.	29·764	29·960	29·723	29·26	29·58	29·68	43·2	50·3	40·5	52	41	41	48½	33½	NW.	NW.	calm	SW.	·158	...	·32	...	41
○ 7.	30·080	30·255	30·047	29·53	29·77	30·12	51·7	52·5	42·6	61	42	49	51	41	W.	SW.	calm	W.	...	...	...	0·77	43
8.	30·414	30·369	30·355	29·85	30·18	30·24	50·5	59·2	49·6	61	35	46	52½	41	SW.	SW.	calm	SW.	...	...	...	...	45
9.	30·444	30·392	30·385	29·90	30·21	30·24	44·5	60·3	43·4	60	30	44	51	38½	SSW.	SW.	calm	SW.	...	...	...	...	46
10.	30·490	30·462	30·426	29·93	30·30	30·35	46·7	56·5	43·3	63	27	44	49	41½	S.	S.	calm	WSW.	...	...	...	...	45
11.	30·512	30·473	30·401	29·97	30·33	30·27	45·2	58·7	40·0	64	30	44	56	39	S.	SE.	calm	var.	...	...	...	...	44
12.	30·400	30·366	30·273	29·85	30·25	30·28	46·6	59·3	42·2	67	31	41·5	53½	34½	E.	SW.	S.	SE.	...	...	...	...	46
13.	30·398	30·376	30·331	29·87	30·30	30·30	46·6	61·0	44·6	59	37	46	56	35	N.	E.	E.	SE.	...	...	...	...	47
14.	30·388	30·351	30·192	29·94	30·18	30·11	40·2	56·7	37·7	57	33	36·5	53½	37	E.	W.	calm	SW.	...	...	...	0·04	45
☾ 15.	30·176	30·152	30·005	29·70	30·04	29·94	42·8	53·7	39·6	66	30	43	56½	42½	NE.	W.	W.	W.	...	...	...	...	40
16.	29·942	29·921	29·729	29·40	29·75	29·48	49·7	60·6	41·6	65	35	53	62	41½	S.	S.	W.	SE.	...	...	...	...	47
17.	29·630	29·603	29·577	29·08	29·35	29·30	51·3	61·7	49·2	56	41	51·5	49	47	S.	S.	S.	SW.	...	·01	...	...	49
18.	29·444	29·525	29·404	28·98	29·11	29·15	51·7	56·7	46·8	56	40	49	52	43	E var.	SW.	S.	SW.	...	...	...	...	48
19.	29·628	29·713	29·598	29·14	29·20	29·25	49·7	56·0	44·2	54	34	46·5	51½	43	SSWvar.	SW.	S.	WSW.	...	·01	...	...	48
20.	30·650	29·647	29·565	29·24	29·39	29·32	50·3	54·0	44·3	57	39	47	50	39½	E.	SW.	SE.	E.	·022	·13	...	...	46
21.	29·672	29·625	29·482	29·22	29·32	29·14	49·5	56·4	43·6	54	48	48	51	39	S.	S.	SSW.	S.	·133	·12	...	1·20	46
22.	29·378	29·596	29·362	28·84	29·01	29·27	51·9	54·3	48·7	58	36	52	50	45	S var.	SW.	W.	S.	·036	·02	·12	...	50
● 23.	29·878	30·128	29·803	29·29	29·44	29·78	49·3	56·6	43·2	59	43	47	50½	39	SSW.	W.	W.	SW.	·025	...	...	...	48
24.	30·270	30·222	29·192	29·70	29·94	29·94	51·4	58·3	46·6	58	30	50	48½	44½	SE.	SW.	W.	SW.	...	...	...	...	46
25.	30·160	30·123	29·952	29·60	29·85	29·70	51·8	55·7	44·3	61	32	47	48½	44½	SSE.	S.	calm	S.	...	...	...	...	45
26.	29·728	29·698	29·593	29·21	29·55	29·40	55·5	59·0	47·0	65	39	52	48½	42	S.	S.	calm	SE.	...	·02	...	...	49
27.	29·778	29·863	29·721	29·21	29·48	29·63	51·5	64·2	45·0	58	27	48	52	39½	S.	SW.	calm	W.	·036	·08	·26	...	48
28.	29·970	29·914	29·897	29·43	29·60	29·65	45·0	59·7	41·2	54	40	46	47	43	SSW.	S.	SW.	SSW.	·105	...	...	1·36	44
29.	29·938	29·922	29·787	29·37	29·66	29·47	51·2	56·6	44·8	58	40	51·5	53	42½	S.	SW.	calm	SSE.	...	·10	·02	...	48
☽ 30.	29·912	29·915	29·836	29·34	29·60	29·35	48·2	57·0	43·0	55	41	47	49	39½	W.	W.	calm	S.	·072	·08	·10	...	48
31.	29·678	29·638	29·497	29·06	29·02	29·20	49·0	55·0	44·7	56	41	47	49	40	S var.	W.	W.	SW.	·069	·03	·07	...	46
Mean.	29·940	29·968	29·856	29·42	29·665	29·753	47·1	55·4	42·7	57·09	35·61	45·3	50·1	39·2					Sum. 1·047	1·32	1·20	3·37	Mean. 45

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 44. JUNE 1841.

XXIX.—*The Anatomy of* Nautilus. By M. Valenciennes*.

Baron von Humboldt gave the Academy an account of the examination of the animal of *Nautilus Pompilius*, the third animal of this species which has been seen by naturalists, which has been made by M. Valenciennes in Paris, and by whom it had been communicated to him in a letter. "M. Meder, a merchant in Java," says M. Valenciennes, "has sent me the animal of the *Nautilus Pompilius*, already described by Owen, which was fished up between Timor and New Guinea. I think that the drawings which I have made of this animal will be somewhat more distinct than those by Mr. Owen. I have discovered an organ which had escaped the celebrated English anatomist, namely, a conical hollow tube clothed with papillæ, which contains in its interior a folded membrane, having the greatest resemblance to that in the nostrils of Fishes; I do not doubt, therefore, that it is an organ of smell. Mr. Owen supposed this organ to be in another place, at the base of the inner tentacula; yet it must have quite another destination, since there are also two other entirely similar organs at the base of the outer tentacula, which Mr. Owen has not seen†. I am inclined to consider them as membranes which belong to the organ of taste. I was not able to find any inward ear, nor could I discover any cephalic

* From Reports of the Royal Academy of Berlin for Jan. 28, 1841.

† [They are described as follows in Mr. Owen's Memoir on the Pearly Nautilus: "Although the external configuration of the oral sheath is thus varied, its internal surface is uniform and smooth, except at the lower part near the anterior margin, where there are two clusters of soft conical papillæ, and *on each side of these a group of laminæ disposed longitudinally.*" (p. 14.) The oral sheath is formed by the confluence of the bases of the outer tentacula: the single group of laminæ at the base of the inner tentacula was conjectured by Mr. Owen to be the analogue of the lamellated olfactory organ in fish, on account of its rich supply of nerves and its position immediately anterior to the mouth. The organs conjectured to be those of smell by M. Valenciennes are two hollow tentacula, situated on the outside of the head, one beneath each eye; there is a remnant of one of these tentacula beneath the remaining eye in the wounded, and, at this part, mutilated specimen, described by Mr. Owen.—Ed.]

cartilage. The pericardium has a most remarkable arrangement. It is folded in such a manner as to form six pockets or sacs about the heart, three on each side, each of which opens at the base of the gills, two at the hinder gills. Through these openings the pericardium has a free connexion with the great respiratory cavity of the animal. Upon these sacs are situated the spongy elevations, similar to those which Cuvier discovered in *Octopus*. Owen has also delineated them, but not plainly enough. Lastly, the examination of the head has shown me that this is surrounded by *eight* arms, as in *Octopus*. The two upper arms are broad and flat, and capable of expansion. They surround the shell on the side of the raised part of the spirally-wound cone (the convexity of the last convolution but one), so that the black part on the mouth of the shell, not far from the spire, supports the basis of the broader arms; when they spread over the shell they deposit upon it the outer layer streaked with yellow, nearly in the same way as the margins of the foot of the *Cypreæ* form a layer which is coloured different to that which the neck-band of the animal deposits*. I consider the divisions which project on the arms as organs similar to the suckers of the *Octopus*. The outer arms have seventeen divisions (*gaines*), from which proceed as many feelers (*cirrhes*). The two great and broad arms have each only two divisions. The two arms nearest to the mouth possess, the one thirteen, the other twelve suckers (*ventouses*) or divisions. The animal is fastened to the shell by two strong muscles, which are continued into the interior, in order to support the funnel which is formed by the reverted fold, which contains in the interior the tongue-shaped organ, through which the entrance of the water into the respiratory cavity is prevented when the animal moves about quickly in the water. The *Octopus* needs no such provision, as it swims backwards; *Sepia*, which moves in an oblique direction, possesses only a rudiment. According to this, the *Nautilus* has as many arms as an *Octopus*; but they are differently shaped, very short, and furnished with contractile feelers, which come forth from divisions which take the place of the suckers, and which have even been considered as arms. The tube, which descends into the sipho, continues through all the convolutions, even to the very innermost. It is fleshy and surrounded by a calcareo-gelatinous membrane, which is excreted from the tube itself. This tube cannot therefore enter into connexion with the interior of the cavities of the chambers; these cavi-

* [From this description it is evident that M. Valenciennes accedes to Mr. Owen's view of the relative position of the animal of the *Nautilus Pompilius* to its shell, which had been opposed by Mr. Gray and M. De Blainville.—Ed.]

ties, which must be empty, cannot therefore be at all connected with each other. Of the function of this sipho, in which, as Rumphius and Owen have observed, vessels are distributed *, I, at present, have formed no opinion.

"The animals examined by Owen and myself cannot, in my opinion, belong to the same species. Owen says that the beak of his animal is calcareous at the summit and serrated; mine has a corneous beak as far as the summit, and is perfectly smooth at the margin. Owen's *Nautilus* was fished up near Erromanga, one of the Hebrides; mine in the New Guinea Sea, therefore at a distance of 1000 or 1200 miles from the former.

"I can now conceive how a *Nautilus* moves: it effects this by its long and thick arms, which are combined to a kind of foot; thus they are able to push themselves along under the surface of the ocean, as our *Limneæ* and *Planorbes* do in marshes; yet with this difference, that these are then in an inverted position, so that the brain lies under the œsophagus when they move upon the water; instead of which the *Nautilus* remains in its natural position upon the water, the brain above the œsophagus. If it can creep along at the bottom of the sea, as Rumphius asserts, this must certainly take place in an inverted position. The *Nautilus* is therefore formed entirely after the structure of the Cephalopoda, and has nothing in common with the Gasteropoda†; nor has it anything in common with *Spirula*. Of this I possess fragments, which sufficiently prove their resemblance to the *Sepia* or *Loligo* by the form of their mantle, and by having only two branchiæ. *Belemnites* are nothing but straight, not convoluted, spirulæ. The aspect of the *Nautilus* shows moreover that it can possess no operculum, and that the *Aptychus*, as M. Voltz supposes, cannot be looked upon as an operculum. If the *Aptychus* is part of an Ammonite, as is highly probable, then this part must either be sought for near the mouth or in the pharynx."

Remarks of Professor J. Müller.

Essential differences do not occur between Owen and Valenciennes in the number of tentacula, but only in the explanation of these in reference to the organs in the *Sepiæ*. Owen looks upon his digitations or tentacular tubes as the arms, and adopts indeed only the nineteen digitations on each side,

* [The entire siphon was termed an artery by Rumphius, but he nowhere alludes to the small vessels of the siphon, injected and described by Mr. Owen.—Ed.]

† [The *Nautilus* possesses, in common with the Gasteropods, the single systemic heart, without the two separate branchial hearts which characterize the higher Cephalopoda.—Ed.]

whilst he designates the groups of tentacula placed about the mouth as four *appendices labiales tentaculiferæ*. Valenciennes regards the flaps, from which proceed the tentacular tubes, as arms. His two upper arms is Owen's *hood*. As this, according to Owen, sends off two tentacula, he regards it as two digitations of a similar kind as the remainder, united in the middle. The flaps on each side, on which the seventeen tubes with tentacula are situated, are called by Valenciennes the second or outer arm; the tentacula are considered by him as analogous to the suckers of the *Sepia*. Owen calls the single tentacular tubes arms, of which he reckons nineteen on each side; Rumphius has twenty*. Valenciennes gets the third (upper inward) and fourth (under inward) arm on each side out of the front and hinder *appendices labiales tentaculiferæ* of Owen, each of which, according to him, has twelve tentacula; according to Valenciennes one has thirteen, the other twelve; according to Rumphius each has sixteen. Owen compares the under *appendices labiales* to the pedunculated arms of the Calmars, the upper ones as a further development of the outer lip of the same.

Valenciennes' view has much in its favour, inasmuch as the genus of Cephalopods, *Cirrotheuthis* of Eschricht, has arms, which are not furnished with suckers, but with delicate filiform tentacula. Valenciennes mentions two tentacula on each of the upper arms, together therefore four; Owen has only two tentacula altogether upon his *hood*. Valenciennes has also indicated the tentacula before and behind the eye. Their presence is an objection to his view; their structure, however, differs from that of the other tentacula.

The foliaceous organs, which Owen takes for the organ of smell, are in Valenciennes' descriptions doubled; for he has an organ which Owen wants, in the vicinity of the eye, a tube with a folded membrane in the interior, which he considers as the organ of smell, because it is formed as in Fishes. Very probable. That the cephalic cartilage, which Owen has described, is said to be wanting, seems to me somewhat suspicious.

What has been communicated about the pericardium is interesting, and differs from Owen's description in the number of the apertures†. And, lastly, what has been communicated concerning the sipho is important, as is the confirma-

* [Rumphius includes the two that are combined to form the hood, in his series of twenty, which thus corresponds with Mr. Owen's enumeration. —Ed.]

† [Mr. Owen's words, in reference to the apertures here alluded to, are: "and on each side, at the roots of the branchiæ, there is a small mammillary eminence with a transverse slit, which conducts from the branchial cavity to the pericardium." *Loc. cit.* p. 27.—Ed.]

tion of the muscular annection of the animal to the shell. The animal observed by Valenciennes may very possibly be a different species, as the non-serrated margin of the snout and its perfectly corneous state would lead us to believe.

XXX.—*On Red and Green Snow.* By the late Prof. MEYEN*.

M. CH. MARTIUS, who twice accompanied the French expedition to Spitzbergen, has given us some interesting observations on coloured kinds of snow, which throw quite a new light on this subject. On the occasion of speaking of the structure and development of the cells of plants in his treatise, 'Du microscope, et de son application à l'étude des êtres organisés, et en particulier à celle de l'utricule végétale et des globules du sang,' Paris, 1839, 4to, p. 19, he brings forward the several simple orders of Algæ the individuals of which consist of solitary vesicles, and there *Protococcus viridis* and *nivalis* are mentioned as the simplest plants; and the description of a green field of snow is given, which was seen on the coast of Spitzbergen on the 25th of July, 1838, by MM. Martius and Bravais. The surface of the snow was white, but a few centimetres below it was as deeply coloured as if it had been sprinkled with a decoction of spinage. In another instance M. Martius found this green substance scattered like dust over the surface of a snow-field, the greater part of which was covered with an immense mass of *Protococcus nivalis*; below the surface and on the edges of the field the snow was also coloured green.

The microscopical examination was made in Paris, and it was found that the snow-water was filled with an amorphous green matter, among which were spherical *Protococcus* cells; some were red and much larger than the green ones, and others were rose-coloured, and as far as size goes stood between both. Later researches showed that the snow was composed of globules, which varied much in size and colour; some appeared to be simple, green or pale rose-coloured, and 0·01 to 0·05 millimetres in diameter; others, which were however scarcer, were blood-red and 0·02 mill. in diameter. Other globules appeared to be compound, for they appeared like a case in which other globules were enclosed; their diameter was 0·05 to 0·055 mill.: in one globule there were 5 red small ones, and M. Martius never saw green ones enclosed in this way.

From many observations M. Martius came to the conclusion, that the red globules of the green snow are identical with those of the red snow, and that the green snow (*Protococcus*

* From Wiegmann's Archiv, Heft i. 1840, p. 166, communicated by H. Croft, Esq.

viridis) and the red (*Protococcus nivalis*) are one and the same plant, only in different stages of development, but that it is difficult to say which of these states is the original.

Moreover in the red snow there were some red moniliform filaments, which appeared to belong to the order *Torula.*

To these observations on the colouring of snow by so-called *Protococci*, the following addenda may be made. There is now no doubt that the species of *Protococcus* are true Infusoria*, and indeed *Protococcus viridis* and *nivalis* are nothing more than *Enchelis sanguinea* and *Ench. Pulvisculus* (*Euglena sanguinea* and *Eug. viridis*, Ehrenberg): the appearance of a red dot near the base of the rostrum, which is considered an eye, makes it possible, by means of the present magnifying powers, to judge of this point with certainty.

The long and rapidly-moving *Enchelides* were not formerly considered as species of *Protococcus*; but the above-mentioned species exhibit at times a perfectly motionless state, in which they appear spherical, and thus they have been described as *Protococci.* In this passive state they have been observed by Müller and Ehrenberg. The former thought them dead; and the latter says of *Enchelis Pulvisculus* ('Die Infusionsthierchen, p. 120), that it often becomes suddenly pyriform or spherical without unfolding itself; and that this appears to be the result of uneasiness caused by a chemical change in the water, which kills it. This explanation is however evidently incorrect: moreover the animalcules are by no means dead when motionless and spherical, but are in a state of development; they become gradually larger, indeed sometimes fourfold. In such enlarged individuals several small ones are formed, and it is not uncommon to see three, four, five or six, or even more therein; in *Enchelis Pulvisculus* these young globules are coloured a beautiful green, and the containing integument consists of a fine and colourless skin, which afterwards disappears. One often sees the red dot on these young globules, and this is a good character to distinguish these formations from small *Nostochineæ.* M. Martius, it is true, never saw small globules appear on the large green ones of the snow; but he came to the same result, viz. that the green and red snow are formed by one and the same plant (which he holds the vesicles to be), in different states of development.

It is these spherical, reposing animalcules which often ap-

* Agardh's Order *Protococcus* consisted not of *Enchelides* only; with *Protococcus viridis* was also placed that small green plant which is found in infinite numbers among the so-called *Oscillatoria muralis*, and which covers barks of trees with a green coating. It is this plant which I have described and depicted as *Protococcus viridis* (Linnæa of 1827, p. 403. tab. vii. fig. A,1—4); it has often been held to be the original cells of Lichens, and Turpin, in 1828, called it *Heterocarpella quadrijuga.*—Mey.

pear in almost incredible numbers, and, surrounded with a kind of slime, form more or less thick skins, which often cover the bottoms of shallow standing waters, particularly of ditches, etc. Such green skins will sometimes remain several months, not only in the natural state, but also in a room, and only occasionally do some of the green globules pass into the active state; they stretch themselves, exhibit the rostrum, etc. In comparison to the immense mass of young and old individuals, very few only pass out of this to all appearance vegetable mass into free moving animalcules. M. Agardh, in 1823, saw in red snow that the globules generally considered as vegetables sometimes pass into animalcules; and the behaviour of the *Enchelides* in the passive and active state is the reason why so many philosophers have spoken of a metamorphosis of Infusoria into plants. One would be obliged in fact to hold these spherical, inactive *Enchelides* as plants if solitary ones did not occasionally begin to move, and if one had not observed their origin. When the animalcules contract themselves, the rostrum is laid along the side, but only in the first stages is it observable. However, there still remains something mysterious in this passive state of the *Enchelides* and in their rare increase: by repeated observations it may perhaps be explained. It is still a question whether *Enchelis Pulvisculus* and *En. sanguinea,* which colour the snow now green, now red, are really one and the same animalcule. M. Ehrenberg has, it is true, characterized each, both by descriptions and by delineation, as different species: in the red ones he saw several grain-like balls in the interior; but from the drawing it is evident that these are the same as the young globules observed by myself in the green animalcules. M. Ehrenberg erroneously regards them as coloured eggs, which are first green, then become red and are enclosed in the gastric cells. He saw that the red animalcules were larger than the green ones; but M. Martius observed that the red bladders in snow varied much in size; and I myself have often found individuals of *Ench. Pulvisculus,* which were considerably larger than the usual red animalcules, and quite as large as they occasionally are, on which account the size cannot be taken as a distinguishing character.

M. Ehrenberg relates of the red *Enchelides* that several are still quite green, while others appear spotted, half red and half green; and this might perhaps be taken as the best proof that these so differently coloured Infusoria belong to one and the same species. I myself could never distinguish a red from a green one when individuals of equal size were compared together. It is true we have as yet no explanation, how red can be changed into green, or *vice versâ*; but we know that

this frequently occurs with the Algæ without the species being changed, though there have been botanists who have described Confervæ in the red and green states as different species.

M. Turpin also, in a new treatise, has derived the green and red colour of water, snow, earth, wood, marble statues, etc. etc. from green and red *Protococcus* globules, which, according to his idea, are true plants; but he has evidently observed them only in the passive state. ('Quelques observations nouvelles sur les *Protococcus*, qui colorent en rouge les eaux des marais salants.'—Comptes Rendus de 18 Nov., p. 626.)

XXXI.—*An Amended List of the Species of the Genus* Ovis. By Edward Blyth, Esq. [With a Plate.]

[Concluded from p. 201.]

7. *O. Burrhel*, nobis. Smaller and more robust than the Nahoor, with shorter ears, and very dark horns; having no white upon it; and general colour dark and rich chestnut-brown, with the ordinary black markings upon the face, chest, and front of the limbs very distinct; tail apparently minute.

This handsome species bears pretty much the same relationship in appearance to the Nahoor, which the English breed of South Down domestic sheep bears to the Leicester breed, except that there is not so much difference in size. Length of the unique stuffed specimen in the museum of this Society, from nose to tail, 54 inches, but a foot less would probably give the dimensions of the recent animal, as the skin is evidently much stretched; height of the back 32 inches, from which also about 2 inches might be deducted; from muzzle to base of horn 8 inches, and ears $3\frac{1}{2}$ inches. The horns measure 20 inches over the uppermost ridge, and 10 round at base, having their tips 25 inches apart; but those of a specimen noticed in the 'Bengal Sporting Magazine' (for 1839, p. 295) were $25\frac{1}{2}$ inches long, with a girth of $11\frac{1}{2}$ inches; and a horn of this same species, which I examined at Mr. Leadbeater's, had attained a length of 2 feet, and circumference of 11 inches at base, having a span of 14 inches from base to tip inside, and numbering at least ten indications of annual growth, and probably at least one more towards the tip, which could not be made out with certainty. The respective lengths of these were successively $10\frac{1}{2}$, $2\frac{1}{2}$, $2\frac{1}{4}$, $1\frac{3}{4}$, $1\frac{1}{4}$, $1\frac{1}{2}$, 1, 1, $\frac{3}{4}$, and the basal $\frac{1}{2}$, inches. The coat of the Burrhel Sheep is rather long, and harsher than that of the Nahoor, having less wool concealed beneath it than in the Moufflon and Rocky Mountain species. The female is undescribed, and I have met with no other specimens than are here mentioned.

In the description of the preceding species, the principal differences are stated which distinguish the horns of that animal from those of the present one. The Burrhel's horns have all the ridges rounded off, though still sufficiently distinct, and the marks of annual growth are deeply indented, the horn bulging a little between them. Upon a front view, the backward curvature of the tips disappears altogether,

H. C. Richter del.

J. D. C. Sowerby sculp.

and the animal has an imposing appearance, finer than that of the Nahoor. Its colour is much darker than that of the Moufflon.

The Burrhel would seem to inhabit a much loftier region of the Himalaya than the Nahoor, where it bounds lightly over the encrusted snow, at an altitude where its human pursuers find it difficult to breathe. It has the bleat of the domestic species, as indeed they all have, and is very shy and difficult of approach. Flocks of from ten to twenty have been observed, conducted by an old male, which make for the snowy peaks upon alarm, while their leader scrambles up some crag to reconnoitre, and if shot at and missed, bounds off a few paces further, and again stops to gaze. They pasture in the deep hollows and grassy glens. The Society's specimen was met with near the Boorendo Pass, at an altitude estimated to have been from 15,000 to 17,000 feet. The notice in the 'Bengal Sporting Magazine' refers to the same locality; and another notice most probably alludes to this species, in Lieut. Hutton's 'Journal of a Trip through Kunawar,' published in the 'Journal of the Bengal Asiatic Society' for 1839, p. 994*. Finally, Mr. Leadbeater informed me that the horn described as having been in his possession was brought from Nepâl, together with specimens of the Nahoor and Musk, and the skull and horns of a Himalaya Ibex, which I also examined.

8. *O. cylindricornis*, nobis (the Caucasian Argali). Col. Hamilton Smith notices this animal in his description of *O. Ammon* (published in Griffiths's English Edition of the 'Règne Animal,' vol. iv. p. 317), and writes me word that an individual died on landing it at Toulon, whither it had been brought by a French consul, who did not preserve the skull or skin, but set up the horns, which were quite fresh when he saw them. "Each horn was about 3 feet long, arcuated, round, as thick at the top as at the base, of a brown colour, nearly smooth, and about 15 inches in circumference. They were so heavy and unmanageable," writes Col. Smith, "that I could not lift both together from the ground, nor place them in that kind of juxta-position which would have given me an idea of their appearance on the head. I could not well determine which was the right or which the left horn. Circumstances prevented my taking a second view of them, as they arrived only the day before I left Paris, and they are now doubtless in the museum of that capital." In my former paper I alluded to this animal as probably distinct, and apparently allied to the Burrhel: the foregoing details confirm me in that opinion, and remove all doubt of its distinctness, as there is no other species to which they will at all apply. The sketch which Col. Smith has favoured me with represents a sheep-horn, apparently

* In the continuation of this 'Journal,' *ibid.* for 1840, p. 568, Lieut. Hutton identifies the "*Burul*" of the Boorendo with Mr. Hodgson's *Nahoor*: it is likely that both species are found there; but there can be no doubt whatever of their distinctness, as a comparison of the horns alone will suffice to show. "Of the *Ovis Ammon*," Lieut. Hutton observes, "I could learn nothing, save that an animal apparently answering to the description is found in Chinese Tartary, and I saw an enormous pair of its horns, nailed among other kinds, to a tree as an offering to Devi." These, however, may have belonged to *O. Polii*.—E. B.

of the same general form as those of the Burrhel and Nahoor; but the dimensions specified are very superior to those attained in the instance of either of the two Himalayan species adverted to, and I can only suppose that the (reverted?) tips had been broken off, and the truncated extremity worn smooth. The wild sheep of Caucasus and Taurus are at present little known, nor does any notice of this genus occur in the catalogue of Caucasian animals published by M. Ménétries; though it is nevertheless certain, from the vague incidental notices of various travellers, that some, and not unlikely several, exist. At Azaz, by the foot of Taurus, Mr. Ainsworth mentions having seen an animal which he designates *Ovis Ammon* (*vide* 'Travels in Assyria, Babylonia, and Chaldea,' p. 42).

9. *O. Gmelini*, nobis (the Armenian Sheep). This species belongs to the Moufflon group, but is yet very different from the Moufflon Sheep of Corsica. It is described and rudely figured in the *Reise durch Russland* (vol. iii. p. 486, and tab. lv.) of the younger Gmelin; and the skull and horns, forwarded by that naturalist to St. Petersburgh, have been figured and described by Pallas in his *Spicilegia* (Fasc. xii. p. 15, and tab. v. fig. 1.). Messrs. Brandt and Ratzeburg erroneously identified it, at the suggestion of M. Lichtenstein, with the wild Cyprian species, the horns of which have a nearly similar flexure. Fine specimens of the male, female, and young, lately received by this Society from Erzeroom, enable me to give the following description:

Size of an ordinary tame sheep, with a remarkably short coat, of a lively chestnut-fulvous colour, deepest upon the back; the limbs and under parts whitish, with few traces of dark markings, except a finely contrasting black line of more lengthened hair down the front of the neck of the male only, widening to a large patch on the breast; and in both sexes a strip of somewhat lengthened mixed black and white hairs above the mid joint of the fore-limbs anteriorly, which corresponds to the tuft of *O. Tragelaphus*; tail small, and very slender: horns of the male subtrigonal, compressed, and very deep, with strongly marked angles and cross-striæ, diverging backwards, with a slight arcuation to near the tips, which incline inwards. As regards the flexure alone, but not the character of the horn, which is allied to that of the Common Ram, this handsome species links the Moufflon group with the Nahoor and Burrhel group. See Plate V.

Length nearly 5 feet from nose to tail; the tail 4 inches; from nose to base of horn 8 inches, and ears $3\frac{1}{2}$ inches. Horns (about full-grown, or nearly so,) 20 inches over the curvature, 10 round at base, 4 deep at base inside, their widest portion 2 feet apart, and tips 21 inches, with a span of $13\frac{1}{2}$ inches from base to tip inside; their colour pale. Around the eye and muzzle this species is whitish; the chaffron and front of the limbs are more or less tinged with dusky, and its coat is rather harsh, and fades considerably in brightness before it is shed. Female generally similar, but smaller, with no black down the front of the neck, and in the observed instances hornless. The lengthened black hair of the male is only 1 inch long, and that composing the tuft on the fore-limbs is so disposed that the latter is white in the centre, flanked with blackish.

According to M. Gmelin, this species is found only on the highest mountains of Persia. Its rutting season takes place in September, and lasts a month; and the female yeans in March, producing two or three lambs at a time: the males, he informs us, are very quarrelsome amongst each other, insomuch that he had been at one place where the ground was completely strewed with horns that had been knocked off in their contests; so that if any variation in the flexure of these horns had been observable, this industrious naturalist would doubtless have remarked it. Sir John McNeill informed me that "it appears to be the common species of the mountains of Armenia; occurring likewise on the north-west of Persia;" but the wild sheep of the central parts of Persia is evidently distinct, "having horns much more resembling those of the domestic Ram, being spiral, and completing more than one spiral circle. I think I am not mistaken in supposing," continues Sir John, "that I have also had females of this species brought to me by the huntsmen with small horns, resembling those of the ewes of some of our domestic sheep; but, on reflection, I find that I cannot assert this positively, though I retain the general impression." It is highly probable that a wild type of *O. Aries* is here adverted to, which would thus inhabit the same ranges of mountains as the wild common Goat (*C. Ægagrus*); and with respect to the circumstance of horns in the female sex, I may here remark that this character is very apt to be inconstant throughout the present group. It has already been noticed in the instance of *O. Nahoor*; and the elder Gmelin states that the females of *O. Ammon* are sometimes hornless, while those of the Corsican *O. Musimon* are generally so. The same likewise happens in different species of wild Goats, in the Goral of India, and in the prong-horned animal of North America; and even in the Gazelles, and other ovine-nosed species of what are commonly confused together under the name of *Antelope*, there have been instances of hornless males as well as females. A male Springbok of this description, as I am informed by Col. Hamilton Smith, was long in the possession of the Empress Josephine; and the specimen of *Ixalus Probaton*, Ogilby, in the museum of this Society, doubtless affords another example of the same phænomenon.

10. *O. Vignei*, nobis: the *Shà* (not *Snà*) of Little Thibet, and *Koch** of the Sulimani range between India and Khorassan. This fine species is closely allied to the Corsican Moufflon, but is much larger, with proportionally longer limbs, and a conspicuous fringe of lengthened blackish hair down the front of the neck, and not lying close, as in the Moufflon†. Its size, I am informed by Mr. Vigne, is that of a large Fallow Deer; and from the general appearance of these animals, their length of leg, and swiftness on the

* *Koch* appears to be generic for Sheep, and the same word as *Kutch* in "*Kutch-gar*," or *Koosh* in "*Koosh-gar*," applied to *O. Polii*.—E. B.

† At least, as in the Moufflon in summer garb; for, in winter, it hangs out loosely also in the latter species, but is much more copious than apparently in *O. Vignei*, and also resembles less the pendent hair of the same part in *O. Tragelaphus*.—E. B.

mountains, "they reminded me," remarks that gentleman, "of Deer rather than Sheep."

The general colour of this animal, to judge from an elaborately finished painting, taken from a living individual in its native country by Mr. Vigne, to whom we are indebted for all we know concerning the species, is a rufous brown, apparently not so deep as in the Moufflon; the face livid, or devoid of the rufous tinge of the body, and not terminated by a white muzzle, as in the Moufflon Sheep: the belly is white, separated by a black lateral band; and the limbs are brown, not mottled, as in the Moufflon, but with a whitish ring immediately above each hoof, then a dark ring, and above this a little white posteriorly, as in the Nylghau. The fringe in front of the neck is doubtless peculiar to the male, and the hairs of it would appear to be 4 or 5 inches long, and hang loosely. Tail about 6 inches long, and slender, apparently resembling that of the Armenian species rather than the Moufflon's.

A full-grown pair of horns measure $32\frac{1}{2}$ inches over the curvature, and 11 inches round at base; their widest portion apart, measured outside, is 2 feet, the tips converging to 8 inches, and span from base to tip also 8 inches: they are subtriangular, much compressed laterally, the anterior surface $2\frac{3}{4}$ inches broad at base, with its side-angles about equally developed, and the posterior part of the section tapers rather suddenly to a somewhat acute angle; eight years of growth are very perceptible, which successively give 12, 7, 4, 3, 3, $1\frac{1}{2}$, $1\frac{1}{2}$, and $\frac{1}{2}$, inches; they bear considerable resemblance to those of the Moufflon Sheep, but differ in being very much larger, and in the circumstance of the outer front-angle being as much developed as the inner one; and they have not the slightest tendency to spire, but, describing three-fourths of a circle, and originally diverging as in a common Ram, they point towards the back of the neck, somewhat as in *O. Tragelaphus*. Another and younger specimen, however, has a decided spiral flexure outward, more especially towards the tip, and has also the outer angle much less developed than in the corresponding terminal portion of the former. This pair had grown to 11 inches long, with the tips $14\frac{1}{2}$ inches apart; only one year's growth, and that apparently incomplete, is however exhibited, and the curvature is likewise less than in the older specimen. The portion of skull attached is also so much smaller, that I think it prudent to hesitate in identifying it as specifically the same. The posterior margins of the orbits are but $4\frac{1}{2}$ inches apart, whereas in the other they are $5\frac{1}{2}$ inches. There are no materials for extending the comparison, but a few more dimensions may be given of the smaller one. The greatest width of this skull, at the posterior portion of the *zygoma*, is 5 inches, and the orbits are $3\frac{1}{4}$ inches distant where most approximated: the series of 5 developed molars occupied $2\frac{3}{4}$ inches; width of second true molars apart, posteriorly and externally, $2\frac{1}{4}$ inches; of anterior false molars, measured outside and before, $1\frac{1}{8}$ inch; greatest width of palate $1\frac{3}{4}$ inch, and from front of first false molar to anterior portion of occipital *foramen*, $5\frac{3}{4}$ inches. Mr. Vigne, indeed, assures me that the adult has only five grinders on each side of both jaws, as in the Chirew, which, if nor-

mal, would make an important distinction, as the smaller specimen would undoubtedly have developed a third true molar, and possesses three false ones; whereas it is in one of the latter that the Chirew is deficient. I am inclined, however, to regard the two specimens as belonging to the same species, since I have observed analogous differences in the mere flexure of the horn in different Corsican Moufflons; but it was at all events proper to indicate the disparity.

"Vast numbers of this species," relates Mr. Vigne, "are driven down by the snow in winter to the branches of the Indus, near Astor, at the southern extremity of Little Thibet, where the river breaks through the chain of the Himalaya. I once saw a young one, apparently of this species, in Persia, but took no memorandum of it at the time; it was dirty and draggled, but, I think, was covered with short wool." I have great pleasure in dedicating this species to that gentleman*.

11. *O. Musimon*, Linnæus: the Moufflon Sheep of Corsica and Sardinia, but not, there is reason to suspect, of the Levantine countries. It is unnecessary to give a detailed description of this beautiful little species, though I may mention that the fine living male in the Gardens measures 39 inches from nose to tail, the tail 5 inches; from nose to base of horn 7 inches; ears 4 inches; neck, from posterior base of horn to the abrupt angle of its insertion, 8 inches, and thence to base of tail 21 inches; height at the shoulder $2\frac{1}{4}$ feet. The horns of this individual are remarkable for not spiring in the least degree, whence they point towards the back of the neck: they measure 21 inches over their curvature, and $8\frac{1}{4}$ inches round at base, being in their fifth year of growth; their widest portion apart

* The Wild Sheep of the Parapomisan range, or Hindu Koosh mountains, described in 'Journ. As. Soc. Beng.' for 1840, p. 440, has been identified by Mr. Vigne as, "without doubt," the same as the above *O. Vignei*, notwithstanding certain apparent discrepancies. "Adult male 3 feet 4 inches at shoulder, and 5 feet 4 inches from nose to base of tail. Girth of body, measured behind shoulder, 4 feet: head 1 foot: horns $2\frac{1}{2}$ feet round the curvature, and 12 inches in circumference at base, turning spirally backwards and downwards, with the points inclining forwards. A large beard from the cheeks and under-jaw, divided into two lobes. Neck ponderous, 14 inches long and 24 inches in circumference: it has no mane above. General colour pale rufous, inclining to gray, and fading off to white beneath. *Muzzle white*; beard on either lobe white, connected to a streak of long black flowing hair, reaching to the chest. Legs covered with white short hair; belly white; tail small, short, and together with the buttocks white. The female is inferior in size, and not so much of a rufous colour, with small horns, inclining backwards and outwards, about 6 inches in length. The lambs, which are produced in May and June, are the colour of the female, but have a dark stripe down the back, and in front of the fore-legs." "I have now," writes Capt. Hay, "three lambs of this species in my room, perfectly domesticated; but such places as they attempt to climb, show the nature of the mountains they inhabit. What think you of a couple of them setting to work to climb my chimney, nearly perpendicular, but with projecting bricks here and there?" It is noticed that this animal has the usual number of molars, six on each side of both jaws; and I understand that there is a stuffed specimen in the Paris Museum.—E. B.

is 15 inches, and at the tips 6 inches; but another pair, upon the stuffed specimen in the museum, which show the more usual slight spirature, are 26 inches long, having the widest portion 14 inches apart, and the tips as much as 12 inches: this pair shows seven years of growth, and their development was evidently completed, though they are only 7 inches in girth at base. The female has seldom any horns, which, when they exist, are ordinarily about 2 inches long.

The character of the horn of the Moufflon is nearly the same as that of the domestic Ram, only that it is never so much prolonged, nor indeed to more than two-thirds of a circle: the inner front edge is acute to near the base, where the outer one approaches to an equality with it; the first half being thus unequally triangular, and the remainder much compressed, with strongly marked *rugæ*, and having the inner surface of the horn concave. It has always appeared to me, however, that the specifical distinctness of the Moufflon is very obvious, and I doubt whether it has contributed at all to the origin of any tame race. That it interbreeds freely with the latter, under circumstances of restraint, is well known; but we have no information of hybrids, or *Umbri*, as they are called, being ever raised from wild Moufflons, though the flocks of the latter will occasionally graze in the same pasture with domestic sheep, and all but mingle among them. The male of this animal is denominated in Corsica *Mufro*, and the female *Mufra*, from which Buffon, as is well known, formed the word *Moufflon*: and in Sardinia the male is called *Murvoni*, and the female *Murva*, though it is not unusual to hear the peasants style both indiscriminately *Mufion*, which (as Mr. Smyth remarks in his description of that island,) is a palpable corruption of the Greek *Ophion*. It is sometimes stated, but I do not know upon what authority, that a few of these animals are still found upon the mountains of Murcia.

12. The Cyprian Moufflon, figured and described by Messrs. Brandt and Ratzeburg from a specimen in the Berlin Museum, and contrasted by them with M. F. Cuvier's figure of the Corsican animal, is probably a distinct species, intermediate to *O. Musimon* and *O. Gmelini*: its horns have more the curvature of those of the latter species, but are not so robust, and curve round gradually backward from the base, instead of at first diverging straightly, as in *O. Gmelini*; but the colour of the coat would appear to resemble that of the Corsican Moufflon, only without the rufous cast, and the specimen figured wants also the saddle-like triangular white patch, which is seldom* absent in the Moufflon of Sardinia and Corsica. The *Tra-*

* Indeed *never*, as I now suspect, from observing that the hair composing this triangular white patch in the Moufflon, though even with the rest of the coat in summer, is in winter very much lengthened beyond the rest, forming a sort of whorl, and imparting a singular aspect to the animal when viewed otherwise than laterally. At the same season, the Moufflon has a considerable standing mane of lengthened black hair on the nape and forequarters, and that on the front of the neck is very copious and projecting, being directed forwards from the lower part, and downwards from the upper portion of the fore-neck. It is remarkable that the same lateral whorl of lengthened white hairs occurs in certain breeds of domestic sheep. There is now, for instance, in the Zoological Gardens, Regent's Park, a pair of sheep

gelaphus of Belon, it is true, observed by that author in Candia and in Turkey, is described by him to have "horns similar to those of Goats, but sometimes gyrated like those of a Ram"; yet the fact of a nearly similar flexure of horn to that represented by Messrs. Brandt and Ratzeburg, proving to be of normal occurrence in the allied Armenian wild Sheep, confers additional probability on the supposition that the Berlin specimen of the Cyprian Moufflon has also normally curved horns, which alone would go far to establish its claim to rank as a species, in which case it might bear the appellation of *O. Ophion.*

13. *O.* ——: *Ixalus Probaton,* Ogilby. I stated in my former paper an opinion, to which I am still disposed to adhere, that this animal is no other than a genuine sheep, but specifically distinct from any at present known: the specimen had long lived in captivity, as is obvious from the manner in which its hoofs had grown out; but whereas I formerly sought to account for its absence of horns, by ascribing this to probable castration at an early age, I am now inclined to consider that this abnormity—for such there is every reason to suppose it—was individually congenital, as in other rare cases before alluded to. The Armenian wild Sheep approaches more nearly to this species than any other as yet discovered; so much so, that before actually comparing them I thought that they would prove to be the same; but they are nevertheless distinct, as is particularly shown by the longer and less slender tail of the present animal, and the very different texture of its coat: the absence of dark markings on its face and limbs may prove to be an individual peculiarity. The specimen is of the size of a large tame Sheep, and entirely of a chestnut fulvous colour, dull white beneath and within the limbs, as also on the lips, chin, lower part of the cheeks, and at the tip of the tail. From nose to base of tail it measures about 50 inches,—the tail half a foot, and height of the back $2\frac{1}{2}$ feet. From nose to rudiment of horn 9 inches, and ears 4 inches: the vestiges of horns, which exactly resemble those found upon many breeds of tame Sheep, are 2 inches apart. Upon the minutest examination of the specimen, I can perceive no character whatever to separate it from the genuine Sheep, nor any distinction more remarkable than the trivial circumstance of its chaffron not being bombed, as usual, which however is equally the case with *O. Tragelaphus.* I have been favoured, however, by Col. Hamilton Smith with a drawing of an animal observed by himself on the banks of the Rio St. Juan in Venezuela, which appears to accord so nearly with *Ixalus Probaton,* except in the particular of bearing horns similar to those of the Rocky Moun-

from the West Indies, which, during the winter, have been clad with a copious fleece of a rufous brown colour, through which these long white hairs projected and were very conspicuous, contrasting with the rest: at the approach of spring the woolly fleece was shed, and succeeded by a coat of hair like that of the various wild species. These sheep are hornless, and have the usual long body of the domestic races; their tail is rather short, but more than twice as long as the Moufflon's, and the chaffron is much bombed. From these facts I infer the near affinity, rather than the identity, of the latter with the domestic species, the aboriginal type of which would certainly also exhibit much long hair pendent from the front of the neck, as retained in the Icelandic and some other breeds.—E. B.

tain Goat, that its absolute identity is probable, in which case it would be curious that a species so very nearly allied to the genus *Ovis* should yet differ from it so considerably in the character specified. The South American animal adverted to is the *Aploceros Mazama* of Col. Smith, and is probably congenerous with the *Pudu* of the Chilian Andes mentioned by Molina, (the existence of which would appear to have been lately re-ascertained by M. Gay,) and also with the fossil *Antilope Mariquensis* of Dr. Lund: there would indeed appear to be other living species of this type, more or less distinctly indicated by different authors.

14. *O. Aries*, Linnæus: the Domestic Sheep. Assuming that different species have commingled to produce this animal, as appears to be very evident in the instance of the Dog, it is still remarkable that we have certainly not yet discovered the principal wild type, or indeed any species with so long a tail as in many of the domestic breeds, which I cannot doubt existed also in their aboriginal progenitors: nothing analogous is observable among the endlessly diversified races of the domestic Goat, which all appear to have been derived exclusively from the Caucasian *C. Ægagrus*; and as in my former paper I suggested the probability that a wild Sheep more nearly resembling the domestic races than any hitherto discovered would yet occur somewhere in the vicinity of the Caucasus, it now appears that such an animal does exist in central Persia, as noticed in my description of *O. Gmelini*: nor should it be forgotten that Hector Boëtius mentions a wild breed in the island of St. Kilda, larger than the biggest Goat, with tail hanging to the ground, and horns longer and as bulky as those of an Ox*. Pennant remarks upon this subject, that such an animal is figured on a bas-relief, taken out of the wall of Antoninus, near Glasgow.

Of all the wild species of true *Ovis* that have been here described, the Rass [*Kutch-gar*] of Pamîr approaches nearest to *O. Aries* in the character of its horns, though differing in one particular, besides size, that has been pointed out; namely, that the two front angles are about equally developed; whereas in *O. Aries*, as in the Moufflon, the inner angle is more acute to near the base. Some experience in the deduction of the specific characters of sheep-horns enables me to state with confidence, that the normal character of the long-tailed domestic breeds of Europe, and also of most other breeds, is intermediate to that of the Rass and that of the Moufflon, combining the flexure and the prolongation of the former with the section of the latter, but becoming proportionally broader at the base than in either; more as in the Argalis of Siberia, Kamtschatka, and North America. That *O. Aries* is totally distinct from all, I have been long perfectly satisfied, and examination of the Rass in particular has strongly confirmed me in this opinion. I think it likely, however, that more than one wild species have commingled to form the numerous domestic races, though certainly not any that have been described in this paper. It is not very long since the question was habitually

* Two *crania* of sheep, apparently male and female, from the Irish peat, in the possession of the Earl of Enniskillen, and exhibited some time ago at a meeting of the Geological Society, are probably of this race.

discussed, whether the tame Sheep had descended from the Argali of Siberia or the Moufflon of Corsica; and now that so many more indisputably distinct wild species have been added to the catalogue of this genus, it is probable that we are still very far from having ascertained the complete existing number, but that several more yet remain to be discovered upon the lofty table-lands and snowy mountains of middle Asia, from the Caucasus and Taurus to the Altai, and among them, it is very probable, some much more nearly allied to the domestic races than any at present known.

The whole of the foregoing animals appertain to my subgeneric group *Ovis*, as distinguished from *Ammotragus*, which latter is characterized by the absence of suborbital sinuses, like the Goats, but differs from the latter by possessing interdigital *fossæ*, as in other Sheep. This difference between the Goats and Sheep appears to have been first noticed by Pallas, and has since been descanted upon by Prof. Géné in vol. xxxvii. of the *Memorie della Reale Accademia delle Scienze di Torino*. The fact of such a diversity in genera so nearly allied in habitat as the Goats and Sheep, renders the problem of the utility of the structure in question somewhat difficult of solution. The species upon which I found the subgenus *Ammotragus*, has decidedly an Ovine, rather than a Caprine aspect, when viewed alive: the male emits no stench, as in the Goats; the bleat is precisely that of *Ovis*, and the animal butts like a Ram, and not like a Goat. Unlike the other species of admitted wild Sheep, as well as the long-horned or true wild Goats, it has a concave chaffron, and no markings on the face and limbs: its tail is rather long, which is the case in no species of *Capra*, and is also remarkable for being tufted at the extremity. The indigenous habitat, North Africa, is a further peculiarity in the genus in which it is here placed, though two species of wild Goats respectively inhabit Upper Egypt and the snowy heights of Abyssinia.

15. *O. Tragelaphus*, Pallas: the African Goat-Sheep. This animal appears to vary considerably in size, some exceeding a Fallow Deer in stature, while others are much smaller. It has no beard on the chin, like the true Goats, but is remarkable for the quantity of long hanging hair in front of the neck, and on the upper part of the fore-limbs, the former attaining in fine males to about a foot in length, and the latter to 9 inches; there is also some lengthened hair at the setting on of the head, and a dense nuchal mane, the hairs of which are 3 inches long, continued over the withers till lost about the middle of the back. General colour tawny or yellow-brown. Horns moderately stout, turning outwards, backwards, and so inwards, with the tips inclining towards each other.

The splendid male in the British Museum measures 5 feet from nose to tail, and tail 9 inches, or with its terminal tuft of hair 13 inches; height of the back $3\frac{1}{2}$ feet, but the living animal would not have stood so high by several inches; from muzzle to base of horn 11 inches, and ears 5 inches. The finest pair of horns which I have seen are in the same collection, and measure 25 inches over the curvature, $10\frac{1}{2}$ round at base, with an antero-posterior diameter of $2\frac{1}{2}$

inches inside; they diverge to 23 inches apart, measuring outside, at a distance of 6 inches from the tips, which latter return to 15 inches asunder; their span from base to tip inside is 13 inches; at base they are closely approximated, but not quite in contact. General form subquadrangular for nearly a foot, then gradually more compressed to the end, and having a very deep longitudinal furrow for the greater portion of their length outside, above which the horn bulges: there is a mark of annual growth at $1\frac{1}{4}$ inch from the base, another $1\frac{1}{2}$ inch further, and a third after an interval of 3 inches; but the rest are too indistinct to be made out with certainty among the wrinkles of the horn. A large pair of female horns were 16 inches long; $7\frac{1}{2}$ round at base; their widest portion apart, near the tips, 19 inches; and the tips $17\frac{1}{4}$ inches: their surface is marked with broad transverse indentations, which in the males ordinarily become more or less effaced with age. The female of this species is a third smaller than the other sex; and a lamb in the collection of this Society is extremely kid-like, with the spinal mane upon the neck and shoulders very conspicuous, but no lengthened hair on the fore-neck and limbs: in the half-grown male, the latter especially is still not much developed.

This species is well known as the *Aoudad* of the Moors, and the *Kebsh* of the Egyptians; it is also, according to Rüppell, the *Tedal* of the inhabitants of Nubia, which is doubtless the same as *Teytal*, applied by Burckhardt to the wild Goat of that region, in addition to the word *Beden*, which (in common with Rüppell and others) he also assigns to the latter. Sir Gardner Wilkinson, however, confirms Burckhardt, by informing us that the Goat referred to is called in Arabic *Beddan*, or *Taytal*, the former appellation referring to the male only. This author adds, that the present species "is found in the eastern desert, principally in the ranges of primitive mountains, which, commencing about lat. 28° 40′, extend thence into Ethiopia and Abyssinia." According to M. Rüppell, "it is found in all North Africa above 18° in small families, and always upon the rocky hills;" frequenting the steepest and most inaccessible crags amid the woods and forests of the Atlas, and descending only to drink. It is a wonderfully agile leaper, even more so than the wild Sheep and Goats generally, and is remarkable for always browsing, in preference to grazing. The *Ovis ornata*, figured by M. Geoffroy in the great French work on Egypt, would appear to be merely a small-sized individual*.

* The "Wild Sheep" of Tenasserim, mentioned by Captain Low (in Journ. Roy. As. Soc. for 1836, p. 50) as abundant in that region, is most probably the *Kemas hylocrius* of Mr. Ogilby, or *Warry-a-too* of the Chatgaon hills, which is also more or less common throughout the Malabar, Coromandel and Vindhayan ranges of Peninsular India, where it is known as the "Jungle Sheep" to British sportsmen, having precisely the bleat of this genus. *Vide* Bevan's 'Thirty Years in India,' ii. 267. This author remarks its being very common in Wynaud. A female represented (though very indifferently) in one of Gen. Hardwicke's unpublished drawings in the British Museum, from a specimen killed in Chatgaon, is clearly identical in species with the male specimen in the Zoological Society's Museum, which was received from the Neelghierries. Mr. Ogilby has rightly classed this ani-

The following may serve for definitions of the various ascertained species of wild Sheep that have been here described:—

1. *O. Polii*, Blyth. O. cornibus maximis triquetris, angustis altissimisque; angulis anterioribus æqualibus: extrorsùm spiraliter gyratis, et tàm prolongatis quam sunt cornua Arietum domesticorum longissima: sulcis transversìm indentatis; colore pallido. Animal non cognitum est, sed *O. Ammoni* magnitudine saltem haud inferius. Habitat apud planitiem elevatam *Pamír* dictam, in Asiâ centrali.

2. *O. montana*, Desmarest. O. cornibus maximis triquetris, crassissimis, et sæpe inter angulos tumidis, ad apicem compressioribus; sulcis transversìm indentatis; deorsùm et antrorsùm gyratis ad parallelum, apicibus extrorsùm eductis: colore pallido, sed sæpe rufo-brunneo suffuso. Animal ad magnitudinem *Cervi Elaphi* appropinquans, sed artubus brevioribus; pilis griseo-fulvis pallidis, maculis genericis super facie, pectore, artubusque fuscis; caudâ brevissimâ, et disco albescente circundatâ. Habitat apud Americæ Septentrionalis montes, occidentalem versus.

3. *O. Ammon*, Pallas. Diversitas hujus speciei ab præcedente

mal with the *Jharal* of Mr. Hodgson (which is decidedly the *Capra Jemlaica* of Col. H. Smith) and the *Goral* of Gen. Hardwicke; which two latter species, if not the first also (as is most probable), are very remarkable for having constantly four mammæ, wherein they differ from all the allied forms. It is necessary, however, to remark here, that I do not consider the *Surow*, or *Thar* of Mr. Hodgson, and its congener the *Cambing-outang* of Sumatra, to be nearly allied to the Goats and Sheep. The members of the subdivision *Kemas*, Ogilby (from which I exclude the Chamois), are besides distinguished from the true Goats, as a subgenus of which generic group I prefer to rank them, by having short horns, nearly as large in the female as in the male, always cylindrical at the tips, and forming a prolongation of the plane of the visage; no beard on the chin; comparatively long limbs; and by having the chaffron straight, or even concave, in lieu of being bombed. The *K. hylocrius*, which has never been described, is rather smaller than the Jharal, with a very short, coarse, and somewhat crisp coat, of a grizzled purplish chocolate colour, inclining to olive on the face: the horns diverge much less, having more the direction of those of *K. Goral*, but are moderately thick at base, and very sheep-like, bulging externally more than in *K. Jemlaicus*, with even an indistinct trace of an outer front-angle; they are indented with numerous cross-channels, and have little more than a tendency to exhibit the pendent knobs in front, conspicuous in those of the Jharal; their colour is dull black; at base they are 1 inch apart, diverging to 9½ inches at the tips, with a length of 9 inches over the slight curvature. The animal stands above 2½ feet at the back, and measures about 4 feet from nose to tail; the tail 3 inches, or 5 inches to the end of the hair; from nose to base of horn 9 inches, and ears 5 inches. There is a raised dorsal line, darker along the nape and fore-quarters; and the hairs of the coat, which are very slightly crumpled, and lie roughly, from each hair having a stiff curvature, are grizzled chocolate and yellow-gray, the former colour much predominating; there is some dull white in front of the neck, lower parts, and inside of the limbs; and the feet are blackish anteriorly, with a black patch also a little above the callous space on the fore-knees: tail the same colour as the back. The female would appear to differ only in having the horns not quite so thick and large.—E. B.

non cognoscenda est, quamvis patria differt, hâc in Siberiâ Orientali habitante; tertia alia species ambobus distincta regione intermediâ Kamtschatkæ invenitur, itidem simillima, tamen (apparenter) facillimè dignoscenda; viz.

4. *O. nivicola*, Eschscholtz. O. cornibus triquetris, et inter cornua *Polii* et *Montanæ* Ovium apparenter intermediis; apicibus magis prolongatis quam in *O. montanâ*, sed ad basin crassioribus; potius quam in *O. Polii* prolongatis, sed cornibus utriusque minoribus. Magnitudo hujus animalis inferior est, et pilorum color flavescens, sine disco caudali. Habitat apud montes Kamtschatkæ.

5. *O. Californiana*, Douglas. O. cornibus crassis triquetris, ad apicem compressioribus; sulcis transversìm indentatis; curvamine aperto extrorsùm (non antrorsùm) gyrantibus, apicibus plurimùm extrorsùm ductis; colore pallido, aut rufo-brunneo paulùm suffuso. Magnitudo Ammonis, vel paulùm inferior: caudâ elongatâ, et non (?) disco pallido circundatâ. Habitat apud Californiam.

6. *O. Nahoor*, Hodgson. O. cornibus crassis subcylindraceis, suprà magis planiusculis, culmine abruptiore medio, dimidio-distali compressiori, et extrorsùm arcuatis, apicibus retortis: sulcis transversis obsoletis; colore pallido. Magnitudo Arietis grandis; pilis griseis, vel in junioribus adultis fulvo terminatis, maculis genericis fuscis; caudâ brevi et floccosâ. Habitat apud regiones medias montium Himalaicorum, et in Tibetâ Magnâ.

7. *O. Burrhel*, Blyth. O. cornibus crassis subcylindraceis, suprà convexioribus, culmine longitudinali minùs abrupto, et aliis angulis minùs prominentioribus quàm in specie præcedente, subæqualioribus; in arcu extrorsùm curvatis, apicibus retrorsis; sulcis transversis obsoletis; colore nigrescenti-rubido. Magnitudo inferior est *Nahoori*, sed forma robustior; pilis castaneo-brunneis intensis; maculis genericis nigris et distinctis; caudâ minimâ (?) et non floccosâ. Habitat apud montium Himalaicorum regiones summas.

8. *O. cylindricornis*, Blyth. O. cornibus maximis cylindraceis, in arcu extrorsùm (?) sine diminutione curvatis, apicibus non cognitis; sulcis transversis obsoletis: colore nigrescenti-rubido. Habitat apud Caucasum.

9. *O. Gmelini*, Blyth. O. cornibus triquetris et robustis, altis, et transversìm sulcatissimis; in arcu retrorsùm divergentibus, apicibus introrsùm ductis: colore pallido. Magnitudo Arietis; pilis brevissimis, et castaneo-fulvis splendidè coloratis; maculis genericis subdistinctis, sed lineâ pilorum longiorum nigrâ infra collum in mare solo excipiendâ, apud pectus se expandente, et in utroque sexu cæsarie rudimentâ brachiis, sicut in *Ove Tragelapho*: caudâ brevi et gracillimâ. Habitat apud Armeniam et provincias Occidentales Persiæ Septentrionalis.

10. *O. Vignei*, Blyth. *O. Musimoni* simillima, sed magnitudine *Cervi Damæ* grandis, artubusque longissimis: cornibus robustis, compressis, et subtriquetris, angulis anterioribus æqualibus; lunatìm non spiraliter gyratis; et sulcis transversìm indentatis: colore pallido. Corporis pilis rufo-brunneis; facie artubusque lividis; ventre, et annulis supra ungulas albis; lineâ laterali nigrâ; pedibus annulo se-

cundo nigro posticè albo super-marginato notatis; apice caudæ (brevis et gracilis,) et lineâ pilorum paulò pendentium infra collum ad pectus tendente, nigris. Habitat apud Tibetam Minorem. *Varietas dubia* minor, cornibus extrorsùm gyratis, cum angulo interiori prominentiori.

11. *O. Musimon*, Linnæus. O. cornibus compressis, ad basin triquetrioribus, angulo interiori prominentiori; lunatìm gyratis, et sulcis transversìm indentatis: colore pallido. Magnitudo *Arietis* parvi, caudâ brevi et magis villosâ quàm in specie præcedente: pilis rufo-brunneis; facie lividâ, cum capistro albo; ventre, clunibus, dimidiisque artuum inferioribus, albis; et lineâ laterali, caudâ, pectore, et membrorum plerumque dimidiis superioribus, nigris: maculâ triangulari albâ utroque lumbo sæpe (semper?) conspicuâ. Habitat apud insulas Corsicæ et Sardiniæ, et forsan provinciam Murciæ in Hispaniâ.

12. *O. Ophion*, Blyth. *O. Musimoni* simillima, sed cornibus retrorsis, apicibus accurvatis: pilisque brunneis, et non rufescentibus (?). Habitat apud Cyprum, et forsan regiones alias Levantinas

13. *O. Aries*, Linnæus.

14. *O.* ——? *Ixalus Probaton*, Ogilby. Magnitudo *Arietum* maximorum, caudâ paulùm elongatâ: cornibus in specimine solo cognito abnormaliter (?) rudimentalibus. Pilis castaneo-fulvis, et infra albescentibus.

15. *O.* (*Ammotragus*) *Tragelaphus*. O. cornibus magnis subquadrangularibus, moderatè crassis, ad apicem compressioribus, sulcis transversìm indentatis; divergentibus et retrorsùm curvatis, sed prope basin rectis, apicibus acclinatis; colore pallido. Magnitudo *Cervi Damæ* superior, pilis flavescenti-brunneis; collo jubato, et infrà cum pectore brachiisque capillato, caudâ elongatâ extremitate villosâ; facie non convexâ—ut in omnibus speciebus aliis, sinibusque suborbitalibus nullis. Fœminâ semper (?) cornutâ, cornibusque fortioribus quàm in fœminis specierum cæterarum hujus generis, quæ sæpe non cornutæ sunt, sed plurimæ cornua parva, tenuissima, et compressiora ferunt, quæ in maribus junioribus aut curvata sunt, aut sæpe rectiora. Habitat apud Africæ Septentrionalis montes rupestres.

EXPLANATION OF PLATE V.

Fig. 1. *Ovis Polii*; 2. Do. side view; 3. *O. sculptorum*; 4. Do. side view; 5. *O. californiana*; 6. *O. Nahoor*; 7. *O. Burrhel*; 8. *O. Gmelini*; 9. *O. Vignei.*

XXXII.—*Notes on some of the smaller British Mammalia, including the Description of a New Species of* Arvicola, *found in Scotland.* By the Rev. Leonard Jenyns, M.A., F.L.S., &c.

The following notes contain the results of some inquiries and observations respecting our smaller Mammalia, made since the publication of my 'Manual,' and my several papers

on the British Shrews, etc., in former volumes of this Magazine.

(1.) *Vespertilio Pipistrellus,* and *V. mystacinus.*—M. de Selys-Longchamps has favoured me with continental specimens of both these species, which prove identical with ours. I deem the circumstance worth mentioning, because, at the time of publishing my paper in the Linnæan Transactions on the common Bat of this country, it was thought by some persons that the proof of its identity with the Pipistrelle of the Continent, obtained from an actual comparison of specimens, was still wanting; and I am not aware of such comparison having been yet made until now.

(2.) *Vespertilio Daubentonii.*—I am quite aware of the error that I committed in my 'Manual,' in confounding this species with the *V. emarginatus* of Geoffroy; and I have not the slightest doubt of the correctness of Mr. Bell in referring the bat which I described under this last name to the *V. Daubentonii.*

(3.) *Vespertilio ædilis* (Ann. of Nat. Hist., vol. iii. p. 73).—MM. Keyserling and Blasius have given it as their opinion, that the bat which I described as new under the above name, is a mere variety of the *V. Daubentonii**. I myself alluded in my original paper to the possibility of this being the case; and I have now scarcely any doubt of the fact, as well from what the above authors have stated, more particularly with respect to the incision at the apex of the tragus occasionally varying in the two ears of one and the same individual,—as from the recent examination of a bat, undoubtedly referable to the *V. Daubentonii,* in which there was a slight approach to the form of tragus observable in the specimen on which I founded the above species. This last bat was taken in Ireland, and was kindly submitted to my examination by Mr. Thompson of Belfast.

I still think, however, that, though I committed an error, my paper will have been of use in calling the attention of British naturalists to the *fact* of the tragus occasionally varying in form in this manner, of which I do not apprehend they were generally aware any more than myself.

(4.) *Martes Foina.*—Mr. Bennett and Mr. Bell have both expressed doubts as to whether the common Martin be distinct from the Pine Martin†, though the latter gentleman has for the present kept them separate in his 'British Quadrupeds.' Mr. Eyton, in a paper recently printed in

* See No. 29 of this Journal, p. 149.

† See Mr. Bennett's remarks on this subject in the 'Gardens and Menagerie of the Zoological Society,' vol. i. p. 230.

this Magazine*, seems decidedly inclined to consider them as but one species; and until lately I was myself strongly disposed to embrace the same opinion. In the early part, however, of the summer of 1840, Mr. Henderson, of Milton Park, in Northamptonshire, was kind enough to send me two specimens of the common Martin, killed in that neighbourhood, both of which were young animals, and had probably been bred that year, as the milk-teeth had not yet been supplanted by the permanent set, and the bones of the head were very loosely united: nevertheless these individuals had the cranium larger and heavier than that of an adult specimen of the Pine Martin in Mr. Yarrell's collection, who also showed me several other crania of both species, of different ages, and satisfied me that they were distinct. At the same time it is evident, from the united observations of several naturalists, that the colour of the breast is no distinguishing character, and probably dependent upon either age or season. Mr. Eyton is of opinion that the breast is yellow in the young and white in the adult; and this would be confirmed by the specimens above alluded to, in both which this part was bright yellow tinged with orange.

These individuals were of the same size, and measured 17 inches in length, exclusive of the tail, which was not quite 9. The length of the cranium was 3 inches 4 lines; its breadth across the zygomatic arches 1 inch 10 lines; its weight 4 drachms 38 grains.

(5.) *Sorex rusticus*, and *S. Hibernicus*.—Since the publication of my paper on the British Shrews†, in which I first noticed the *S. rusticus*, and the Irish variety which I provisionally termed *S. Hibernicus*, I have been favoured by Mr. W. Thompson of Belfast with the opportunity of examining a large number of specimens of this last kind obtained in Ireland, and am quite satisfied as to its being a distinct species from the *S. tetragonurus*, but not from the *S. rusticus*, which I had previously obtained in this country, and of which I have since procured other specimens. In future, therefore, these two species, the *S. rusticus* and the *S. Hibernicus*, must be considered as the same; and I should have continued the former name in preference to the latter, as being, on the whole, more eligible, but for the circumstance of several specimens of this shrew having been transmitted to naturalists, abroad as well as at home, under the title of *S. Hibernicus*, and the probability that, if it be now changed to that of *rusticus*, it may entail some confusion. I have to request, therefore, that the name *Hibernicus* be hereafter adopted for this species, which, though not confined to Ireland, seems to be the com-

* No. 33, Dec. 1840, p. 290. † Ann. of Nat. Hist., vol. i. p. 417.

mon species in that country, and much more abundant there than in England, where it gives place in a great measure to the *S. tetragonurus*. It has also been observed in very different localities in Ireland; and one specimen sent to me by Mr. Thompson was stated to have been taken in the county of Antrim, at an elevation of 1200 feet above the sea.

Everything that I have stated in the paper above alluded to, with respect to the characters of the *S. rusticus*, and the distinguishing marks by which it may be known from the *S. tetragonurus*, is applicable to the Irish Shrew, excepting as regards the cranium (p. 420); and I must beg, that what I have said on that point be considered as erased, having since ascertained that I was led into an error by the examination of a specimen, the cranium of which did not exhibit its true form from the manner in which it had been prepared. Moreover, it was this error which partly led me to regard the English and Irish specimens of *S. Hibernicus* as distinct. In fact, the cranium of the species just named does not differ from that of the *S. tetragonurus*, except in being much smaller. The following are their respective dimensions:—

	Length. lines.	Breadth. lines.	Height. lines.
Cranium of a middle-sized *S. tetragonurus*	$9\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{3}{4}$
——— of an old full-grown *S. Hibernicus*	$7\frac{1}{2}$	$3\frac{1}{2}$	2

The dimensions indeed, generally, of this last species are so much less than those of the former, that it is hardly possible to mistake them, especially if attention be paid to the feet, and also to the tail and attenuation of the snout. Perhaps I have rather over-stated the average dimensions of the *S. Hibernicus* in my former memoir (called there *S. rusticus*), when I set them at "hardly $2\frac{1}{2}$ inches"; but I had not then seen so many individuals. None of those submitted to my examination by Mr. Thompson exceeded 2 inches and $2\frac{1}{2}$ lines; and I doubt whether in general the species much exceeds that size. The specimen to which I alluded as being 2 inches and 8 lines, I am now inclined to think must have been a *S. tetragonurus*, which often reaches 3 inches.

In respect to the internal structure of these two species, which I have examined and compared, I see no very important differences between them. The stomach is of a very peculiar form in both, having its pyloric portion so extraordinarily elongated, that it might easily be mistaken for a portion of the intestine itself. This, indeed, as well as other points in the anatomy of these animals, would deserve further notice, but for the circumstance of M. Duvernoy's memoir*,

* Mém. de la Soc. du Mus. d'Hist. Nat. de Strasbourg, tom. ii. mém. 2.

so often alluded to in my former papers, in which they have been treated of in detail, and to which I must refer those who are interested in the subject. I may, however, make one or two remarks, as supplemental to his.

M. Duvernoy states the length of the intestinal canal in the *S. tetragonurus*, compared with the length of the body, to be as three to one, and rather more. In most of the specimens which I have examined, I have found it nearly as four to one, and in some instances even bearing a higher ratio than this; whilst the ratio of three to one more nearly accords with the case of the *S. Hibernicus*. The relative, however, as well as the absolute length of the intestinal canal, varies a little in both species, according to the size of the individual. I shall here annex the actual measurement of this, and one or two other parts, such as were observed, first, in a medium-sized specimen of the *S. tetragonurus*, and then in an old full-grown *S. Hibernicus*.

S. TETRAGONURUS.

	inches.	lines.
Length of the head and body	2	7
——— of the tail	1	9
Greatest diameter of the distended stomach	0	7
Distance from the cardiac orifice to the pylorus, being the length of the pyloric gut	0	10
Entire length of the intestinal canal, from the pylorus to the anus	10	9

S. HIBERNICUS.

	inches.	lines.
Length of the head and body	2	2½
——— of the tail	1	5
Greatest diameter of the distended stomach	0	6½
Distance from the cardiac orifice to the pylorus	0	9
Entire length of intestinal canal, as before	7	0

The number of ribs, which is not mentioned by Duvernoy, I find to be 14 in both species, of which 7 are true and 7 false.

The number of vertebræ was also found to be the same in the case of a single individual of each species, and may be estimated as follows:—

Cervical	7
Dorsal	14
Lumbar	6
Sacral	2
Caudal	15
Total	44

In a second specimen, however, of the *S. tetragonurus* the number of caudal vertebræ was as many as 16, whilst in a second of the *S. Hibernicus* it was only 14; thus showing that in each species it is subject to some variation.

In the above table I have estimated the number of sacral vertebræ as 2, according to Duvernoy, who, though he has not given the entire number in the column, has noticed the very peculiar and elongated form of these two, having a sharp ridge on their upper surface, much developed, and common to them both. It is evident, however, on a close inspection, that the first of these two vertebræ, which he speaks of as being the most elongated, is resolvable into 4, which are more or less consolidated together, according to the age of the individual. In some instances the lines of separation between them are so distinct, that they might be counted separately; in which case the entire number of vertebræ in the *S. tetragonurus* would stand at 47 or 48, and in the *S. Hibernicus* at 46 or 47.

I have deemed it of importance to mention these facts with respect to the vertebræ, from the circumstance of M. de Selys-Longchamps having found it a valuable character in distinguishing some closely allied species of *Arvicola*, and observed to me that he thought it might prove of equal service in helping to discriminate those of the genus *Sorex*. It appears, however, from what has been stated, that the exact number in the tail, in this instance, cannot be relied on.

(6.) *Sorex castaneus* (Ann. Nat. Hist., vol. ii. p. 43).—I have not been able to obtain any more specimens of this species*, and can therefore say nothing further as to its being really distinct from the *S. tetragonurus*. M. de Selys-Longchamps, who has paid so much attention to this genus, and to whom it was shown during his visit to London in 1839, declined giving any decided opinion about it; at the same time, he observed that he had never seen any individuals of the *S. tetragonurus* of so rufous a tint. I conceive, however, that the fact of a male and female having been found together, the latter of which was big with young when taken, rather tends to support the idea of its being distinct. Also, independently of its colour, and one or two other external peculiarities, there is a slight difference observable in the cranium, as already pointed out in a former paper†.

* The original specimens were not obtained in my own immediate neighbourhood, nor by myself, but in a fen distant some miles from me, and by a person who has since left the district; and I am ignorant of the exact locality in which he met with them.

† Ann. N. H., vol. i. p. 424.

I regret that, when I dissected one of the above specimens, soon after its capture, I did not notice the number of ribs and vertebræ, which might have helped to determine the question. This is a point to which attention should be paid by any naturalist who may be fortunate enough to meet with others. The viscera resembled those of the *S. tetragonurus*; the intestinal canal, however, being relatively a trifle longer than in that species, and measuring 10 inches 4 lines, the length of the body being 2 inches 4½ lines.

I may just observe, before quitting this species, that the shrew which Mr. Thompson obtained from Ballantrae, and considered as referable to the *S. castaneus**, has been kindly submitted to my examination, and proves to be only a pale variety of the *S. tetragonurus*; and it is at his own request that I mention this circumstance. In both my specimens of the Chestnut Shrew, the rufous tint, in the recently killed animal, was quite as bright and decided as in the harvest-mouse or squirrel.

(7.) *Sorex fodiens.*—The peculiar form of stomach noticed above in the case of the *S. tetragonurus* and the *S. Hibernicus*, is probably to be found in all those shrews having the same type of dentition as those species, and belonging to Duvernoy's subgenus *Amphisorex*†. In the *S. fodiens*, which has a distinct dental formula, and constitutes the subgenus *Hydrosorex* of Duvernoy (*Crossopus* of Wagler), the stomach is of a somewhat globular form, and without any elongation of the pyloric portion whatever.

In a female specimen of this species, 2 inches 11 lines in length, exclusive of the tail, the following internal measurements were observed:—

	inches.	lines.
Diameter of the distended stomach	0	11
Distance from the cardiac orifice to pylorus	0	3½
Length of the intestinal canal	15	0

In another female, exactly of the same length, the intestinal canal was found to be only 12 inches 9 lines, showing that this part is subject to considerable variation in respect to extent. Neither in this, nor in any other species of this genus, is there any cæcum, or much distinction between the small and great intestines, the diameter of the canal being nearly everywhere the same.

The number of ribs in the *S. fodiens* is 13, 1 less than in the *S. tetragonurus*; whereof 7 are true and 6 false.

* Charlesworth's Mag. of Nat. Hist., vol. iii. p. 585.

† Supplement to his first memoir, 1838.

There are 6 lumbar vertebræ and 17 caudal, there being 1 more of these last than in any specimen of the *S. tetragonurus* yet examined; and the entire number of vertebræ will stand at 45 or 48, according as the sacral are reckoned at 2 or 5 as before. This estimate was obtained from an examination of three specimens.

(8.) *Sorex ciliatus.*—I have seen so many intermediate specimens, in point of colour, between this and the last species, that I consider it extremely doubtful whether they be distinct. Nevertheless, it deserves to be mentioned, that in one very dark-coloured individual of the *S. fodiens*, and which was sent to me as the *S. ciliatus*, though it was not quite so uniformly black as my original specimen of this latter, or so bulky for its length, I found 18 caudal vertebræ, being 1 more than in any of the three individuals of the *S. fodiens* above-mentioned. This must not be considered as conclusive in favour of the *S. ciliatus* being a species, as we have already seen the number of caudal vertebræ varying by 1, in the case of the *S. tetragonurus*; yet it should serve to stimulate to further inquiry. I regret that I have not myself had an opportunity of examining into the value of this character in more specimens.

I once thought that there were other anatomical peculiarities by which this species might be distinguished from the *S. fodiens*, to which M. de Selys-Longchamps has made some allusion*; but having since had reason to suspect that they are not to be relied upon, I forbear dwelling on them.

(9.) *Mus sylvaticus*?—I have two or three times had submitted to my examination specimens of a mouse found on the tops of the Irish mountains, either belonging to this species or very closely allied to it; but those which I have seen have been in too bad condition (merely dried skins) to enable me to decide this point. One of these was taken in the county of Kerry, at an elevation of 2500 feet above the sea-level. The only respects in which they appear to differ from the *M. sylvaticus* are, in being of a darker colour, smaller, and with some of the relative proportions rather less; but it must be left for those who have an opportunity of examining a large number in the recent state, to say whether there are any real grounds for believing them to be distinct. On the whole, I am inclined to think that they are only a small variety of that species, somewhat modified in its characters from the peculiar locality which they inhabit.

(10.) *Arvicola amphibius.*—Not long since I obtained a small Water Vole, which I consider exactly intermediate

* Micromammalogie, p. 29.

between the *A. amphibius* and the *A. ater* of MacGillivray. The following is a correct description of the colours:

Extreme tip of the snout dusky; cheeks and upper part of the head very deep brown, with a slight reddish tinge, the tips of the hairs being of this colour; back, from between the ears to the root of the tail, wholly black, the short pile as well as the long hairs being of one uniform tint throughout; sides very deep brown, slightly tinged with reddish; belly deep ash-grey, with a tinge of reddish like the sides; chin ash-grey, without the reddish tinge, which is deepest just beyond the contour of the chin, and between the fore-legs; all the feet covered with very short black hairs above, smooth and naked and paler underneath; tail black, and of one colour throughout.

The length of this individual was 5 inches 3 lines, exclusive of the tail, which was 3 inches 3 lines. I have observed, like Mr. MacGillivray*, that the black variety of this species is generally much smaller than the brown. Yet I have known a few instances to the contrary; and one individual, which was the most uniformly deep-coloured one I ever saw, was also the largest. I regret, however, that the note which I made of its exact dimensions has been lost.

(11.) *Arvicola arvalis.*—This species, like the last, appears subject to some variation of character, particularly as regards colour; so much so, as at one time to have led myself, as well as others, to suspect there might be two species confounded under one name.

Two individuals which I have had by me in spirits several years, have the feet and tail yellowish, as described by De Selys-Longchamps†, the latter being entirely of one colour; the fur above reddish brown, with the ears appearing out of it; the hair on the under parts of the body rather short and thin, and greyish white, the basal portion of each hair being ash-colour. The larger of these individuals was a female taken in the breeding season, measuring 4 inches 1 line in length, exclusive of the tail, which was 1 inch $3\frac{1}{2}$ lines. The upper parts in this specimen were quite as red as in the *A. rubidus* of De Selys.

I have since, at different times, obtained many other individuals, in which the snout, feet and tail were deep ash-grey, approaching to dusky instead of yellowish; the tail also exhibiting an appearance of two colours, as in the *A. rubidus* and *A. subterraneus* of the above author. Some of these had the fur as described above; but in others it was

* Naturalist's Library, vol. vii. (Brit. Quad.) p. 264.

† Micromammalogie, p. 106.

rather longer, reducing the ears to nearly its own length; and the hair on the under parts was not only longer and thicker, but darker at the roots, a considerable portion from the base upwards being dusky.

Similar to these last described are several individuals in the Museum of the Zoological Society, which, being shown to M. de Selys-Longchamps during his visit to London in 1839, he was at first inclined to think different from the *A. arvalis* of his work. However, in a subsequent communication by letter to this country, he writes word that he has, since the publication of his 'Etudes de Micromammalogie,' obtained information with respect to the *Mus agrestis* of Linnæus, found in Sweden; and he says that it appears to be the same as his *Arvalis*, only the colour of the Swedish individuals is rather darker, and the upper part of the tail darker than the under. He then adds, that he had observed a similar local variety in the collection of the Zoological Society, and that he does not think that it is specifically distinct from the common *Arvalis*.

That this opinion is correct I have but little doubt; and I conceive that the variation in the length and colour of the fur is probably dependent upon season, though the difference of colour in the feet and tail in some specimens can be traced to no particular cause.

(12.) *Arvicola neglecta*, Thompson.—For some time I was inclined to consider also as a mere variety of the *A. arvalis* some specimens from Scotland, the first of which I received from Mr. Thompson so long back as the spring of 1839. To the kindness and liberality, however, of this gentleman I have lately been indebted for permission to examine a much larger number of the same kind of *Arvicola* collected last autumn at my request, and after a close comparison of both sexes of different sizes with English individuals, I am inclined to think that they deserve to rank as a distinct species. I should say that Mr. Thompson had been previously led to form this opinion, and that it was also the opinion of M. Agassiz, to whom he showed specimens, on the occasion of that naturalist's visit to Scotland last summer. I have accordingly adopted Mr. Thompson's own name *neglecta* for this species, of which he is the discoverer, and which he has merely put into my hands to describe.

Mr. Thompson informs me that this new *Arvicola* is common on moors in two localities in the district around Megarnie Castle in Perthshire, where he first observed it himself, whilst shooting, in 1829. He has also received it from some sporting friends at Aberarder in Inverness-shire. At this last

place it was taken in traps set for vermin on broken rocky ground at the base of the glens: it was also caught by the dogs, and knocked on the head by the shooters, in the heathy tracts up to the summits of the mountains; and he adds, which is worthy of remark, that, from want of speed, it was much more easily killed than the common mouse or rat.

The most striking peculiarity in this new species is its large size compared with that of the *A. arvalis*. Both males and females occur measuring five inches in the body without the tail; and it is said that they are sometimes met with five and a half inches long, or even exceeding this. The following are the relative proportions of a male specimen of medium size, according to Mr. Thompson:—

	in.	lin.
Head and body	5	0
Tail to end of bone	1	3
Tail to end of hair	1	6
Head	1	7½
Ears	0	5
Whiskers	1	0
Fore-foot	0	5½
Hind-foot	0	10

A female of the same size preserved the same relative measurements, excepting that the hind foot was shorter by half a line. I observe, amongst the specimens he has sent myself, that the males have generally the feet and tail somewhat larger and stouter than the females. The same thing, however, occurs to a less degree in the *A. arvalis*.

As regards external form, including the characters of the snout, eyes, ears, feet, toes, and tubercles on the soles, it is similar to the common species. In each also there is the same number of mammæ, four pectoral and four inguinal*.

The general colour of the upper parts is also the same; but the fur is everywhere considerably longer, so as to cause the ears to be entirely concealed; and its greater length, as well as the greater quantity of it, is especially obvious on the under parts, where it is also darker at the roots, and of a rather purer white at the tips of the hairs. Some specimens are more rufous above than others; but the brightness of the tint appears to have no constant connexion with the sex or size of the individual. The colour of the feet and tail, in all cases, is dusky; the latter somewhat darker above than below, as in the

* This is of importance to be noted, since in the *A. subterraneus* of De Selys, a closely allied species found in Belgium and France, and possibly to be met with in this country, the number of mammæ is only *six*, all of which are inguinal.

dark-coloured variety of the *A. arvalis* noticed under the head of that species.

With a view to inquire still further into the characters of the *A. neglecta*, by permission of Mr. Thompson I dissected several specimens, and compared their internal structure with that of the *A. arvalis*; but, excepting in the cranium to be hereafter noticed, no very obvious differences presented themselves. There are a few points, however, in relation to this subject, which may be worth stating.

The length of the intestinal canal, as well as the relative length of its different portions, both in the *A. neglecta* and the *A. arvalis*, varies much in different individuals, and even in individuals of the same size and sex. Mr. Yarrell* and Mr. MacGillivray† have both given measurements of these parts in the *A. arvalis*, which are very different from each other, but which, as the latter gentleman has not mentioned the size of the individual from which they were taken, do not admit of direct comparison. I shall annex the results which I obtained in three different instances of the *A. neglecta*, and one of the *A. arvalis*.

	No. 1.		No. 2.		No. 3.		No. 4.	
	in.	lin.	in.	lin.	in.	lin.	in.	lin.
Small intestines ...	13	3	14	9	9	9	10	3
Cæcum	6	0	7	9	4	0	3	9
Large intestines ...	12	6	15	0	9	0	7	0

No. 1. was a male *neglecta*, measuring four inches in length, exclusively of the tail. No 2. was a female of the same species, and exactly of the same size. No. 3. was a young male of the same species, measuring three inches. No. 4. was a male *arvalis*, exactly of the same size as No. 3. It will be observed, that Nos. 3. and 4, which are different species, do not differ more in this respect than Nos. 1. and 2, which are sexes of the same.

Another part which I found varying in different individuals was the gall-bladder. It is observed in anatomical works that this organ is found wanting in many of the *Rodentia*, particularly among the Rats ‡. Mr. Yarrell observes, that both the field and bank Campagnol are equally devoid of it. If it be really the fact, that it is never present in the former of these two species, this circumstance will tend to the confirmation of the *A. neglecta* being distinct, in which I have observed it in the only three cases I have examined, though of such different degree of development as to lead to the suspicion that

* Lond. Mag. Nat. Hist., vol. v. p. 600. † Brit. Quad., p. 267.
‡ Blum. Man. Comp. Anat., by Lawr. (2nd edit.), p. 128.

it may sometimes be wanting here also. In one individual it was of considerable size, attaining to the margin of the liver; in a second it was less; in a third it was very small, but still obvious. I have not observed it, any more than Mr. Yarrell, in the true *A. arvalis.*

The *A. neglecta* and the *A. arvalis* agree in the number of vertebræ. M. de Selys-Longchamps has given the entire number in the latter as forty-six, which accords with the number given by Mr. Yarrell, as well as with that observed by myself in several individuals of each of the above species, unless a very minute rudimentary one at the extremity of the tail be included, in which case the entire number must be set at forty-seven. In one instance, however, of the *A. neglecta,* a female, I found an additional caudal vertebra, making the entire number forty-seven without the rudimentary one. This affords another proof of the caution that is required in drawing any conclusion as to the number of vertebræ from the examination of single specimens.

The number of ribs was in all cases the same for both species, seven true and six false; being also the number given to the *A. arvalis* by De Selys.

The only part of importance remaining to be mentioned is the cranium. I have examined that of three individuals of the *A. neglecta,* and, though in general form the same, I find it decidedly larger, broader across the zygomatic arches, and with the bones of the zygoma itself stronger, than that of the *arvalis,* comparing two individuals of the same size in other respects. In the adult animal, the strength and bend of the zygomatic bones become very considerable, indicating great muscular powers in biting and masticating its food. The following are the relative measurements of the crania of a large and small *A. neglecta,* and also of that of the *A. arvalis* for comparison.

	No. 1.		No. 2.	No. 3.
	in.	lin.	lin.	lin.
Entire length	1	0	11	10½
Breadth across zyg. arches	0	7 barely.	6 exceeding.	5¾
Breadth behind the zyg. arches	0	5¼	4¾	4¾

No. 1. is that of an individual of the *A. neglecta,* measuring four inches in length, tail excluded. No. 2. is that of another individual of the same species, measuring three inches. No. 3. is that of an individual of the *A. arvalis,* exactly of the same size as the last.

Having entered above, in some detail, into the characters of the *A. neglecta,* and the grounds on which I venture to confirm Mr. Thompson's opinion, as to its being distinct from

the *A. arvalis*, it may be useful just to place side by side the essential differences between these two species, which after all are not very great, and on the true value of which I do not pretend to speak positively.

A. arvalis.—*Body* 4 *inches: ears projecting out of the fur: colour of the fur above reddish brown; beneath greyish white, the hair sometimes dusky at the roots.*

A. neglecta.—*Body* 5 *or* 5½ *inches: fur long, entirely concealing the ears: colour of the fur above reddish brown, beneath whitish, with a large portion of the hair from the root upwards dusky.*

To these differences may be added the absence of a gall-bladder in the *A. arvalis*, and its presence in the *A. neglecta*, if further observation prove the constancy of this character; also the differences in the cranium above pointed out.

(13.) *Arvicola rubidus*, De Selys? (*A. riparia*, Yarr.)—I cannot but feel some doubts as to the identity of the *A. riparia* of Mr. Yarrell and the *A. rubidus* of De Selys, notwithstanding the opinion of this last author, from the striking difference observable in the cranium of our English specimens, as compared with the figure and description of this part in the *A. rubidus*, given in the 'Micromammalogie.' M. de Selys says of this last, "*crâne plus allongé que chez les autres;*" and again, "*orbites moyens, allongés, étroits en arrière, les arcades zygomatiques étant peu arquées.*" His figure is according to this description, and represents the length of the cranium as rather more than twice its breadth across the zygomatic arches. But neither will agree with a cranium in my possession, which is not more elongated than that of the *A. neglecta*, spoken of above, and in which the orbits are as broad, and the zygomatic arches as much bent, as in that species, the breadth across being considerably more than half the entire length. This cranium belongs to an *Arvicola*, which was obtained by Mr. Thompson from Aberarder, where it was taken in company with the *A. neglecta*, and along with which it was kindly forwarded to me in 1839. Neither he nor myself had any doubts of its being the *A. riparia* of Yarrell, though in size it rather exceeded any specimens I had seen previously. The following were its measurements:—

	in.	lin.
Head and body	3	9
Head	1	0½
Tail	2	0
Ears	0	4¼
Hind-foot	0	8
Fore-foot	0	4½

It will be seen that the tail was more than half the length of the body: it was also of two colours, as in the *A. riparia*, dusky above, whitish beneath. The ears were apparent out of the fur; and the general colours were those of the species just mentioned.

I will now annex the exact relative measurements of the cranium:—

	lines.
Entire length	11
Breadth across zygomatic arches	6½
——— behind the zygomatic arches	5½
Length of the nasal bones	3 rather exceeding.
Breadth of the nasal bones	1½
——— of space between orbits	1¾
Length of the orbit	4 nearly.
Breadth of the orbit	2¼

Though much bent, the bones of the zygomatic arches are very slight compared with those of the *A. neglecta*, or even the *A. arvalis*. The incisors also are shorter and slenderer. All the molars above and below are deeply stained with a purplish ebony colour, pervading nearly the whole exposed portions of the teeth, except their grinding surfaces. There is only a faint stain of this colour on the molars of the *A. neglecta* and the *A. arvalis*.

Though this cranium appears so dissimilar to that of the *A. rubidus* of De Selys, as represented in his work, it closely resembles his figure of that of the *A. duodecimcostatus*; a species, however, to which it cannot be referred, inasmuch as the specimen described above had the same number of ribs as the *A. arvalis*.

The number of vertebræ I am not able to state, as previous to my having an opportunity of examining its internal structure, the specimen had been deprived of a portion of its tail*.

I may, however, add the measurements of the intestinal canal:—

	in.	lin.
Small intestines	14	9
Cæcum	4	9
Large intestines	8	6

These measurements will be found very different from those given by Mr. Yarrell; but as we have already seen how liable to variation these parts are in relative length, and as Mr. Yar-

* I may just state in explanation, that after examining its external characters in 1839, the specimen was returned to Mr. Thompson, who had it skinned, I imagine, for mounting. The body was afterwards forwarded to me in spirits for dissection, in a mutilated state.

rell's specimen was much smaller than mine, too much stress must not be laid on this circumstance. It deserves to be noticed, however, that this specimen had a gall-bladder like the *A. neglecta*, small yet quite distinct, which Mr. Yarrell's had not. Hence this organ is certainly sometimes present, and at other times absent, in the same species, unless we imagine, which I conceive very improbable, that the one here described was different from his.

The stomach was of the same form as in the *A. arvalis* and *A. neglecta.* The liver consisted of seven distinct lobes, five large and two smaller ones.

I have already stated that this specimen was taken at Aberarder, in Inverness-shire; and Mr. Thompson informs me, that, supposing it to be the *A. riparia* of Mr. Yarrell, he believes it to be the most northern British habitat for this species.

Swaffham Bulbeck, April 26, 1841.

XXXIII.—*Supplement to a Catalogue of Irish Zoophytes.* By Arthur Hill Hassall, Esq. Read before the Natural History Society of Dublin, November 6th, 1840.

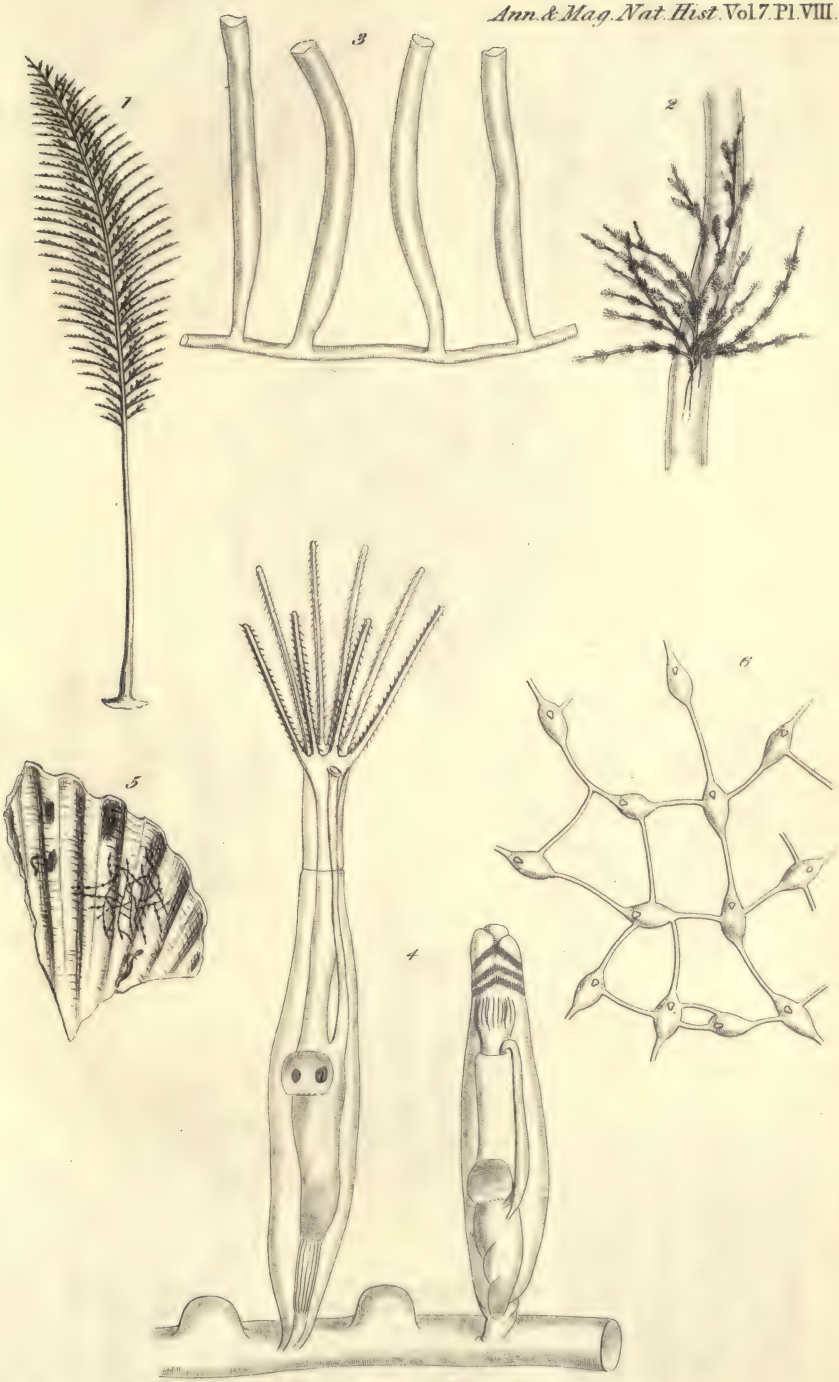
[With Five Engravings.]

Mr. Chairman and Gentleman,

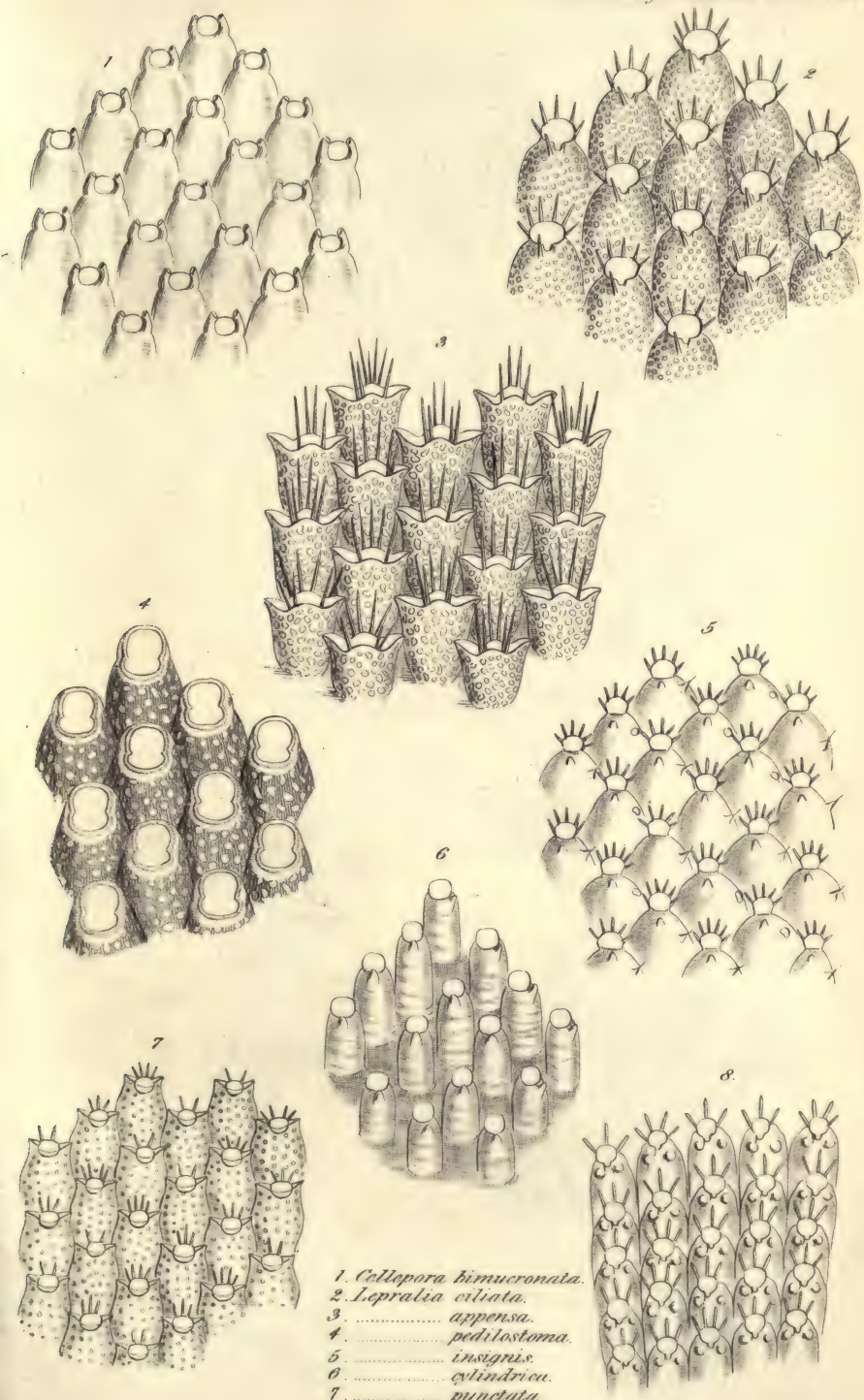
As to many of my hearers the subject of the present communication, entitled a 'Supplement to a Catalogue of Irish Zoophytes,' published in the November Number of the 'Annals and Magazine of Natural History,' may be altogether new, I propose, before entering upon the consideration of it, to make some observations on Zoophytes generally. This course will, I hope, serve both to interest my audience, as well as to relieve, in some measure, the tediousness of a mere enumeration or technical description of species, which, however valuable to science itself, possesses but little to attract or engage the attention. The most careless wanderer on the sea-shore must often have noticed the beauty and delicacy of the conformation of these interesting productions, rivalling in their purity and freshness the element which they inhabit and adorn, and have been struck with wonder and admiration at the evidence of designing care which they so remarkably exhibit even in their general appearance. Nor is the beauty and elegance so observable in their outward form diminished by a closer inspection. If the power of a microscope be applied to them, and their more intimate structure be disclosed, new beauties

1. Coryne squamata. 3.4. Sertularia Margarita.
2. Hermia glandulosa. 5. ..... pumila.

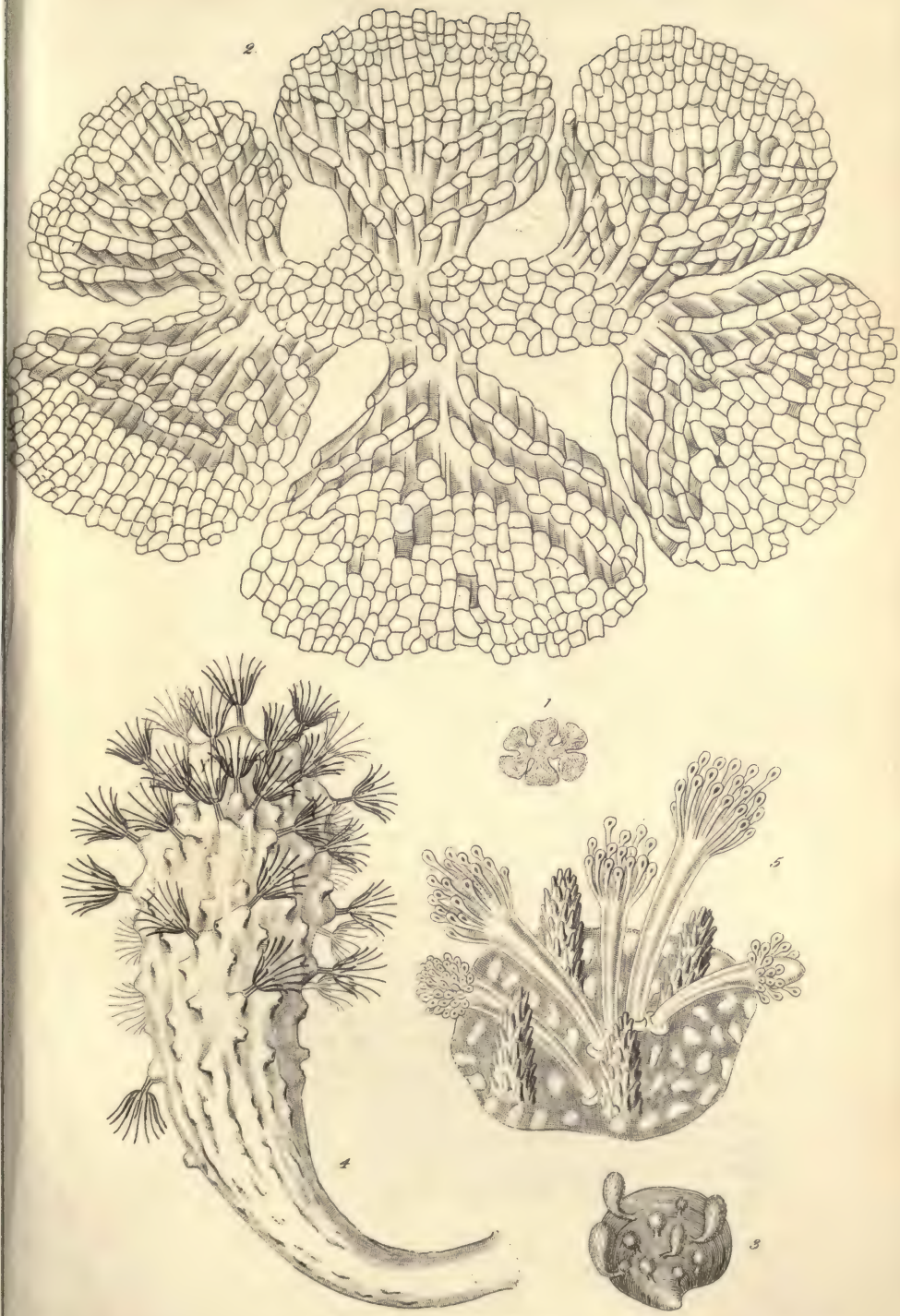
Thuiaria articulata.



1. *Plumularia fruticosa.*
2. *Valkeria imbricata.*
3. *Langenella repens?*
4. *Valkeria*, new species.
5. *Hippothoa lanceolata.*
6. ..... *d°* ..... *mag.d*



1. Cellepora bimucronata.
2. Lepralia ciliata.
3. ..... appensa.
4. ..... pedilostoma.
5. ..... insignis.
6. ..... cylindrica.
7. ..... punctata.
8. ..... linearis.



1. 2. Tubulipora lobatula
3. 4. Alcyonidium hirsutum
5. Echinochorium claviger um

J. D. C. Sowerby sculp.

and wonders are made manifest to the admiring gaze. In this particular all natural productions differ from those of man and art, in whose works a minute examination renders apparent defects, rudeness and deformity.

But little more than a century has elapsed since the true nature of the productions about to occupy our attention was first discovered: prior to that period various opinions were entertained respecting them. By one class of persons, and these were by far the most numerous, they were regarded as the undoubted subjects of the vegetable kingdom, and were so arranged and classified in the various systems of the most learned botanists of that day. Nor is this to be wondered at, when we consider the striking resemblances which these objects bear to vegetables, both in form and habits; some of them being eminently arborescent in their mode of growth, and being fixed by roots, either imbedded in the sand, or attached to rocks, stones and other substances, in the same manner as sea-weed, and consequently being incapable of locomotion, a character at that time considered essential to constitute an animal, being possessed in common by all the animals then known.

By a second set of persons, at the head of whom stands the name of the illustrious Linnæus, all the horny and flexible Zoophyta were considered to hold a station intermediate between the animal and vegetable kingdoms, partaking of the nature of both. The Lithophyta were, however, arranged by him in the animal kingdom, on the supposition that lime was always an animal product. "The animalcules of the Lithophyta, like the testaceous tribes," he said, "fabricated their own calcareous polypidom, forming the whole mass into tubes, each ending on the surface in pores or cells, where alone the animal seems to dwell; but the polypes of the proper Zoophyta, so far from constructing their plant like polypidoms, were, on the contrary, the productions or efflorescences of it; just as the flowers do not make the herb or tree, but are the results of the vegetative life proceeding to perfection. Polypes, according to this fancy, bore the same relation to their polypidom that flowers do to the trunks and branches of a tree; both grew by vegetation: but while the one evolved from the extremities blossoms, which shrunk not under external irritation, and were therefore properly flowers, the other put forth flowers, which, because they exhibited every sign of animality, were therefore, with reason, considered animals." In a letter to Ellis he remarks, alluding to the Zoophytes, "they are, therefore, vegetables, with flowers like small animals." In his 'Diary' he further observes, that they are "vegetables with re-

spect to their stems, and animals with respect to their florescence."

By a third party Zoophytes were deemed to be of a mineral origin. This theory was particularly advocated by Henry Baker: "The rocks in the sea on which these corals are produced," he says, "are undoubtedly replete with mineral salts, some whereof, near their surface, being dissolved by the sea-water, must consequently saturate with their saline particles the water round them to a small distance, where, blending with the stony matter with which the sea-water always abounds, little masses will be constituted here and there and affixed to the rocks. Such adhering masses may be termed roots, which roots, attracting the saline and stony particles, according to certain laws in nature, may produce branched or other figures, and increase gradually by an apposition of particles becoming thicker near the bottom, where the saline matter is more abounding, but tapering or diminishing towards the extremities, where the mineral salts must be fewer in proportion to their distance from the rock whence they originally proceed; and the different proportions of mineral saline particles of the stony or other matter wherewith they are blended, and of marine salt, which must have a considerable share in such formations, may occasion all the variety we see. Nor does it seem more difficult to imagine that the radiated, starry, or cellular figures along the sides of these corals, or at the extremities of their branches, may derive their production from salts incorporated with the stony matter, than that the curious delineations and appearances of minute shrubs and mosses on slates, stones, etc., are owing to the shootings of salts intermixed with mineral particles; and yet *these* are generally allowed to be the work of mineral steams or exhalations." It is scarcely necessary to observe, that the whole of the theories of which I have given but a very short outline, highly ingenious and interesting as they are, are yet untenable: the beautiful and poetic hypothesis of Linnæus is, however, the nearest approximation to the truth. We learn from Dr. Johnston's excellent 'Introduction to his British Zoophytes', from which I have had occasion to quote largely, when speaking of the opinions of Linnæus, and to which I must again refer when mentioning those of Ellis, that Ferrante Imperato, an apothecary in Naples, was the first naturalist, according to M. de Blainville, distinctly to publish as the result of his proper observations the animality of corals and madrepores; and he is said to have accompanied the description of the species which fell under his notice with illustrative figures of considerable accuracy. His 'Historia Naturale' was printed at

Naples in 1599; but although again reprinted in 1672, the book and the knowledge it contained had sunk into such oblivion, that when Peysonnel, in the year 1727, communicated the same discovery to the Academy of Sciences in Paris, it was received by the members of that learned body in a manner which is sufficient to convince us that it was entirely new to them, and exposed the author to the obloquy and censure which are the usual portions of an original discoverer.

To John Ellis, however, a merchant in London, is to be accorded the honour of having placed the fact of the animality of Zoophytes beyond all doubt or controversy. The inquiries entered into by this individual were prosecuted with an ardour and a diligence worthy of the subject, and affording a bright and refreshing example for others to imitate; and it is pleasing to notice, that the zeal he displayed and the labour he bestowed were amply recompensed by the importance of the results to which his investigations led. "There was nothing unformed or mystical in Ellis's opinion. Certain marine productions, which, under the names of Lithophyta and Ceratophyta, had been arranged among vegetables, and were still very generally believed to be so, he maintained and proved, with a most satisfactory fulness of evidence, to be entirely of an animal nature, the tenements and products of animals similar in many respects to the naked freshwater polype. By examining them in a living state, through an ordinary microscope, he saw these polypes in the denticles or cells of the zoophyte; he witnessed them display their tentacula for the capture of their prey; their varied actions and sensibility to external impressions and their mode of propagation; he saw further that these little creatures were organically connected with the cells, and could not remove from them, and that although each cell was appropriated to a single individual, yet was this united by a tender thready line to the fleshy part that occupies the middle of the whole coralline, and in this manner connected with all the individuals of that coralline. The conclusion was irresistible: the presumed plant was the skin or covering of a sort of miniature hydra,—a conclusion which Ellis strengthened by an examination of their covering separately, which he said was as much an animal structure as the nails or horns of beasts, or the shell of the tortoise: for it differs from sea-plants in texture as well as hardness, and likewise in their chemical production; for sea-plants, properly so called, such as the Algæ, Fuci, etc., afford in distillation little or no traces of a volatile salt; whereas the corallines afford a considerable quantity, and in burning yield a smell somewhat resembling that of burnt horn and other animal substances, which of itself is a

proof that this class of bodies, though it has the vegetable form, yet is not entirely of a vegetable nature."

Among the many recent cultivators of this interesting department of natural history, the name of Dr. Johnston of Berwick stands pre-eminent, whose excellent work on the British Zoophytes has done much to exalt the subject, and to diffuse a more general taste for its cultivation. I trust that ere long we shall be favoured with a second volume on the Zoophytes of Great Britain by that gentleman.

The term *Zoophyte* is applied to all those productions which, bearing a strong resemblance to vegetables in form and some other particulars, are yet of an animal nature. The more arborescent of them are often called corallines, a name which is peculiarly appropriate, being a derivative of the word coral, to which they are intimately allied, and by means of which such gigantic changes are daily being effected. Islands, and I might almost say, without incurring the charge of exaggeration, continents are being raised from the deep abysses of the ocean, to be, perchance, at some future period clothed with vegetation, and peopled like unto our own fair land—to be the arena on which many eventful scenes in the world's history are to be performed; and these mighty results are to be brought about by the agency of insects scarcely perceptible to our unaided sight, but whose operations, though slow, silent and invisible, are yet certain and unceasing:—

> "Unconscious, not unworthy, instruments,
> By which a hand invisible was rearing
> A new creation in the secret deep.
> Omnipotence wrought in them, with them, by them;
> Hence, what Omnipotence alone could do
> Worms did. I saw the living pile ascend,
> The mausoleum of its architects,
> Still dying upwards as their labours closed:
> Slime the material, but the slime was turn'd
> To adamant by their petrific touch;
> Frail were their frames, ephemeral their lives—
> Their masonry imperishable."

In nothing is God's infinity and man's littleness more strikingly exhibited and contrasted than in the operations of nature upon a grand scale, and this is particularly evident in the instance of the formation of coral islands to which I have referred. The extreme simplicity of the means employed for the attainment of such vast ends cannot but be a subject of astonishment and admiration to every reflecting mind, and this simplicity is apparent in all the ways and workings of nature. How different is it with man's designs; how compli-

cated are the means which he employs for the attainment of his projects; and often how inefficient are they for the fulfilment of the end proposed, and how easily are they overturned and annihilated by the intervention of some natural cause—his greatest labours and most cherished hopes frequently being dashed to the ground or buried in the deep by some earthquake or storm!

"Zoophytes," to adopt the language of Dr. Johnston, "present to the physiologist the simplest independent structures compatible with the existence of animal life, enabling him to examine some of its phænomena in isolation, and free from the obscurity which greater complexity of anatomy entails. The means of their propagation and increase are the first of a series of facts on which a theory of generation must arise; the existence of vibratile cilia on the surface of the membrane, which has since been shown to be so general and influential among animals, was first discovered in their study, and in them is first detected the traces of a circulation carried on independently of a heart and vessels. The close adhesion of life to a low organization; its marvellous capacity of redintegration; the organic junction of hundreds and thousands of individuals in one body, the possibility of which fiction had scarcely ventured to paint in its vagaries, have all in this class their most remarkable illustration."

I have ascertained that all the more transparent Zoophytes possess highly luminous properties. This fact I first discovered in a specimen of *Laomedia gelatinosa*, and subsequently in a great variety of other species. If a portion of it, adhering to the sea-weed to which it is attached, be taken from the water and agitated, a great number of bright phosphorescent sparks will be emitted; these sparks proceed from each of the denticles of the coralline containing polypi, and the phænomenon is equally apparent, whether the specimen be in or out of water. The imagination could scarcely conceive a more beautiful spectacle than would be furnished by the shining of countless myriads of these tiny lamps, lighting up the dark recesses and caves of the ocean. I lately had an opportunity of beholding this novel and interesting sight of the phosphorescence of Zoophytes to great advantage, when on board one of the Devonshire trawling-boats which frequent this coast. The trawl was raised at midnight, and great quantities of corallines were entangled in the meshes of the network, all shining like myriads of the brightest diamonds. I would advise any person wishing to witness this beautiful spectacle on a large scale, to sally forth some dark night to the sea-shore, and disturb, either with a stick or the foot, the sea-wrack left by the

receding tide, among which numerous corallines will be imbedded, particularly if a high wind have prevailed during the day. Although I have not as yet had an opportunity of carrying into effect what I here recommend, I am convinced that any individual who would be at the trouble and possessed sufficient resolution to leave a warm fire at this uninviting season, and encounter the rough, but refreshing sea-breeze, would meet with an ample reward for the labour bestowed and self-denial exercised. The fact of the phosphorescence of one species of *Sertularia*, *S. pumila*, was, I have lately learned, discovered by Stewart some time since; but the announcement of it did not, it appears, lead to further inquiries into this interesting subject.

An important distinctive character between Ascidian Zoophytes and those of other classes, may be derived from the arrangement of the tentacula. In the Ascidian type of Zoophytes the tentacula are arranged in a determinate order, being disposed either in a crescent, as in some freshwater species, or in the form of a bell, as in the marine orders of this class; whereas in the Hydroid, Helianthoid and Asteroid classes they do not describe any regular figure, but are irregularly disposed around the mouths of the polypi. An Ascidian zoophyte, therefore, may at once be distinguished from all others by observing the arrangement of the tentacula, and without reference to internal organization. It is difficult to conceive anything more strikingly beautiful, on a small scale, than one of these Ascidian Zoophytes viewed under the field of a microscope: the regular and elegant cup-like form described by the tentacula; the ceaseless and rapid action of the cilia; the uniform direction of the current which flows over these, carrying with it numberless revolving particles, some whereof are destined for the little creatures' sustenance; and all these, if seen through a strong light, clothed in the brightest prismatic colours, cannot fail to elicit the admiration of the beholder. Should the slightest motion occur to disturb it, the polype instantly withdraws itself within the shelter of its little habitation, at once its home and its grave, and is concealed from sight; its beauties are however again displayed as soon as the agitation of the surrounding water ceases. It is difficult, I say, to conceive a more beautiful or interesting spectacle than is furnished by a *single* polype when thus viewed; but what must be the appearance formed by the countless thousands of these animals which daily thus display themselves, peopling cave, rock and pool! and yet nearly six thousand years have elapsed since their first creation before the eye of man rested on them.

Not amongst the least pleasurable of the emotions which we experience in the study and contemplation of these beautiful productions, is that feeling of health and vigour which attends us in our excursions in search of them. At one time wandering upon the smooth and golden strand, exploring among the tangled sea-wrack left by the receding tide for these minute treasures of creation; now diving into some deep and dark caverns, in which the waves roar and dash against the rocks with terrific violence, but still producing an effect upon the mind pleasing and enchaining; at another stretching oneself at full length beside some clear and liquid pool, in which the most beautiful and diversified landscapes may be described—rocks, trees, shrubs and flowers in miniature, all are palpable to the least imaginative mind, the colours of the sea-weed rivalling the brightest and most varied tints of an autumnal forest.

How superior, in the purity and satisfaction resulting from their pursuit, are the pleasures which we derive from the contemplation of the works of God, as manifested in the creation, to those sought after, by so many, and with such eagerness, in crowded and bustling cities!

> "I care not, Fortune, what you me deny;
> You cannot rob me of free nature's grace;
> You cannot shut the windows of the sky
> Through which Aurora shows her bright'ning face;
> You cannot bar my constant feet to trace
> The lonely shore at dewy morn and eve.
> Let health my nerves and finer fibres brace,
> And I their toys to the *great* children leave:
> Of nature, feeling, virtue, nought can me bereave."

Among the uses of these minims of creation, one of the highest appears to me to be, that of exciting in the mind of man a spirit of inquiry, calculated to detach his thoughts from the sordid selfishness of worldly occupation, and to raise them with feelings of admiration and love to that Omnipotent Being, who at the first formation of things pronounced all his works "very good."

Entreating the attention of the Society for a short time longer, I shall at once proceed to the consideration of the matter of the 'Supplement' itself.

The species are enumerated in the order in which they occur in Dr. Johnston's 'Zoophytes.'

Coryne squamata. Found growing upon *Fucus siliquosus,* opposite Sea-point, south side of Dublin Bay, above low-water mark.

Hermia glandulosa. This species sometimes attains a height of three inches. The glandular heads of the tentacula appear to be

furnished with minute cups, similar to those of the Cuttle-fish, by means of which the polypi are enabled to hold their prey; and not, as stated by Mr. Lister, covered with "short projections, like blunt hairs." The reproductive gemmules are supported on a short footstalk, and are fewer in number and several times larger than those of the preceding species.

Dublin Bay, on various Fuci; not common.

Tubularia larynx. Both varieties of this species are trawled up in great abundance off Howth and Lambay. They are also found attached to the under surface of stones, on the east side of Kingstown Harbour.

Thoa muricata.—Giant's Causeway.

Sertularia Margareta. Polypidom branched, branches alternate; rachis straight; cells nearly opposite, ovato-tubular, contracted on the outer side; vesicles 4-sided, armed with 8 long teeth.

This species, in the absence of its remarkable vesicles, requires a very careful examination to distinguish it from *S. abietina.* There are, however, well-marked differences between them. The stem in this species is straight, whereas in *S. abietina* it is flexuose; the cells are more nearly opposite, and are contracted on the outer side; apertures plain. The branches are alternate; there are three cells on the rachis in the interval between each branch. Vesicles 4-sided, very large, increasing in size at the distal end, and armed near the summit with 8 stout spines, two placed at each angle.

To this new and interesting species I have assigned the Christian name of a lady, distinguished not only for an ardent love of the works of nature, but as a zealous collector in various branches of natural history on these shores. See Plate VI. fig. 3, 4.

A *Sertularia* is figured and described in Ellis's and Solander's 'Zoophytes' under the name of *S. pinaster,* which bears a considerable resemblance to the above. I do not, however, believe them to be of the same species, as the vesicles in this are furnished with but four spines.

Dredged up off Howth sparingly; also found near the Giant's Causeway.

S. pumila. The number of tentacula in this species is not very constant, but usually about 16: they are not disposed in any determinate order, as they always are in the Ascidian type of Zoophytes, but are variously arranged.

Sertularia filicula. This species was incorrectly enumerated as among those found in Dublin Bay in my Catalogue. It is not met with upon that coast; I have, however, obtained a few specimens in the neighbourhood of the Giant's Causeway.

Thuiaria articulata. The stem in the specimens found in Dublin Bay is not naked on the lower half, as it is generally described, but is clothed with pinnæ to near its base, giving the polypidom a very beautiful appearance. See Plate VII. fig. 1, 2. The specimen figured in this plate is the finest I ever saw, and I could not resist the temptation of giving a drawing of it.

Not unfrequently obtained by trawling off Howth.

Plumularia pinnata. Is generally found growing on a long filamentous sea-weed, up the stem of which it creeps often for more than a foot in extent, and round which the root-fibres form a complete sheath. The specimens thrown up by the sea are usually denuded of the short branches which proceed from the pinnæ. The vesicles are produced in great abundance, pyriform, blunt and plain above: each vesicle contains 3 or 4 dark-coloured ova. Dr. Johnston, in a letter I lately received from him, remarks, "I long ago discovered the error of giving *toothed* vesicles to *Pl. pinnata*: they are only toothed from laceration, after the ova have escaped. It is curious that the ova should be produced in such numbers from the root-fibres; but such is a common occurrence with this pretty species."

Tolerably abundant in various parts of Dublin Bay.

Pl. setacea. The upper part of the vesicles of this species is prolonged into a short tube, affording an additional distinctive character between it and *Pl. pinnata,* which it so closely resembles.

Trawled up off Howth, very rare.

Pl. Catharina. Frequently trawled up off Howth and Lambay, in deep water, and but rarely cast upon the shore.

Pl. cristata. I have examined a specimen of this species, obtained by my friend G. J. Allman, Esq., near Cork, having plumes nearly three inches in length, and in which the ovarian vesicles are produced only from the main stalks or midribs, giving to the whole polypidom a very beautiful and unique appearance.

Pl. myriophyllum. Not common: obtained only by trawling off Howth and Lambay,

Pl. frutescens. I have met with but one specimen of this species, consisting of a single plume elegantly tapering to a point above. See Plate VIII. fig. 1.

Alcyonidium rubrum, Müller. Dr. Johnston considers this to be but a mere variety of *Alcyonidium digitatum,* or that species in its "primary crustaceous condition." That it is not *Alcyonidium digitatum* in its primary crustaceous condition, I am convinced, from the circumstance of having frequently met with it of a very large size, as large as the ordinary species ever occurred to me, nor do I consider it to be a variety; for although no difference exists in the number of the tentacula or in the form of the spiculæ, it yet, in my opinion, must be regarded as a distinct species, as I have always met with it of the same uniform deep red colour; neither have I been able to detect any gradations of colour between it and the common kind, as might be expected were it but a variety. I have occasionally, too, obtained both growing upon the same shell, each possessing its own peculiar colour; and this is a strong fact in favour of their distinctness, as the great difference in colour could not be accounted for by a reference to any external causes, both specimens being subjected to the same influences.

Actinia mesembryanthemum. Everywhere common off the coast of Dublin.

A. Bellis. "Body elongated; the lower part narrow, smooth, the

upper enlarged and glandularly warty: oral disc expanded, lobed: tentacula in several rows, variegated."—*Gærtner.*

This beautiful species is certainly no variety of *Actinia gemmacea,* as has been supposed by some from the perusal of Gærtner's description of it. It inhabits the fissures of rocks, in which the whole of the body of the polypus is concealed, the expanded cup-like head alone being visible above the margin of the fissure. The body is often lengthened to the extent of two inches; its basis is contracted, but gradually widens upwards towards the calyx; the lower portion of it is nearly colourless, higher up it becomes of a flesh colour, this changing into a greenish brown, of which it continues up as far as the feelers. The upper half of the body is covered with numerous small white glands, which possess great powers of suction. The diameter of the calyx, which is somewhat cupped, in the larger specimens often exceeds two inches; its margin does not describe a perfect circle, but is variously festooned. The colour of the disc is dark brown, ornamented with broad bands of opaque white, and finely streaked and dotted with light yellow. The feelers are very small, placed on the edge of the calyx in several rows, to the depth of $\frac{1}{3}$rd of an inch; those nearest the disc, also, are about $\frac{1}{3}$rd of an inch in length, and are the longest, the outermost tentacula being but little more than papillæ; they are of a lighter brown than the disc, and are variegated with transverse bands and spots of white. The shades of brown in the different parts of each *Actinia* vary considerably with the specimens.

Found in a clear pool, opposite Dalkey Island, but little below high-water mark, the only locality in which I have ever met with it; and what is not a little peculiar is, that it is confined to that one pool, although there are others in its immediate vicinity apparently equally suitable for it.

A. gemmacea. Everywhere common on the coast of Dublin.

A. dianthus. Frequently trawled up off Howth and Lambay.

A. maculata. The tentacula of this species are *not* contractile: in this particular it resembles the genus *Anthea* of Johnston.

A single specimen, trawled up off Howth.

Anthea cereus. Although this species has not the power of shortening its feelers in the same way as the Actinias, yet, if specimens be kept for some time in sea-water, their length becomes diminished, not by contraction, but by a process of invagination.

The three varieties of this species, described by Gærtner, are found in Sandy-cove, near Dublin; the green one but sparingly. They usually adhere to Fuci, generally to *Fucus serratus,* and but rarely to stones. Below low-water mark.

Valkeria cuscuta. Branches opposite; cells in clusters, oval.

The above is the correct definition of this species, which it was long ere I could identify by Ellis's description of it. He described the cells as being "in pairs, usually opposite," whereas they are really in clusters. Ellis's description is only applicable to the species in an imperfect and injured state. *Valkeria cuscuta* is readily di-

stinguishable from *V. imbricata,* with which it was at first confounded by me, first, by the more delicate texture of the whole polypidom; secondly, by the smaller size and oval shape of the cells. In *Valkeria imbricata* the cells are cylindrical; the clusters of cells in it, too, are more nearly approximated, and the number of cells in each cluster is more numerous than in *V. cuscuta.*

Abundant, Sandy-cove, near Dublin.

[To be continued.]

XXXIV.—*List of Phanerogamous Plants, together with the Cryptogamic Orders* Filices, Equisetaceæ, *and* Lycopodiaceæ, *observed in the Shetland Islands.* By Thomas Edmondston, Jun., Esq.

Monandria Monogynia.

1. *Hippuris vulgaris.* Deep muddy streams. Common.
2. *Salicornia herbacea.* Salt marshes. Frequent.

Monandria Digynia.

3. *Callitriche verna.* Pools and marshes. Common.

Diandria Monogynia.

4. *Veronica officinalis.* Not very common. Chiefly in dry stony places.—Var. *β. rigida.* Common in all waste grounds: stem erect; very rigid leaves, *not* serrated; all the plant glabrous; capsule very distinctly winged.
   ——— *montana.* Rare. Ollaberry; Northmavin.
   ——— *Beccabunga.* Rare. Near Tingwall.
   ——— *Anagallis.* Rare. Brook near Laxfirth Mainland.
5. *Pinguicula vulgaris.* Uncultivated grounds. Everywhere abundant.

Diandria Digynia.

6. *Anthoxanthum odoratum.* Common.

Triandria Monogynia.

7. *Iris Pseudacorus.* Common in all damp places.
8. *Schœnus nigricans.* Damp heaths. Abundant.
   ——— *albus.* Marshy places. Rare. Moola Unst.
9. *Scirpus cæspitosus.* Heaths. Very abundant.
   —— *lacustris.* Rare. Loch of Lund, Unst: probably not indigenous.
   —— *palustris.* Salt marshes chiefly. Common.
10. *Eriophorum vaginatum.* On the more elevated heaths, as Hermaness, Unst. Most common.
    ——— *polystachion.* All marshy places. Common.
11. *Nardus stricta.* Heathy grounds. Common.

Triandria Digynia.

12. *Phalaris arundinacea.* Common.
13. *Phleum pratense.* On the richer grounds abundant.

14. *Alopecurus geniculatus.* Wet places. Common.
15. *Agrostis vulgaris.* Common.
——— *alba.* Wet places. Abundant.
16. *Aira cæspitosa.* Waste places. Not common.
—— *flexuosa.* Heaths. Frequent.
—— *præcox.* Cultivated grounds. Common.
17. *Holcus lanatus.* Waste and cultivated ground. Common.
18. *Melica cærulea.* Heaths, &c. Common.
19. *Poa trivialis.* Pastures, &c. Common.
— *pratensis.* Meadows and pastures. Abundant.
— *annua.* Waste grounds. Common.
20. *Glyceria fluitans.* Streams and ditches. Abundant.
21. *Briza media.* Rare. Unst.
22. *Dactylis glomerata.* Pastures, &c. Common.
23. *Cynosurus cristatus.* Meadows and pastures.
24. *Festuca ovina.* Dry pastures. Common.
——— *vivipara.* Elevated heaths. Common.
——— *duriuscula.* Common.
——— *elatior.* Sides of lakes and streams. Rare.
25. *Bromus mollis.* Fields and waste grounds. Common.
——— *arvensis.* Fields. Rare.
26. *Avena fatua.* Not common. Shetland name Hug-aits.
27. *Arundo Phragmites.* Rare. Loch near Ronas-hill.
——— *Calamagrostis.* Very rare. Loch near Faedaland, Northmavin.
28. *Lolium perenne.* Meadows and pastures.
29. *Elymus arenarius.* Sandy sea-shores. Common.
30. *Triticum repens.* Everywhere common. Shetland name Whigga.

Tetrandria Monogynia.

31. *Scabiosa succisa.* All damp humid soils.
32. *Asperula odorata.* Dry banks. Rare. Bardister, Northmavin.
33. *Galium saxatile.* Heaths. Abundant.
——— *verum.* Dry banks. Frequent.
——— *boreale.* Sides of lakes. Not common.
——— *Aparine.* Sea-shores. Common.
34. *Plantago major* and *lanceolata.* Waste places. Common.
——— *media.* Not common.
——— *maritima* and *Coronopus.* Sea-shore. Common.
35. *Alchemilla vulgaris.* Fallow lands. Rare. Near Ollaberry.
——— *alpina.* Rare. Ronas-hill.

Tetrandria Tetragynia.

36. *Potamogeton natans.* Shallow pools. Common.
——— *heterophyllus.* Deeper ditches. Abundant.
37. *Sagina procumbens.* Waste grounds. Common.

Pentandria Monogynia.

38. *Myosotis arvensis.* Fields, &c. Common.
——— *cæspitosa.* Brooks and pools. Abundant.

39. *Pulmonaria maritima.* Gravelly sea-shores. Not common.
40. *Lycopsis arvensis.* Fields. Common.
41. *Primula vulgaris.* Dry pastures. Common.
42. *Menyanthes trifoliata.* Deep ditches. Common.
43. *Anagallis tenella.* Bogs. Not common.
44. *Azalea procumbens.* Rare. Ronas Hill, Northmavin.
45. *Jasione montana.* Dry banks. Common.
46. *Viola canina.* Common.
——— *tricolor.* Everywhere abundant.
47. *Lonicera Periclymenum.* Cliffs, &c. Not common.
48. *Hedera Helix.* Rare. Pictishburgh. Walls.

PENTANDRIA DIGYNIA.

49. *Gentiana amarella.* On limestone. Not common.
——— *campestris.* Pastures. Common.
50. *Daucus Carota.* Waste ground. Abundant.
51. *Chærophyllum sylvestre.* Waste places. Common.
52. *Angelica sylvestris.* Damp situations. Abundant.
53. *Ligusticum scoticum.* Rocky or sandy sea-shores.
54. *Carum Carui.* Damp meadows. Rare. Near Refirth, Island of Yell: probably not indigenous.
55. *Hydrocotyle vulgaris.* Marshy places. Common.
56. *Heracleum Sphondylium.* Dry pastures. Abundant.
57. *Conium maculatum.* Shady situations. Not common.
58. *Pastinaca sativa.* Waste ground. Not common.

PENTANDRIA TETRAGYNIA.

59. *Parnassia palustris.* Wet meadows. Not common.

PENTANDRIA PENTAGYNIA.

60. *Statice Armeria.* Sea-shores. Abundant.
——— *Limonium.* Rare. Knab, near Lerwick.
61. *Linum catharticum.* Dry heaths. Common.

PENTANDRIA HEXAGYNIA.

62. *Drosera longifolia.* Rare. Lamhoga, Island of Fetlar.
——— *rotundifolia.* Mossy hills. Rare. Yell and Northmavin.

HEXANDRIA MONOGYNIA.

63. *Scilla verna.* Common everywhere.
——— *nutans.* Rare. Probably not indigenous.
64. *Narthecium ossifragum.* Turfy heaths. Abundant.
65. *Juncus effusus.* Turfy bogs. Common. Shetland name, Floss.
——— *trifidus.* Elevated bogs. Not common.
——— *squarrosus.* Boggy heaths. Common.
——— *uliginosus.* Moist places. Common.
——— *triglumis.* Rare. Ronas Hill.
66. *Luciola sylvatica.* Shady glens. Abundant.
——— *campestris.* Barren pastures. Common.

HEXANDRIA TRIGYNIA.

67. *Rumex crispus.* Very common.

Rumex Acetosa and *Acetosella.* Abundant everywhere.
68. *Triglochin palustre.* Muddy situations. Common.

HEPTANDRIA MONOGYNIA.

69. *Trientalis europæa.* Mountain heaths. Rare. Hermaness, Unst.

OCTANDRIA MONOGYNIA.

70. *Epilobium angustifolium.* Cliffs. Not common.
——— *montanum.* Rare. Near Snarravoe, Unst.
——— *palustre.* Wet places. Abundant.
71. *Vaccinium Myrtillus.* Dry heaths. Common.
72. *Erica vulgaris* (*Calluna*). Common.
—— *cinerea.* Common.
—— *Tetralix.* Abundant.

OCTANDRIA TRIGYNIA.

73. *Polygonum Persicaria.* Abundant. Wet places.
——— *Bistorta.* Rare. Broo, Dunrossness.
——— *aviculare.* Cultivated grounds. Common.

DECANDRIA MONOGYNIA.

74. *Arbutus Uva-ursi.* Not common.
——— *alpina.* Rare. Ronas Hill.

DECANDRIA DIGYNIA.

75. *Saxifraga oppositifolia.* Rare. Fitful Head.

DECANDRIA TRIGYNIA.

76. *Silene maritima.* Stony sea-shores. Abundant.
—— *acaulis.* Dry hills and stony places. Frequent.
77. *Stellaria media.* Waste and cultivated ground. Common.
78. *Arenaria peploides.* Sea-shores. Common.
——— *marina.* Sea-coast. Not rare.
——— *norvegica.* This interesting addition to the British Flora is confined, so far as I know, to the serpentine formation around the Bay of Baltasound in this island. Its specific description is as follows:—Root fibrous, long; stems numerous, branched, procumbent, sometimes more or less erect; leaves small, ovate, fleshy, glabrous, somewhat imbricate; flowers terminal, solitary, white, rather large; petals generally six, sometimes five, broadly ovate; calyx-sepals five, fleshy, glabrous as the leaves. Very abundant on the gravelly barren hills to the north of the bay, growing nearly on a level with the sea, along with *Cerastium latifolium* and *Cardamine hastulata,* which, with the exception of *Statice Armeria* and *Plantago maritima,* are almost the only plants to be found in its vicinity.

I first discovered this plant in May 1837: I was then only commencing the study of botany, and though I knew its genus, and so marked it in my herbarium, I could not make out its species.

In the end of July, the same year, Dr. Gilbert Macnab came to Unst, in the course of a botanical tour he was making through

Shetland; I met him at some distance from Baltasound, and accompanied him thither; on the way, as he was questioning me on the botany of the island, I mentioned two plants to him as being (as I thought) rare or peculiar,—the one turned out to be the *Pisum maritimum* of Linnæus (*Lathyrus pisiformis*, Hook. 'Br. Fl.'), the other was this species of *Arenaria*; I named to him the genera to which the two plants belonged, but wished to have his opinion on the species. Next day, in looking over my little collection, we found the specimens of the two plants: Dr. Macnab thought they were new to the British Flora, and he had not seen them before; he was also of the same opinion as myself as to their genera. I guided him to the localities where I first found the two plants, and we procured abundance of specimens. A few days after, when Dr. Macnab left Unst, I gave him a number of specimens for the opinions of Drs. Hooker and Graham. Dr. Graham at first pronounced it to be nondescript, but was soon induced to change his opinion from seeing a plant in Prof. Hooker's herbarium (gathered by Sir George Mackenzie in Iceland) labelled as *Arenaria norvegica*, which he thought agreed with the Unst plant.

I have since botanically examined almost the whole of my native islands, but I have not been able to find a single plant of this species, except in the locality where it was first found by me. I have only further to add, that I have endeavoured to cultivate it by transplanting to a garden; I have not, however, succeeded, although plants of *Cardamine hastulata* and *Cerastium latifolium*, under the same circumstances, grew and took root. I have, however, not had an opportunity of trying to raise it from the seed.

79. *Cherleria sedoides.* Rare. Hill of Klibberswick, Unst.

DECANDRIA PENTAGYNIA.

80. *Sedum Telephium.* Rocks by the sea-side. Rare.
81. *Agrostemma Githago.* Scarcely indigenous.
82. *Lychnis Flos-cuculi.* Meadows and pastures. Common.
——— *sylvatica* (*L. dioica*). Fields, &c. Common.—*β. vespertina.* Rare.
83. *Cerastium vulgatum.* Fields and waste grounds. Common.
——— *viscosum.* Common.
——— *tetrandrum.* Sand. Rare. Balta Island.
——— *latifolium.* Rare. Near Baltasound only.
84. *Spergula arvensis.* Abundant. Shetland name, Meldy.

ICOSANDRIA PENTAGYNIA.

85. *Cratægus Oxyacantha.* Rare. Near Tingwall.
86. *Sorbus Aucuparia.* Precipices and cliffs. Not common.
87. *Spiræa Ulmaria.* Swampy meadows. Common.

ICOSANDRIA POLYGYNIA.

88. *Rosa tomentosa.* Dry banks, &c. Abundant.

89. *Potentilla anserina.* Waste grounds. Common. Roots sweet and nutritious, and occasionally eaten under the name of 'Murraks.'
90. *Tormentilla officinalis.* Dry heaths and pastures. Common.
——— *reptans.* Dry heaths. Rare.
91. *Comarum palustre.* Wet boggy ground. Common.

POLYANDRIA MONOGYNIA.

92. *Papaver Rhœas.* Corn-fields. Not common.
——— *dubium.* Common.

POLYANDRIA POLYGYNIA.

93. *Thalictrum alpinum.* Moist heaths. Abundant.
94. *Ranunculus Flammula.* Watery places. Common.
——— *repens.* Dry barren pastures. Abundant.
——— *acris.* Abundant everywhere.
95. *Ficaria ranunculoides.* Meadows and pastures. Frequent.
96. *Caltha palustris.* Marshy places. Common.

DIDYNAMIA GYNOSPERMIA.

97. *Ajuga reptans.* Common.
98. *Lamium purpureum.* Waste and cultivated grounds. Common.
——— *intermedium.* Not common.
99. *Galeopsis Tetrahit.* Cultivated grounds. Common.
100. *Stachys palustris.* Moist meadows. Common.
——— *ambigua.* Not common. Tingwall.
101. *Thymus Serpyllum.* Dry heaths. Common.
102. *Prunella vulgaris.* Meadows and pastures. Common.

DIDYNAMIA ANGIOSPERMIA.

103. *Euphrasia officinalis.* Dry pastures. Abundant.
104. *Pedicularis sylvatica.* Moist heaths. Abundant.
——— *palustris.* Boggy pastures. Common.

TETRADYNAMIA SILICULOSA.

105. *Draba incana.* Rare. Unst and Fetlar.
106. *Thlaspi Bursa-pastoris.* Waste and cultivated ground.
107. *Cochlearia officinalis.* Sea-shore and inland. Common.
108. *Bunias Cakile.* Sandy sea-shore. Common.

TETRADYNAMIA SILIQUOSA.

109. *Cardamine pratensis.* Moist meadows. Common.
——— *hastulata* (*Arabis petræa*). Near Baltasound, Unst. Rare.
110. *Sinapis arvensis.* Corn-fields. Common. Shetland name Runjy.
111. *Raphanus Raphanistrum.* Fields. Common.

MONADELPHIA DECANDRIA.

112. *Geranium phæum.* Rare. Island of Fetlar.
——— *molle.* Meadows and pastures. Common.

Diadelphia Hexandria.

113. *Fumaria parviflora.* Sandy fields. Abundant.

Diadelphia Octandria.

114. *Polygala vulgaris.* Dry heaths. Common.

Diadelphia Decandria.

115. *Ulex europæus.* Dry heaths. Not common. Hill of Wormiedale.
116. *Anthyllis Vulneraria.* Dry pastures. Abundant.
117. *Pisum maritimum* (var.). Very rare. Sandy down. Burraforth, Unst, only. Root very long, creeping to a great extent, sending up stems at intervals; stem procumbent, angular; stipulas sagittate; tendrils with 3—5 pair of lanceolate, glaucous, dark green leaflets; racemes terminal, on long peduncles; flowers shortly pedicellate, moderately large; wings very beautiful, bright purple, with darker veins; standard and keel whitish. This plant was first added to the 'Flora Scotica' by myself in June 1837.
118. *Lathyrus pratensis.* Fields and way-sides. Common.
119. *Vicia Cracca.* Meadows and pastures. Common.
120. *Trifolium repens.* Meadows and pastures. Common.
——— *pratense.* Dry meadows, &c. Abundant.
121. *Lotus corniculatus.* Pastures. Common.

Polyadelphia Polyandria.

122. *Hypericum pulchrum.* Dry heaths. Frequent.

Syngenesia Æqualis.

123. *Sonchus arvensis.* Corn-fields. Common.
——— *oleraceus.* Waste or cultivated ground. Frequent.
124. *Leontodon Taraxacum.* Meadows and pastures. Not common.
——— *autumnale.* Common.
125. *Hieraceum sylvaticum.* Dry banks. Frequent.
——— *maculatum.* Abundant.
126. *Arctium lappa.* Sandy soils. Rare. Dunrossness.
127. *Carduus lanceolatus.* Waste and cultivated ground. Common.
——— *arvensis.* Corn-fields. Common.
128. *Onopordum Acanthium.* Gravelly soils. Not common.

Syngenesia Superflua.

129. *Tanacetum vulgare.* Road-sides, &c. Abundant.
130. *Artemisia vulgaris.* Waste ground. Common.
131. *Gnaphalium dioicum.* Heaths and dry pastures. Common.
132. *Serratula alpina* (*Saussurea alpina*). Rare. Ronas Hill.
133. *Tussilago Farfara.* Clayey soils. Not common.
——— *Petasites.* Humid meadows. Not uncommon.
134. *Senecio vulgaris.* Cultivated grounds. Common.
——— *Jacobæa.* Meadows and pastures. Common.

135. *Solidago Virgaurea.* Dry heaths and pastures. Common.
136. *Bellis perennis.* Meadows and pastures. Common.
137. *Pyrethrum inodorum.* Waste grounds. Common.
138. *Chrysanthemum Leucanthemum.* Meadows and pastures. Frequent.
139. *Achillæa Millefolium.* Dry meadows. Common.
——— *Ptarmica.* Humid meadows. Common.

Gynandria Monandria.

140. *Orchis mascula.* Meadows and pastures. Frequent.
——— *latifolia.* Wet situations. Abundant.
141. *Satyrium viride* (*Habenaria virid.*). Heaths. Common.
142. *Zostera marina.* Sea-shore. Abundant.

Monœcia Monandria.

143. *Euphorbia helioscopia.* Cultivated grounds. Common.

Monœcia Triandria.

144. *Carex dioica.* Marshes. Abundant.
—— *ovalis.* Heaths. Not common.
—— *arenaria.* Sandy sea-shores. Common.
—— *recurva.* Dry heaths. Common.
—— *binervis.* Moist heaths. Frequent.
—— *ampullacea.* Watery situations.

Monœcia Tetrandria.

145. *Sparganium natans.* Lakes. Abundant.
——— *simplex.* Common.
146. *Littorella lacustris* (*Plantago uniflora*). Common.
147. *Urtica dioica.* Roads and way-sides. Common.
148. *Myriophyllum spicatum.* Ditches and pools. Frequent.
149. *Betula alba.* Shady banks. Not common.

Diœcia Diandria.

150. *Salix fusca.* Dry heaths. Common.
—— *aurita.* Banks of lakes, &c. Abundant.
—— *aquatica.* Watery places. Not common.
—— *herbacea.* Rare. Ronas Hill.

Diœcia Triandria.

151. *Empetrum nigrum.* Heaths. Common. Berries greedily devoured by *Lestris parasiticus.*

Diœcia Octandria.

152. *Rhodiola rosea.* Rocks and cliffs. Common.

Diœcia Monadelphia.

153. *Juniperus communis.* Rare. Cliffs, Koningsburgh.

Polygamia Monœcia.

154. *Atriplex laciniata.* Sea-coast. Common.
——— *patula.* Cultivated and waste ground.

Cryptogamia Filices.

155. *Polypodium vulgare.* Walls and shady banks. Common.
156. *Aspidium Filix-mas.* Common.
——— *Filix-fœmina.* Common.
157. *Scolopendrium vulgare.* Moist shady places. Rare.
158. *Osmunda regalis.* Very rare. Near Sandwick, Unst.
——— *Lunaria.* Hilly pastures. Common.
159. *Ophioglossum vulgatum.* Very rare. Burn of Sundybanks, near Scalloway, Mainland.

Cryptogamia Lycopodiaceæ.

160. *Lycopodium clavatum.* Rare. Ronas Hill.
——— *Selaginoides.* Moist heaths. Common.
——— *Selago.* Also abundant.

Cryptogamia Equisetaceæ.

161. *Equisetum sylvaticum.* Shady banks. Not common.
——— *fluviatile.* Wet places. Rare. Loch of Cliff.
——— *palustre.* Marshes. Common.
——— *arvense.* Moist fields. Abundant.

EXTINCT SPECIES.

Pinus Picea.

An old man told me that he found a fir tree, about six feet below the surface of the ground, when digging peat at the east side of Unst. It was about forty feet in length, and about six feet in circumference. It was much decayed on the outside, but quite sound in the heart.

The cones of the Silver Fir (according to Dr. Neill) have been found in the peat moors in Orkney, although I am not aware of their being observed in Shetland; and as this species seems, when planted, to succeed the best of all its tribe, it may be supposed that the tree in question was of this species.

Corylus Avellana.

The nuts and trunks of this tree have also at different times been dug up in the peat moors.

XXXV.—*On the Composition of Chalk Rocks and Chalk Marl by invisible Organic Bodies: from the Observations of Dr. Ehrenberg**. By Thomas Weaver, Esq., F.R.S., F.G.S., M.R.I.A., &c. &c.†

The remarkable discoveries effected, and the new light thrown on geology by the indefatigable researches of Dr. Ehrenberg, during several years past, through the medium of the microscope, particularly in respect of the Infusoria and Polythalamia tribes, highly instructive and interesting as they must be to all naturalists, are especially so to the geologist, since they open to him a large field of inquiry, eminently deserving of cultivation. To draw attention to this subject, which involves no less than an investigation as to what extent minute organic bodies, invisible to the naked eye, may have contributed to the production of all limestone formations, whether of an origin posterior or anterior to the epoch of the chalk, descending thus in the series to the primary limestones, it appeared to me that a sketch taken from a portion of the labours of Dr. Ehrenberg might be not only useful, but especially acceptable to such geologists as may not be conversant with the language of the original. I propose then, in the first instance, to advert briefly to the earlier researches of Dr. Ehrenberg concerning the Coral tribes in general, and those of the Red Sea in particular‡; and in the second, to present such extracts from the Memoir, the title of which stands at the head of this paper§, as may answer the purpose of a general view.

At the instigation of the Royal Academy of Sciences of Berlin‖, Dr. Ehrenberg and his friend, the late Dr. Hemprich,

* Communicated by the Author.

† With an Appendix touching the researches of M. Alcide d'Orbigny.

‡ See in the Abhand. der König. Acad. d. Wissenschaften zu Berlin for the year 1832:—

1. Contributions to the physiological knowledge of the Coral animals in general, and in particular of those of the Red Sea, with an attempt to classify them according to their physiological distinctions; read 3rd March, 1831, with additions printed 1st Dec. 1833, pp. 225–380.

2. On the Nature and Structure of the Coral Banks of the Red Sea, read 22nd March 1832; revised and printed in Feb. 1834, pp. 381–432.

§ *Ueber die Bildung der Kreidefelsen und des Kreidemergels durch unsichtbare Organismen*, in the Transactions of the Royal Academy of Sciences of Berlin, for the year 1838, read 20th Dec. 1838, and 18th Feb. 1839, pp. 59–149.

‖ See the Report read to the Academy by M. Alr. von Humboldt on the Travels of Doctors Ehrenberg and Hemprich through Egypt, Dongola, Syria, Arabia, and the Eastern declivity of the highlands of Abyssinia, in the years 1820–1825, conveying a clear idea of the arduous and extraordinary labours of those gentlemen in all branches of Natural History: Berlin, 1826. Dr. Hemprich fell a sacrifice to his exertions in Abyssinia, on the 30th of June, 1825.

visited the Red Sea during a period of eighteen months, namely, nine months from the year 1823 to 1824, and an equal number in 1825, having been nearly twelve months of the time on board ship, in which interval they passed over nearly the whole extent of that sea, saw many of its islands and coral banks, and landed with a view to special examination on forty-eight different points of the two coasts; but the whole number of islands and special points of the coast seen by them amounts to about 150, independently of the long coast of Sinai in Arabia, which they examined in continuity. In these laborious efforts, attended with extreme danger, they collected 110 species of Coral animals, being nearly three times as many as had been found or described by all former observers, namely, by Shaw, Forskål and Savigny, and later by Rüppel.

To determine the subjects of that collection with the greater precision, it became necessary to undertake a review of the whole class of the Coral animals, and the more so as Dr. Ehrenberg found that his own observations were frequently in collision with the systematic distinctions that have prevailed up to the present time. In this review the author has especially compared the four most recent extensive systems, namely, of Schweigger in 1820, Rapp in 1829, Cuvier in 1830, and Blainville likewise in 1830, which may be said to embody the judgment of the present generation upon the labours of earlier periods, and to comprise the sum of existing knowledge in this department of natural history. He has in particular turned his attention to the work of Blainville *, since it contains the greatest number of new details, having been enriched by the latest manuscript observations and drawings of Quoy and Gaimard, the result of their second voyage round the world with Capt. D'Urville. In these newer works, the labours of Lamarck having been critically employed, the author was relieved from the necessity of noticing them in a special manner.

The attempt to reconcile the observed discrepancies led the author to separate the Coral animals into two organic natural groups, which are well marked and distinct from each other, and which he named *Anthozoa* (Flower-animals) and *Bryozoa* (Moss-animals). In the course of these researches the author found that the whole group of the Anthozoa, which consist of the proper (single-mouthed) coral animals, and which had been gradually distributed under more than 158 generic names, including even heterogeneous animals and plants, might, according to his own observations of their correspondence in

* *Dictionnaire des Sciences Naturelles*, 1830.

affinity and relations of structure and development, be reduced to eighty-six genera, but which number might perhaps be still further diminished, as a few genera might be classed as sub-genera. The Anthozoa he has divided into two orders, *Zoocorallia* (Animal-corals) and *Phytocorallia* (Plant-corals). In the Memoir is given a systematic description of the Orders, Tribes, Families, Genera and Species of the Anthozoa, while further details are reserved for the author's work, entitled, *Symbolæ Physicæ*. The subjoined Table will show the general arrangement, extending to the genera.

Anthozoa.

Ore ventriculoque distinctis, tubo cibario anoque discreto nullis, corpore intus radiatim lamelloso. (Vibratio nulla, gemmæ et spontanea divisio frequentissimæ.)

Ordo I.—Zoocorallia.

Corpore aut omnino molli, aut Cephalopodum more intus lapidem generante (secernente nec excernente) hinc sæpe omnino libera et, præter formam, animalium characteres omnes perfectius servantia.

		Species. Of the Red Sea. Unproved.	Observed by himself.	Total living.	Fossil Genera.	Genera.
Tribus I. Zoocorallia Polyactinia.	Familia I. Actinina. Genera 9. Species living . 50. In the Red Sea 23.	...	16	29	...	1. Actinia.
		...	1	1	...	2. Metridium.
		...	1	1	...	3. Megalactis.
		1?	...	1?	...	4. Thalassianthus.
		...	1	10	...	5. Cribrina.
		...	1	3	...	6. Actinodendron.
		...	1	1	...	7. Epicladia.
		...	1	1	...	8. Heterodactyla.
		...	...	3	...	9. Lucernaria.
	Fam. II. Zoanthina. Genera 4. Fossil 2. Species living . 12. In the Red Sea 7.	...	2	3	...	10. Hughea.
		1	...	2	...	11. Zoanthus.
		1	1	4	...	12. Mammillifera.
		...	2	3	...	13. Palythoa.
		...	...	...	F.	Siphonia.
		...	...	...	F.	Lymnorea.
	Fam. III. Fungina. Genera 6. Fossil 5. Species living . 12. In the Red Sea 3.	...	1	3	F.	14. Fungia.
		...	1	5	...	15. Haliglossa.
		...	...	3	...	16. Polyphyllia.
		...	...	...	F.	17. Cyclolithas.
		1?	...		F.	18. Turbinalia.
		...	...	...	F.	19. Trochopsis.
		...	...	...	F.	Diploctenium.

		Species. Of the Red Sea. Unproved.	Observed by himself.	Total living.	Fossil Genera.	Genera.
Tribus II. Zoocorallia Octactinia.	Fam. IV. Xenina.					
	Genera 3.	...	3	3	...	20. Xenia.
	Species living . 7.	...	3	3	...	21. Anthelia.
	In the Red Sea 6.	...	...	1	...	22. Rhizoxenia.
	Fam. V. Tubiporina.					
	Genus 1.					
	Species living . 3.	...	1	3	...	23. Tubipora.
	In the Red Sea 1.					
		...	1	1	...	24. Halcyonium.
	Fam. VI. Halcyonina.	...	5	12	...	25. Lobularia.
	Genera 6.	...	2	2	...	26. Ammothea.
	Species living 28.	...	2	4	...	27. Nephthya.
	In the Red Sea 13.	...	3	8	...	28. Sympodium.
		...	...	1	...	29. Cliona.
	Fam. VII. Pennatulina.	...	...	4	...	30. Veretillum.
	(*a*) Halisceptra.	...	...	1	...	31. Pavonaria.
	Genera 4.	...	...	1	...	32. Umbellularia.
	Species living . 7.	...	...	1	...	33. Scirpearia.
	In the Red Sea 0.					
	(*β*) Halipteria.	...	...	2	...	34. Renilla.
	Genera 3. Fossil 1.	...	...	3	F.?	35. Virgularia.
	Species living . 10.	...	...	5	...	36. Pennatula.
	In the Red Sea 0.					
Tribus III. Zoocorallia Oligactinia.	Fam. VIII. Hydrina.					
	Genera 2.	...	...	4	...	37. Hydra.
	Species living . 6.	...	...	2	...	38. Coryna.
	In the Red Sea 0.					
	Fam. IX. Tubularina.	...	...	4	...	39. Syncoryna.
	Genera 4.	...	...	3	...	40. Tubularia.
	Species living . 12.	...	...	4	...	41. Eudendrium.
	In the Red Sea 0.	...	...	1	...	42. Pennaria.
	Fam. X. Sertularina.					
	Genus 1.					
	Species living . 4.	1 ?	...	4	...	43. Sertularia.
	In the Red Sea 1.					
	Zoocorallia...	5	49	151	8	

Ordo II.—Phytocorallia.

Corpore aut lapideam aut corneam materiam adglutinantem secernente, ac dorso (solea) excernente ejusque ope semper adnato (Ostrearum more).

		Species. Of the Red Sea. Unproved.	Observed by himself.	Total living.	Fossil Genera.	Genera.
Tribus IV. Phytocorallia Polyactinia.	Familia XI. Ocellina. Genera 14. Fossil 12. Species living 41. In the Red Sea 7.	...	...	2	...	44. Desmophyllum.
		...	...	3	...	45. Cyathina.
		...	1	1	F.	46. Stephanocora.
		...	...	3	F.	47. Monomyces.
		...	1	9	F.	48. Oculina.
		...	...	4	F.	49. Turbinaria.
		...	3	8	F.	50. Explanaria.
		...	...	6	F.	51. Cladocora.
		...	...	...	F.	52. Columnaria.
		...	1	1	F.	53. Strombodes.
		...	...	...	F.	54. Cyathophyllum.
		...	...	...	F.	55. Pterorrhiza.
		...	1	4	F.	56. Anthophyllum.
		...	...	...	F.	57. Stylina.
	Fam. XII. Dædalina. (α) Astræina. Genera 4. Fossil 3. Species living 28. In the Red Sea 15.	1	2	7	...	58. Caryophyllia.
		...	4	7	F.	59. Favia.
		...	8	14	F.	60. Astræa.
		...	...	...	F.	61. Favosites.
	(β) Mæandrina. Genera 7. Fossil 6. Species living 28. In the Red Sea 5.	...	2	7	F.	62. Mæandrina.
		...	2	12	F.	63. Manicina.
		...	...	1	...	64. Merulina.
		...	1	4	F.	65. Pavonia.
		...	...	2	F.	66. Agaricia.
		...	...	2	F.	67. Polyastra.
		...	...	...	F.	68. Monticularia.
Tribus V. Phytocorallia Dodecactinia.	Fam. XIII. Madreporina. Genera 3. Fossil 3. Species living 41. In the Red Sea 24.	...	7	21	...	69. Heteropora.
		...	17	20	F.	70. Madrepora.
		...	...	...	F.	71. Catenipora.
		...	...	...	...	Pleurodictyum.
	Fam. XIV. Milleporina. Genera 4. Fossil 2. Species living 23. In the Red Sea 11.	...	...	...	F.	72. Calamopora.
		...	4	6	...	73. Seriatopora.
		1	2	7	F.	74. Millepora.
		...	3	10	...	75. Pocillopora.
Tribus VI. Phytocorallia Octactinia.	Fam. XV. Isidea. Genera 4. Species living 10. In the Red Sea 1.	...	...	1	...	76. Corallium.
		...	...	4	...	77. Melitæa.
		...	1	3	...	78. Mopsea.
		...	...	2	...	79. Isis.
	Fam. XVI. Gorgonina. Genera 6. Fossil 1. Species living 63. In the Red Sea 3.	1?	...	3	...	80. Prymnoa.
		1?	...	10	...	81. Muricea.
		...	...	23	...	82. Eunicea.
		1?	...	4	...	83. Plexaura.
		...	...	12	F.?	84. Gorgonia.
		...	...	11	...	85. Pterogorgia.
Tribus VII. Phytocorallia Oligactinia.	Fam. XVII. Alloporina. Genus 1. Species living 1. In the Red Sea 0.	...	...	1	...	86. Allopora.
	Phytocorallia	5	61	235	27	
	Zoocorallia	5	49	151	8	
	Anthozoa	10	110	386	35	
	Of the Red Sea	120				

In the preceding Table we see that of the forty-three genera of Zoocorallia, there are eight which are found fossil; the living species amount to 151, of which fifty-four exist in the Red Sea, and forty-nine of these have been observed by the author, five remaining unproved. Of the forty-three genera of Phytocorallia there are twenty-seven which are found fossil; the living species amount to 235, of which sixty-six exist in the Red Sea, and sixty-one of these have been observed by the author, five remaining unproved. The general result is, that out of eighty-six genera of Anthozoa, thirty-five occur in the fossil state; and that of 386 known living species of Anthozoa, 120 exist in the Red Sea, of which 110 species were observed by the author. The same Table also shows that of the seventeen families of known Coral animals, thirteen exist in the Red Sea, while four are wholly wanting, namely, those of Pennatulina, Hydrina, Tubularina and Alloporina. The total number of known living species comprised in each family is also given, as well as the relative number actually existing in the Red Sea.

The 120 species of Anthozoa existing in the Red Sea thus constitute nearly one third of the whole number of living species, and being comprised in forty-four genera, the latter rather exceed one half of the number of known living genera.

Of the known living Corals there are eight genera peculiar to the Red Sea, namely, *Megalactis*, *Thalassianthus*?, *Epicladia*, *Heterodactyla*, *Anthelia*, *Ammothea*, *Stephanocora* and *Strombodes*. It appears also that eighty-eight species are peculiar to it, not having been hitherto observed anywhere else.

Among the genera of the Red Sea that of *Strombodes* excites peculiar interest, having previously been found only in the fossil state. It affords a key to the structure of the remarkable Cyathophylla, differing from the view hitherto entertained, and rendering it quite clear that the internal central star of the encased forms is not a young one, but the oldest or mother star, which is often surrounded by broad radiated mantle-folds productive of buds.

It appears probable that the Red Sea and the part of the Mediterranean so nearly adjoining on the Libyan coast, possess only two forms out of the 120 species in common, namely, *Actinia Tapetum* and *A. Mesembryanthemum*.

Of the Bryozoa group, Dr. Ehrenberg gave in the same memoir, contained in the volume of the Transactions for 1832, only the more general results of his investigations, without entering into detail; but the subject is resumed in his later memoir, inserted in the volume for 1838, in which he has presented a tabular view of the Bryozoa, distributed into Orders,

Families and Genera, with their characteristics. According to this view the Bryozoa comprise four Orders, *Polythalamia*, *Gymnocoræ*, *Thallopodia* and *Scleropodia*; the Polythalamia being divided into *Monosomatia* (single-bodied), consisting of fifty-six genera, and *Polysomatia* (many-bodied or polyparian), composed of twenty-two genera, forming altogether seventy-eight genera of Polythalamia. The following Table exhibits the general arrangement.

BRYOZOA.

Animalia asphycta, tubo cibario simplici, sacciformi aut tubuliformi, vera corporis articulatione nulla aut sensim numerosiore, corporis forma gemmis aut novis articulis accedentibus sensim aucta, hinc indefinita, nunquam sponte dividua, omnia et singula verisimiliter periodice ovipara, ideoque hermaphrodita.

ORDO I.—POLYTHALAMIA.

Libere vagantia et loricata.

Monosomatia.

Familia I. MILIOLINA.
Genera 2. ? Miliola, ? Gromia.

Familia II. NODOSARINA.
Gen. 11. Glandulina, Mucronina, Nodosaria, Orthocerina, Dentalina, Lingulina, Frondicularia, Rimulina, Vaginulina, Planularia, Marginulina.

Familia III. TEXTULARINA.
Gen. 6. Bigenerina, ? Dimorphina, Textularia, Grammostomum (*Vulvularia*), Polymorphina, Virgulina.

Familia IV. UVELLINA.
Gen. 11. Guttulina (et *Globulina*), Uvigerina, Bulimina, Valvulina, Rosalina, Clavulina, Globigerina, Pyrulina, Sphæroidina.

Familia V. ROTALINA.
Gen. 22. Operculina, Soldania, Planorbulina, Rotalia, Trochulina, ? Spirulina, Calcarina, Pleurotrema, Planulina, Discorbis, Omphalophacus, ? Gyroidina, Truncatulina, Lenticulina, Nonionina, Cristellaria, Siderolina, Dendritina, Robulina, Anomalina, Saracenaria, Cassidulina.

Familia VI. PLICATILIA.
Gen. 6. Biloculina, Spiroloculina, Triloculina, Articulina, Quinqueloculina, Adelosina.

Polysomatia.

Familia VII. ASTERODISCINA.
Gen. 5. Asterodiscus, Lunulites, Orbitulites, Cupularia, Flustrella.

Familia VIII. SORITINA.
Gen. 2. Sorites, Amphisorus.

Familia IX. FRUMENTARINA.
Gen. 3. ? Dactylopora, ? Ovulites, ? Polytripe.

Familia X. HELICOSORINA.
Gen. 5. Peneroplis, Pavonina, Vertebralina, Orbiculina, ? Heterostegina.

Familia XI. HELICOTROCHINÆ.
Gen. 3. Polystomella, ? Amphistegina, ? Geoponus.
Familia XII. ALVEOLINEA.
Gen. 2. Melonia, Alveolina.
Familia XIII. FABULARINA.
Gen. 2. Fabularia, Coscinospira.

ORDO II.—GYMNOCORÆ.

Libere vagantes, nudæ.

Familia I. CRISTATELLINA.
Gen. 2. Cristatella, Zoobotryon.

ORDO III.—THALLOPODIA.

Stolonibus thallove membranaceo affixa, incrustantia nec adnata, sed loricata.

Familia I. HALCYONELLEA.
Gen. 8. Halcyonella, Vesicularia, Bowerbankia, Farrella (= *Lagenella*) *, Valkeria, Stephanidium, n. G., Dynamene, Halodactylus (= *Alcyonidium*).
Familia II. CORNULARINA.
Gen. 1. ? Cornularia.
Familia III. ESCHARINA.
Gen. 5. Eschara, Melicertina (= *Melicerita*) †, Crisia, Acamarchis, Notamia.
Familia IV. CELLEPORINA.
Gen. 5. Cellepora, Flustra, Membranipora, Briolophus, n. G., Apsendesia.
Familia V. AULOPORINA.
Gen. 1. Tubulipora.

ORDO IV.—SCLEROPODIA.

Stolonibus destituta, excreto fulcro axique anorganicis firmiter affixa eisque fruticulosa.

Familia I. MYRIOPORINA.
Gen. 9. Hornera, Idmonea, Retipora, Distichopora, Myriopora, Tilesia, Cricopora, Ceriopora, Spiropora.
Familia II. ? ANTIPATHINA.
Gen. 1. Antipathes.

"The two last orders, the Thallopodia and Scleropodia," the author observes, "are considerably richer in forms, and it would be very easy by an uncritical compilation to enlarge greatly the number of names; but such confusion has been produced in names by Lamouroux and later writers, the same body being often designated by many new names, that I shall not venture to extend my judgment further at present. What

* The name *Lagenella* was appropriated to an infusorial form in 1832.

† *Melicerta* is already employed among the Radiaria, *Melicertum* with the Acalepha, *Melicerita* is not correct in language.

Perhaps hereafter it may be advisable to substitute *Textilaria* for Textularia, *Polystomatium* for Polystomella, *Cyclodiscus* for Discorbis, &c.

has been advanced will suffice to show clearly the position of the Polythalamia, such as it appears to me, in the animal kingdom."

On Chalk and Chalk Marl.

The memoir on the chalk and chalk marl is distributed under the following heads:—

1. Historical Introduction, pp. 59—68.
2. New method of observing, pp. 68—70.
3. On calcareous-shelled organisms, invisible to the naked eye, as the principal constituents of writing chalk, pp. 70—74.
4. On Chalk Marl and its relations to Chalk, and to the Flints of the Chalk, pp. 74—87.
5. On the compact limestone of Upper Egypt and Arabia, as formed by the Polythalamian calcareous animalcules of the White Chalk of Europe, pp. 87—90.
6. On the principal organic calcareous forms which constitute all chalk, and the local differences, pp. 90—95.
7. Preliminary view of new researches respecting living Polythalamia, and their relation to the formation of the sand of Sea Downs, pp. 96—106.
8. Application of the preceding observations to the systematic distinctions of Polythalamia, with a tabular view of the Bryozoa, according to their orders, families and genera, with their characteristics, pp. 107—121.

(N.B. Of this tabular view I have given a transcript above.)

9. On the geographical distribution of living Polythalamia on the African and Asiatic coasts of the Mediterranean, and in the Red Sea, with a tabular view of the genera and species, pp. 121—127.
10. A concise Diagnosis of the new families, genera and species,
    1. Of the siliceous Infusoria of the chalk marl, containing thirty-one new species, of which seventeen species belong to five new genera, and fourteen species to five former-known genera, pp. 128—130.
    2. Of the calcareous-shelled Polythalamian animalcules of the chalk and sea sand, sixty-seven new species, beside two new species from the Jura (Oolite) limestone, pp. 130—135.
11. A summary view of the conclusions drawn from the preceding expositions, pp. 135—139.
12. Explanation of the Plates, pp. 140—147.
13. A tabular view of the organic bodies invisible to the naked eye, which form the chief constituents of chalk, chalk marl, the compact limestone of Egypt and Arabia, and the nummulitic limestone of the Pyramids of Geza or Gyzeh.

The reader being thus put in possession of the general scope of the work, I now proceed to exhibit in full the conclusions to which the author has been led (as indicated under the head of No. 11), to which I shall subjoin further extracts taken from different portions of the Memoir, for the purpose of general illustration.

Conclusions.

1. Many, and probably all, *White Chalk Rocks* are the produce of microscopic coral-animalcules, which are mostly quite invisible to the naked eye, possessing calcareous shells of $\frac{1}{24}$ to $\frac{1}{288}$ line in magnitude, and of which much more than one million are well preserved in each cubic inch, that is, much more than ten millions in one pound of chalk *.

2. The *Chalk Marls* of the Mediterranean Basin are the produce of microscopic Infusoria possessing siliceous shells or cases, mostly quite invisible to the naked eye, intermingled with a small proportion of the calcareous animalcules of the chalk.

3. The peculiar state of aggregation in *White Chalk* does not arise from a precipitate of lime previously held in solution in the water of the sea, nor is it the result of the accumulation of the small animalcules, but it proceeds from a disintegration of the assembled microscopic organisms into much minuter inorganic calcareous particles; the reunion of which into regular, elliptical, granular laminæ, is caused by a peculiar crystalloid process, which may be compared to crystallization, but is of a coarser nature, and essentially different from it. The best writing chalk is that in which this process has been developed to the greatest extent.

4. The compact limestone rocks also which bound the Nile in the whole of Upper Egypt and extend far into the Sahara or Desert, being neither white nor of a staining quality, as well as the West Asiatic compact limestone rocks in the north of Arabia, are, in the mass, composed of the coral animalcules of the European chalk. This affords a new insight into the ancient history of the formation of Libya from Syene to the

* It is to be understood that I speak only of such Polythalamia as are well preserved, wholly disregarding their fragments. Of the well-preserved there are contained in one fourth part of a cubic line, or in one twelfth of a grain of chalk, frequently 150 to 200 in number, equal to 600–800 in each cubic line, or 1800–2400 in each grain, and from 1,036,000 to 1,382,400 in each cubic inch; and hence in one pound of chalk the number far exceeds ten millions.

The larger Polythalamia and Bryozoa of the chalk are best obtained from the sediment produced by brushing the chalk under water; the entirely microscopic forms remain long suspended in water.

Atlas, and of Arabia from Sinai to Lebanon, thus opening a large field to organic distribution.

5. Many of the chalk-like formations bordering on the Mediterranean in Sicily, Barbary and Greece, really belong to the period of the European chalk formation, as proved by their organic contents, although commonly held to be different from the chalk, and considered as tertiary *.

6. The chalk beds of the South of Europe, around the basin of the Mediterranean, are distinguished from those of the north and east of Europe by numerous well-preserved chalk animalcules, and less numerous inorganic laminæ; while in the north and east of Europe these relations are reversed †.

7. In the South of Europe the beds of marl which alternate with the chalk consist of siliceous shells of Infusoria, and flints are wanting; while in the North of Europe beds of flint alternate with the chalk, and marls with Infusoria are wanting. This exchange of character tends to explain the peculiar relation of flint to chalk, indicating that the pulverulent siliceous particles of Infusoria have been converted into compact nodules of flint.

8. It has been lately remarked that the chalk which contains flints is deficient in numerous siliceous Infusoria, when compared with the Bilin slaty Tripel or polishing slate (*Polirschiefer*) containing semi-opal; but this deficiency now disappears, and a rich substitute takes its place, the Infusoria in the North of Europe having been employed in the formation of flints; while in the south, remaining unchanged, they are preserved in the Infusoria marls.

9. The chalk animalcules resemble most those of the sea-sand and the Miliolites, which, up to the present day, have been ranged among the Mollusks with the Cephalopods; but neither of these are either Cephalopods or Mollusks, nor even Infusoria (as asserted by a late observer); but they are Bryozoa, animals of Moss-corals, which are most nearly related to Flustra and Eschara.

10. The sea downs of some, and probably of most coasts, are still in course of formation by living Bryozoa, which, though very small, resembling grains of sand, are yet, for the most part, larger than the chalk animalcules, and a large pro-

* In Sicily, however, there occur many breccias of chalk, which have suffered a subsequent change, and may be referred to the tertiary epoch.

† Thus in the white and yellow soft writing chalk of the North of Europe the inorganic crystalloid portions sometimes equal or rather exceed in mass the organic remains; but in the South of Europe, in Sicily, these organisms with their fragments are greatly predominant, consisting, as it appears, exclusively of well-preserved Polythalamia.

portion of the sand of the Libyan Desert has been proved to consist of such grains. It is only in Nubia above Syene that the desert sand becomes a pure detritus of granite *.

11. In the various countries of the earth in which occur white and earthy, as well as coloured and compact rocks, composed of microscopic calcareous animalcules, the genera and species of these animalcules present so striking an agreement with those of the white chalk of Rügen, that they may well be deemed characteristic of one and the same period of geological formation. It cannot be asserted for a certainty that the same forms have been observed any where else†.

12. In the beds subjacent to and more ancient than the chalk, namely, in those of the Oolite or Jura limestone formation, we have also clear evidence of the existence of other microscopic Polythalamia. These, however, are such as have not hitherto been found anywhere in the chalk.

13. The early assertion that *all* limestone was the produce of animals‡, though resting on no sufficient foundation, and therefore justly held in slight regard by modern geologists, yet now deserves every attention, since it clearly appears that a limestone formation widely extended on the surface of the earth is composed of microscopic animals, visibly converted in a gradual manner into inorganic chalk and compact limestone. If similar phænomena appear also in the Jura limestone formation, and should become still further confirmed, these considerations (combined with the long-known existence of coarser corals and shells in both formations) tend to show how necessary it is, when examining the composition of any considerable portion of the solid mass of the earth, to strengthen our natural senses by artificial means, in order to obtain a distinct knowledge of the extent to which organic life may have contributed to its production.

14. The extreme minuteness of the chalk animalcules is strikingly proved by this, that even in the finest levigated whiting multitudes of them are still present, and may be applied without suffering change to the most varied technical purposes. Thus in the chalk coating given to painted chambers, paper, or even glazed visiting-cards (when not coated with white lead

* On these very interesting and not easily developed relations, I hope, at a future day, to be able to make a more special communication.

† If I have applied the same name in some cases both to animalcules of the chalk and to forms existing in the present sea-sand, or in recent fossil beds, it has arisen partly from my being unacquainted with the original forms of the latter, and partly from my desire not to create unnecessary perplexity by the adoption of new names. It should be observed that they are distinguished by marks of interrogation. All those which I could really compare were different.

‡ By Linnæus in 1745 and 1748, and Buffon in 1749.

alone), may be seen a pretty mosaic of well-preserved, moss-coral animalcules, but which are invisible to the naked eye. And thus our natural vision receives from such a surface the impression of the purest white, little deeming that it contains the bodies of millions of self-existing beings, of varied and beautiful forms, more or less closely crowded together (as in Plate IV., where the subjects are magnified 300 times).

Explanation of the Plates and Tabular View.

The Memoir is accompanied by four Plates*, presented with the view of facilitating a comparison between the organic relations of minute fossil bodies invisible to the naked eye, and those of still living bodies visible to the naked eye.

Thus the first three Plates exhibit recent small bodies naturally visible, with which the naturally invisible forms of the fourth Plate may be readily associated.

The first three Plates serve also to elucidate the true nature of the Polythalamia (hitherto mistaken), showing their greater affinity to the Bryozoa (Flustra) than to all other animal forms, and in particular the great difference there is between them and Cephalopods and Infusoria. They represent partly the unfolded, soft, external parts of living subjects, and partly dead, naked bodies, artificially divested of their calcareous shell, and not hitherto figured.

Lastly, these first three Plates serve to convey a view, according to some of their principal divisions, of the structure of the whole group of forms occurring in Polythalamia, and in particular to illustrate their frequent assemblage in families, or Polyparies, as they are termed. Plate I. contains simple forms; Plates II. and III. composite or family forms, Polyparies; of which Plate II. contains family forms assembled in single rows, and Plate III. family forms arranged in many rows.

If, as already observed, we examine a wall or paper whitened with finely levigated chalk, or a glazed visiting-card not coated with white lead alone, but also with chalk, they would appear, when magnified 300 times, more or less rich in subjects, as represented in Plate IV.

Plate I. contains *simple recent Polythalamia* from the sea-sand of Rimini. Fig. 1. *Rotalia Beccarii*; the shell only was known, but the figures show also the form of the animal when deprived of its shell by an acid, the form of both being the same. Fig. 2. *Marginulina Raphanus* (*Nodosaria Raphanus*, *Nautilus Raphanus priorum*), also very common at Rimini and other Italian coasts, and which had hitherto been erroneously ranked with Orthocera.

Plate II. contains *Polyparies of recent Polythalamia assem-*

* These plates do not accompany Mr. Weaver's paper.

bled in single rows, from the Red Sea and the Mediterranean. The two subjects represented in this Plate were collected by me in the year 1823, and it is peculiarly interesting, through my newly-discovered method of observing*, to have been able to see in several divisions of the internal body the remains of the siliceous Infusoria, of which they had made a repast fifteen years before. Fig. 1. *Peneroplis planatus*, d'Orbigny, *Nautilus planatus* of Fichtel and Moll, from the Red Sea. The shells of this animalcule were hitherto only known, but the soft organic animal form which they inclose is here also represented. Fig. 2. *Coscinospira Hemprichii*, a form from the Red Sea, also found in the Libyan part of the Mediterranean, and which was formerly erroneously placed adjoining the *Spirula* of the Cephalopods, and more recently as connected, through *Lituolites nautiloides*, with *Spirolina*.

Plate III. contains *Polyparies of recent Polythalamia assembled in many rows*. This Plate contains the only living animalcule of the Polythalamia group, hitherto so far observed as to admit of its classification. The three forms given in this Plate, constructed of many rows of animalcules, may be distinctly associated with the Flustra and Eschara of the Bryozoa, to which, through the well-known *Lunulites* and *Orbitulites* (hitherto ranked with coral animals), they approximate in a convincing manner. Fig. 1. *Orbiculus numismalis*, from the sea-sand of the Antilles Isles. Fig. 2. *Sorites orbiculus* = *Nautilus orbiculus*, Forskål, *Nummulina* (*Assilina*) *nitida*, d'Orbigny, ? from the Red Sea. The same species lives also in the Mediterranean. In a part magnified 300 times we see the animalcule with eight feelers protruding from its cell. In some of the cells may be seen distinct shells of siliceous Infusoria; in others appear oviform globules. Fig. 3. *Amphisorus Hemprichii* closely resembles the *Sorites*; but it has cells on both sides bearing single animalcules, and hence

* The new method of observing is the following:—Place a drop of water upon a lamina of mica, and put into it of scraped chalk as much as will cover the fine point of a knife, spreading it out and leaving it to rest a few seconds; then withdraw the finest particles which are suspended in the water, together with most of the water, and let the remainder become perfectly dry. Cover this remainder so spread out with *Canadian balsam*, the turpentine of the *Pinus* (*Abies*) *balsamea*, and hold it over a lamp until it becomes slightly fluid without froth. A preparation thus made seldom fails, and when magnified 300 times in diameter we see that the mass of the chalk is chiefly composed of minute well-preserved organisms. In this preparation all the cells of the Polythalamia appear at first black with a white central spot, which is caused by the air contained in the cells, which, as is well known, appear under water as annular black bodies; but by degrees the balsam penetrates into all the single cells, the black rings of the air vesicles disappear, and we recognize all the small cells of the Polythalamian animals, often presenting a very pretty appearance.

the discs are twice as thick as in *Sorites*. If we compare *Sorites* with *Flustra*, we may place *Amphisorus* by the side of *Eschara*, but, being both free moving bodies, they are different from them.

Plate IV. contains the *invisible animalcules of the chalk and chalk marl*, displayed in twelve specimens of rock; 1 to 9 being portions from the chalk, and 10 to 12 from the chalk marl, magnified 300 times. In these specimens the calcareous Polythalamia amount to sixteen species, and the siliceous Infusoria to twelve species, with siliceous spicula of sponges. The twelve localities from which these specimens of the rock masses were derived are the following:—No. 1 to 5, *writing chalk*; namely, 1. from Puszkary, in Poland, opposite Grodno, from the shore of the Memel; 2. from Jütland, in Denmark; 3. from the island of Rügen in Pomerania; 4. from Gravesend, on the Thames; 5. from Meudon, near Paris; *firmer* writing chalk, No. 6, from Cattolica in Sicily; *compact, not writing* chalk, No. 7, from the Mokattum hills near Cairo; and No. 8, from the Catacombs of Thebes in Upper Egypt; *compact gray limestone*, No. 9, from the mountain mass of Hamam Faraūn in Sinai, Arabia; *chalk marl*, No. 10, from Oran in Africa; No. 11, from Caltasinetta in Sicily; No. 12, from Greece.

In the *general table* indicated above, under the head of No. 13 of the contents of the memoir, a list is given of the principal forms of the invisible organic bodies which constitute the rocks from which the twelve above-mentioned specimens were taken, as well as the chalk of Brighton, the chalk marl of Zante in the Ionian Islands, and the nummulite limestone of the Pyramids of Geza in Egypt. From this it results that the principal forms in these rocks consist of twenty-five species of calcareous-shelled Polythalamia, thirty-nine species of siliceous-shelled Infusoria, seven species of soft-shelled Infusoria of the flints, and five species of siliceous plants.

The twenty-five species of calcareous-shelled Polythalamia, belonging to eight genera, are the following:—

Flustrella *concentrica*; Globigerina *bulloides*?, G. *helicina*?; Planulina *sicula*, P. **turgida*; Robulina *cretacea*; Rosalina **foveolata*, R. *globularis*?, R. **lævigata*, R. *pertusa*; Rotalia **globulosa*, R. *ocellata*, R. *ornata*, R. *perforata*, R. *scabra*, R. *stigma*; Textularia *aciculata*?, T. **aspera*, T. *brevis*, T. **dilatata*, T. **globulosa*, T. *perforata*, T. *spinosa*, T. **striata*; Turbinulina *italica*? Quinqueloculina? from Benisuef, is doubtful. N.B. *Textularia globulosa*, when in fragments, is not easily distinguished from *Rotalia globulosa*; and in like manner the fragments of *Textularia perforata* may be confounded with *Rotalia perforata*.

The thirty-nine species of siliceous-shelled Infusoria belong to fourteen genera, and are as follow:—

Actinocyclus *ternarius*, A. **quaternarius*, A. **quinarius*, A. *senarius*, A. *septenarius*, A. *octonarius*, A. *denarius*; Coccone-ma *Cretæ*; Cornutella *clathrata*; Coscinodiscus *Argus*, C. *centralis*, C. *lineatus*, C. **minor*, C. **Patina*; Denticella *Fragilaria*, D. *tridens*; Dictyocha *Fibula*, D. *Navicula*, D. *polyactis*, D. *speculum*, D. *stella*, D. *triangula*; Eunotia *zebra*; Fragilaria *rhabdosoma*, F. *striolata*?; Gallionella *aurichalca*?, G. *sulcata*; Haliomma *Medusa*, H. *crenatum*; Lithocampe *lineata*, L. *Radicula*, L. *solitaria*; Navicula *africana*, N. *Bacillum*, N. *eurysoma*, N. *ventricosa*, N. *sicula*; Pyxidicula *prisca*; Synedra *ulna*.

The seven species of soft-shelled Infusoria of the flints belong to three genera, and are the following:—Chætophyta *Pyritæ*; Peridinium *pyrophorum*†; Xanthidium *bulbosum*, X. *furcatum*, X. *hirsutum*, X. *ramosum*, X. *tubiferum*.

The five species of siliceous plants belong to two genera, namely, Spongia (*Tethya*?) *aciculosa*, S. *cancellata*, S. **Cribrum*, S. *binodis*; Spongilla (*Tethya*?) *lacustris*‡.

Of these principal forms the before-mentioned rocks partake in the proportions as stated below: namely,

	Species of Calcareous Polythalamia.	Species of Infusoria.		Species of Siliceous Plants.
		Siliceous, in Chalk.	Soft-shelled in Flints.	
The *Chalk* of				
Puszkary contains	6			
Rügen	7	1		
Jütland	6			
Gravesend	6	3	5	
Brighton	7	1	4	
Meudon	9	.....	2	
Cattolica	9			
The *Chalk Marl* of		Siliceous Infusoria.		
Caltasinetta	7	27	.....	4
Oran	2	18	.....	1
Zante	5	8	.....	2
Greece	3	9	.....	1
The *Compact Chalk* of				
Egypt	8			
Arabia	6			
The *Nummulite Limestone* of The Pyramids of Geza ...	6	Containing 4 species of Nummulite, the largest of which is one inch in diameter.		

† *Peridinium delitiense* has hitherto been found only in flint pebbles near Delitzsch, yet accompanied with forms that are common in the flints of the chalk.

‡ In the preceding lists, the species which are marked with an asterisk * are those which most frequently occur, forming the masses of the rocks. The *Rotalia globulosa* occurs in all the localities.

On the Chalk Marl, and its relations to the Chalk and its Flints.

The whole coast of Oran in Africa appears to belong to the chalk formation, composing the plain east of the town, and extending thence to the Atlas. The marl brought from thence as tertiary by M. Rozet in great quantities I had an opportunity of examining in Paris, and I found not only Polirschiefer and an Infusoria conglomerate, but calcareous animalcules of the same species as occur in the chalk of Poland, Rügen, Denmark, and Paris, and which there mainly contribute to its mass. It thus appeared that the so-called tertiary formation of the coast of Barbary might, without much hazard, be brought into a nearer connexion with the chalk. In his description of this tract, M. Rozet states*, "The tertiary formation is extensively developed in Oran, forming the soil of the large plain on the east of the town, and on the south to the Atlas. It forms also the sea-coast to an extent of 3000 metres between Mers el Kebir and Cape Falcon, and the whole soil of the adjacent plain. The lower bed is a blue marl, like that which we found at Algiers and within the Atlas. It appears destitute of organic remains. The second or upper deposit consists of marly and calcareous beds in alternation, forming a thickness of 30 to 40 metres. In the plain these beds are apparently horizontal, as well as in the elevated plain of the Rammra hill; but in the hills south-west of the town of Kasba they are, on an extent of two hours march, inclined to the north, at an angle sometimes exceeding 30°. The beds of limestone are white and chalk-like, yellowish and coarse granular, usually forming the lower part, succeeded by others alternating with yellow marls, which are often slaty and charged with sand, and between them are found layers of ostreæ and other shells. Among them two beds are distinguished, each one metre in thickness, composed of very white finely-laminated marl, containing numerous well-preserved impressions of fishes, so that in a cubic mass of one foot we seldom fail to find three or four fishes. In these beds of marl thus enclosing the fishes, other organic remains do not appear; but in the calcareous and sandy beds which intervene, occur layers of large oysters mingled with grypheæ. The upper part of this deposit is composed of a calcareous breccia, which is exhibited at the surface in the soil of the whole plain on the south-west of Oran."

This exact description of the position and thickness of the white marl with impressions of fishes, has a reference to the

* Rozet, *Voyage dans la Régence d'Alger*, Paris, 1833. tome 1. chap. v. pp. 56, 63.

Infusoria conglomerate of Oran, to which I have already adverted. It is probably what formed the Tripel of the earlier periods of Italy. When M. Rozet speaks (at p. 28–30) of the great extent of the tertiary tract near Algiers as similar in its relations to those of Oran, I cannot agree with him. On the contrary, forming my judgment by the organic remains, I consider the desert tract near Algiers as really composed of a tertiary formation, which reposes on chalk. This opinion is founded on my observation, that the tract in Libya, extending from Alexandria to Siwa, is composed of tertiary beds, while from Cairo to Geza the chalk formation occurs, which terminates at the granite of Syene, but is far spread into the Desert. The valley of Siwa appears to form the northern boundary of the chalk in Eastern Libya.

In the South of Italy, at Caltasinetta and its neighbourhood, the relations had been correctly seized by our late friend Frederick Hoffmann, from whose diary I have been favoured with an extract by M. von Dechen. He represents the series of strata which occupy the greater part of Sicily as composed of limestones, sandstones, clays, and marls; the lower members being probably referable to the Jura formation, succeeded by such as clearly belong to the chalk, and many beds of which perfectly resemble the hard chalk of the north-west of Germany (Teutoburger Wald). Among the marls are white chalk-like thinly laminated masses, analogous to Tripel, designated by Hoffmann as *white chalk marl*, and which especially occur in the southern part of the island. The beds of the chalk formation usually dip 20° to 30°, while the strike is nearly constant, from 15° to 45° S. of E. and N. of W., parallel to the south coast. The tertiary beds which succeed the chalk are composed of loose sand, friable sandstone, testaceous breccias, clays and limestones. They cover the chalk unconformably, resting on the truncated edges of the latter. The chalk beds are upon the whole poor in organic remains, and these are seldom distinct; there occur Hippurites, Nummulites, Lenticulites, and in a few places indistinct Ammonites and Belemnites, while the tertiary beds are quite filled with innumerable Mollusks, of which nine-tenths are still living in the Mediterranean. This distinction is so striking that it scarcely required the difference of relative position in order to draw a correct line between the two formations. Even had so circumspect a geologist as Frederick Hoffmann not correctly seized and pronounced with decision on these local relations, the numerous microscopic siliceous Infusoria with calcareous Polythalamia which I have found in the chalk marl would have led to the same conclusion.

If we compare Hoffmann's description of this portion of Sicily with that given by Rozet of the coast near Oran, we cannot avoid recognizing a similarity of relations; and the thinly laminated marly beds with impressions of fishes, between Caltasinetta and Castrogiovanni, which Hoffmann refers with certainty to the chalk formation, correspond to the similar beds which occur near Oran, but which were said to be tertiary. And the parallel is confirmed by the microscopic siliceous Infusoria and calcareous animalcules which I have discovered in both.

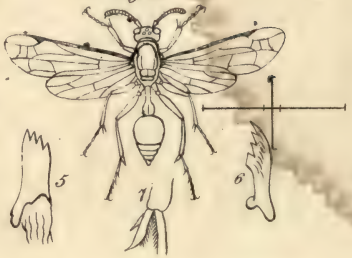
The genera and species of the siliceous Infusoria in Sicily are so similar to those of Oran and Zante, that of thirty-six species, four occur in all the three countries, three in Caltasinetta and Zante, seven in Caltasinetta and Oran, while in all of them the *Coscinodiscus Patina* is greatly predominant. Of all these siliceous animals, not a single species has been found in the chalk of the North of Europe, nor even in the flints. On the other hand, the calcareous-shelled animalcules, which in the South of Europe accompany the siliceous animals, comprise about one half of the same species that are found in the North, yet exceeding them in quantity.

From the examination of the organic constituents of the chalk marl we learn the hitherto unknown fact, that numerous swarms of microscopic Infusoria were in existence within the period of the secondary formation of the earth's surface, chiefly belonging to such as possess siliceous cases or shells, and which for the greater part are members of such sections of the Bacillaria family as had previously appeared to be confined to the tertiary or newest formations.

Of the thirty-nine or forty species of siliceous Infusoria occurring in the chalk formation, thirty-four or thirty-five have not hitherto been found in the recent state; but it is remarkable that the remaining five or six species so closely resemble existing species of the present day, that they present no peculiar character by which they could be distinguished from them, and hence the application of new names appeared inadmissible. They are, *Eunotia zebra*, *Fragilaria rhabdosoma*, *F. striolata ?*, *Gallionella aurichalca*, *Navicula ventricosa*, *Synedra ulna**.

In the chalk itself only four out of the thirty-nine or forty

* The indifference shown to climate by Infusoria, and the peculiarity of their organic development, seem to render it possible that they might be more readily preserved through many catastrophes of the earth than other forms. By the faculty which they possess of spontaneous division, a single individual can, under very favourable circumstances, be multiplied in the course of a few hours to the extent of millions.



Jos. Dinkel del.t

J. Basire, lith.

MYRAPETRA SCUTELLARIS & NEST FROM S. AMERICA.

species of siliceous Infusoria have hitherto been met with, namely, *Fragilaria rhabdosoma*, *Fragilaria striolata ?*, *Gallionella aurichalca*, and *Pyxidicula prisca*. They are very rare, and found only in the vicinity of the beds of flint.

[To be continued.]

XXXVI.—*Description of a South American Wasp which collects Honey.* By Mr. Adam White, M.E.S.; an Assistant in the Zoological Department of the British Museum.

[With a Plate.]

Some of the Wasp tribe of the New World form their nests of a solid and rather thick pasteboard. Such structures have been met with in Pennsylvania*, while they occur frequently in the more tropical parts of South America as far as Buenos Ayres†, and very probably much to the south of that point: in the description of the Isthmus of Darien ‡, Wafer mentions "the bird's nest bee, the hives of which are black and hard, hanging from the trees like birds' nests."

The best known is that of the *Chartergus nidulans* §, which is formed "of a beautifully polished white and solid pasteboard, impenetrable by the weather ||." It has been fully described by Reaumur in the sixth volume of his 'Mémoires': in the British Museum there are two specimens of this nest. They are securely attached to the branch of a tree by their upper end, and vary much in length, from a few inches, as in the Museum specimens, to two feet or even more. In the former case they are more or less round and have but four or five combs, while in the latter they are of a long cylindrical shape, and have a

* Rymsdyk, Mus. Britannicum, tab. 1. f. 2.

† Mr. Cuming tells me he has seen specimens there, at least four feet long: in a deserted one a swallow had built her nest.

‡ Voyage and Description of the Isthmus of America (1704), p. 214.

§ The *Vespa nidulans*, Fab., is figured by Coquebert (Ill. Icon. tab. 6. fig. 3.), and Guerin (Iconogr. pl. 72. fig. 7.). In Saint Fargeau's 'Hist. Nat. des Hymenopt.' i. p. 546, it constitutes, along with another black species, the genus *Chartergus*; I believe it is the type of Latreille's *Epipone*. Cuvier (Bull. des Sc.) seems to have first pointed out, in 1797, the error into which Reaumur fell, of considering a Chalcididous parasite found in these nests as being the constructors of them. He regarded it as the *Chalcis annulata* of Fabricius, an insect found in the pupæ of nocturnal Lepidoptera. In 1798 Fabricius described the insect as *Chalcis conica* (Suppl. Ent. Syst. 242), having obtained specimens from the nest: the name he afterwards altered to *pyramidea* (Syst. Piez. 167), as his former specific name was pre-occupied. Mr. Sells has recently found the parasite in the nest (Journal of the Proceedings of Entomol. Society, ii. p. 30), and Mr. Westwood has published a more accurate figure than that given by Reaumur (Ent. Soc. Trans., ii. pl. 20. f. 6.).

|| Kirby and Spence, Introd. i. p. 506.

corresponding number of partitions; additional combs are added to the lower part as the occupants increase in number. These combs are horizontal, convex on the under side, and fixed to the walls of the nest by their whole circumference. The cells are hexagonal and open downwards, as in most other nests constructed by the *Vespidæ*. Each of the combs has a hole near the middle, through which access is obtained to the uppermost apartments. The outer entrance is by a small round orifice near the middle of the under side, which is more or less funnel-shaped.

In the Museum there is a nest from the West Indies of a greyish brown colour; it is bell-shaped, and attached to the branch of a tree in the same way as the other. The base, however, is flat, the entrance being by a small hole close to the edge: each stage of combs has a similarly situated orifice to give access to the various compartments. There are five straight horizontal partitions, fixed, as in the preceding, by their entire circumference; on the lowest there are no indications of cells, on the fourth there is a circular cell unfinished, while in the three upper combs the hexagonal cells are confined to the middle. The texture of this nest is coarse, the fibres on the surface and throughout being distinctly visible. It is seven and a half inches long, the base where its diameter is greatest having nearly the same dimensions.

This nest closely agrees with one from Cayenne figured by Cuvier*; the constructor is a small Vespidous insect of a shining black colour, with brown wings and a pedicellate abdomen, which the French naturalist has named *Vespa Tatua*†, from its local name "La Mouche Tatou." Burmeister‡ says this insect forms a nest, having "the superior surface covered with a multitude of conical knobs;" in Cuvier's figure it is perfectly smooth.

The insects which form these curious habitations have been observed by Lacordaire§ in their native country. Their societies are not dissolved each year, as happens with the wasps of our climates, which, on the approach of cold weather, are nearly all cut off.

The nests are found in copse-wood, principally near plantations (at least in Guiana), and are generally suspended at a height of three or four feet from the ground. During the rainy season, from January to the middle of June, only perfect

* Bull. des Sc. par la Soc. Phil., n. 8.

† The *Polistes morio* of Fabricius, who describes the nest from Cuvier's communication. It is the *Epipona Tatua* of Saint Fargeau.

‡ Man. of Ent., transl. by Shuckard, § 296. p. 523.

§ Introd. à l'Entom., ii. p. 508.

nests are to be met with; in January and February the cells are in great measure filled with larvæ; in March and April these decrease in number, and by the end of May scarcely any are to be found. These are thought to turn into females, which, not finding room in their old nursery, emigrate and form new colonies, as when the fine season returns, which is about the middle of June, nests are to be found in progress; but instead of only one female being at work, as is the case with our wasps, Lacordaire has observed as many as a dozen busily engaged in constructing their new abode. As soon as a series of cells is completed larvæ may be found in them, and the nest is gradually increased by the addition of new combs. In September the structure is half finished, and towards the end of November it is most frequently completed. The old nests of the preceding year continue peopled as before, but new larvæ were only observed in them in abundance in September or October; these are believed to turn into neuters: if this is the case, the reverse takes place with the European wasps, the neuters of which are first excluded.

Mr. Walter Hawkins has presented to the collection of the British Museum a pasteboard nest from the banks of the Rio Yancay (Uruguay ?), which differs very materially from both the structures I have alluded to above. It seems to be of the same description as the fabric referred to by Burmeister,—by Westwood* as existing in the Berlin Museum, and appears to me to be identical with the nest of the "Chiguana" wasp referred to by Azara†.

As the accompanying figs., 1 and 2, drawn by Mr. Dinkel, give its shape and general appearance better than any description could do, it is only necessary to say, that, viewed sideways, it is of an oblong form, rounded at the base. The orifices at the side, near the bottom, bulge out considerably.

When viewed from beneath it is somewhat ovate. It is very generally covered with conical knobs of various shapes, nearly all of which are more or less rubbed at the end, but in some places, less exposed, they are pointed, and in many instances nearly three-quarters of an inch long. At the very top, and on the side above the entrance, there are but few of these projections; in two or three places the surface is very distinctly contracted, and in the concavities there are no projecting points; the knobs seem to run in irregular, generally transverse, ridges.

The entrances, as may be seen in fig. 2, are artfully protected by pent roofs from the weather, which, in the rainy season, is

* Introd. to Mod. Classif., ii. p. 251.

† Voyages dans l'Amér. Mérid., i. p. 171.

sometimes very violent; they are also so intricately twisted, as to prevent the ingress of any moth or other enemy, at least of any size. The hardness of the whole mass must tend very much to protect its constructor from the attacks of insect or honey-seeking animals; and the natives, with some degree of probability, believe, that feline and other animals are deterred from taking the nest by the pointed knobs with which it is covered; Mr. Hawkins's correspondent in Buenos Ayres assured him of this.

The substance is hard, the texture close, and, when seen with a slight magnifying power, seems curiously matted*. The natives say that it is principally formed of the dried dung of the "*Capincha*," which, from the description, would appear to be some sort of Water Cavy.

On making a longitudinal section of this singular insect-structure down the middle, I found there were fourteen combs in it, exclusively of a globular mass at the top, seemingly the nucleus of the nest; this is nearly encircled by the two nearest combs. The other twelve are arranged beneath these, the uppermost most nearly approaching a circle in their arrangement as they approximate to the mass at the top. The different "stories" of combs are attached to the common wall of the nest; the entrances to the various compartments are at the sides, a small irregular-shaped space being left between the comb and the outer envelope in various parts of it. *All* the combs are covered to the very edge by the cells, except the parts of them that are immediately close to the orifices of the nest, where, if they existed, they would impede the entrance and exit of the inhabitants. The uppermost combs are thickest, being throughout from seven to five lines in thickness, whilst the lower are not half that depth. The cells are small, hexagonal, and, as in other wasps' nests, have the opening downwards; they are formed of a light *papery* substance, similar in colour to the outer covering. This, as might be expected, is thickest at the top, where, internally, from the meeting of several combs, it is rather loose; at the base it is thinnest. The knobs are solid throughout, and, like the external envelope from which they arise, are formed of numerous layers of "paper" so closely blended as to be hardly di-

* The structure of paper and pasteboard, as made by insects, would form an interesting subject of investigation. In several specimens which I have had an opportunity of examining under a powerful microscope, there seem to exist great differences, some consisting of particles of wood or other vegetable substances, simply agglutinated; while in others these particles appear to have undergone a change within the body of the insect or some other animal, and to have lost all traces of their vegetable origin; others again, as in the present instance, seem to combine both.

stinguishable: the solid wall of the nest at top is about a quarter of an inch in thickness. The nest is nearly sixteen inches long: the broadest part, which is on the same line with the orifices, is more than a foot long; the narrowest point is nine or ten inches. At the base, an imaginary straight line, drawn from the orifices to the opposite side, would be nearly a foot long. It would seem as if the nest was complete; indeed, unless the insects had the power of redissolving the matter at the base, or the inclination to gnaw it off, I cannot see how they could make additions to it.

Many of the uppermost combs have the cells, in the middle, filled with a brownish red honey, which, in its present state, possesses scarcely any smell or taste. The occurrence of honey in the combs is interesting, inasmuch as it still further confirms the accuracy of Azara's observation, and is made by a Vespidous insect having the first joint of the abdomen elongated into a pedicel.

Azara, in the account of his residence in various parts of South America, mentioned the fact of several *wasps* of these countries collecting honey. The Baron Walckenaer, who edited the French translation of this work, published in 1809*, thought that the Spanish traveller, who was unskilled in entomology, had made some mistake with regard to the insects, and regarded the so-called wasps as belonging to some *bee* of the genus, of which the *Apis amalthea* is the type (*Melipona.*) Latreille also believed that they must be referred to the genera *Melipona* or *Trigona*, insects which, in South America, take the place of our honey-bee. These authors were afterwards clearly convinced of the correctness of Azara's observations, by the circumstance of M. Auguste de St. Hilaire† finding near the river Uruguay, an oval grey-coloured nest *of a papery consistence, like that of the European wasps*, suspended from the branches of a small shrub about a foot from the ground. He and two other attendants partook of some honey, and found it of an agreeable sweetness, free from the pharmaceutic taste which so frequently accompanies European honey. He gives a detailed account of its poisonous effects on himself and his two men, in the paper referred to. A. de Saint Hilaire *afterwards* procured specimens of the insect, which was described by Latreille‡ under the name of *Polistes Lecheguana.*

* Voyages dans l'Amér. Mérid., i. p. 165, *note.*

† Mémoires du Muséum, xii. p. 293, etc.; see also Ann. des Sc. (1824), iv. p. 335, etc.

‡ Mém. du Mus., xi. p. 13; xii. pl. 12. fig. B. Mr. Shuckard says (Lardn. Cab. Cycl., Ins., p. 183) *Brachygastra analis* of Perty (del Anim., etc., p. 146. tab. 28. f. 6.) is synonymous, and on comparing descriptions I

Latreille has entered at some length into its history, correcting the mistake he had fallen into in a preceding memoir*. He is inclined to believe that the nest figured by Hernandez† under the name of "Yzaxalasmitl" belongs to the Lecheguana. If this be the case, "Chiguana" or "Lecheguana" must be a name applied to different sorts of wasps‡, as Azara's Chiguana is said expressly to inhabit a hard nest, having the surface covered with prominent inequalities.

In Latreille's insect, the mesothorax is strongly truncated at the end, and the scutellum is rather square and hollowed out behind, the upper portion of the base of the abdomen being applied to it; the pedicel of the abdomen is extremely short. In the insect, specimens of which I found on opening the knob-covered nest I have described, the mesothorax and its scutellum are gradually rounded off, and the first joint of the abdomen is elongated into a pedicel.

I am somewhat at a loss to which of the modern subgenera to refer it, as it seems in some respects to differ from them all. It would come nearest Saint Fargeau's genus *Epipona*, which seems not the *Epipone* of Latreille's former works. From *Polybia* of the same author it would appear to be not distantly removed. I cannot find a description of it in any work I have access to.

Myrapetra §, nov. gen.

Head transverse, wider than the thorax; *stemmata* placed in an equilateral triangle on vertex: *antennæ* (in neuter) 12-jointed, inserted in a depression of the face above the clypeus, rather closer to the edge of the emarginate eyes than they are to each other; torulus deeply punctured. *Mandibles* rather long and stout, with nearly parallel sides; the outer margin with a few hairs, beneath they are hollowed out, and viewed from above seem to have several longitudinal striæ; at the end they are obliquely truncated and furnished with four teeth: the inner, when the mandible is viewed laterally, appears broad and truncated, but when seen from beneath is small and rather sharp; it is not much removed from the other three, which are acuminate, and

can find no difference in them. He proposed in the above volume the name *Nectarina* for Latreille's and Perty's insect, as *Brachygastra* is preoccupied in Entomology; but *Nectarinia* being already used in Ornithology, Mr. Shuckard proposes in lieu of it *Melissaia*, the species being *M. Lecheguana*.

* On South American Bees, published in Humboldt and Bonpland's 'Rec. d'Observ. de Zoologie.'

† Nov. Hist., etc., p. 333. Latreille quotes the other as being in all probability the Lecheguana's nest, but his doing so seems to arise from an inadvertent misquotation.

‡ St. Hilaire speaks of two species being distinguished in the country, one making white and the other reddish honey.

§ A fanciful word compounded of the names of two ancient cities, one in Asia Minor, the other in Arabia.

rise gradually one above another, though, measuring from their base to the tip, they are nearly equal in length. *Clypeus* somewhat longer than broad, somewhat cordate; in front acuminate, and edged with short stiff hairs.

Thorax: mesothoracic scutellum and metathoracic præscutum neither particularly abrupt nor excavated. *Upper wings* as long as the entire insect, with the marginal cell extending considerably nearer to the apex of the wing than the *third submarginal*, which is *dilated on the outer side at the base; second submarginal cell contracted towards the marginal, but has a part of the radial nervure common to both. Legs* rather long; posterior pair having the tarsus longer than the tibia, which terminate in two calcaria, the interior of which is much longer than the other, dilated and obliquely cut at tip (a structure found in many of the neighbouring genera, so that it must play some important part in the œconomy of these insects); the spurs of the first two pair of tibiæ equal in length; the tip of the posterior femora and the base (at least) of the lengthened first joint of tarsus, have each a brush of short hairs.

Abdomen rather slender; the first segment narrowed into a turbinate pedicel, not quite so long as the other segments taken together, at base cylindrical*; second segment very slightly contracted at base, then suddenly campanulate (or rather acorn-cup-shaped) and much larger than the others which it encloses; the tips of it are simple†.

* In Mr. Shuckard's collection, a black Mexican insect, and one at least of St. Fargeau's genera, have this part much depressed.

† There exists in the collection of the British Museum, without locality attached to it, a somewhat longer-bodied but shorter-winged insect, with the first *abdominal segment* pedicellate, the second much broader than in *Myrapetra*, and appearing encircled at the apex by a coronet of short flattened equal processes placed close to each other, somewhat like the peristome of certain mosses; the second segment nearly conceals the other segments, from one of which, however, the processes may arise.

The *clypeus* in this is rather square in front, angulated in the middle, and furnished with several short stiff hairs; the sides in front also angulated.

The *mandibles* are somewhat elongate, rather thicker at base than the tip, which ends obliquely and appears to have four close teeth (the inner indistinct?). The *metathoracic scutellum* is longitudinally hollowed in the middle; the *anterior wings* have the *second submarginal cell somewhat lozenge-shaped, and slightly but distinctly petiolate towards the radial nervure; the third cubital is dilated exteriorly at base.* I propose to name this subgenus *Anthreneida.*

The only species (*A. coronata*, n. sp.) I have seen, is the one alluded to above, which has the thorax and abdomen deeply punctured; it is brownish black, with the first abdominal segment rufous; clypeus in front yellowish, rather smooth. Over the whole of the insect there is more or less of a brownish silky pubescence, more especially on the second large, campanulate, abdominal segment; the wings are clear, except the marginal cell, which is brown (the brown extends somewhat over the radial nervure on the outside of third submarginal cell), and a narrow line of the same colour below costal nerve widening towards the stigma; the flattened abdominal processes are yellowish and margined at the extremity.

The following description may serve to distinguish the species *Myrapetra scutellaris*, n. sp. (Pl. IV. t. 4–7):

M. brunneo-fuliginosa, sericeo ubique pubescens, mesothoracis scutello, metathoracis præscuto flavescentibus; alis hyalinis, stigmate nervisque brunneis.

Hab. Amer. Merid. In Mus. Brit.

It is smooth; the scutellum has a fine impressed dark line down the middle; the stemmata are of an amber colour.

The figure of the insect is lithographed from an outline made by Mr. Westwood at my request, which, however, is slightly altered, as the specimen, when Mr. Westwood drew it, was unset. The section of the nest, fig. 3, was most carefully drawn by Mr. Basire, jun. from the original. In the Museum collection there are two specimens seemingly identical with those I took from the nest, and Mr. Shuckard has shown me a larger specimen which may very probably be the female; this has dark stemmata.

I have been unable to add a description of the maxillæ, palpi or tongue, the last of which, in an insect collecting honey as this does, must be particularly organized; but hope, that when more specimens are met with, I may have an opportunity of doing so.

I may add, that in the nest I found the remains of a black-bodied, black-winged fly, with rufous thorax, allied to *Bibio*; and of a neuropterous insect resembling the *Hemerobius nervosus* in size and markings of wings, but with a longer thorax: the nest described is the specimen alluded to by Mr. Gray, in the 'Synopsis of the British Museum,' p. 27 (ed. 42).

BIBLIOGRAPHICAL NOTICES.

The Principles of Botany. By W. Hughes Willshire, M.D. London, 1840. 8vo, pp. 232.

This work has been written with the immediate view of assisting students of medicine in the acquisition of the amount of botany supposed to be required by the various bodies before whom they present themselves for their licence or diploma. It is perhaps to be regretted that any work should be published professing to give the *minimum* amount of the knowledge of a science required by the members of a liberal profession, and especially of one which, in some points, is so intimately connected with medicine as that of botany. Of late years the structure and functions of all organic bodies have been shown to obey common laws, and a proper knowledge of physiology can only be acquired by studying the organic kingdom as a whole. In this point of view, structural and physiological botany ought to constitute a portion of the fundamental studies of the medical student. We mention

this particularly, because we believe it has been too much the fashion for students to learn, and examiners to require of them, only so much botany as shall enable them to tell the name of a plant when they see it, or, at most, its Linnæan class and order. We do not say this to disparage the work before us; we think Dr. Willshire has done his task well; but we would rather see his book used by medical students as a means of refreshing their memories than as an introduction to the science of botany. The volume is small and unpretending, and the author has succeeded in furnishing a large amount of matter in a small compass.

An outline is given of every department of the science, commencing with structural botany and passing on through the physiology and pathology of plants, and concluding with systematology. A few pages are devoted to morphology, in which the principles of this department are well laid down; but we think that the author might have usefully given more extension to this section of his book, especially as the subject is at present, in systematic botany, one of so much practical importance. In systematic arrangement the author follows DeCandolle, an outline of whose system, with the characters of the natural orders, he has given.

In illustration of the orders medical plants are referred to; but we think that, both for the convenience and use of the medical student, some of the more common wild or garden plants should have been introduced. As a condensed view of the principles of botany up to the time it has been written, we can recommend Dr. Willshire's volume both to the medical student and amateur botanist.

Arcana Entomologica, or Illustrations of new, rare, and interesting Exotic Insects. By J. O. Westwood, F.L.S., &c. No. 1.

Under this title Mr. Westwood has commenced the publication of a work much wanted by English entomologists. It is long since Drury and Donovan's works made us acquainted with the many splendid and singular insects with which the cabinets of English collectors are enriched. Since that time numbers of equally beautiful and singular species have been received in this country, especially from our different possessions abroad, which have either remained undescribed, or have been made known for the most part by short and meagre descriptions.

In the present work Mr. Westwood proposes to describe and figure some of the most interesting of the exotic novelties contained in our collections; and if we may judge by the present part, we may congratulate entomologists upon the proposed undertaking. It contains four plates, each of which consists of several coloured figures; the first plate illustrates several Asiatic cornuted species of *Cetoniidæ*, including both sexes of a new and splendid species brought home by Mr. Cuming. This plate contains not less than twenty different figures of the insects and their generic details. The second plate is devoted to four species of the extraordinary genus *Phyllomorpha*, of

which the *Cimex paradoxus* is the type. Plate 3. represents the transformations of *Papilio Hector* from General Hardwicke's drawings; and Plate 4. illustrates two species of a curious new genus of Locusts.

The plates of this work are drawn by the author himself, who has been so long and well known as a delineator of insects. The figures are drawn with much spirit; although, in delicacy of execution, they will not bear comparison with Mr. Curtis's beautiful work. Figures of plants are also added, which give a more graceful appearance to the plates. The work has our cordial wishes for its success.

Naturhistorisk Tidskrift. Udgivet af Henrik Kröyer. Copenhagen, Vol. I. 1836 and 1837.

We have much pleasure in drawing the attention of the lovers of Natural History to this Journal, established in 1836 as an early and frequent medium of publication for the researches and observations of the naturalists of Denmark, and a vehicle of information relative to those of other countries. The principal articles in the first volume are the following:—

No. I. Prof. Schouw, Nature in Northern Africa.—H. Kröyer, On a new Crab, Geryon:—*Scutum cephalicum* longius quam latius, antice arcuatum, postice truncatum, longitudinaliter valde convexum; *frons* latior, declivis sed parum arcuata; *margines laterales anteriores* nonnihil recurvati, dentibusque prædita validis. *Regio branchialis* expressior apparet, minus vero regio *hepatica*; *pedunculi oculorum* crassi, breves; *margo orbitæ inferior* a fronte disjuncta, orbitaque igitur a fossula antennarum minime seclusa; margo orbitæ superior inferiori prominentior. Articulus antennarum externarum basilaris liber mobilisque; articulus secundus canto oculi interno exceptus ad frontem non prominet; tigellus terminalis longior articulis tribus prioribus plus duplo. Articulus caudalis tertius quartusque maris duobus prioribus latiores. Par pedum tertium et quartum, quæ paria præ ceteris longitudine eminent, inter se fere æqualia sunt.——Species, *G. tridens:* Margines laterales anteriores dentibus armati tribus validis; frons minutis quatuor iisque obtusis prædita; in medio marginis carpi superioris firmus quoque conspicitur dens, minorque in superiore brachii parte.—Chr. Drewsen, On the Migration of young Eels.—H. Kröyer, Ichthyological Notices: new Fish from Greenland, *Chirus præcisus* (Caput nudum; pinna dorsalis unica, longissima, caudali connexa; pinnæ ventrales jugulares; suturæ utrinque quaternæ, quarum ternæ ad mediam fere corporis longitudinem evanescunt. Mem. br. 6, P. pect. 18, ventr. 4, dors. 48, an. 34, caud. 11.), *Blennius lampetræformis.*—J. Schiödte, Monograph of the Danish species of the genus of Insects, *Amara Bonelli.*—Bibliographical Sketch of Geo. Cuvier, by the Editor.

No. II. J. W. Hornemann, On the Danish Flora.—J. Schiödte, On the genus *Amara.*—H. Kröyer, On Parasitic Crustacea, as regards the Danish Fauna; with descriptions of new species.

No. III. G. Forchammer, On Tertiary Fossiliferous Strata at Friderits, and the Bay of Veile.—Botanical Notices, by Drejer.—J. Voigt, Biography of Dr. Carey, founder of the Botanical Garden in Serampore.—Schiödte, On the genus *Amara*.—Kröyer, On Crustacea (*continued*).—Chr. Drewsen and F. Boie, Contributions to the Natural History of the Hymenoptera, with descriptions of new species.

No. IV. J. Schiödte, Synopsis of the *Pompilidæ* of Denmark.—S. Drejer, On *Polygonum*, *Stellaria graminea*.—Prof. Blytt, Botanical Notices.—J. Steenstrup, On the extinct Species of the two families *Anatiferidæ* and *Pollicipedidæ*, Gray.—G. Forchammer, On the Coal Formation of Bornholm, and on the Level of the Sea at Bornholm.—H. Kröyer, Notices of Northern Ichthyology.

No. V. J. W. Hornemann, On the Danish Flora.—Kröyer, On Crustacea (*continued*).—F. Boie, List of the Lepidoptera of Denmark, Schleswig-Holstein and Lauenburg.—H. Kröyer, On *Blennius Lumpinus*.

No. VI. F. Boie, Lepidoptera of Denmark, etc. (*concluded* from No. V).—J.W. Hornemann, On the Danish, Norwegian, and Holstein Botanists and promoters of Botany that have received the honour of having genera of Plants named after them.—J. Schiödte, On a new genus of Braconoïd Ichneumonidæ, *Copisura*.—H. Kröyer, On Parasitic Crustacea.

Tijdschrift voor Natuurlijke Geschiedenis en Physiologie. By Professors Van der Hoeven and De Vriese. Part VI.
Nos. I. and II. 1839.

Contributions to our Microscopical Knowledge of delicate Animal Tissues; by P. Harting.—Some Contributions to the Natural Family of the Cacteæ; by Dr. W. H. De Vriese. In this article the author has given descriptions of some new species of *Echinocactus* and *Mammillaria* cultivated in the Garden of Amsterdam.

Echinocactus macranthus.

E. oblique-globosus, pallide-virescens, basi lignosus, attenuatus, 13-costatus; costis sinubusque acutis; aculeis 10–11; centrali uno longissimo ($6\frac{1}{2}$ centim.); radiantibus brevioribus, horumque summo maximo, infimo brevissimo, deflexo, uncinato; omnibus flavis vel fuscis; areolis exstantibus, ovatis, vel oblongo-ovatis, junioribus densissime velutino-tomentosis.

Mammillaria Pfeifferiana.

M. simplex, ovato-oblonga, glaucescenti-viridis; axillis supremis tomentosis, inferioribus nudis, mammillæ incrassato-conicæ; areolæ nudæ, junioribus tamen tomentosis. Aculeis exterioribus radiantibus, 19 horizontalibus, æqualibus; centrali uno, longissimo, curvatulo, subulato, verticali ratione centro radiorum imposito.

Mammillaria speciosa.

M. simplex, robusta, cylindraceo-columnaris, læte virens, axillis sublanatis, mammillis numerosissimis, exiguis, brevibus, de-

presso-conicis, basi rhomboideis; areolis junioribus tomentosis, reliquis nudis; aculeis radiantibus 22 brevissimis, setiformibus, interioribus 5–6–8 elongatis et horum uno quandoque centrali; omnibus levi tactu deciduis, niveis, centralibus apice rufis.

Mammillaria recurvispina.

M. simplex, glaucescens, subgloboso-depressa, mammillis conico-obtusis, crassis; areolis et axillis nudis. Aculei 8. Unus supremus tenuissimus, infimus longissimus crassior, reliqui tria paria efformant opposita. Omnes sunt reflexi, curvati, radiantes.

Notices respecting *Pæderia*; by P. W. Korthals. The author remarks, that as *Musca vomitoria* is misled by the peculiar smell of the Aroideæ, just so is *M. sarcophaga* misled by plants of this genus.—Description of the Gœttingen Botanic Garden; by Dr. J. F. Hoffmann.—Botanical Notices, by Dr. J. F. Hoffmann: On *Lemna arrhiza*; On the Occurrence of Petiolated Hairs in *Villarsia nymphæoides* and other Aquatic Plants; On the Spontaneous Ignition of *Dictamnus albus*.—F. A. G. Miguel De *Encephalarto horrido*, Lehm., ejusque formis.—Botanical Notices, by C. Mulder: Vegetable Monstrosities.—J. Van der Hoeven on the Heart of the Crocodiles, with an account of our knowledge thereof.—Dr. H. Schlegel on the Nostrils in Sula.—*Notices of Works:* Huschke De Bursæ Fabricii origine; Gould's Birds of Australia; Imhoff's Genera Curculionidum.

No. III.

Anatomy of the Scorpion Fly (*Panorpa communis*); by Dr. A. Brants.—Dr. A. J. D. Steenstra Toussaint De Systemate Uropœtico *Squali glauci*.—Q. M. R. Verhuell on the Differences between *Pieris Napi* and *Pieris Rapæ*.—H. C. Van Hall on the Increase of Trees in Thickness.—A. C. C. F. Van Winter's Geognostical Notices of the Basalts of the Central Rhine.—*Notices of Works:* Analysis of the New Transactions of the First Class of the Royal Institute of the Netherlands; Archives du Muséum d'Histoire Naturelle; Mayer's Comparative Anatomy; Van Deen's Anatomical Description of a monstrous 6-legged Frog; H. Schlegel's Drawings of Amphibia, 2nd Decade; J. Muller on the Auditory Organs in the *Cyclostomi*; Peligot and Decaisne on Sugar Beet-root.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

Nov. 18, 1840.—Read the first part of a Memoir on the Evidences of Glaciers in Scotland and the North of England, by the Rev. Prof. Buckland, D.D., Pres. G.S.

Dr. Buckland's attention was first directed by Prof. Agassiz in October 1838 to the phænomena of polished, striated, and furrowed surfaces on the south-east slope of the Jura, near Neuchâtel, as well as to the transport of the erratic boulders on the Jura, as the effects of ice; but it was not until he had devoted some days to the exami-

nation of actual glaciers in the Alps, that he acquiesced in the correctness of Prof. Agassiz's theory relative to Switzerland. On his return to Neuchâtel from the glaciers of Rosenlaui and Grindelwald, he informed M. Agassiz that he had noticed in Scotland and England phænomena similar to those he had just examined, but which he had attributed to diluvial action: thus in 1811 he had observed on the head rocks on the left side of the gorge of the Tay, near Dunkeld, rounded and polished surfaces; and in 1824, in company with Mr. Lyell, grooves and striæ on granite rocks near the east base of Ben Nevis. About the same time Sir George Mackenzie pointed out to the author in a valley near the base of Ben Wyvis, a high ridge of gravel, laid obliquely across, in a manner inexplicable by any action of water, but in which, after his examination of the effects of glaciers in Switzerland, he recognizes the form and condition of a moraine.

After these general remarks, Dr. Buckland proceeds to describe the evidence of glaciers observed by him in Scotland last autumn, partly before and partly after an excursion, in company with Prof. Agassiz; but he forbears to dwell on the phænomena of parallel terraces, though he is convinced that they are the effects of lakes produced by glaciers.

The district which Dr. Buckland examined previously to his excursion with Prof. Agassiz, lay in the neighbourhood of Dumfries; and the line of country which he investigated subsequently, extended in Scotland from Aberdeen to Forfar, Blair Gowrie, Dunkeld, and by Loch Tumel and Loch Rannoch to Schiehallion and Taymouth, and thence by Crief, Comrie, Loch Earn Head, Callender and Stirling, to Edinburgh; and in England by Berwick, Wollar, the Cheviots, Penrith, and Shap Fell, to Lancashire and Cheshire.

Moraine near Dumfries.—The picturesque ravine of Crickhope Linn, about two miles north of Closeburn, and one mile east of Thornhill, intersects nearly horizontal strata of new red sandstone, and is traversed by the Dolland rivulet. On emerging from the upper end of the ravine a long terminal moraine is visible, stretching nearly across the mountain valley, from which the Dolland Burn descends to fall into Crickhope Linn; and it resembles, when viewed from a distance, a vallum of an ancient camp, being covered with turf. It is formed principally of an unstratified mass of rolled pebbles, derived from the slates of the adjacent Lowder Hills, with a few rounded fragments of granite, the nearest rock of which *in situ* is that of Loch Doon, in Galloway, thirty miles to the north-west. Its height varies from twenty to thirty feet; its breadth at the base is about one hundred feet, and its length is four hundred yards. At the southern extremity it is traversed by the Dolland rivulet, and at the northern by the Crickhope Water; and in the centre it is intersected by a road.

Moraines in Aberdeenshire.—Dr. Buckland considers the gravel and sand which cover the greater part of the granite table-land from Aberdeen to Stonehaven to be the detritus of moraines; and the large insulated tumuli and tortuous ridges of gravel, occupying one hundred acres, near Forden, a mile east of Achinbald, to be terminal

moraines; also the blocks, large pebbles, and small gravel spread over the first level portions of the valley of the North Esk, after emerging from the Sub-Grampians, to be the residue of moraines re-arranged by water.

Moraines in Forfarshire.—The cones and ridges of gravel at Cortachy and Piersie, near Kirriemuir, and at the confluence of the Carity valley with that of the Proson, are considered by Dr. Buckland to have been produced by glaciers, and modified in part subsequently by water. The polish and striæ on a porphyritic rock near the summit of the hill, on the left side of the main valley, and immediately above the moraines, he is of opinion must also be assigned to glacier action. The vast longitudinal and insulated ridges of gravel, extending for two or three miles up the valley east of Blair Gowrie, and the transverse barriers forming a succession of small lakes in the valley of the Lunanburn, to the west of that town, he considers to be moraines; likewise the lofty mounds comprising the ornamental grounds adjacent to Dunkeld Castle; the detritus covering the left flank of the valley of the Tay, along a great part of the road from Dunkeld to Logierait; that on the left flank of the Tumel valley from Logierait to Killicrankie; and on the left flank of the Garrie, from Killicrankie to Blair Athol.

The vast congeries of gravel and boulders on the shoulder of the mountain, exactly opposite the gorge of the Tumel, Dr. Buckland is of opinion was lodged there by glaciers which descended the lateral valley of the Tumel from the north side of Schiehallion and the adjacent mountains, and were forced across the valley of the Garry, in the same manner as modern glaciers of the Alps (that of the Val de Bagne, for example,) descend from the transverse, and extend across the longitudinal valleys. Dr. Buckland mentions the mammillated, polished and striated slate rocks, about one mile above the falls of the Tumel, on the left portal of the gorge of the valley, as the effects of a glacier which descended the gorge: he notices also the rounded outline and polish on veins of quartz, which project eight or ten inches above the weathered surfaces of masses of mica slate near the same locality. Similar mammillated masses of mica slate retaining striæ and flutings are visible at Bohaly, one and a half miles east of Tumel Bridge.

Evidences of Glaciers on Schiehallion.—The north and north-east shoulders of the mountain present rounded, polished, and striated surfaces, many of which have been recently exposed by the construction of new roads. On the left flank of the valley called the Braes of Foss, and near the thirteenth milestone, a newly-exposed porphyry dyke, forty feet wide, exhibited a polished surface and striated, parallel to the line of descent which a glacier from Schiehallion would take; and on the right flank, one hundred yards north of the eleventh milestone, another and smaller dyke of porphyry presented similar phænomena. In the intermediate space the recently uncovered slate rocks and quartzite are rounded, polished, grooved, and striated, parallel to the direction which a glacier would assume where each surface is situated.

Moraines at Taymouth.—Two lofty ridges of gravel, which cross the park at right angles to the sides of the valley between the village of Kenmore and Taymouth Castle, the hill, on which stands an ornamental dairy-house, and the gravel, on which are situated the woods overhanging the left bank of the lower end of Loch Tay, Dr. Buckland considers to be moraines, or the detritus of moraines; also the deeply-scored and fluted boulders of hornblende rock, with other debris near Fortingal, at the junction of Glen Moulin with Glen Lyon.

Moraines in Glen Cofield.—A remarkable group of moraines occurs on the high lands which divide the valleys of the Tay and the Bran; and between the sixteenth and fourteenth milestones thirty or forty round-topped moraines, from thirty to sixty feet high, are crowded together like sepulchral tumuli. These mounds, composed of unstratified gravel and boulders, Dr. Buckland says cannot be referred to the action of water, as they are placed precisely where a current descending from the adjacent high lands would have acted with the greatest velocity; and they exactly resemble some of the moraines in the valley of the Rhone, between Martigny and Löek. The village of Amulrie is considered by the author to stand on a group of low moraines; and the road for two or three miles from it, towards Glen Almond, to traverse small moraines or surfaces of mica slate, rounded by glaciers. A few conical moraines appear also on the high lands between Glen Almond and Crieff.

Proofs of Glaciers in and near Strath Earn.—This part of the valley of the Earn is flanked irregularly with ridges and terraces of gravel, the detritus of moraines; and on its north side, in the woods adjacent to Lawers House, near Comrie, hard slaty rocks of the Devonian or old red sandstone system have been rounded and striated. At the west end of Comrie, near the bridge, blue slate rocks have been also rounded and guttured.

Evidence of Glaciers near Comrie.—In this district Dr. Buckland tested the value of the glacial theory by marking in anticipation on a map the localities where there ought to be evidences of glaciers having existed, if the theory were founded on correct principles. The results coincided with the anticipations. On a hill above the gorge, called the Devil's Caldron, near Fentallich, are rounded surfaces of greenstone, partially covered by moraines; and at Kenagart, also immediately above the Devil's Caldron, is a small cluster of moraines, easily separable into lateral and terminal. Two miles up the valley a medial moraine forms a ridge on the level ground, in front of the confluence of Glen Lednoch and Glen Garron. The farmhouse of Invergeldy is stated to stand on the detritus of a moraine, and the glen descending to it from Ben-na-cho-ny to be partially obstructed with moraines. The surface of the granite at Invergeldy, which supplied the stone for Lord Melville's monument at Crieff, is rounded and mammillated, but too much weathered to present a polish or striæ. On a hill of trap, however, half a mile south of the farm of Lurg, there is a distinct polish, striated in the direction which a glacier descending the subjacent valley would assume. In

Glen Turret, on the shoulder of the mountain immediately above the south-west extremity of Loch Turret, a very deep ravine intersects a vast lateral moraine, which Dr. Buckland shows must have been lodged there whilst the Loch was a mass of ice, and the valley above it filled with a glacier more than five hundred feet above the present level of the lake. At the falls of the Turret, at the lower extremity of the gorge, is an extensive lodgement of moraines; and at the upper end, on the left bank of the Turret, near a gate which crosses the road, the slate-rocks are polished and furrowed; and at both these localities Dr. Buckland had anticipated that glacial action ought to be found.

Evidence of Glaciers near Loch Earn.—On the north bank of the Loch rounded and furrowed surfaces and portions of lateral moraines are exposed by the roadside; and at Loch Earn Head is a group of conical moraines at the junction of Glen Ogle with Loch Earn, and at the very point where, had they been brought by a rapid current, they would have been propelled into the Loch. It is nevertheless the exact position where the terminal moraine of a glacier would be deposited.

Moraines near Callender.—Moraines are stated to cover more or less the valley of the Teith from Loch Katherine to Callender, and the lofty terraces flanking the valley from Callender to Doune are considered to be the detritus of moraines, modified by the great floods which accompanied the melting of the ice. One of them, near Callender, has been mapped as the vallum of a Roman camp. The little lakes on the right bank of the Teith, four miles east of Callender, Dr. Buckland considers due to moraines obstructing the drainage of the country; and the greater part of the first table-land on the right bank of the Teith, between Callender and Doune, including the portion on which stands Mr. Smith's farm, to be composed of re-arranged glacial detritus.

Proofs of Glacial Action at Stirling and Edinburgh.—Having thus shown that glaciers once existed in the glens and mountainous districts of Scotland, Dr. Buckland proceeds to point out the evidence of glacial action at points but little raised above the level of the sea, and distant from any lofty group of mountains. In 1824 he had noticed that the trap-rock then recently exposed on the summit of the hill, between the castle and the church, was polished and striated, but at his last visit in 1840 these evidences had become obliterated by weathering. The grooves and scratches described by Sir James Hall on the Costorphine hills near Edinburgh, and on the surface of Calton Hill, Prof. Agassiz is of opinion cannot be explained by the action of water; but they resemble, he says, the effects produced by the under-surface of modern glaciers. In his recent examination, in company with Mr. McLaren, of the Castle Rock at Edinburgh, Dr. Buckland found further proofs of the correctness of the glacial theory, by discovering at points where he anticipated they would occur, namely, on the north-west angle of the rock, distinct striæ upon a vertical polished surface; and at its base a nearly horizontal portion of rock, covered with deep striæ; also on the south-west

angle obscure traces of striæ and polished surfaces*. Some of these effects may be imagined to have been produced by stones projecting from the sides or bottom of floating masses of ice; but it is impossible, Dr. Buckland observes, to account by such agency for the polish and striæ on rocks at Blackford Hill, two miles south of Edinburgh, pointed out to him by Lord Greenock in 1834. On the south face of this hill, at the base of a nearly vertical cliff of trap, is a natural vault, partly filled with gravel and sand, cemented by a recent infiltration of carbonate of lime. The sides and roof of the vault are highly polished, and covered with striæ, irregularly arranged with respect to the whole surface, but in parallel groups over limited extents. These striæ, Dr. Buckland says, cannot be referred to the action of pebbles moved by water; 1st, because fragments of stone set in motion by a fluid cannot produce such continuous parallel lines; and 2ndly, because if they could produce them, the lines would be parallel to the direction of the current: it is impossible, he adds, to refer them to the effects of stones fixed in floating ice, as no such masses could have come in contact with the roof of a low vault. On the contrary, it is easy, he says, to explain the phænomena of the polish by the long-continued action of fragments of ice forced into the cave laterally from the bottom of a glacier descending the valley, on the margin of which the vault is placed; and the irregular grouping of the parallel striæ to the unequal motion of different fragments of ice, charged with particles of stone firmly fixed in them, like the teeth of a file. The cave is not three hundred feet above the level of the sea, and the proving of glacial action at this point justifies, the author states, the belief that glaciers may also at that period have covered Calton Hill and the Castle Hills of Edinburgh and Stirling.

Dec. 2.—The second part of Dr. Buckland's Memoir on the Evidence of Glaciers in Scotland and the North of England, was read.

The first part of the Memoir concluded with an account of glacial phænomena in the neighbourhood of Edinburgh (see *antè*, p. 326); and the line of country more particularly described in this portion extends southward from Edinburgh by Berwick, Newcastle, the Cheviots, the lake districts of Cumberland and Westmoreland, Kendal and Lancaster, to Shap Fell. A large portion of the low lands between Edinburgh and Haddington is composed of till or unstratified glacier-mud containing pebbles. In the valley of the North Tyne,

* In October 1840, Mr. McLaren found a polished surface on a portion of rock near the south-west base of Arthur's Seat.

Dr. Buckland has in his possession lithographs copied from drawings made by Mr. James Hall, of distinct west and east furrows which extend over a portion of the north side of the summit of Calton Hill, and on the surface of the carboniferous sandstone at Craig Leith Quarry. Dr. Buckland saw similar dressings in 1824 in a sandstone quarry near the house of Lord Jeffrey, two miles west of Edinburgh; and in 1840, in a railway section at Bangholm Bower, one mile north-east of Edinburgh, he found in stratified till and sand many striated and fluted boulders.

about one mile east of Haddington, is a longitudinal moraine midway between, and parallel to, the river and the high road; and Dr. Buckland directs attention to the trap-rocks which commence a little further eastward, and are intersected by the Tyne for four or five miles above Linton, as likely to present scored and striated surfaces, where the valley is most contracted. Four miles west of Dunbar another long and lofty ridge of gravel stretches along the right bank of the river; and for three miles to the south-east of Dunbar extends a series of terraces or modified lateral moraines. In the high valleys at the east extremity of the Lammermuir hills, between Cockburn's Path and Ayton, moraines dispersed in terraces are also visible at various heights on both sides of the river; and on the left margin of the estuary of the Tweed, three miles north of Berwick, round tumuli and oblong mounds of gravel are lodged on the slope of a hill 300 or 400 feet above the level of the sea.

Moraines in Northumberland.—On many parts of the coast of Northumberland, especially near Newcastle, deposits of till rest upon the carboniferous rocks. At the village of North Charlton, between Belford and Alnwick, Mr. C. Trevelyan pointed out to Dr. Buckland in 1821, a tortuous ridge of gravel which was supposed to be an inexplicable work of art; but which he became convinced, after an examination in 1838 of the upper glacier of Grindelwald and that of Rosenlaui, is a lateral moraine. Dr. Buckland was prevented from examining the gorges through which the Burns descend from the eastern extremity of the Cheviots, but he directs attention to them as points where striæ and other proofs of glacial action may be found. Immediately below the vomitories of the eastern valleys of the Cheviots, enormous moraines are stated to cover a tract four miles from north to south, and two from west to east; and the high road to wind among cultivated mounds of them from near Woller, through North and South Middleton, and by West and East Lillburn to Rosedean and Wooperton. On the left bank of the College Burn *, immediately above the bridge at Kirknewton, Dr. Buckland discovered last autumn a moraine thirty feet high, stratified near the top to the depth of a few feet, but composed chiefly of unstratified gravel, inclosing fragmentary portions of a bed of laminated sand about three feet thick. Some of these fragments were in a vertical position, others were inclined, and the laminæ of which they were composed, were, for the greater part, variously contorted. He is of opinion that these detached portions were severed from their original position, moved forward, and contorted by the pressure of a glacier, which descended the deep trough of the College Burn from the northern summit of the Cheviots.

Evidence of Glaciers in the mountains of Cumberland and Westmoreland.—Proofs of glacial action, Dr. Buckland says, are as abundant throughout the lake districts and in the districts in front of the great vomitories through which the waters of the lakes are discharged,

* For a notice by the late Mr. Cully, of a sudden flood in this district in 1830, see Proceedings of the Geological Society, vol. i. p. 149.

as in Scotland and Northumberland. Thus, in the vicinity of Penrith, near the junction of the Eden with the Eamont and the Lowther, are extensive moraines loaded with enormous blocks of porphyry and slate, brought down, Dr. Buckland observes, by glaciers, which descended from the high valleys on the east flanks of Helvellyn, and in the mountains around Patterdale, into the lake of Ulleswater (considered to be then occupied by ice), and from the valleys by which the tributaries of the Lowther descend from the east flank of Martindale, from Haweswater and Mardale. A remarkable group of these moraines is by the road side near Eden Hall four miles east of Penrith; and the detritus of moraines is stated to occupy the greater part of the valley of the Eamont, from Ulleswater to its junction with the Eden. On the southern frontier of these mountains in Westmoreland and Lancashire similar moraines occur on an extensive scale. Thus, immediately below the gorge through which the Kent descends from the mountains of Kentmere and Long Sleddale, many hundred acres of the valley of Kendal are covered with large and lofty insulated piles of gravel; and smaller moraines, or their detritus, nearly fill the valley from Kendal to Morecombe Bay. Five miles north-east of Kendal, on the high road from Shap, on the shoulder of the mountain in front of the valley of Long Sleddale, and at an elevation of 500 feet, a group of moraines occupies about 200 acres, and is distinguished from the adjacent slate rocks by a superior fertility. On the south of Kendal, the high roads from Burton and Milnthorpe to Lancaster, pass for the greater part over moraines or their detritus; and Lancaster Castle, placed in front of the vomitory of the Lune, is stated to stand on a mixed mass of glacial debris, probably derived from the valley of the Lune. The districts of Furness, Ulverston, and Dalton are extensively covered with deep deposits of glacier origin, derived from the mountains surrounding the upper ends of Windermere and Coniston lakes; and they contain a large admixture of clay, in consequence of the slaty nature of many of the mountains. A capping of till and gravel, thirty to forty feet thick, overlies the great vein of hæmatite near Ulverston. The numerous boulders upon the Isle of Walney also indicate the progress of the moraines from Windermere and Coniston to the north-west extremity of Morecombe Bay.

Dr. Buckland was prevented from personally examining, during his late tour, the south-west and west frontiers of the Cumberland mountains, but he conceives that many of the conical hillocks laid down on Fryer's large map of Cumberland, in the valley of the Duddon, at the south base of Harter Fell, are moraines; that some of the hillocks in the same map on the right of the Esk, at the east and west extremities of Muncaster Fell, are also moraines formed by a glacier which descended the west side of Sca Fell; and that many of the hillocks near the village of Wastdale were formed by moraines descending westward. Dr. Buckland is likewise convinced that moraines exist near Church in the Valley; also between Crummoch Water and Lorton, in the valley of the Cocker; and near Isle, in the valley by which the Derwent descends from Bassenthwaite lake

towards Cockermouth, though there are no indications of them on Fryer's map.

Near the centre of the lake district are extensive medial moraines on the shoulder of the hill called the Braw Top, and formed by glaciers at the junction of the valley of the Greta with that of Derwent Water.

Dr. Buckland had no opportunity of seeking for polished and striated surfaces in the high mountain valleys of the lake district; but he found them on a recently exposed surface of greywacke in Dr. Arnold's garden at Fox Howe near Ambleside; likewise near the slate quarry at Rydal; and on newly bared rocks by the side of the road ascending from Grassmere to the Pass of Wythburn; he is also of opinion that many of the round and mammillated rocks at the bottom of the valley, leading from Helvellyn by the above localities to Windermere, owe their form to glacial action.

The remarkable assemblage of boulders of Criffle granite at Shalkbeck, between Carlisle and Cockermouth, Dr. Buckland conceives may have been transported across the Solway Frith on floating masses of ice, in the same manner as the Scandinavian blocks are supposed to have been conveyed across the Baltic to the plains of Northern Germany.

Dispersion of Shap Fell Granite by Ice.—The difficulties which had long attended every attempt to explain the phænomena of the distribution of the Shap Fell boulders, Dr. Buckland considers, are entirely removed by the application of the glacial theory. One of the principal of these difficulties has been to account for their dispersion by the action of water; northwards along the valley, descending from Shap Fell to Shap and Penrith; southwards in the direction of Kendal and Morecombe Bay; and eastward, over the high table-land of Stainmoor Forest, into the valley of the Tees, as far as Darlington. A glacier descending northwards from the Fell would, on the contrary, carry with it, Dr. Buckland says, blocks to the village of Shap, and strew them thickly over the space where they are now found; another, taking a southern course, would drop the boulders on the hills and valleys over which the road descends by High Borough Bridge to Kendal; and a third great glacier, proceeding eastwards betwixt Crosby, Ravensworth, and Orton, would cross transversely the upper part of the valley of the Eden, near Brough, and accumulate piles of ice against the opposite escarpment until they overtopped its lowest depression in Stainmoor Forest, and disgorged their moraines into the valleys of the Greta and the Tees. There are abundant proofs, Dr. Buckland states, of the existence of this glacier in large mud and boulder moraines, in the ascent of the gorge between Shap Fell and Birbeck Fell, and in the furrows and striæ, as well as the mammillated forms of the rocks at the portals of the gorge, particularly on the northern side. In the physical structure of this neighbourhood, Dr. Buckland points out other conditions which would have facilitated the accumulation of glaciers, as the lofty mountains of Yardale Head, which overtop Shap Fell on the north-west, and the still higher mountains

to the west, whose snows must have nourished enormous glaciers; and he concludes by stating that Professor Agassiz, during an independent tour, arrived at similar conclusions respecting the mode by which the Shap boulders were distributed.

ZOOLOGICAL SOCIETY.

August 25, 1840.—W. H. Lloyd, Esq., in the Chair.

Two papers were read, in which the authors resume the descriptions of the Shells collected by H. Cuming, Esq., Corr. Memb., in the Philippine Islands, who exhibited specimens in illustration of the papers.

The first of these papers is from W. J. Broderip, Esq.

Bulinus Dryas. *Bul. testâ elongato-ovatâ, vix subdiaphanâ, peristomate interrupto, crassiusculo, lato, expanso, subrecurvo; nitidè albâ vel flavescente brunneo castaneove vittatâ.*

Var. *a. alba, anfractu basali trivittato, vittâ superiore et inferiore striis nigro-fuscis; mediâ castaneâ, nonnunquam interruptâ.*

This variety is sometimes yellowish, and the three bands on the body-whorl are nearly uniform chestnut.

Var. *b. anfractu basali bicincto, vittâ superiore angustâ, vittâ inferiore tristrigatâ.*

Var. *c. anfractu basali nitidè albo, vittâ superiore et inferiore angustis nigrescentibus limbato.*

Var. *d. Pallidè flava fasciâ suturali albente, anfractu basali vittâ superiore et inferiore angustissimis, castaneis limbato; cæteris castaneo univittatâ.*

Var. *e. Tota alba.*

Hab. ad Mansalai in insulâ Mindoro.

Legit H. Cuming in sylvis.

Mr. Cuming informs us that the animal of this elegant shell, which in the form of the spire and the distribution of the colouring, though not in the colouring itself, reminds the observer of *Achatinæ fasciata, emarginata* and *virginea* of Swainson (Zool. Ill.), varies much. In all the varieties the broadly expanded lip is white, both above and below, and the bands of the body-whorl terminate abruptly upon its upper part, so that the shell almost looks as if the wide white lip had been added to some of the Riband *Achatinæ*, for varieties of which some of the young might be taken by a cursory observer. The animal was ash-coloured, darker above. General length of the shell about two inches; width of body-whorl from $\frac{6}{8}$ths to $\frac{7}{8}$ths of an inch.

Bulinus Sylvanus. *Bul. testâ elongato-ovatâ, subdiaphanâ, subpyramidali, anfractibus ventricosioribus, fuscâ castaneo vittatâ, strigis et maculis flaventibus vel albentibus, longitudinalibus pictâ; peritremate interrupto, columellæ basi subsinuatâ, aperturâ subauriculari; labro expanso, recurvo.*

Var. *a. Fusca vel flavescens fasciâ suturali tenui albâ, apice pur-*

purascente, anfractu basali castaneo trifasciato, fasciis inferioribus maximis, strigis angulatis longitudinalibus picto, anfractibus cæteris frequentissimè longitudinaliter strigatis et maculatis.

Var. *b. Nitidè flavescens, anfractu basali castaneo quadrivittato.*

Var. *c. Flavescens anfractu basali bivittato.*

Several of this variety have traces of the longitudinal zigzag lines and spots upon the body-whorl.

Var. *d. Ventricosior, anfractu basali trivittato, apice purpurascente, vittis nigricantibus.*

Var. *e. Sordidè fusca strigis et maculis angulatis elongatis obscurè sparsa.*

Var. *f. Tota flavescens, lineâ tenuissimâ suturali albâ, gracilior.*

Hab. In insulâ Mindoro.

Legit H. Cuming in sylvis.

Some of the varieties of this fine shell, especially variety *b*, will remind the observer, at first sight, of the species last described; but Mr. Cuming informs us that the animal is reddish brown, and, besides other differences in the shell, the colouring-matter, instead of stopping short at that point of the body-whorl, just where the lip begins to expand, is continued on to the very rim, which is in most instances bordered with it; nay, the colour generally becomes more intense upon the upper part of the expansion. Varieties *d.* and *e.* were found at Calapan; varieties *c.* and *f.* at Puerto Galero. The latter variety has generally a chestnut oblique stripe or spot at the bottom of the whorl and on the upper expansion of the outer lip, continued from above the *columella.* Sometimes there is an obscure line of a somewhat darker hue belting the body-whorl in this same variety.

This species varies a good deal in length and breadth. The average length may be taken at about two inches, and the width across the body-whorl at from more than an inch to $\frac{6}{8}$ths of an inch.

Bulinus fictilis. *Bul. testâ subpupiformi, anfractibus sex ventricosis, lineis incrementi obliquis fortioribus, peristomate interrupto, expanso, crassiusculo, labro expanso, aperturâ subauriculari, suprà subangulatâ, albâ.*

Var. *a. Nitidè fusca strigis, punctis, lineisque albentibus notata, anfractûs basalis vittâ suturali angustâ subalbidâ.*

Var. *b. Albescens, strigis maculisque castaneo-nigricantibus longitudinalibus, clarioribus.*

Var. *c. Flavescens, lineis strigisque longitudinalibus albentibus, anfractûs basalis fasciâ angustâ obscurâ.*

Var. *d. Griseo-albens vel albens, strigis longitudinalibus albidis.*

Hab. in insulâ Philippinâ Cuyo dictâ.

Legit H. Cuming in sylvis.

In var. *a.* the dark ground-colour of the shell is striped, and powdered, as it were, with the whitish *epidermis*; in var. *b.* this whitish *epidermis* predominates, so that the longitudinal zebra-like stripes arising from the exposure of the dark brown, but shining ground-colour, are comparatively distinct. Var. *d.* seems to be the albino-

state of the species. General length about $1\frac{5}{8}$ths inch; breadth about $\frac{5}{8}$ths.

BULINUS LARVATUS. *Bul. testâ elongato-pyramidali, gracili, subdiaphanâ, lineis incrementi obliquis, aperturâ auriculari, supernè angustatâ, labro crasso, expanso, recurvo, fuscâ strigis pallidis obliquè longitudinalibus, distantibus, variâ; aperturâ albâ; labri margine externo infernè fusco limbato.*

Hab. in insulâ Cuyo.

Legit H. Cuming in sylvis.

It is not without doubt that I have separated this shell specifically from the last; but in addition to the difference of shape, the colouring matter, here again, instead of stopping short just above the outer lip, where it begins to expand, as is the case with *Bul. fictilis*, is carried on and over the external expanse of the outer lip, so as to constitute a coloured rim on its lower external edge. In other respects there is much similarity between the two. General length about $1\frac{1}{2}$ inch; breadth across body-whorl rather more than half an inch.—W. J. B.

Following is the continuation of Mr. G. B. Sowerby's paper:—

HELIX DECIPIENS. *Hel. testâ globosâ, tenuis, lævis, haud nitens, striis incrementi subtilissimè striata, plerumque pallescens, nonnunquam unicolor, sæpius zonis duabus nigris ornata; anfractibus quatuor, rotundatis, ultimo maximo; aperturâ subcirculari; peritremate reflexo, albo, columellâ albâ, subincurvâ, rectiusculâ.*

Long. 1·2, lat. 1·35.

Hab. supra folia arborum ad insulam Marinduque, Philippinarum.

The appearance of the different varieties of this species might lead to the supposition that they were distinct species, in consequence of the peculiarities of the outer portion of the epidermis. The whole epidermis of this species seems worthy of particular notice: it consists of an inner coat, which is rather thick, horny, apparently strongly adhesive, and of a greenish brown yellow colour; and of an outer partial coat, which is white and hydrophanous, and which does not entirely cover the inner coat, but is variously arranged upon it in the different varieties. The following are the most remarkable varieties:—

a. Shell brown, with two very dark-brown spiral bands, a lighter antesutural band, and a very dark columellar band. Lip white at the back as well as in front. From the island of Marinduque.

b. Shell coloured similarly to the last, but having its outer surface slightly rugulose. From the same locality.

c. Shell coloured similarly to the two former, but with an external white epidermis disposed in slightly interrupted spiral bands. Found on the leaves of trees in Tayabas, in the province of Tayabas, Island of Luzon.

d. Shell light brown, with a dark-coloured antesutural band, and very dark columellar band; external white epidermis disposed as the last. From the same locality.

e. Shell brown, not banded, with the white external epidermis

disposed in irregular and interrupted lines, nearly following the direction of the lines of growth, but increasing in width so as to form an interrupted band at the circumference of the shell. Found on the leaves of small trees on the island of Capul.

f. Shell pale brownish yellow, with the white external epidermis similarly disposed, but forming two rather broader and less interrupted bands, one at the circumference and the other anterior. From the same locality.

g. Shell white, with alternating light and dark brown bands; antesutural line and band round the columella dark brown. From Ligao, South Camarenis, island of Luzon: found on the leaves of trees.

h. Similar to *g*, but the alternating bands are dark brown and black; the antesutural line and the band round the columella also are black. From Pasacao, South Camarenis: found on the leaves of trees.

i. Similar to the last, only destitute of the central brown band. From the same locality as *h*.

k. Shell white, with three brown bands; antesutural line and columellar band of the same colour. From Ligao.

l. Shell white, with two brown bands; antesutural line and columellar band of the same colour. From Ligao.

m. Shell white, with a single brown band at its circumference. From Ligao.

n. Shell white, with alternately very pale and dark brown bands; antesutural line and columellar band dark brown. From Ligao.

o. Shell very pale brown, with a very thin epidermis; two dark brown bands, the one before and the other behind the light brown circumferential band; antesutural line and columellar band dark brown. From Ligao.

p. Shell totally white. Also from Ligao.

Helix opalinus. *Hel. testa pyramidalis, conica, obtusa, hyalina, tenuis, albido-viridescens, lævis, nitida, striis incrementi tenuissimis solùm sculpta; anfractibus senis, subconvexis, ultimo anticè obtusè subcarinato; suturâ distinctâ, anticè lineâ albâ angustissimâ; aperturâ obliquâ, subrotundatâ, supernè basi ultimi anfractûs ferè planâ modificatâ; peritremate subreflexo, propè columellam subincrassato; columellâ albâ, subincurvâ, sulco subobsoleto circumdatâ.*

Long. 1·25, lat. 0·8.

Hab. supra folia fruticum propè St. Jaun, Provinciam Cagayan Insulæ Luzonicæ.

A remarkably delicate species, having nearly the form of *Helix pileus*; it is, however, narrower in proportion to its height, its volutions are less numerous, and rather more convex. This elegant species has the usual colour and semitransparency of the *Semi-Opal*, which, however, becomes rather greener towards the base.

Helix cincinnus. *Hel. testa ovato-pyramidalis, tenuis, lævis, plerùmque nitida, subhyalina; epidermide albo fuscoque variâ, haud nitidâ nonnunquam induta; spirâ elatiusculâ, obtusâ; anfracti-*

bus senis, convexiusculis, solùm striis incrementi tenuibus indutis; suturâ distinctâ; aperturâ subovali, posticè acuminatiusculâ, supernè basi anfractûs ultimi rotundatâ modificatâ, sinistrorsùm sinuatâ; peritremate angusto, reflexo; columellâ albâ, anticè perobliquè subtruncatâ.

Long. 1·8, lat. 1·1.

Hab. supra folia arborum ad Insulas Philippinas.

Another very variable species, particularly in its colouring and in the characters dependent upon its epidermis. Numerous, however, as its varieties are, and abundant as the species is, it does not appear to have been described either by Lamarck or De Férussac; indeed, I have not been able to find any species nearly approaching it, except *Helix ventricosa*, De Fér., which is figured in Chemn. vol. ix. f. 1007, 1008, and which somewhat resembles the banded variety of our shell. The following varieties have been brought by Mr. Cuming:—

a. Shell white, last volution pale green, which is darker in its anterior part. From the island of Rumblon.

b. The same as *a*, but having a dark brown band surrounding the columella. On some specimens of this variety the remains of a dark brown epidermis is to be seen about the anterior part of the last volution. From the island of Burias.

c. Shell white, with a pink band surrounding the columella, and scattered remains of a dark brown epidermis on the last volution. From Temple Island.

d. Shell white, with a dark brown band surrounding the columella, and scattered remains of a dark brown epidermis on the last volution. From the island of Burias.

e. Shell rose-colour, with scattered remains of a dark brown epidermis about the anterior part of the last volution. From Temple Island.

f. Shell red-brown, with a dark brown band surrounding the columella, and scattered remains of a dark brown epidermis about the anterior part of the last volution. From Temple Island.

g. Shell light red-brown, with a dark brown band surrounding the columella, and mottled with a nearly white, hydrophanous and a dark brown epidermis, which becomes altogether darker coloured toward the anterior part of the last volution. From the island of Burias.

h. Shell pink, epidermis as in *g*. From the island of Burias.

i. Shell white, with the dark brown columellar band and epidermis as in *g*. From the island of Burias.

k. Shell white, very pale greenish toward the anterior part of the last volution, with a broad dark brown columellar band, a narrow brown band at the circumference of the shell, and a pale antesutural brown band. From the island of Burias.

l. Coloured as *k*, but with broader and darker bands. From the same locality.

Bulinus ovoideus, Brug. *Bul. testa ovato-oblonga, ovoidea, alba lævis, striis incrementi exilissimis obliquis solùm sculpta, zonis*

nigris variis plerumque ornata; anfractibus quinque subventricosis, ultimo spiram ferè duplo longiori, aperturâ subovatâ, posticè subacuminatâ, intùs albâ, zonas exhibentibus; peritremate reflexo, albo; columellâ rectiusculâ, labio columellari subincrassato, anticè reflexo, ad labium externum adjuncto.

Hab. ad insulam Ticao Philippinarum.

This species has been inadvertently figured in the 'Conchological Illustrations' under the name of *Luzonicus*, having previously been figured by De Férussac in his 'Hist. Nat. des Mollusques terrestres et fluviatiles,' tab. 112. f. 5, 6, and described in the 'Encycl. Méthod., by Bruguière* under the name of *ovoideus*, which name must of course be retained. Bruguière's specimen was quite white; those figured by Lister and De Férussac had a single dark band. Mr. Cuming has brought the following varieties:—

a. White, the anterior part of the first three volutions light brown. From the island of Masbate, on leaves of trees.

b. White, with three broad brown bands close behind the suture.

c. The same as the last, with an additional black band in front of the postsutural band.

d. White, with a narrow brown band behind the suture.

e. Brownish white, with perfectly white antesutural band, and three very broad dark brown bands.

f. White, with two dark brown bands, both anterior to the circumference of the shell.

g. White, with a single dark brown band. This is the variety that has been figured in 'Conch. Illustr.,' Bulinus, f. 53, under the name of *B. Luzonicus*; it is also given in Guérin's 'Magazin de Conchyliologie' (1838), tab. 116. f. 2. under the name of *B. Costerii*: of course both these names must be abandoned in favour of the older name of Bruguière.

h. Entirely white. This variety is of smaller size than most of the others.

i. Apex reddish brown, ground-colour white; anterior part of the last volution pale brown, with three dark brown bands.

k. Apex white or pale reddish, antesutural band white; then two broad dark brown bands, nearly confluent; then a lighter brown band, sometimes nearly white; then a broad dark brown band; and finally, the circumference of the columella white.

l. White, with two dark brown bands in front, and a very narrow light brown band behind the circumference.

Helix Albaiensis. *Hel. testa subglobosa, depressiuscula, tenuis, lævis, alba, plerumque fusco-zonata, lineis incrementi tenuissimis solùm insculpta; spirâ subdepressâ, anfractibus 3½ subconvexis, ultimo maximo inflato; aperturâ extùs rotundatâ; peritremate albo, rotundato, reflexo, mediocri; intùs sinuatâ, sinu profundo, anticè per columellam, latiusculam, albam, posticè per modificationem anfractûs penultimi efformato; suturâ subinconspicuâ.*

Long. 1·2; lat. 1·5 poll.

* Hist. Nat. des Vers, tome vi. p. 335.

Hab. supra folia fruticum apud Matnog, Provinciam Albaiensem insulæ Luzonicæ.

The following three varieties of this new species have been discovered by Mr. Cuming, viz. :—

a. White, with a little light brown at the apex and outside the columellar lip.

b. White, with two brown bands, one anterior to, and the other posterior to, the circumference of the shell; a dark brown antesutural line and a dark brown band outside the columellar lip.

c. The same as *b*, with the two brown bands nearly meeting over the circumference.

Helix aurata. *Hel. testa depressiusculo-subglobosa, tenuis, lævis, subnitens, flava, apice roseo; spirâ rotundato-depressâ; anfractibus* $3\frac{1}{2}$ *convexis, ultimo maximo; aperturâ semilunari, latâ, posticè basi ultimi anfractûs gibbosâ modificatâ; labio externo posticè paululùm coarctato, deinde subreflexo, albo, crassiori, rotundato; columellâ albâ, latâ, subincrassatâ; suturâ distinctâ.*

Long. 0·9; lat. 1·4 poll.

Hab. in foliis arborum ad St. Jaun Provinciam Cagayan Insulæ Luzonicæ Philippinarum.

Two varieties of this remarkable and beautiful species have been found by Mr. Cuming. The similarity of the young shell to *Helix picta* is very great: the full-grown shell differs, however, very much in shape from that species. Both varieties are remarkable for a bright red apex.

Var. *a.* Bright yellow, with a scarlet band placed just before the suture, beginning at the second volution and increasing in breadth with the growth of the shell: this var. has also a blue line on the outside a little in front of the scarlet band, which is black within.

Var. *b.* Upper half of the shell bright yellow; lower half white.

Helix Roissyana, De F. *Hel. testa subglobosa, crassiuscula, lævis, coloribus plerumque albo, nigroque fasciata, et ut assolent epidermide obscurâ, haud nitente, obtecta; spirâ obtusissimâ; anfractibus* $4\frac{1}{2}$, *rotundatis, subventricosis, ultimo maximo, cæteris quadruplo longiori; suturâ distinctâ; aperturâ sublunari, intùs albâ, labii externi margine arctè revolutâ, nigrâ, columellari albâ; columellâ rectiusculâ, planulatâ, albâ s. albicante.*

Helix Roissyana, De Fér. 'Hist. Nat. générale et particulière des Mollusques terrestres et fluviatiles,' tab. 104. f. 2, 3.

Long. 1·2; lat. 1·4 poll.

Hab. propè Puerto Galero ad Insulam Mindoro, Philippinarum.

Five principal varieties of this species are remarkable; one alone has been represented, though not described by De Férussac. If the colours alone were to be depended upon as specific characters, two of these varieties would be considered distinct species. Deshayes has omitted to mention or to describe this species in his second edition of Lamarck (Anim. sans Vert.); I am therefore much gratified by having the opportunity afforded me of pointing out its characters and making known its several varieties.

Var. *a*. White, with a yellowish epidermis, a very dark brown, almost black, antesutural band, and a rather broad, black band surrounding the columella.

Var. *b*. The same as the last, with an additional broad intermediate anterior black band.

Var. *c*. Similar to the last, with the addition of a black band anterior to the sutural band, and with the anterior intermediate band much wider.

Varieties *a*, *b*, *c*, are all found at Puerto Galero.

Var. *d*. Nearly black all over, and only showing more or less distinct remains of white on the three first volutions; epidermis very thin and nearly colourless. Found at Calapan, in the Island of Mindoro.

Var. *e*. Of a dark chestnut-brown colour, with the same arrangement of colour as the last, but covered with a thickish, brown, opake, hydrophanous epidermis. From Puerto Galero.

I am compelled to regard as a variety of this species a shell which Mr. Cuming has brought from the island of Tablas, whose spire is more elevated, having nearly five volutions; it is of a dark colour, with more or less distinct lighter bands, and the same thickish, brown, opake, hydrophanous epidermis as the last: its columella, and the columellar lip, are of a brownish purple. I designate this as Var. *f*.

The figure given by De Férussac represents a rather dwarf variety, of which I have seen a specimen in Mr. Metcalfe's collection.

Helix (Cochlogena, De F.) ignobilis. *Hel. testa subglobosoconica, tenuis, albicans, subhyalina, fasciis duabus castaneis ornata; spirâ subconoideâ; anfractibus* $4\frac{1}{2}$, *lævibus, nitidis, subplanulatis, striis incrementi tenuissimis solùm sculptis; suturâ distinctâ; aperturâ subrotundâ, intùs albâ, fasciis duabus conspicuis; peritremate reflexo, rotundato, albo; columellâ rectiusculâ continuo.*

Long. 1·2; lat. 1·2 poll.

Hab. ad insulam Romblon, Philippinarum.

The subconical form of the spire, with very slightly ventricose volutions, distinguish this from all its most nearly-related species. When young it is slightly carinated. The anterior part of the last volution is usually coloured of a pale yellowish tint.

Helix (Cochlogena, De F.) tenera. *Hel. testa subglobosa, tenuis, alba, subhyalina; spirâ subacuminatâ, obtusâ; anfractibus* $4\frac{1}{2}$, *lævibus, subventricosis, striis incrementi tenuissimis solùm insculptis, ultimo fasciâ angustâ, viridi picto; suturâ distinctâ; aperturâ subrotundâ, intùs albâ fasciâ solitariâ subinconspicuâ; peritremate tenui, reflexo, albo; columellâ latiusculâ, rectiusculâ, albâ, extùs anticè subangulatâ.*

Long. 1; lat. 1 poll.

Hab. propè Mansalai ad insulam Mindoro, Philippinarum.

Var. b. *fasciis duabus castaneo-nigris.*

Nearly related to the last (*H. ignobilis*): it may be distinguished by being rather smaller, by having its volutions rather more convex,

its peritreme thinner, its columella straighter, and angular in front externally. A variety occurs with two dark brown, nearly black, bands, the one above and the other below the ordinary green band. The posterior of these is seen nearly up to the apex.

HELIX (COCHLOGENA, De F.) COLLODES. *Hel. testa subglobosa, tenuiuscula, nitida, alba; epidermide lutescente induta, apice roseo; spirâ subelatâ, obtusâ; anfractibus quinque, ventricosis, ultimo ad basin paululùm planulato; suturâ distinctâ, anticè castaneâ; aperturâ subrotundâ, intùs albâ; peritremate reflexo, nigricante; columellâ albicante, paululùm recurvâ.*

Long. 1·2; lat. 1·2 poll.

Hab. ad insulam Tablas, Philippinarum.

I have named this species *collodes*, in consequence of the remarkable appearance of the epidermis, like a coat of glue covering all the outer surface except the apex. In form this species is much like *H. ignobilis*; its spire is not, however, so much acuminated, and the apex is much more obtuse than in that species: its peritreme, moreover, is thinner, and although reflected, it is not rounded as in that species.

HELIX (COCHLOSTYLA, De F.) ORBITULUS. *Hel. testa subglobosa, crassiuscula, lævis, obliquè lineis incrementi tenerrimè insculpta; anfractibus* $4\frac{1}{2}$ *ad* 5, *subventricosis, ultimo maximo, ventricosiori; suturâ distinctâ, anticè albâ; aperturâ subrotundâ, intùs albâ; peritremate latiusculo, rotundato, reflexo, albo; columellâ albâ, rectiusculâ, paululùm inflexâ.*

Long. 1·1; lat. 1·1 poll.

Hab. propè Mansalai ad insulam Mindoro, Philippinarum.

Var. *a.* Shell nearly globular; spire very obtuse, white, base dull yellowish; two spiral green bands commence at about the third volution, and increase in width and strength of colour until they reach the back of the outer lip; of these the lower is by much the broader.

Var. *b.* Shell *oblong*, and coloured in the same manner as the last; but the last volution is green above (the anterior side of the suture being always pure white), increasing in intensity from its commencement: in this variety the dull yellowish colour of the anterior or basal part of the last volution is much deeper than in var. *a.*

Var. *c.* Shell larger; its volutions rather more ventricose, similar to the last in colouring, but having two additional dark brown, nearly black bands, which are distinctly seen within. This is by far the largest and handsomest variety of the three.

Note.—"M. Valenciennes informs me that this species was brought in 1830 by the officers of the 'Favourite,' and placed in the galleries of the Museum of Paris, under the name of *H. chlorogrammica*, Val.; but as it does not appear that he has published either the name or any description of the species, I continue to use the name which I have given it above."

HELIX (COCHLOSTYLA, De F.) OOMORPHA. *Hel. testa ovato-oblonga, crassa, obscura, spiraliter tenuitèr substriata, lineis incrementi decussata; anfractibus quinque subventricosis; suturâ di-*

stinctâ; apertûrâ suborbiculari, intùs obscurâ; peritremate ferè continuo, albo, reflexo, rotundato; columellâ subundatâ, labio columellari extenso, ad umbilicum fere velato; umbilico mediocri.

Long. 1·1; lat. 0·7 poll.

Hab. ad insulam Tablas dictam, Philippinarum.

Mr. Cuming has obtained only a single specimen of this species: it is very different from all the others, its peritreme being continuous nearly all round, the only interruption being about a seventh where it is intersected by the last volution; colour dull light brown, with a dark brown band in front of the suture; the greater part of the last volution dark brown, and having a light narrow band near the umbilicus in addition to the light band near the suture.

Helix incompta. *Hel. testa ovata, tenuiuscula, obscura; epidermide fuscâ, haud nitente induta, obliquè tenuiter lineis incrementi striata; anfractibus quinque subconvexis, ultimo majori; suturâ distinctâ, anticè posticèque fuscâ; apertûrâ subrotundâ, posticè subacuminatâ; peritremate tenuiter reflexo, rotundato, anticè subtruncato, albo; columellâ rectâ, albâ, anticè subtruncatâ.*

Long. 1·1; lat. 0·66 poll.

Hab. ad insulam Tablas dictam, Philippinarum.

Nearly resembling the last in shape and in its dull surface, but differs in having no umbilicus, and in its peritreme not being nearly so continuous. The last volution has its suture brown, a brown band in the middle and another round the columella. A single specimen only was found.

Helix stabilis. *Hel. testa ovoidea, solidiuscula, lævis, nitidiuscula, alba; anfractibus senis, paululùm convexis, anticè castaneis, nigro-fasciatis, obliquè lineis incrementi striatis; apertûrâ obliquâ, subovatâ, intùs albâ, peristomate albo, incrassato, rotundato, anticè subeffuso; columellâ albâ, inconspicuâ, labio columellari paululùm expanso.*

Long. 1·35; lat. 0·8 poll.

A species which in general appearance bears some resemblance to *Bulinus ovoideus* of Brug. and De F., tab. 112. f. 5, 6. (the same as *B. Luzonicus*, 'Conch. Illustr.' Bulinus, f. 53.); this species, however, increases more rapidly toward the anterior part; it has, moreover, one more volution. The aperture is placed very obliquely, so that the shell stands firmly when placed upon it. The dark burnt colour of the anterior part of this shell is seen in every volution in the form of a spiral postsutural band. It has a thick light-coloured epidermis, of which some traces have not been entirely effaced.—G.B.S.

WERNERIAN NATURAL HISTORY SOCIETY OF EDINBURGH.

April 17, 1841.—Professor Jameson in the Chair.

A paper was first read "On the Nature and Currents of the Atmosphere, and their Influence on the Variations of the Height of the Barometer." By William Brown, Esq.

Mr. Goodsir then read a paper "On a new Genus, with descrip-

tions of some new Species of *Pycnoganidæ.* With specimens and drawings." By Mr. Henry Goodsir, Surgeon, Anstruther.

Of the genus *Orithegia,* one species was described, *O. globosa*; of *Pallene* one species, *P. circularis*; of *Nymphon* four species, *N. pellucidum, spinosum, minutum, Knoxii*; and one species of a new genus, *Pephredo,—P. capillata.* One of these new Crustaceans was taken in Orkney, the others in the German Ocean and Firth of Forth. The paper concluded with some observations on the circulation in this family, and on the generative organs, the orifices of which the author has detected on the under surface of the body, at the insertion of one of the pairs of legs.

Mr. Goodsir then communicated a paper by Mr. Forbes and himself, "On a new genus of Ascidian Mollusks." This genus the authors styled *Pelonaia,* and characterized thus: *Testa* cylindrical, unattached; orifices without rays, on two equal, approximated, papillose eminences at the anterior extremity. They described two species,—*P. corrugata,* from the Firth of Forth, and *P. glabra,* from Rothsay Bay. The anatomy of both species was given in detail, and differed from that of the attached *Ascidiæ* in its perfect bilaterality. The authors adverted to the value of the genus as a connecting link between the Molluscous and Annulose animals, and referred to its analogical relations to certain of the *Echinodermata.*

ROYAL SOCIETY OF EDINBURGH.

May 3rd, 1841.—Lord Greenock in the Chair.

The first communication was entitled "Experimental Researches on the Production of Silicon from Paracyanogen." By S. Brown, M.D.

The author had intimated in a former paper that he had been led to infer from experiment, that two familiar substances, long and universally regarded as distinct elements, are only modifications of one and the same material form; and having extended his inquiries, he now ventures to maintain that carbon and silicon are isomeric bodies. The method in which he establishes this proposition is very simple, and consists in the description of a number of processes by which carbon may be transformed into silicon; and crucial experiments, intended to prove that there is no intelligible source of fallacy in the processes which are given. Accordingly, the present communication is of a purely practical character. It is composed of five sections: the first treats of the production of silicon from free paracyanogen; the second, of the formation of amorphous mixed siliciures of copper, iron, and platinum, by the reaction of paracyanogen on these metals; the third, of the quantity of nitrogen separated from paracyanogen when it is changed into nitrogen and silicon; the fourth describes processes for the preparation of definite and crystalline siliciures of iron from the paracyanide of iron, and from the ferrocyanide of potassium; and the fifth gives easy formulæ for the extraction of silicic acid from the ferrocyanide of potassium by the action of carbonate of potassa.

Our reason for noticing this investigation in a periodical devoted to the objects of natural history, is this: If Dr. Brown's observations be corroborated by those who repeat his singular experiments,

there will be opened up a new sphere of geological inquiry of the highest order. With the aid of a transelemental chemistry (for we understand Dr. Brown has transformed several other elementary forms besides carbon) we may approach the subject of the molecular genesis of the earth; and the geological relations of carbon and silicon are certainly sufficiently striking to warrant the entertainment of this hope. As it is, there are several points in natural history which seem to be illustrated by the particular case of transformation now in hand. As one instance, we would specify the siliceous character of many organic remains found in circumstances in which the source of silicon is perplexing and unintelligible.

In the discussion which followed, Professor Traill remarked, that though he had not had an opportunity of repeating Dr. Brown's experiments, yet, from his acquaintance with that gentleman, he had a strong conviction of their value; and this notwithstanding the very startling principles and extraordinary conclusions to which they necessarily led. He had no hesitation in saying, that since the early days of Davy, when that great chemist brought the metalloids to light, no investigation had been made approximating in importance to the present, whose publication would do honour to the Society, and whose interest, as it regarded the subjects of Botany, Palæontology and Geology, in its widest range, was altogether unbounded.

Professor Christison begged to meet a statement which he understood had gone abroad, that he had given a guarantee to the accuracy of these investigations. This was by no means the case. The fact was, that, now for some time otherwise employed, he was not capable even of testing these admirable experiments: no one, in fact, could do so but a first-rate analytic chemist, perfectly master of the most recent manipulations of the laboratory; and he would warn every one against coming to a decision regarding these conclusions, well styled *startling*, either for or against, without such preliminary investigation. At the same time, it was true that he had been familiar with the details of the inquiry; he had searched, along with the author, but in vain, for grounds of fallacy, and he formed the very highest estimate of their value and importance.

Professor Syme communicated a paper by Mr. Goodsir, "On the Anatomy of *Amphioxus lanceolatus* of Yarrell."

After a short statement of the labours of Yarrell, Couch, Retzius and Müller, the author gave a detailed description of the structure of *Amphioxus*, as observed in the dissection of one of two specimens taken by Mr. Forbes in the Irish Sea. The abdominal folds, and the anterior and posterior anal fins were described, and the existence of a fin in front of the anus illustrated by an observation made by Professor Agassiz, of the temporary existence of a similar fin in the embryos of certain freshwater fishes.

The osseous system presented two divisions,—the true or neuro-skeleton, and the intestinal or splanchno-skeleton. The true skeleton consisted of a chorda dorsalis, equally pointed at both extremities, without the slightest trace of a cranium, and destitute of any of the peripheral vertebral elements, with the exception of a row of cells—

germs of interspinous bones and fin-rays—along the base of the dorsal and anal fins. The tissue of this neuro-skeleton was not even cartilaginous, consisting merely of membrane and globular nuclei, derived from the original elementary cells. The splanchno-skeleton consisted of a hyoid apparatus, and of 70 to 80 pairs of elastic filamentous ribs. The hyoid apparatus—in two divisions, with 17 pieces in each—exhibited 34 rays, pointing inwards, and each springing from one of the 34 basal elements of the hyoid bone. These rays the author looked upon as developments of the tubercles and teeth of the central aspect of the branchial apparatus of the higher fishes, and not as branchiostegal rays. The ribs were enveloped in the mucous membrane of the intestine, and each alternate pair bifurcated below, to enclose the abdominal longitudinal vessel or heart. From these circumstances, and from other considerations, the author looked upon the ribs of *Amphioxus* not as true ribs, but as splanchno-ribs—repetitions of the hyoid bone—analogues of the tracheal and bronchial cartilages of the higher Vertebrata. The tissue of the splanchno-skeleton is more advanced than that of the neuro-skeleton; the ribs are cartilaginous; the hyoid bones hollow cartilages, with isolated cells or nuclei in their interior.

The nervous system presents nothing more than a spinal cord, without a trace of cerebral development, and from 60 to 70 pairs of spinal nerves. The spinal cord was in the form of a ribbon, pointed at both ends, with a dorsal median groove, and a line of black or grey matter; was composed of nucleated cells, without tubes or fibres, and gave origin to the nerves in single roots only. The nerves were all symmetrical, dividing into dorsal and ventral branches. The second pair sent back a dorsal and a ventral branch, to join the corresponding branches of the other nerves, along the sides of the body, and along the bases of the dorsal and anal fins; from which distribution the author was inclined to believe, that although the second pair in *Amphioxus* presented certain resemblances to the vagus, it was, in reality, the trifacial.

The vascular system consisted of a straight abdominal vessel, the branchial artery or heart, without any trace of valves or division into cavities. This vessel sent off lateral branches, which passing up on the internal surface of the intestine, along the ribs, communicated by a capillary respiratory system of vessels with a dorsal trunk or aorta.

The intestinal tube was straight from mouth to anus, its anterior half dilated, strengthened by ribs as described above, and its entrance guarded by the hyoid rays. This dilated portion of the canal received sea-water, as in the *Ascidiæ*, to act on the respiratory vascular ramifications on its internal surface, which is undoubtedly ciliated in the living animal. The digestive portion of the canal is narrow, and presents not a trace of a liver, or of any other assistant chylo-poietic viscus.

As there was no trace of branchial fissures—as the ribs were too numerous to be looked upon as true branchial arches (branchial arches alternating with branchial fissures)—and as the other organic systems were in the condition of those of an embryo before the appearance of branchial clefts, the author was led to the conclusion

that the *Amphioxus* had never had, at any period of its existence, branchial clefts;—that it was an animal which had arrived at its perfect development before the branchial clefts had appeared, and, consequently, with an undeveloped osseous and nervous system, without a liver, and with an unilocular heart.

After examining the generative organs, and other departments of its anatomy, the author entered upon the consideration of the zoological position of *Amphioxus*, which he observed could no longer be ranked with *Petromyzon* and *Myxine*, but must take an ordinal place in any new arrangement of the class. In conclusion he remarked, that although genera allied to *Amphioxus* might now be rare, yet in the ages which have passed since the development of organic forms commenced, *Abranchiated* fishes may have been more common, and may yet afford subjects of research to the palæontologist.

XXXVII.—*Information respecting Zoological and Botanical Travellers.*

May 27.—The subjoined letter, giving news of our friends Mr. Forbes and Mr. Thompson, has arrived just in time for insertion; and our wish to communicate it to our readers must be our excuse for omitting several articles. A letter from Mr. Schomburgk, dated Demerara, April 6, informs us that he was just setting out on a two months' expedition, intending to return in June, and to start again at the latter end of August.

To Richard Taylor, Esq.

My Dear Sir, Syra, 7th May, 1841.

According to my promise, I send a letter for the Annals, giving a sketch of our natural history proceedings, so far. I hope the news may interest my brother naturalists at home.

Best respects to all friends for myself and Mr. Thompson.

Believe me ever, dear Sir, most sincerely yours,

EDWARD FORBES.

On the 17th of April Mr. Thompson and I arrived at Malta, and found the Beacon about to sail for the Archipelago. During the four days we remained at Valetta we made some short excursions into the country, and were rewarded, amongst other things, by finding *Clausilia syracusana* in abundance, a species hitherto unrecorded out of Sicily. We left on the 21st, and directed our course to the Morea, proposing to water the ship at Navarino, and were a week on the passage, the winds being very light, and the weather delightfully fine, which afforded a favourable opportunity for making observations on the pelagic animals of the Mediterranean. The tow-net was overboard, and the hand-net in requisition whenever it was possible, but hitherto we have not met with that abundance of floating life which so delights the explorers of more northern seas. *Medusæ* have been few and far between, three or four species only having been seen, and but few individuals of each. Few floating creatures ap-

peared in the morning or midday, however fine or calm the sea might be; but towards sunset they became more numerous. *Salpæ*, some single, and some united together in long chains, were by no means uncommon; sometimes very numerous towards the close of day; and the opportunity was not lost of observing the habits and structure of those interesting mollusca, of which four or five species have been caught. In the beginning of the night, when the sea was smooth, the curious animal named by Forskahl *Salpa democratica*, came to the surface in considerable numbers, and the microscopic examination of them has furnished some interesting results. About the same time, *Pteropoda*, chiefly an acicular species belonging to Rang's genus *Criseis*, were taken in the tow-net, and numerous minute Crustacea. The Pteropods taken gave me an opportunity of observing some points in their organization under a high power whilst the creatures were alive. I found the respiratory organ in the form of a curved process, projecting from the right side of the neck and clothed with large vibratile cilia. There were no cilia on their wing-like fins, but in some species there were rows of minute prickles regularly arranged. One morning six shells of a species of *Atlanta* were found in the tow-net, but the animals had perished.

On Wednesday, the 28th, we entered the fine bay of Navarino, and remained there three days, which were fairly divided between Zoology, Geology and Botany. The first was given to fossil-gathering on the tertiary banks which line the bay. These banks are full of well-preserved fossils, and during our short visit they yielded us fifty species of Testacea and several Echinidæ. Beds of beautiful amber were not uncommon in the tertiary, but where the amber prevailed there were no fossils. Generally the clay was reddish, and there the larger Zoophaga, the Arcæ, and the Oysters were most abundant: here and there were tracts of a dark blue clay, in which *Naticæ*, *Cerithia*, *Dentalia*, *Corbula Nucleus* and *Ringicula*, with a species of *Mytilus*, were associated together. In one limited spot, a beautiful species of *Neritina*, with all its colours as vivid as if recent, was not uncommon. It was possibly a freshwater species, washed by some ancient stream into the ancient sea. As an able ally, Mr. Spratt, one of the Beacon's officers, had previously collected the same species in Rhodes, associated with *Paludina clathrata* and a *Unio*. The abundance of *Rissoæ* in some places indicated a weedy bottom, and such parts as contained *Echinidæ* were harder than the others, containing few shells, and presenting the appearance of consolidated sand, as we might look for on seeing its inhabitants.

A day's dredging, and a search along the shore, turned up fifty-one living Testacea and three naked Mollusca, one of them a very beautiful little blue *Doris*. The number, state, etc. of the products were duly registered in the dredging papers of the Association. In the deeper parts of the bay the bottom was muddy, and it was interesting to find the same or representative species associated together in the mud which were grouped in the corresponding portion of the Pliocene. Only sixteen of the recent inhabitants of the bay were identical with the fossil species collected the day before.

By means of the seine seventeen species of fish were procured, several of which are not noted in the French account of the Morea.

Our botanical excursions to the mainland, and to the island of Sphacteria, filled the vasculum with a number of beautiful plants, most of which, however, were species common in the south of Europe. *Chrysanthemum coronarium* abounded around the town; *Psoralea bituminosa*, several species of *Cistus* and *Helianthemum*, *Phlomis fruticosa*, *Pistachia Lentiscus*, *Salvia officinalis*, *Poterium spinosum*, and Myrtle were the most abundant plants upon the hills. It was interesting to see how the botany corresponded to the geology, the vegetation of the tertiary being of a vivid green, while the prevalence of *Cisti* on the older limestone gave a brown hue to the country.

From Navarino we sailed round Cape Matapan to the islands of the Ægean, and our next anchoring-place was Syra, where we now are. In the sea among the isles, our tow-net furnished us with two species of *Firola* and a beautiful *Beroe*. A microscopic examination of the former exhibited no traces of vibratile cilia on their branchiæ or any part of their bodies. One of them exhibited considerable ferocity, attacking and swallowing a smaller species with all the zest of a practised cannibal.

During the voyage, favourable opportunities have occurred for making observations on the phosphorescence of marine animals. So far, the results have been, that none give out light unless irritated; that the *Salpæ* give out no light, though they sometimes appear so to do in consequence of luminous Crustacea taking up their abode in their interiors; that minute Crustacea are the chief source of the phosphorescence of the sea at night; and that the phosphoric light of *Aurelia Forskaliana* is given out from the bases of the tentacula, and that of *Beroe* from the vessels beneath the ridges of cilia.

More zealous allies than Captain Graves and his officers in the good cause of Natural History can nowhere be found; and with such aids, results of greater importance than those I have sketched out, will, I trust, soon turn up. EDWARD FORBES.

MISCELLANEOUS.

Motacilla alba of Linnæus.—Two pairs of this White Wagtail, which is distinct from the common Pied Wagtail of this country, were seen by Mr. F. Bond of Kingsbury, near the reservoir, in the early part of the present month, and although these birds were very shy, Mr. Bond succeeded in shooting three of them, two males and a female. The female is distinguished from the male by the purer pearl-grey colour of the plumage on the back; and the black on the back part of the head does not extend so far down the back of the neck. The differences between the Pied and the White Wagtails were first pointed out by Mr. Gould, and figures representing the distinctions will be found in his 'Birds of Europe,' and in my own work on our British Birds.—WM. YARRELL, 18th May, 1841.

CHÆTURA RUFICOLLIS; CAYENNE.

May 8, 1841.

Gentlemen,—Amongst the many additions to the ornithological department of the Museum of the Liverpool Royal Institution which have been added of late, is a Swallow, which appears to me to be new to science, and on showing it to Mr. Natterer, he considered it as never having been described. It belongs to that division which Mr. Swainson characterises under the name of *Chætura*, and I propose the specific name of *ruficollis*, from a distinct rusty colour which surrounds the neck. The throat and breast are of the same colour, but having a mottled appearance, from the feathers of these parts being only edged with rufous. The chin is nearly sooty-coloured, the feathers being very slightly edged with rufous. Body above and below sooty black; the outer webs of the wings and tail much darker, with slight purplish reflections. The top of the head is dark sooty, but the front is brownish black. Should you think the above worthy a place in your valuable Magazine, I shall feel obliged by its insertion. And remain yours, etc.,

HENRY JOHNSON, Curator,
Liverpool Royal Institution.

YOUNG GIRAFFE.

A young male Giraffe was born at the Garden of the Zoological Society, on Thursday last, the 27th of May. The mother and fawn are quite well.

METEOROLOGICAL OBSERVATIONS FOR APRIL 1841.

Chiswick.—April 1. Cloudy. 2. Fine: clear. 3. Slight haze: cloudy and fine. 4. Cloudy: slight rain. 5. Cloudy and fine. 6, 7. Very fine. 8. Fine in the morning: hail-shower at 1 P.M.: cloudy and fine at night. 9. Overcast and cold. 10—12. Cloudy and cold. 13. Cloudy: rain. 14. Cloudy: slight rain. 15. Showery. 16, 17. Fine. 18. Overcast and cold. 19. Fine. 20. Overcast. 21. Cold and dry. 22. Cloudy and cold. 23. Heavy rain. 24. Fine. 25. Very fine: slight rain: cloudy and windy at night. 26. Hazy: fine. 27. Very fine. 28. Rain. 29. Rain: very fine: clear at night. 30. Dry haze throughout the day: clear at night.

Boston.—April 1. Fine: rain early A.M. 2. Stormy: rain early A.M. 3, 4. Fine. 5. Cloudy: rain P.M. 6. Fine. 7. Cloudy: rain P.M. 8. Cloudy. 9. Fine: rain early A.M. 10. Cloudy. 11. Cloudy: rain early A.M.: hail-storm P.M. 12. Cloudy: rain early A.M. 13. Fine: rain early A.M. 14, 15. Fine: rain P.M. 16. Fine: ice this morning. 17. Fine. 18. Cloudy. 19. Fine. 20. Fine: hail and rain P.M. 21. Cloudy: rain P.M. 22. Cloudy: rain early A.M. 23. Rain. 24. Fine. 25. Fine: rain early A.M. 26. Cloudy. 27, 28. Fine. 29. Cloudy. 30. Fine.

Applegarth Manse, Dumfries-shire.—April 1. Fine A.M: rain P.M. 2. Fine: showers P.M. 3. Fine: one shower. 4. Fine A.M.: rain P.M. 5. Fine: slight shower. 6. Fine and fair all day. 7. Rain P.M. 8. Fair A.M.: shower P.M. 9. Fine and fair all day. 10, 11. Occasional showers. 12. Fine and fair. 13. Wet P.M. 14. Showery P.M. 15. Rain and hail. 16. Rain, sleet and hail. 17—20. Showers. 21. Fair and cold. 22, 23. Frosty morning: fine. 24. Very wet P.M. 25. Rainy forenoon. 26. Wet all day. 27. Rain A.M.: cleared up. 28. Beautiful day: thunder and rain. 29, 30. Fine and fair.

Sun shone out 27 days. Rain fell 20 days. Thunder 2 days. Frosty mornings 2. Hail 2 days.

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. Roberton; *by* Mr. Thompson *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. Veall *at Boston, and by* Mr. Dunbar *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1841. April.	Barometer.						Thermometer.								Wind.				Rain.				Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 8¼ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dumfries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Self-register. Min.	Max.	Min.		Max.	Min.									
1.	29·642	29·632	29·596	29·15	29·51	29·40	46·3	54·7	43·7	52	41	46	51	38	W.	W.	N.	SW.	·061	·05	·08	...	45
2.	29·662	29·727	29·600	29·12	29·45	29·60	47·7	51·7	44·6	56	26	47	48½	36½	NW.	NW.	NW.	W.	·058	...	·04	...	46
3.	29·728	29·707	29·640	29·25	29·49	29·47	45·0	53·6	38·2	57	26	43·5	48½	35½	SW.	NW.	calm	SW.	...	...	...	...	44
4.	29·676	29·642	29·467	29·14	29·35	29·23	43·7	53·6	38·3	55	39	46	51	36½	S.	SW.	calm	WSW.	...	·11	...	...	41
5.	29·404	29·436	29·371	28·94	29·28	29·55	47·0	56·0	43·0	56	35	47·5	51	40½	SE.	S.	calm	E.	·102	...	...	...	43
○ 6.	29·710	29·745	29·661	29·28	29·64	29·63	46·4	54·2	43·2	55	31	46·5	53½	35	N.	NE.	calm	E.	...	·02	·08	...	43
7.	29·806	29·781	29·777	29·40	29·60	29·56	43·3	53·8	40·3	52	37	38	49½	39½	E.	SW.	N.	S.	·036	·03	...	0·11	40
8.	29·806	29·779	29·775	29·29	29·45	29·68	47·0	54·0	42·4	53	34	45	52	38½	NW.	W.	W.	NW.	·033	...	·07	...	45
9.	29·910	29·988	29·820	29·43	29·83	29·93	48·0	52·5	41·7	55	37	47	51½	32	NW.	N.	calm	NNW.	·125	·01	·03	...	44
10.	30·082	30·020	29·958	29·62	29·98	29·97	44·7	53·7	40·3	49	31	46	49	37	NW.	E.	calm	NE.	...	...	...	...	41
11.	29·954	29·939	29·923	29·65	30·00	30·00	40·8	46·7	38·6	49	32	42	45½	33	N.	NE.	calm	NE.	...	·01	·07	...	38
12.	29·912	29·962	29·907	29·54	29·90	29·80	41·2	47·2	36·7	45	27	43	48½	32½	NNW.	NE.	calm	N.SSW.	·025	...	·05	...	35
☾ 13.	30·100	30·130	30·077	29·63	29·78	29·83	45·3	46·6	37·7	56	42	46	52	38½	S.	SW.	calm	W.	...	·08	·02	...	38
14.	30·110	30·088	29·983	29·58	29·76	29·78	49·8	53·0	45·0	57	32	49	51	42	S.	SW.	calm	W.	·080	·01	...	0·70	41
15.	29·916	29·899	29·761	29·31	29·65	29·55	48·7	56·7	42·4	58	26	47	47	35	S.	NW.	calm	SW.	...	·05	·10	...	43
16.	29·742	29·762	29·714	29·28	29·48	29·56	45·7	55·3	37·7	57	31	46·5	49	37½	SSW.	NW.	calm	W.	·063	...	·10	...	41
17.	29·914	29·946	29·874	29·45	29·75	29·63	46·4	54·6	42·4	60	39	48	53	33	W.	NE.	calm	SW.	...	...	...	...	41
18.	29·972	29·975	29·924	29·37	29·67	29·67	49·4	54·6	42·8	61	41	51	50½	40½	SW.	W.	calm	SW.	...	·14	...	...	43
19.	29·908	29·895	29·881	29·30	29·60	29·70	48·7	59·2	44·8	58	32	48·5	51	39½	NW.	W.	NW.	W.	·166	...	...	...	42
20.	29·800	29·803	29·682	29·27	29·54	29·70	46·8	56·8	42·2	56	36	48	49	39	W.	W.	calm	W.	...	...	...	...	39
● 21.	29·852	29·904	29·810	29·46	29·92	30·03	47·6	52·8	41·7	53	40	46·5	47½	37	NNE.	NE.	calm	NE.	...	...	·36	0·12	45
22.	29·882	29·866	29·734	29·48	29·94	29·72	45·3	53·2	41·0	53	41	45	49	28½	NE.	NE.	E.	SW.	...	·32	·07	...	39
23.	29·424	29·645	29·450	29·10	29·53	29·41	43·7	51·6	42·3	48	28	44	51	31	NW.	NW.	E.	SW.	·500	·52	·09	...	44
24.	29·712	29·677	29·528	29·20	29·37	29·18	48·5	55·0	40·2	56	39	49	51½	33½	S var.	SW.	calm	SE.	·333	·15	·32	...	43
25.	29·688	29·846	29·650	29·13	29·28	29·20	50·5	65·7	43·9	59	52	50	54	38	S.	S.	W.	SSE.	·072	...	·21	...	46
26.	30·040	30·100	29·980	29·39	29·53	29·74	57·7	59·3	50·2	66	55	59	51	45½	S.	SW.	SW.	S.	...	...	...	...	51
27.	30·140	30·103	30·078	29·47	29·80	30·00	63·3	72·2	56·5	75	46	65·5	55	47½	S.	SW.	calm	SSE.	...	...	...	...	56
☽ 28.	30·200	30·132	30·099	29·50	30·10	30·10	63·3	72·4	57·0	76	45	66	61	41½	N.	NE.	calm	SE.	·022	·07	...	1·00	58
29.	30·152	30·141	30·098	29·56	30·06	30·18	52·3	71·6	50·6	71	42	53	59	45½	N.	NE.	calm	SE.	·072	·01	...	...	55
30.	30·226	30·171	30·091	29·68	30·17	30·03	58·4	69·2	46·6	68	41	53·5	64	41	NE.	NE.	calm	SE.	...	...	...	...	47
Mean.	29·869	29·881	29·796	29·36	29·681	29·694	48·4	56·4	43·2	57·40	36·79	48·4	51·5	37·6					Sum. 1·748	1·58	1·69	1·93	Mean. 44

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 45. JULY 1841.

XXXVIII.—*On the Existence of Branchiæ in the young* Cæciliæ; *and on a Modification and Extension of the Branchial Classification of the* Amphibia*. By John Hogg, Esq., M.A., F.R.S., F.L.S., F.C.P.S., &c.

Looking over, in November last, the volume of the 'Comptes Rendus' of the meetings of the Academy of Sciences at Paris for the year 1839, I came to the report of a paper entitled, "Notice historique sur la place assignée aux *Cécilies* dans la série zoologique, par M. de Blainville," in which (No. 22, at p. 673) I read the passage which I have thus translated:—"In the mean time, in 1836, on the opportunity of describing some reptiles which were brought from California by M. P. E. Botta, I gave a characterized analysis of my system of Herpetology and Amphibiology, and I supported the place that I had assigned to the *Cæcilia* by the curious fact observed by Prof. Müller of a young *Cæcilia* in the Museum at Leyden, which was furnished with *branchial apertures*.

"1839. Although this fact appears not to have been known, any more than, without a doubt, my own labours on this subject were, to Mr. John Hogg, who has just published a long memoir on the Classification of the Amphibia in Mr. Charlesworth's 'Magazine of Nat. Hist.' for June [and concluded in the August Number] 1839, it will be there seen that he has also arrived at the same conclusion with us; that is to say, of making a distinct class of the Batrachians under the name of *Amphibia*, and a separate order of the *Cæciliæ* under the new denomination of *Abranchia*, because he has selected for his principal consideration the organs of respiration: only that he places them at the commencement, in order to connect

* [This communication, in its original state, was received by the Editors in the middle of February; but they retained it until the author's return to London, in order to direct his attention to the papers on the *Lepidosiren* by M. Milne Edwards and Sir W. Jardine.—Ed.]

them with the *Ophidians*, instead of terminating the class by them*."

Here it was that I received the first intimation of Prof. J. Müller's discovery of *branchial apertures* in a young *Cæcilia*; and on a further perusal, I found that this historical notice by M. de Blainville was both in answer to, and continuation of, M. Duméril's 'Mémoire sur la classification et la structure des Ophiosomes ou Céciloïdes, famille de Reptiles qui participent des Ophidiens et des Batraciens, rélativement à la forme et à l'organisation,' which had been read at a previous meeting of the Academy, and the report of which is inserted in a former number (20) of the same volume of the 'Comptes Rendus' (p. 581).

M. Duméril has given a brief description of this highly interesting discovery; but as this is abridged from a *part* only of Prof. J. Müller's own account as published in Oken's 'Isis' for 1831, p. 710, and supposing that the whole of so distinguished an anatomist's paper on the subject—which also comprises his classification of the *Amphibia*—will be received with satisfaction, since it is published in a foreign work not frequently to be met with in England, I make no apology for giving a translation of the whole from the original German.

"Branchial apertures discovered in a young *Cæcilia hypocyanea*, in the Museum of Natural History at Leyden, by Prof. John Müller.

"In the spring of the year 1831 I visited the great Museum of Zoology and Anatomy at Leyden, where the particular kindness of MM. Temminck, Van der Hoeven, Sandifort, Brörs, Schlegel, and Dr. Haan, made my short stay highly profitable and useful. On an examination of the *Cæciliæ* which are preserved in that exceedingly rich Museum of Natural History, I discovered, in quite a young *Cæcilia hypocyanea*, upon each side of the neck, some lines from the extremity of the fissure of the mouth, an aperture a line in length. This opening is in length somewhat more than in height; it is placed in the yellow band which marks the sides of the *Cæcilia hypocyanea*, and this yellow band is just there much wider. The edge of the aperture is sharp; in its interior black fringes were visible, which appear fixed to the horns of the tongue-bones or branchial arcs, but they did not project out of the aperture. The apertures themselves continue in more open communication with the cavity of the mouth. This young *Cæcilia*, which,

* Comptes Rendus des Séances de l'Académie des Sciences, tom. ix. No 22. 2e Semestre, 1839.

being the only specimen, could not be dissected, measured $4\frac{1}{2}$ inches in length; whilst a full-grown specimen of the same species, that exhibited no vestige of these apertures, was more than a foot long.

"It is therefore now ascertained, that the *Cæciliæ*, which have so many anatomical resemblances with the naked Amphibians, really belong to them, and that they undergo metamorphosis. They likewise resemble in external structure the *Amphiumæ*, which, with a vermiform shape of the body, retain their gill-apertures during life, without the branchiæ remaining. The division of the *Batrachians* is too confined and defective. All the *scaled* or *shielded Amphibians* (the Crocodiles, Lizards, Serpents and Tortoises) have as common characters—one distinct penis or two, a double cloaca, two orifices in the organ of hearing, and a cochlea. These must constitute one division. All the *naked Amphibians*, on the contrary, have no penis, a single cloaca, only one orifice, and no cochlea in the ear. All the *Amphibia nuda* possess either early gills, later lungs, or both during the whole of life. The orders of the *Amphibia nuda* are as follow:—

"I. *Gymnophidia* seu *Cæciliæ*. Without feet, branchial apertures in the young state.

"II. *Derotremata*, from δερη, *neck*, and τρημα, *aperture*. Four rudimentary feet. Apertures in the neck throughout life without branchiæ. Here belong the *Amphiuma* and *Menopoma*.

"III. *Proteidea*. Gills and lungs through the whole of life. *Proteus, Axolotl, Menobranchus, Siren*.

"IV. *Salamandrina*.

"V. *Batrachia*.

"Messrs. Schlegel and Van der Hoeven will gladly testify the accuracy of the before-mentioned assertion concerning the *branchial apertures* of the young *Cæcilia*. This animal remains preserved in the Museum at Leyden. The anatomy of the *Cæcilia lumbricalis*, and many of the doubtful or anomalous Serpents, I have described in a separate paper that appeared in Meckel's 'Archives.' I will communicate in a supplement thereto, a drawing of the young *Cæcilia hypocyanea* with its gill-apertures. I have there also endeavoured to place the distribution of the anomalous and true Serpents upon anatomical grounds; and the arrangement of the *naked Amphibians*, except the second principal division of the *Amphibia* in the five orders above given, is accurately made from full anatomical examinations. These orders of the *Amphibia nuda* are

proposed according to the form of the animals, which are there just so separated as the Serpents, Lizards, Crocodiles, and Tortoises are in the division of the *Amphibia squamata.*"

Now the species of *Cæcilia* there described by Prof. J. Müller is the *C. hypocyanea* of Van Hasselt, which was so named on account of its pale *blue* colour along the *under* part of its body; it is synonymous with what Linnæus names *C. glutinosa,* and what Wagler calls *Epicrium Hasseltii,* and is a native of Ceylon as well as Java.

But it is remarkable that, although nearly ten years have transpired since this discovery took place, no mention is made of it in any English work on Natural History* with which I am acquainted; *except* indeed in Dr. Grant's last Part (VI.) of his 'Outlines of Comparative Anatomy,' published in the latter part of 1840, where (at p. 551) he has given an extremely short notice of it under the head of 'Organs of Respiration.'

The *presence* of branchiæ then, in the *Cæcilia* in its young state, obliges me to modify, in some degree, the classification which I had instituted four years ago for the *Amphibia,* and which is given in the 'Magazine of Natural History,' new series, vol. iii. pp. 265, 367. For this purpose, my Order I. *Abranchia* must be entirely removed, since it is now clearly proved that every genus of the *Amphibia* is furnished, either at the first period of existence with some kind of branchial apparatus which is afterwards exchanged for a pulmonary one, or else with both sorts of apparatus during the entirety of life.

The late discovery of Müller has decided—what indeed the appearance of the hyoïd bones in the adult *Cæcilians* had given reason previously to suspect—namely, the former existence of branchial apertures with gills or branchial fringes, and a subsequent metamorphosis as to these organs, in the *Cæciliadæ*†. Wherefore the true place to be assigned to this family in the branchial classification is, among the *Caducibranchia,* or those *Amphibia* whose gills *decay* at an early period; although from that able Professor's description it appears that the *gills* themselves, or the *fringes,* are *concealed within* the branchial apertures, and do not hang out of, or project from, those apertures, as they do in the other families of the *Caducibranchia.*

* I fully expected to have seen these *branchiæ* described in the account of the *Cæcilians* at p. 285 of Cuvier's 'Animal Kingdom,' translated by Messrs. Blyth, Mudie, Johnston and Westwood, particularly as its preface says—"the present edition embodies *all* the discoveries of more recent naturalists," and which has only just been published; but I was disappointed.

† See my paper in Mag. Nat. Hist., vol. iii. N. S. p. 368.

It then becomes necessary so to separate them into *two* distinct tribes:—the *first* of which I name *Celatibranchia*, signifying the *gill-fringes concealed*; and the *second* I designate by the term *Prolatibranchia*, i. e. having the *gill-tufts exposed.* Nevertheless, much still remains to be investigated with respect to the early mode of life, aquatic respiration, development of the lungs, and changes in the circulatory organs of the *Cæcilians.*

In Prof. Müller's arrangement given above, the *Cæciliæ* are classed in the *first* order of his *Amphibia nuda* under the name of *Gymnophidia*, or *Naked Serpents*; though I must observe, that this name cannot be strictly applied to these *snake-like* Amphibians, because they are in reality not altogether *naked*, being furnished with numerous *small scales.*

M. Duméril also says in his Memoir*, that M. Bibron and himself have determined, "in the eighth volume of the 'Natural History of Reptiles,' which is now printing, to establish amongst the *Batrachians*, and under the name of *Péromèles*, a first sub-order comprising all the genera that are without *legs.* These are four in number, and compose a family which we call *Ophiosomes* or *Céciloïdes*, because these appellations will remind us of their resemblance to the Serpents, and at the same time will recall the principal genus—the most numerous in species—which is distinguished as the first by the name of *Cæcilia.*"

However, I may here remark, that this sub-order of *Péromèles*, derived from πηρος, *wanting*, and μελος, *limb* or *leg*, is merely synonymous with Oppel's family *Apoda*, which he formed in 1811 for the genus *Cæcilia*, although previously given by Linnæus to an order of Fishes, and which has been subsequently adopted by several zoologists. But in what order or family M. de Blainville has recently placed the *Cæciliæ* in his system of Amphibiology, given in 1836 in his description of reptiles brought from California by M. Botta, I cannot ascertain, not having seen the work itself, but only the passage in the historical notice, before cited, from the 'Comptes Rendus,' p. 673. Yet I am much gratified in learning that M. de Blainville agrees with me in making the *Batrachians* (of the French naturalists) constitute a distinct class under the name of *Amphibia*, and not merely the *fourth* order of the class *Reptilia*, according to the old arrangement of M. Brongniart and his followers, as MM. Daudin, Duméril, Cuvier, etc.

Again, I think a further modification is requisite in my

* Comptes Rendus, 1839, tom. ix. No. 20. p. 583.

previous classification, which is, to separate the Toads from the Frogs (*Ranidæ*), and to place them, as Prof. Bell has done, in *another* family, *Bufonidæ**; one of the chief distinctions of the latter being the *absence of teeth.*

Next, the late discovery of a very remarkable and anomalous animal renders an extension of my proposed classification very necessary;—the animal which I mean is what Fitzinger† and Natterer‡ denominate "Lepidosiren," and consider as forming a new genus of the fish-like *Amphibians,* whilst Prof. Owen § regards it, with another species, as being more nearly allied to the *Fishes.* And I may remark that the *L. paradoxa,* a native of the marshes near the Amazon, in South America, where it is named Caramuru, is extremely like the *Siren* in general character and form; whilst the *L. annectens,* which inhabits the river Gambia in Africa, more resembles in its shape the *Siredon pisciformis,* or Axolotl of Mexico. It is also used for food by the inhabitants of that part of Africa, as the Axolotl frequently is by the Mexicans.

Now the presence of distinct *lungs* in both these animals makes me at once dissent from the opinion of the latter author, and decides with me the question—whether they are to be esteemed as true *Amphibians,* or true *Fishes*?

Yet Prof. Owen has resolved this question in favour of their being *Fishes,* principally from their *nose*; which consists of two membranous sacs, plicated within, opening externally on the upper lip, but (according to his observation) without communicating with the fauces or mouth ||. The other ichthyic

* History of British Reptiles, p. 105.

† Froriep's Notizen, vol. i. p. 90; and Wiegmann's Archiv, 1837, p. 232.

‡ *Lepidosiren paradoxa,* eine neue Gattung, aus der Familie der Fischähnlichen Reptilien, von Johann Natterer, Annalen des Wiener Museums der Naturgeschichte, 1837, vol. ii. p. 165.

§ Description of the *Lepidosiren annectens,* Linn. Trans., vol. xviii. p. 327.

|| M. Milne Edwards, in his paper 'On the Natural Affinities of the *Lepidosiren*' in the Ann. des Sci. Nat. for September 1840, writes as follows:—"One of the reasons upon which Mr. Owen most insists for placing the *Lepidosiren* amongst fish, is the want of communication between the nasal cavity and the mouth; but M. Bischoff asserts, that in the species which he dissected there exist hinder-nostrils (*arrière-narines*) opening into the cavity of the mouth near to the commissure of the lips. I also saw these posterior openings of the nasal cavity in the *L. paradoxa* dissected by M. Bibron, and their abnormal position appears to be in part explained by the absence of superior maxillary bones." This paper, a translation of which was given in the 'Annals and Mag. Nat. Hist.' for February 1841, p. 467, I had not seen until some time after mine was written and in the editors' hands. I must here point out that Mr. Owen made his dissection of the *L. annectens,* while MM. Bischoff and Bibron examined the *L. paradoxa.*

characters observable in their organization I regard as of minor importance.

Thus it seems to me, that we must either account these animals as *Fishes* endowed with true and well-developed *lungs* of a vascular and cellular structure and fitted for respiring air, similar to those of the *Amphibia* and *Reptiles*, and with some other essential characters also common to the *Amphibia*; or as *Amphibians* possessing *nasal sacs* with an external orifice only (according to Mr. Owen) and adapted for smelling like those of the *Fishes*, and likewise having a few other ichthyic characters; or in fewer words, *either* as *Fishes* with the *lungs* and some other principal characters of the *Amphibia*, *or* as *Amphibians* with the *nose* and a few other inferior characters of *Fishes*.

Here, then, we must elect, whether we assume the *lungs* or the *nose* as the chief characters whereby to decide in which class of the *Vertebrata* these animals ought to be most correctly placed. However, it will be readily admitted by all naturalists, that the former or the *respiratory* organs far exceed in importance the latter or the *olfactory* organs, and therefore must compel us at once to select them for the classification of these animals in preference to the latter. And surely even by considering these animals as *Amphibians** possessing the *nose* or *nasal sac* of *Fishes*, it will be much less incongruous and much less departing from the usual and received characters of the divisions of the *Vertebrata*, than if we were to esteem them as *Fishes* furnished with the *lungs* of the *Amphibia*; for this I cannot but think would be too anomalous and too much at variance with the general definition of Fishes —as having gills but *no lungs*—notwithstanding that the air or swimming-bladders of two or three genera of Fishes of the

* M. Milne Edwards has likewise stated, in the paper already quoted, *two* other characters belonging to the *L. paradoxa*, which afford strong evidence in favour of its being correctly esteemed an *Amphibian*. The *first* is, that "M. Bibron has also satisfied himself of the existence of the *two auricles* of the heart described by M. Bischoff, so that in this important respect the *Lepidosiren* stands remote from Fish and approaches nearer to most Reptiles." And the *second* is, that "the lungs of Mammalia, of Birds, and of Reptiles, as every one knows, always originate from the *ventral face* of the digestive tube, whatever their position may be in the splanchnic cavity, and it is always on the ventral side of the pharynx that the opening of the glottis is found; it is the *same* with the *Lepidosiren*."

Now if, on a more minute examination of the *L. annectens*, this animal shall be found never to possess any hinder nostrils communicating with the mouth, and that its heart has only a *single* auricle, then I think it will be necessary to consider it as a *genus* distinct from the *L. paradoxa*, and which I would name *Protomelus*. I must also add, that the *L. paradoxa* has fifty-five pairs of ribs, whilst the *L. annectens* possesses only thirty-six.

family *Clupeidæ* somewhat approach in cellular structure to the lungs of Reptiles.

Wherefore I agree with M. Fitzinger, Dr. Natterer and Prof. Jones*, in regarding these animals as two distinct species of a new *genus*, belonging rather to the *Manentibranchious Amphibians* than to any order of Fishes.

I find also that M. Bischoff concludes, from a skilful dissection of the *L. paradoxa*, that it is an *Amphibian* and not a Fish. See his memoir published at Leipsig in 1840; also the translation of it, with five plates, in the 'Annales des Sciences Naturelles' for August and September 1840. At page 155 of the latter number, Prof. Bischoff observes, concerning the *L. paradoxa*, that its nasal cavities are perforated behind† and open into the mouth; that its heart has two auricles; that its lungs have not the character of swimming-bladders; and that the organization for the most part of its soft parts, especially of those of circulation and respiration, differ from those of Fishes. It is likewise said that this animal produces a sound resembling the cry of a cat. Again, as it is evident, the name "Lepidosiren," signifying a *Scaly Siren*, which was given by M. Fitzinger to this genus, is not altogether appropriate, since it would lead us to conclude that this is the *only* Amphibian possessing *scales*, whereas the *Cæciliæ*, as it is well known, are likewise furnished with small *scales*. And Prof. Owen says, at p. 332 of the Linn. Trans., vol. xviii., that he recorded, in the *MS.* Catalogue of the Museum of the Royal College of Surgeons in London, the *Lepidosiren* under the name of '*Protopterus*'—doubtless derived from πρωτος, *first*, and πτερον, *fin*—to express the *primary* or rudimentary form of its four *fins*. But, since I maintain that this genus really belongs to the *Amphibia*, this name could not possibly apply to it, although that of *Protomelus* would be more characteristic, which signifies the *first* or *primary* form of the *limbs* or *legs*,

* General Outline of the Animal Kingdom, p. 538.

† But Sir W. Jardine considers "the structure of the *nostril* as entirely analogous to that of the organ in Fishes: it is not a respiratory organ in *L. paradoxa*, the double opening is only similar to the valvular separation of the sac in Fishes."—See 'Remarks on the Structure and Habits of *L. annectens*' in the 'Annals and Mag. of Nat. Hist.' for March last, p. 26. This, however, is evidently a mistake, as will appear from the following "addition," which M. Bischoff has given to his paper in 'Annal. des Sci. Nat.,' Sept. Number, p. 155. "Again I add, on the subject of *nasal cavities*, on which so much has already been urged, that some weeks since, at my request, my father-in-law, M. Tiedemann, has likewise examined the nasal cavities of a very small specimen, and that he has found the canal to be in length $5\frac{1}{2}'''$ (rhénales), proceeding obliquely at the back and on the outside, and opening into the cavity of the mouth. The species of Congers, on the contrary, which are found at Vienna, do not present any similar canal."

from πρωτος and μελος; still, in preference to this last appellation, I propose the name of *Amphibichthys*, derived from αμφιβιος and ιχθυς, for this new genus; because it is, of all the *Amphibia*, that which retains the most fish-like or *ichthyic* characters, and is, in fact, intermediate between those two classes.

But it is necessary, for the reception of this new genus—a type also of a new family—in the Order III. *Manentibranchia* of my Branchial Classification, to divide it into *two* groups or *tribes*, because the gills in the *Amphibichthys* differ in being merely *fimbriæ* or fringes *concealed within* the branchial apertures like those in most Fishes, and are not *ramified* or *tufted*, and *externally* persistent, as in the *Siren* or *Proteus*; wherefore the former tribe I distinguish by the appellation of *Fimbribranchia*, and the latter by that of *Ramibranchia*.

Here, then, I subjoin my Classification of the *Amphibia* founded upon the *organs of respiration*, as modified and extended in the manner I have already explained.

Division I. Vertebrata.

Class IV. Amphibia.

Sub-Class I. Monopneumena. Respiring singly, *either* by gills only, *or* by lungs alone.

Order I. Caducibranchia. Gills *decaying*.

Tribe I. Celatibranchia. Gill-fringes *concealed*.

Family I. *Cæciliadæ*. Body lengthened, slender, snake-like; skin smooth, wrinkled, mostly with minute scales; tail extremely short; legs none.

Genus: *Cæcilia*.

Tribe II. Prolatibranchia. Gill-tufts *exposed*.

Family I. *Ranidæ*. Adult body slender, oval; skin smooth or granulated; tail none; legs four; tongue long; teeth minute, fine; tympanum open.

Genera: *Rana, Ceratophrys, Hyla*.

Family II. *Bufonidæ*. Adult body short, roundish, thick, frog-like; skin tuberculated; tail wanting; legs four; tongue long; teeth none; tympanum open.

Genera: *Bufo, Rhinella, Otilopha*.

Family III. *Dactylethridæ*. Adult body short, sometimes oval, frog-like; skin smooth or tuberculated; tail none; legs four; tongue wanting or distinct; teeth minute or partly absent; tympanum hid.

Genera: *Dactylethra, Bombinator, Breviceps*.

Family IV. *Astrodactylidæ*. Adult body short, flat, frog-like, tailless; skin with tubercles; legs four; tongue wanting; teeth none; tympanum hid.

Genus: *Astrodactylus* (*Pipa*).

Family V. *Salamandridæ*. Adult body long, lizard-like; tail long, round or compressed; tympanum none; legs four.

Genera: *Salamandra, Salamandrina, Molge, Triton*.

Sub-class II. Diplopneumena. Respiring doubly, *both* by gills *and* lungs.

Order II. Imperfectibranchia. Gills *imperfect.*

Family I. *Menopomatidæ.* Body long, lizard-like; or lengthened, snake-like; with a tail; legs four; gill-like organs internal.

Genera: *Menopoma, Amphiuma.*

Order III. Manentibranchia. Gills *permanent.*

Tribe I. Ramibranchia. Gills *ramified* or *tufted.*

Family I. *Sirenidæ.* Body lengthened, snake-like, having a tail; legs two in front; gills tufted, external.

Genera: *Siren, Parvibranchus.*

Family II. *Proteidæ.* Body long, lizard-like, or fish-like, with a tail; legs four; gills ramified, external.

Genera: *Proteus, Menobranchus, Siredon.*

Tribe II. Fimbribranchia. Gills *fringed.*

Family I. *Amphibichthyidæ.* Body lengthened or long, fish-like, covered with scales, having a tail; dorsal and caudal membranes, resembling fins, strengthened by soft rays; legs four, rudimentary; gills fimbriated, internal.

Genus: *Amphibichthys* (*Lepidosiren*).

It is worthy of remark, that in comparing the gradual modifications in the organization presented by the different families in this very natural class, there will be found many singular resemblances even between the two extreme groups, the *Cæciliadæ* and the *Amphibichthyidæ*; inasmuch as they both possess scales, and the former seem to be furnished, in their young state, with the same kind of *fringed* gills, concealed within the branchial cavity, as the latter retain during the whole of life: and whilst, on the one hand, the *Cæciliadæ* are snake-like in their form and habits, they constitute the link between the class *Reptilia* and the class *Amphibia*; so, on the other hand, the fish-like shape and characters of the *Amphibichthyidæ* as clearly and gradually connect the class *Amphibia* with the class *Pisces*, both approximations being carried on in a most extraordinary and beautiful manner. And I have before noticed, that the order *Abranchia*, which had been previously formed for a certain *genus* in this class, cannot be applied to any *Amphibian*; for it is now well ascertained that every animal included in this class possesses, during one period of its existence at least, some *branchial* apparatus, which, with the retention of *lungs*, fully proves that these animals ought, according to their natural conformation, to be arranged in a *distinct* class, and not in a *mere* order of the class *Reptilia.* Wherefore the principal characters of the *three* latter classes of *Animalia Vertebrata,—Reptilia, Amphibia, Pisces,*—taken from their *organs of respiration*, are,

membranaceous and cellular lungs without any gills for the *first* class; either gills in the early part of life, then cellular lungs in their adult state, or gills or some branchial apparatus, coexisting with cellular lungs through the whole of life, for the *second*; and gills only, without lungs, for the *third* class.

Norton House, Stockton-on-Tees, April 10th, 1841.

[Note.—Mr. Owen nowhere assumes that the nose, as an absolute zoological character, is equal in importance to the lungs; but believing, with other Comparative Anatomists, that the air-bladder of the fish is essentially a lung, and being able to trace its assumption of the true pulmonary structure within the undoubted limits of the class of Fishes, he is not disposed to allow the respiratory organ to be so important, in relation to the classification of the *Lepidosiren*, as the nasal organ, which manifests no essential alteration of structure in the class of Fishes; but exhibits, throughout that class, a marked distinction from the structure of the nose in Reptiles. Mr. Owen's arguments for the essentially ichthyic character of the *Lepidosiren* are based upon the cumulative evidence of its dermal, dental, osseous, digestive, sensitive and generative systems, rather than on any single and arbitrarily chosen character.—See his 'Concluding Observations,' Linn. Trans., vol. xviii. p. 350; also the Proceedings of the Microscopical Society at p. 211 of our present volume, containing Mr. Owen's examination of the structure of the teeth, which he finds to be altogether such as is peculiar to Fish. The new naming of the genus we cannot approve.—Ed.]

XXXIX.—*Supplement to a Catalogue of Irish Zoophytes.* By Arthur Hill Hassall, Esq. Read before the Natural History Society of Dublin, November 6th, 1840.

[Concluded from p. 287.]

Valkeria imbricata. "Cells in dense clusters, irregularly scattered on the polypidom," cylindrical. Plate VIII. fig. 2.

I have added to the usual definition of this species the word cylindrical, as the form of the cells is the most important practical point of distinction between it and the preceding species. *Valkeria imbricata*, in the first stage of its formation, consists of a single layer of cells spread over the surface to which it is attached (usually *Fucus vesiculosus*), and not rising from it in the form of an independent polypidom. In this stage of its growth it constitutes the *Bowerbankia densa* of Dr. Farre. This fact I have ascertained from a comparison of Dr. Farre's figure and description of that species with it, and its concurrence with these is so close as not to admit of a doubt upon the subject. *Bowerbankia densa* is, therefore, not a distinct species, but merely a condition of the well-known one, *Valkeria imbricata*. Although the examination of numerous specimens of *V. imbricata* which I have made has resulted in the eradication of *B. densa* as a distinct species, I yet must not omit to notice the admirable memoir published in the 'Philosophical Transactions,' upon this and an allied species by Dr. Farre, the gentleman by whom *Bowerbankia densa* was first described and figured as a di-

stinct species, and to whom we are indebted for almost all we know of the anatomy of the Ascidian type of zoophytes.

Some time since, I forwarded to Dr. Johnston specimens under the name of *Bowerbankia densa* for examination: one of them was in fact *Valkeria imbricata* in the primary stage of its growth, that is, spreading over a plain surface; the other was elevated in the form of a distinct polypidom, the condition in which *V. imbricata* is usually met with. I remarked on these specimens somewhat to the following effect, not at the time recognising them as belonging to the species *Valkeria imbricata*, that they represented the species *Bowerbankia densa*, and that *it* did not always confine itself to the surface of the object upon which *it* grew, but sometimes rose from it as a separate polypidom. Dr. Johnston remarked upon them, that they represented "the species in its perfect state." In another letter Dr. Johnston writes, "Accidentally viewing your specimens of *Bowerbankia densa*, var. *ramosa*, it at once flashed on my mind that they were *Valkeria imbricata*, which is indeed the fact. *Bowerbankia densa* and *Valkeria imbricata*, are they not states of one and the same species? Your observations will probably result in the erasure of a spurious species." I have thus Dr. Johnston's testimony in favour of the identity of *Bowerbankia densa* and *Valkeria imbricata**.

Sea Point, Dublin bay: not common.

I may here observe, that many species of zoophytes, as well as the above, spread over the surface of attachment in a single layer, prior to becoming elevated into separate and independent polypidoms. This with many species appears to be a law of their growth, and is very obvious in the Flustras.

V. pustulosa. Not common: Dublin Bay.

Langenella repens. Some weeks ago I forwarded a zoophyte to Dr. Johnston which I conceived might be *Langenella repens.* Dr. Johnston observed on the specimen sent, "This may be *Langenella repens*, but it is not so like as to make one certain; your conjecture is very probably correct, and then it throws light upon a thing which has puzzled us.....If you will turn to my figure of *Flustra membranacea*, you will find some processes or tubes figured, which, in the description, are left undecided as to their nature. These I now consider to belong to *Langenella repens*, or an allied and solitary species." Since the receipt of the letter containing the above observations, I have made a particular examination of these tubes, and have arrived at the conclusion that they are not zoophytes at all. On *Flustra membranacea* the tubes are unconnected with each other, and appear to form shut sacs, no opening being visible at either end, and certainly none is present at its free extremity. Their bases are fixed to the back of the polype cells, and each tube is filled in a recent state with a clear fluid. The use of these processes on *Flustra membranacea* appears therefore to me to be still involved in obscurity. Plate VIII. fig. 3. represents a few of the cells of the

* The cells of *Valkeria imbricata* first manifest themselves on the main stems as mere buds or protuberances, and in this stage of their formation are imperforate.

zoophyte which I thought might be *Langenella repens.* I have given a figure of it in order to avoid any error.

I have recently met with a single specimen of a species of *Bowerbankia,* or, perhaps, I should rather say, of *Valkeria,* differing both from *B. densa* and *V. imbricata,* but in some measure uniting the characters of each. The polypi have only eight tentacula, and the cells are nearly as large as those of *Bowerbankia densa,* but are of a different shape, the upper half of the cells being much narrower than the lower. See Plate VIII. fig. 4.

Pedicellina, *Sars.*

Corpora gelatinosa, nuda, pedicellata, clavata, in surculo tereti repente verticalia. Clava oblonga, compressa varie dilatabilis, supra serie tentaculorum coronata. Tentacula cylindrica cirrata. Os et anus vicina in extremitate superiore excavata.

Pedicellina echinata, pedicellis echinatis.

The above are the characters of a very curious and remarkable zoophyte, imperfectly figured and described, first by Ellis and subsequently by Lister, and of which mention is also made by Fleming under the name of *Hydra coronata.* When in Belfast a short time since, among other works which Mr. Thompson was kind enough to procure for my examination was a copy of Sars's 'Beskrivelser over Polyp.,' &c., published, I believe, in 1835; on looking over which I discovered a figure and description of this but little known species under the name of *Pedicellina*; which name, as well as Sars's generic and specific characters, I have adopted. Sars has described a second species belonging to the genus *Pedicellina,* distinguished from the former by the foot-stalk being destitute of hairs. This species I have not met with. To Ellis is due, I believe, the credit of having first noticed the species of which I am about to give a detailed account.

Before meeting with Sars's work, I had ventured to change Fleming's decidedly incorrect generic appellation of *Hydra,* and to substitute in its place that of *Cardua,* retaining the specific term. I was induced to confer this name upon it from the great resemblance which the polypes of this zoophyte bear to the heads of thistles, and this resemblance is strengthened by the presence of hairs upon their surface. A descending gullet, stomach, and ascending rectum, are distinctly visible. Just above the stomach and apparently connected with it, a yellow body may be noticed: this is in all probability a liver; it is not a gizzard, as no food was seen to pass into it, although I was able to trace its passage in its whole course along the intestinal canal. Above this yellow body a dark, ill-defined mass is seen, the nature of which I am not able to determine. The tentacula are about $\frac{1}{3}$rd the length of the head of the polypus, and are about sixteen in number, tuberculated, and thickly ciliated, as is also the interior of the whole line of the alimentary canal. Near the junction of the stomach and ascending rectum, and contained within them, a small dark body may often be observed in active rotatory movement; the nature of the body, which has been noticed in some other zoophytes, and the cause of its motion, have not, I

believe, been fully understood: it is nothing more than fæcal matter kept in constant rotation by the action of the cilia lining the whole internal surface of the alimentary canal, and which, by their peculiar arrangement, drive it on towards the place by which it is to make its exit—thus supplying the office of proper propelling muscles. The polypi are usually non-symmetrical, one side being more bulged out than the other, but they are capable of assuming various other forms and appearances. The tentacula, too, vary much in their disposition, being sometimes directed either outwards or upwards; at others they are curved inwards, usually to a small extent, but occasionally so much so as to be entirely lost to view, being concealed by the outer tunic of the polypus. The motions of the polypi of this species are very lively and peculiar. All the Ascidian zoophytes are much more vivacious and active in their movements than the Hydroid, and this is the necessary result of their higher organization. "The stems, though commonly still, have free power of motion; and when one is disturbed it bends quickly to and fro, so as to strike one or two more; these again strike upon others, and thus for a few seconds all are in action; but they soon return to quietness, and the arms, which during the commotion had been doubled up, open again."—*Lister.*

I much regret that I was unable, from want of time, to carry my observations further on the anatomy of this species, so well adapted, both from its size and the circumstance of its being the only known naked Ascidian zoophyte, for anatomical examination. I have sent a more perfect figure than has yet been given of this species to Dr. Johnston.

On *Vesicularia spinosa*: very rare: Dublin Bay.

Crisia aculeata. Milne Edwards has figured this species, which I described in the 'Annals of Natural History' for November 1840, in the 'Annales des Sciences Naturelles' for April 1838, under the name of *La Crisie ivoire.* How Milne Edwards could have confounded this somewhat rare species with the common one *C. eburnea,* I am at a loss to conceive. Upon this latter species in no case have I ever met with spines; and had they ever existed, traces of them would have been visible on the sides of the cells, as they always are in *C. aculeata,* even when the teeth themselves have been broken off.

Rarely found on stones, east of Kingstown harbour.

Hippothoa lanceolata. See Plate VIII. fig. 5, 6, for a representation of this elegant species.

Trawled up off Bray on old valves of *Pecten communis.*

Anguinaria spatulata. On stones east of Kingstown harbour, abundant; also at the Giant's Causeway, on Fuci.

Tubulipora verrucaria, Milne Edwards. This species in its perfect state, as it occurs in Dublin Bay, resembles in outline a pentapetalous flower, being *slightly* five-lobed. This peculiarity has not, I believe, been noticed. Some time since, not knowing that it had been described, I gave it the name of *Tubulipora floriformis,* to express this peculiarity of form. To Mr. Thompson of Belfast the credit of the discovery of this as a *native* zoophyte is due, a fact of which I

was ignorant when I published a former paper on Irish zoophytes. Mr. Thompson has also been the fortunate discoverer of one or two other undescribed and beautiful species of *Tubuliporidæ.*

Monkstown, Dublin Bay, on the frond of *Laminaria digitata*: not common.

T. lobulata? Polypidom six-lobed; cells irregular, united.—A. H. H. Polypidom divided into six lobes of unequal size; tubes joined, of irregular form and size. See Plate X. fig. 1, 2. Of the above *Tubulipora* I have met with but a single specimen; its appearance and development however is so different from any hitherto described, that I conceive myself justified in considering it to be a distinct species.

Cellepora ramulosa. Not common: obtained by trawling off Howth.

C. bimucronata. Cells ovate, disposed in a single layer; apertures circular, with a slight excavation below, armed on each side with a short strong process.—A. H. H. A species of *Cellepora* is described by Lamarck under the name of *Cellepora bimucronata,* and which I conceive to be identical with that defined above. Although I am inclined to consider this as a distinct species, I yet do not feel assured that it is really so; if not, it is to be regarded as *C. pumicosa* in the first stage of its formation. See Plate IX. fig. 1.

Berenicea hyalina. On the roots of *Laminaria digitata,* Bray Head: not uncommon.

Lepralia nitida. Lepralia costata or *thoraciformis* would not be an inappropriate name for this curious species, resembling, as each cell so accurately does, a miniature human thorax; the cross pieces representing the ribs, and the broad band into which these are inserted being analogous to a sternum. A distinct spine is frequently to be observed on each side of the lower angle of the mouth of the cell.

On stones east of Kingstown harbour: rare.

L. coccinea. On stones below low-water mark, east side of Kingstown harbour: common.

L. variolosa. On a bivalve, Sea Point: rare.

L. ciliata. "Cells ovate-globose, frosted; the aperture contracted, circular, armed with from five to seven long spines."

The lower border of the mouth of each cell is prolonged into a spout-like process, beneath which, in perfect specimens, a pointed tooth, somewhat shorter than those surrounding the aperture, is visible. See Plate IX. fig. 2.

Rather abundant on stones, shells, and fuci, Dublin Bay.

The following species of *Lepralia* have never, I believe, been described as British zoophytes; whether they are altogether new I cannot say. I have not, however, been able to identify them *with certainty* with any hitherto described, although I have consulted numerous works with this view; among others, Delle Chiaje's 'Anim. senza Vert. di Napoli,' in which many *Lepraliæ* are figured.

L. appensa. Cells somewhat raised anteriorly, frosted, larger above than below; aperture quadrangular, surrounded by four or five

long slender spines of nearly equal lengths; the lateral walls of each cell are prolonged into large, triangular, winged appendages, which are hollow, and communicate with the interior of the cells. See Plate IX. fig. 3. These appendages are always present.—A. H. H. The front wall of each cell rises into the mouth in the form of a strong pointed process.

L. pedilostoma. Crust spreading irregularly; walls of the cells reticulated; aperture calceoliform; margin plain, everted.—A. H. H.

The crust of this species in a recent state is always of a red colour. The cells are but little raised, and are closely approximated to each other. Their divisions and arrangement are often rendered unequal and irregular by the rough surface on which they are developed, being usually found in the crevices of rocks and on stones. See Plate IX. fig. 4.

Blackrock and Portmarnock: not uncommon. I have also found specimens of this species adhering to the bottom of an old hulk, the Olbers, in Plymouth Sound.

L. insignis. Cells raised, ventricose; aperture armed with from five to seven spines. A long spinous process rises out of the cell, low down and to one side.—A. H. H.

This singular species is readily distinguished from all others by the position of a sharp spine or tooth, which proceeds, not from near the aperture, but low down, from the side of the cell, in the wall of which a hole is visible if one of the spines be broken off. The aperture of the cells describes $\frac{3}{4}$ths of a circle, the lower part being straight. In addition to the spines which surround the aperture, and which gradually diminish in length on each side, a short process rises from the front of the cell, just below the aperture. See Plate IX. fig. 5.

Dublin Bay.

L. cylindrica. Crust opaque; cells cylindrical; aperture circular, plain, slightly contracted: a single broad triangular tooth rises from the anterior wall of the cell just below its aperture.—A. H. H.

This species bears a considerable resemblance to *Berenicea hyalina*, from which, however, it is estranged by the opacity of the crust as well as by the presence of the tooth. There is a neck or collar joined to the aperture in *B. hyalina* not present in this. See Plate IX. fig. 6.

A single specimen on the root of *Laminaria digitata*, Dublin Bay.

L. punctata. Cells oval, not much raised; apertures subquadrangular, having the lower lip thickened and somewhat everted. On each side of the opening of the cell a small triangular process is seen, and from the upper margin of the aperture three or four short teeth arise. The walls of the cells are perforated with small holes, which give them a dotted appearance; this is an invariable character of the species. See Plate IX. fig. 7.—A. H. H.

On stones, east of Kingstown harbour.

L. linearis. Cells much depressed, radiating in lines from a centre, and increasing in size towards the edge of the crust, upper

part rounded; aperture contracted, circular, with a minute spout-like elongation below; teeth either three or four, surrounding the upper half of the aperture: on either side of the small spout-like elongation referred to, a short blunt process is visible. See Plate IX. fig. 8.—A. H. H.

On stones east of Kingstown harbour, and at the Giant's Causeway: not common.

Membranipora stellata, Thompson. A species has been described by Mr. Thompson in the 'Annals of Natural History' for April 1840, p. 101, under the name of *Flustra* or *Membranipora stellata.* This supposed species I have ascertained to be merely *Membranipora pilosa*, with the bristle abortive, on an expanded surface. I wrote to Mr. Thompson upon the subject, at the same time forwarding specimens for examination, and that gentleman's reply was confirmatory of my opinion. Mr. Thompson was, I believe, the first who described *M. pilosa* to assume the *stellate* form, and to have the cells disposed in the manner indicated in the description of *M. stellata.*

Flustra truncata.—Giant's Causeway, abundant; but not found upon the coast of Dublin.

F. avicularis. This species in a recent state is of a reddish colour, but becomes of a grayish black in drying; this change of colour in drying is, I believe, peculiar to this species, and the cause of it I am not acquainted with. I have sometimes observed the bird's-head appendages (whose motions are so very peculiar and unaccountable) described as belonging to *C. avicularia*, on this species.

I now find that this species is very abundant in Dublin Bay.

F. lineata. Not uncommon on *Patella cærulea*: Bray.

F. tuberculata. Not common: Merrion, Dublin Bay.

F. distans. Polypidom encrusting, grayish, calcareous, reticulated; cells oval; margin broad, having its inner edge slightly crenulated; two short processes are visible at each upper angle of the cells.

I am informed by Dr. Johnston that this species was discovered some years ago by Mr. Bean, but that the habitat of his specimen was unknown. It is on this account, I imagine, that no description of it has as yet been given in Dr. Johnston's 'British Zoophytes.' Dr. Johnston, in a recent letter to me, remarks, "yours is the only native specimen I have seen." From a comparison of specimens of this with *Flustra tuberculata*, I cannot help suspecting that they are in fact one and the same species. When at Belfast a short time since, I saw several fine specimens of this species in Mr. Thompson's cabinet, obtained some time since upon the coasts of Down and Antrim.

On stones east of Kingstown harbour: not common.

F. carnosa. This species, which is undoubtedly no *Flustra*, ought to be raised to a generic rank and placed in the family *Alcyonidulæ.* Pallas asserts (I quote from memory) that the tentacula vary from 18 to 30: this assertion I am not able to verify, having constantly

found the number of tentacula in each polype to be the same, viz. 30.

Dublin Bay: abundant on *Fucus siliquosus.*

F. Hibernica. I have now ascertained that this species, which I described in my Catalogue of Irish Zoophytes published in the 'Annals' for November 1840, is not a *Flustra* but a *Lepralia*, which I have again figured and described in this paper under the head of *L. pedilostoma.* The figure given with the Catalogue represents a posterior view of the cells, the wall of each cell posteriorly being absent. The error of figuring the cells posteriorly instead of anteriorly, and the absence of the posterior wall, are thus accounted for. The specimen from which the figure was taken adhered to an *Ascidia*; this *Ascidia* grew on the under surface of a rock, in removing which, the *Lepralia*, which covered the rock before the *Ascidia*, also came away,—the *mouths* of the cells adhering to it, and the wall still remaining attached to the rock. The detection of an error of this nature is almost as pleasing as the discovery of a new species.

Cellularia avicularia. This species I now find to be abundant in the Bay of Dublin and about the neighbouring coast.

Alcyonidium gelatinosum. Occurs in long rope-like masses, and is rarely obtained except by trawling. Rare, off Howth and Lambay.

A. hirsutum. The polypidom of this species in its young state is clavate, and not branched. As in this condition it might, possibly, be mistaken for a distinct species, I have given two figures of it, one representing it of its natural size; the other is a magnified view of it, with many of the polypi protruded. When under the microscope it presented a very beautiful appearance, some faint idea of which the drawing, Plate X. fig. 3, 4., is intended to convey.

A. parasiticum. Polypidom encrusting, spongy; cells polygonal, but irregular in size and arrangement. Polypes with sixteen tentacula.

The nature of this production, which has long been involved in obscurity, I have at last succeeded in determining. By very many it was not considered to be a zoophyte at all; I have, however, ascertained, beyond all doubt, that it is a true polypiferous production of the genus *Alcyonidium.* Dr. Johnston describes the polypidom as "entirely composed of particles of sand cemented together with mud or clay." Were this really its character, this fact alone would be sufficient to decide that it could not be a zoophyte; for the polypidoms of all true zoophytes are growths, and not artificial formations. Numerous sandy particles are certainly found in connexion with it, but not, in my opinion, incorporated with it; their presence, I believe, being confined to cells vacant by the death of the polypi. If previously dried, and then dropped into water, it immediately sinks to the bottom, and does not remain there wholly unaltered, but slowly absorbs a portion of the fluid until it has attained its original dimensions. I also believe that I have detected a few siliceous spiculæ, and certainly numerous siliceous granules,

which are to be distinguished from the particles of sand by their much smaller size. In a recent state a membrane is attached to the edges of each cell; this rises up in a globular form, and bears a near resemblance to the papillæ on *A. hirsutum.* The polypi correspond so closely with those of the other species of *Alcyonidium,* that I have thought it superfluous to give a separate figure of it, having the same number of tentacula, viz. 16.

Encrusting various flexible corallines, Dublin Bay: common.

A. echinatum. It is not a little remarkable, that the polypi of this common species should have remained hitherto undescribed. I was lately so fortunate as to meet with some specimens in which I had an opportunity of examining the animals in a living condition. The result of this examination proves, that it is not only not allied to the family with which it has up to this time been classed, but that it is a true Hydra zoophyte, related closely to *Coryne squamata,* between which and *Hermia glandulosa* it forms a new and distinct genus. This new genus it was my wish to have dedicated to Dr. Johnston, the author of the work on British Zoophytes, in acknowledgment of the valuable services rendered by that gentleman to this interesting department of natural science. In this desire I have, however, been disappointed, from the circumstance of a genus in botany having been dedicated to Dr. Johnston, the editor of Girard's 'Herbal.'

The generic name which I have adopted was suggested to me by my friend G. J. Allman, Esq.

The following are the characters of the genus

ECHINOCHORIUM, *Hassall.*

Polypidom encrusting; surface raised into numerous rough papillæ; polypi hydroid, naked, pedicellated.—A. H. H.

Echinochorium clavigerum. Polypidom muricated with rough spinous papillæ about a line in height. Polypi more or less clavate, not retractile within cells; tentacula claviform, about $\frac{1}{3}$rd the length of the body, retractile.

There are numerous indentations on the surface of the polypidom, in each of which the base of a polype is inserted; this latter is about $\frac{1}{4}$th of an inch in height and is of a white colour; its head is somewhat enlarged, and is surrounded with numerous contractile club-shaped tentacula; the number of these varies considerably, but frequently amounts to between twenty and thirty. The tentacula are not arranged in any determinate order, as they always are in the Ascidian type of zoophytes, but are variously disposed. This observation applies to all Hydroid zoophytes. Whether the polypes are separate or united at their bases, I am unable to say. See Plate X. fig. 5., which is a magnified representation of this genus and species. This species does, I believe, possess a stomach, which in one of the polypi in the figure is seen to be everted. Fig. 5, *b.*

Dublin Bay and Portmarnock: common.

A marked correspondence exists between the natural history of the coast of Antrim and the opposed shore of Scot-

land; and the relation is particularly obvious in the distribution of zoophytes, three species of which, common in the North of England and on the Scottish shore, being also present on it, and not, I believe, found upon any other part of the coast of Ireland. Thus *Thoa muricata* (never before recorded as Irish), *Sertularia filicula* and *Flustra truncata,* all more or less extensively distributed upon the English and Scotch coasts, are occasionally met with on the Antrim coast, in the neighbourhood of that wonder of the world, the Giant's Causeway. Ireland, therefore, it may fairly be inferred, is indebted to Scotland for the presence of at least three species of zoophytes, and probably for some others. I think I may venture to predict that *Thuiaria thuja* will eventually be found on the coast of Antrim. I now find that only one species of *Plumularia* is wanting in the Bay of Dublin, and that is *P. pennatula.*

To the title of my Catalogue an objection has been raised by Mr. Thompson of Belfast, on the ground that it does not embrace the whole coast of Ireland, but is confined to a particular portion of it. The justice of this observation, as originally applied to that portion of the Catalogue which has already been published, I willingly admit. It should rather have been entitled a 'Catalogue of the Zoophytes of Dublin and its vicinity;' this title, however, would not be equally applicable to the continuation of the Catalogue, as to some species I have given a second locality.

I wish it to be distinctly understood, that the Catalogue which has been already published, as well as this Supplement, contain only the results of my own personal observation and research. I have, therefore, not deemed it necessary to advert to the writings of other Irish naturalists on this branch of natural history, not having had occasion to refer to them. I may, however, mention, that a catalogue of Irish zoophytes was published by Mr. Templeton, of Belfast, some years ago; that many of Ellis's specimens were obtained on the Irish coast; and that a list of unrecorded species was published by Mr. Thompson in the 'Annals of Natural History' for June 1840, at which time my Catalogue was with Mr. Taylor, the editor, for publication. I must not omit to notice also, that many rare species of zoophytes were procured by Mr. R. Ball and Miss Ball of Dublin, at Youghal, county of Cork.

I have now brought the enumeration and description of the species to a conclusion. During the compilation of this Supplement I have had occasion to make various references to Dr. Johnston, who has always promptly and kindly favoured

me with his opinion, and to whom, therefore, my most sincere thanks are due.

For the beautiful drawings which accompany this communication, some of which I have had the pleasure of exhibiting to the Society, I am indebted to the skill and perseverance of a lady, whose name I would most willingly mention were I authorized to do so.

Having brought this paper to a termination, it now only remains for me, in the first place, to thank the Society for the attention with which it has listened to me, and to hope that any errors of detail which may have been noticed will be excused, when the time occupied, less than two months, not merely in the preparation of the manuscript and drawings, but also in obtaining the materials for it, is taken into consideration; and secondly, to beg its acceptance of a collection of Irish zoophytes, a portion only of which is now upon the table.

In taking my leave for the present, I cannot refrain from the expression of my most cordial wishes that the affairs of this Society may "go on and prosper," conferring, as it must necessarily do, moral and intellectual benefit, not merely on the members composing it, but, through them, upon the country at large. I shall at all times feel great pleasure in contributing my mite towards the promotion of its objects. With this paper terminate, I regret to say, my labours in this interesting, and as yet not fully explored, field of natural history. In a few days I shall be called upon to quit the beautiful ocean,—beautiful in its strength, its purity, its freshness, its majesty, and in its infinity; beautiful in calm and storm; and its still more beautiful and ever-varying productions, in the study and contemplation of which I so much delight.

EXPLANATION OF THE PLATES.

PLATE VI. Fig. 1. A magnified representation of *Coryne squamata.* Fig. 2. *Hermia glandulosa*, a single polype, magnified, exhibiting the reproductive gemmules. Fig. 3. *Sertularia Margarita*, nat. size. Fig. 4. Do., magnified. Fig. 5. *Sertularia pumila*, magnified.

PLATE VII. Fig. 1, 2. *Thuiaria articulata.*

PLATE VIII. Fig. 1. *Plumularia frutescens*, natural size. Fig. 2. *Valkeria imbricata*, natural size. Fig. 3. *Langenella repens?* magnified. Fig. 4. New species of *Valkeria.* Fig. 5, 6. *Hippothoa lanceolata.*

PLATE IX. Fig. 1. *Cellepora bimucronata.* Fig. 2. *Lepralia ciliata.* Fig. 3. *L. appensa.* Fig. 4. *L. pedilostoma.* Fig. 5. *L. insignis.* Fig. 6. *L. cylindrica.* Fig. 7. *L. punctata.* Fig. 8. *L. linearis*: all magnified.

PLATE X. Fig. 1. *Tubulipora lobulata*, natural size. Fig. 2. The same magnified. Fig. 3. *Alcyonidium hirsutum*, in its young state. Fig. 4. The same magnified. Fig. 5. *Echinochorium clavigerum*: *a*, one of the polypes with its feelers retracted; *b*, one with the stomach everted.

XL.—*On the Composition of Chalk Rocks and Chalk Marl by invisible Organic Bodies: from the Observations of Dr. Ehrenberg.* By THOMAS WEAVER, *Esq., F.R.S., F.G.S., M.R.I.A, &c. &c.*

[Concluded from p. 315.]

On the Composition of the Compact Limestone of Upper Egypt and Arabia by the invisible Animalcules of the White Chalk of Europe.

BOTH the nummulite limestone of the pyramids of Geza on the left bank of the Nile, and the same kind of rock on the right bank near Cairo, contain numerous microscopic animalcules of the chalk, which serve as a cement to the Nummulites. I had often examined microscopically specimens which I had brought from thence, but I did not succeed in separating and rendering visible the different elements with equal clearness, until I applied my newly-acquired practice, which was much facilitated by immersing these stones a longer time in water. The same result attended the examination of the other calcareous rock masses of Upper Egypt and Arabia, showing that the animalcules of the chalk occupy in a surprising manner a wide extent of country in Libya.

Nummulite limestone, wherever occurring, has been most usually referred to the tertiary period, although perhaps often belonging to the chalk. In Egypt it possesses no great extent. On the right bank of the Nile it is deposited only in the small hills near Cairo, and on the left bank, as it appears, in a tract extending from Siout to the declivity of the compact limestone, which latter constitutes the mass of the rocks that line the course of the Nile in Upper Egypt. It forms the foundation and principal material of the Pyramids. Northward it is directly bordered by the slimy delta of the Nile, the productive soil of Egypt. Between the Oasis of Jupiter Ammon and the Mediterranean, is a wide elevated plateau or tableland of rock, among whose numerous organic remains are known tertiary forms. The whole of Upper Egypt, as far as Syene, has a similar character. In 1828, though assured that its limestone rocks were more ancient than the tertiary period, yet, from want of distinct fossils, I was doubtful whether they might not be referred to the Jura formation. On the south, and not far from Syene, this limestone is incumbent on sandstone (Quadersandstein?), and the two repose on granite and the primary rocks connected therewith. I gave these views in 1828 in the geologically coloured map which accompanied the first section of the first volume of my Travels in Egypt, Libya, Nubia, and Dongola.

It now results, from the microscopic examination which has

taken place, that the whole of the limestones of Benisuef, Siout and Thebes, on the western bank of the Nile, and of Cairo and Kineh (including the gray marl near Kineh), on the eastern bank, and which inclose the Nile at an elevation of frequently 100 to 300 feet above its level, extending along the river full sixty German miles in length, are, like the Nummulite limestone, composed of an inconceivable accumulation of microscopic calcareous-shelled animalcules, which are of precisely the same genera and species as those which constitute the chalk of Europe. The table-land formed by these calcareous rocks extends far westward into the Desert, and it is perhaps principally composed of them.

A new and unexpected light is thus thrown on these extensive regions. The phænomena apparent in Egypt may be connected with those of Western Africa. It has been already shown that the same animalcules constitute the territory of Oran, stretching far along the foot of the Atlas; and when we consider the equality of surface which prevails in the plain of the Great Desert, or Sahara, of the North of Africa, and compare it with what I have myself seen along the whole extent of its eastern border, as well as on a large portion of its northern, we may be well permitted to think of a similarity of composition.

But these distinct indications of a similar organic influence extend not merely to the west but also to the east of Cairo, expanded into Asia. The specimens collected by Dr. Hemprich and myself from Hamam Faraūn, and Tor in the Sinaian portion of Arabia, which I had formerly considered as ash-gray marl and yellowish-gray limestone of the tertiary epoch, were now proved, by the new method of examination, to consist of quite the same microscopic chalk animalcules as constitute the hilly masses of Upper Egypt. And from hence this formation appears to be continued eastward far into the interior of the Great Desert plain, trending toward Palestine; but on the Arabian coast of the Red Sea we did not find it further south than Tor, which locality alone, among all the points of the east, yielded flints similar to those which occur in the European chalk.

We have here to remark on the absence of siliceous animals in this limestone and marl formation, while the so-called Egyptian pebbles and jaspers occupy the same position in horizontal layers as the flints in the North of Europe, appearing as their substitute. But in these jaspers the organic siliceous elements are no longer to be distinctly found by reason of their intermixture with other substances, and their consequent opacity, giving rise to dendritic and other delineations. It seems as if the solution and conversion of the organic into the inorganic in the Egyptian pebbles (*Cailloux d'Egypte*)

is throughout more perfect than it is in many flints, although the constituent elements of both kinds of stone are very probably quite the same.

On the principal Organic Calcareous Forms which compose the mass of all Chalk.

From what has been already stated, it is evident that the production of the calcareous mass of the chalk is not to be attributed, as formerly conceived, to the larger organic bodies, but to the minuter, and in the greatest measure to such as are invisible, consisting of eight genera of Polythalamia with twenty-five species, and excluding all such as may be distinguished by the naked eye, that is, exceeding $\frac{1}{24}$th of a line in magnitude; the latter, however, are comparatively rare. It is possible that several other, and perhaps many species of the same genera, may yet be discovered in the chalk, as well as other genera, since the investigations hitherto made could only be applied to a minimum of its substance; yet, as these were conducted by me on chalk from many regions, it does not appear probable that other sections of the animal kingdom will be found to have taken so great a share in the formation of chalk as the Polythalamia, the principal prevailing forms of which I have indicated.

From the preceding it is also apparent that the chalk rocks of all countries agree in their constituent organic forms not only according to the zoological class, but also in genera, and for the most part in species likewise; this character being not confined to the white tender writing chalk of Europe, but extending also to the compact limestone rocks of the North of Africa and the West of Asia. Particularly striking is the characteristic persistence of single forms through all these different and widely-separated countries. Thus in all of them are to be found *Rotalia globulosa*, with *Textularia globulosa*, *T. aciculata ?*, and *T. striata*, as well as *Planulina turgida*, thus giving a common character to all these rock formations; and this character becomes the more important, when we consider that these forms are the most numerous, and in fact are the chief constituents of the chalk*.

* The Polythalamian forms which Mr. Lonsdale noticed in the English chalk in 1837 as visible to the naked eye, and amounting to 1000 in one pound of the chalk, and which, with Mr. Lyell, he has named *Lenticulina* and *Discorbis*†, appear, judging by the figures, to be referable to *Rotalia ornata* and *R. globulosa*, including perhaps fragments of *Textularia globulosa*.

I may here remark, that my continued researches on the Polythalamia of the chalk have convinced me, that very frequently in the earthy coating of

† Dr. Buckland's Bridgewater Treatise, 2nd Edition, vol. i. p. 448. 1837. Lyell's Elements of Geology, 1838.

If now the question be asked whether the forms which occur in such masses in chalk belong to it exclusively, and are hence to be considered characteristic of that formation, I am almost disposed to reply in the affirmative. The analogous forms which occur in sea-sand, tertiary sand, and indeed in all modern formations, are viewed for the most part as different and larger species, although of the same genera; and it does not appear that any of these forms can be referred with perfect certainty to such as are now living in the sea.

To the theory of the formation of limestone, the observation is important, that these organic deeply-seated relations are not peculiar to the chalk formation. The tertiary calcareous beds consist, in like manner with the chalk, of multitudes of such Polythalamian animals, which compose in many quarters sandy sea-downs of great extent; and even in the sandy desert of Libya we can recognize distinct Polythalamia. On the other hand, having succeeded in discovering microscopic Polythalamia in the compact flints of the Jura limestone from Cracow, which are of decidedly different forms from those of the chalk, the calcareous animals being *Nodosaria urceolata*, n. sp., and *Soldania elegans*, n. sp., and the siliceous *Pyxidicula prisca*?, with *fragments of soft sponges*, it becomes apparent that such invisible organic bodies were also present in the formation of the Jura limestone.

On the Geographical Distribution of Living Polythalamia on the African and Asiatic Coasts of the Mediterranean, and in the Red Sea.

The materials collected by Dr. Hemprich and myself in the Mediterranean refer to four points on the Libyan coast, and one point on the Syrian coast. In regard to a second point on the latter coast (St. Jean d'Acre), I have acquired a knowledge of some forms from the collection of Dr. Parthey.

From the Red Sea nine forms were made known to us by d'Orbigny, collected from sand presented to him by Deshayes. But from the collections made by Dr. Hemprich and myself from thirteen points along the whole length of the Red Sea, it appears that very numerous forms exist. Of seven of those points, one occurs on the western (African) coast at Suez, and six on the eastern (Arabian) coast, namely, at Tor, Erraie and el Ard, Moileh, el Wusch and Gumfŭde; and of the remaining six, five are islands on the Arabian side, namely, Sanafer,

flints, which is partly calcareous and partly siliceous, the original calcareous-shelled animal forms have exchanged their lime for silex, without undergoing any alteration in figure, so that while some are readily dissolved by an acid, others remain insoluble; but in the chalk itself all similar forms are immediately dissolved.

Maksure, Barkan, Sanac and Ketumbul, and one an island on the African side of the Red Sea, namely, Massaua.

It is possible that by repeated and closer examination of the marine productions collected by us, many other Polythalamia may be found besides those already discovered. In the mean time, as a preliminary, I have drawn up a list of the species hitherto met with*. From this it results that the total number of species of Polythalamia observed in the Red Sea are *fifty*, and in the Mediterranean, on the Libyan and Syrian coasts, *twenty-seven*. The new species derived from the two seas amount to *fifty-four*, of which *twenty-seven* species are peculiar to the Red Sea, and *seventeen* are common to both seas. Particularly worthy of notice is the wide distribution and massy development of the *Peneroplis planatus* and *Sorites Orbiculus*, which are rare on the European coast. These forms are not only present almost everywhere in the East, but constitute the predominant masses. On the other hand, the *Rotalia Beccarii*, which composes the Italian hills, occurs only singly and very rarely in the Red Sea; and I nowhere found it on the Libyan and Syrian coasts. The *Sorites Orbiculus* I have also from St. Domingo.

In reviewing these subjects, even a superficial comparison of them with the contents of the chalk and chalk marl, is attended with the striking result, that none of these living forms are found among the animalcules of the chalk, not even among those which compose the compact limestone of the Egyptian and Arabian rocks, and which are still partly washed by the sea near Hamam Faraūn.

Remarks on Polythalamia.

After a preliminary view of the researches of earlier labourers in this branch of zoological inquiry, Dr. Ehrenberg observes:—A lively interest respecting the minute Polythalamian bodies which enter into the composition of sea-sand was excited anew by the work of Alcide d'Orbigny in 1826, in which are contained a great number of new species, while many of those which were previously known are examined with greater

* Of d'Orbigny's nine species from the Red Sea, there are three which I cannot identify, namely, *Triloculina bicarinata, Quinqueloculina limbata*, and *Q. punctata*; but the other six are probably those with which I have become acquainted, and to which I have therefore given the same names, namely, *Textularia communis, Calcarina Defrancii, C. Gaudichaudii, Quinqueloculina sulcata*, and *Vertebralina striata*. His *Assilina* (*Nummulina*) *nitida* I hold to be the *Sorites Orbiculus*.

Although I possess and have compared many of the Polythalamia which have been described by d'Orbigny derived from the same localities, yet I am in want of a great number of the originals named by him, and as this author has generally given new names unaccompanied by descriptions, I have not in most cases been able to determine to what form the name given by him belongs.

care, and an improved and easier view is taken of the whole subject. By his active exertions he had collected between 600 and 700 species from the sea-sand of France, Italy, England, the Isle of France, Sandwich Islands, the Malouine and Marian Isles, &c., of which, however, only 425 received names. The whole mass of these microscopic animalcules, which he again decidedly associates with the Mollusks and Cephalopods, but in a distinct order under the name of *Foraminifères*, are distributed by him into five families, according to the spiral or other form in the grouping of the cells; these families comprising fifty-two genera. On this work Deshayes made various critical remarks in the *Dictionnaire Classique*. D'Orbigny expressly states that the animal of the Polythalamia (his Foraminifera) resembles the Sepia in the structure of its body, although much smaller, and then proceeds to give the essential characters of the living body of the Polythalamia, yet without naming specifically or generically any one animal from which they were taken*.

Both Blainville and Dujardin have made the correct observation that the minute shells of the Polythalamia are external cases, and not, as incorrectly viewed by Denys de Montfort and Alcide d'Orbigny, internal bones. Yet in referring the microscopic so-called Cephalopods to the Infusoria, Dujardin commits a mistake†. It was this contradiction between observers that induced Férussac, in his great work, *Histoire Naturelle des Mollusques*, to exclude the Foraminifers from the class of the Mollusks; and others entertained similar objections, yet without assigning to them a correct position.

In the year 1831 I laid before the Academy contributions to the knowledge of Coral animals, with an attempt to class them physiologically; which attempt was entirely founded on my own observations of the living animalcules, when, accompanied by Dr. Hemprich, I travelled on the Red Sea in the years 1823 and 1825. In that work I designated the Coral animals as composed of two strongly marked organically distinct groups, under the names of *Anthozoa* and *Bryozoa*. In the year 1831 also, I communicated in the *Symbolæ Physicæ* the first development made of the complicated structure of the *Halcyonella stagnorum*, one of the Bryozoa, and showed that it was quite similar to that of Flustra.

The researches of Dujardin in 1835 gave an entirely new direction to the ideas which had been formed of the Polythalamia, showing that not a trace of resemblance was to be found between them and Sepia; on the contrary, the greatest simplicity of structure became apparent, bespeaking a simple ani-

* *Annales des Sciences Naturelles*, 1826, t. vii. p. 245.

† *Annales des Sciences Naturelles. Seconde Série*, t. iv. p. 343, 1835.

mal body covered by a shell, with the power of extending or contracting itself at will. But when Dujardin expressly compares the Polythalamia to the *Proteus* (*Amoeba*) of the Infusoria, such an association cannot be admitted, unless it be first proved that a polygastric structure exists in those bodies. He has given to them the new name of *Rhizopodes*.

I showed, in 1837, that the Polythalamia could not well possess an organization similar to that of the Infusoria, as not a single known true species of Infusoria has a calcareous shell; and I had, in 1823, discovered, as I conceived, a true living Polythalamia of earlier authors, resembling in organization the very complex Flustra. The correctness of this view was fully established in 1839, after having examined anew, according to my improved method, the small *Nautilus Orbiculus* of Forskål, which d'Orbigny designated in 1826 as *Nummulina* (*Assilina*) *nitida*, specimens of which I had collected from the sand of the Red Sea in 1823, and which I have named *Sorites Orbiculus*. The result proved that the disc-like shell was a Polypary, often composed of more than one hundred single animalcules, the cells of which quite resemble those of a Flustra, the animal putting forth and retracting from six to eight tentacula. And I even discovered in the interior of the single cells well-preserved siliceous Infusoria, the last food taken by the animal; and in some of them also small globular bodies, which, without much constraint, may be considered as eggs. Though I had at an early period observed that the disc was composed of many cells, yet I could not perceive an opening to them; but the discovery of Infusoria in their interior led me to consider by what means they could have been introduced. Reflection reminded me that I had often seen Coral animals which in the expanded state exhibited many large bodies with tentacula and a large mouth, yet when contracted left scarcely a trace of the openings through which they were protruded from the common Polypary. As such I remembered *Pennatula*, *Lobularia*, *Halcyonium* and similar forms, in which I had frequently observed, that in the skin of the animal existed calcareous particles, which on the contraction of the skin so completely closed the opening as to render it no longer perceptible. Renewed examination of the closed surface of the cells of the *Nautilus Orbiculus*, Forskål, now showed to me that in them also dendritic calcareous particles exist, the close approximation of which closes the cell, so that the cover of the cell is in fact the dried skin of the animalcule. I now made an experiment in proof, by dissolving the small shell in dilute muriatic acid, in order to obtain the animal body in a free state; and it succeeded perfectly. I obtained as many animalcular bodies as there were cells, connected to-

gether by band-like processes, and in the interior of many of them there were well-preserved siliceous Infusoria. I then treated in the same manner the *Flustra pilosa* and *F. membranacea* of the Baltic, and found in their interior also siliceous Infusoria. The same results followed a similar examination of the shells of *Rotalia* from the sand of Rimini, of the shells of *Peneroplis planatus*, *Pavonina Antillarum*, and of *Orbiculina numismalis* from the sea-sand of St. Domingo, as well as of other shells with their animals from the sand of the Red Sea and the Mediterranean; so that now a view is obtained of the more general organization of the principal groups of the Polythalamia.

It results clearly from what has been said in respect of these species, which are so common and widely distributed, and which have hitherto been designated in systems as small Nautili, that the straight-jointed shells of Nodosaria (formerly viewed as Orthocera), as well as the spiral shells of Rotalia, Cristellaria, &c. (considered as Nautili or Ammonites), and the shells of Biloculina resembling vermiform tubes (*Serpula*), are none of them internal calcareous parts which were encased by an animal body, similar to the internal bone of Sepia, or the cylindrical spiral bone of Spirula; but, on the contrary, that they are external calcareous shells, bearing analogy to those of Mollusks, or more correctly to those of Flustra and Cellepora, which, after separation by an acid, disclose and render visibly free the internal simple body or the Polypary, exhibiting precisely the same form. If the shell of Polythalamia be frequently perforated with pores, this is no proof that no other openings exist, or that the animals receive nourishment through many tubes, for the same structure is not unfrequently found in Flustra accompanied with the peculiar opening from which the fore-part of the animal body may be protruded; and in these exist also fringe-like filaments, which are extensile and retractile, and by no means to be compared to the pseudopodia or variable feet of Amoeba, but probably bear analogy to the mantle fringes of many Mollusks, applicable to the purposes of creeping and attachment, and for which perhaps they were specially designed. Moreover, Flustra possess a distinct large animal organization; and the siliceous Infusoria, and probable eggs found in Polythalamia, clearly bespeak in them also similar relations, the discovery of which, however, had hitherto been prevented by the calcareous encasement and the minuteness of the objects.

It has resulted from the examination of the soft small animal bodies of living Polythalamia, that while many resemble Flustra or Eschara assembled in families or polyparies, each such family being often composed of hundreds of much mi-

nuter single animalcules, many others are single animals after the manner of Mollusks. Hence arise external characters and forms which have often a reference to very different relations, which it is first necessary to distinguish before we can succeed in obtaining a clear view of the whole. The assiduous and careful labours of d'Orbigny retain their full value, serving as a basis to all future researches; and if in the present communications I shall have succeeded in turning the inquiry into a more physiological channel, my object will be attained.

To the term *Polythalamia*, (originally introduced by Dr. Breyn, of Danzig, in 1732,) a different extension or signification under other names has been given by different authors. To remove this unsteadiness and wanton change of names, which only lead to obscurity, it appears advisable to apply the term Polythalamia, in preference, as Soldani had done, to that group in which the animalcules actually live in many cells, and do not, like the Nautili, possess many empty cells. This distinction, that the animal of the Polythalamia has no empty cells, but that all its cells are simultaneously occupied, is of particular importance in their systematic arrangement among other animal bodies. Where there are many cells, they consist either of so many single animals, the whole constituting a polypary, or of organically filled integrant portions of one and the same individual forming groups. Both structures are foreign to the true Cephalopods. The shell-bearing Cephalopods may with Linnæus be divided into the *unilocular* and *multilocular*.

On the other hand, the want of a sipho which has been assigned as a character of Polythalamia, and from which they were named *Asiphonoidea* by De Haan, is incorrect, inasmuch as many really possess a part which may be fully compared to a sipho, if not in function, yet in form, namely, the tube which connects the separate cells of Nodosarina and of all individual many-celled forms. It is only in the *Miliolina* family among the simple Polythalamia, and it is only in the families of *Asterodiscina* and *Soritina* among those forming polyparies, that the want of a sipho is really necessary, because they live individually in single cells. But all the Nodosarina, Textularina, Uvellina, Rotalina, and Plicatilia among the simple Polythalamia, and the Frumentarina, Helicosorina, and Alveolinea among those which form polyparies, possess tubes of connexion between the cells, which very frequently resemble also in form the sipho of the Nautilus. D'Orbigny, it is true, states also that the cells of Foraminifers are connected by several openings; that, however, proceeds from an erroneous view, for such Polythalamia alone present several openings at the border of the cells, whose calcareous surface is interrupted in the form of a net-work, exhibiting often a relation analogous

to that which is frequent in Madrepora and Astræa, in which the soft body is not divided or sharply cut off by compact calcareous plates, but the soft parts appear interwoven with minute calcareous rods, in a lattice-like manner. These numerous small connecting openings, which are sometimes visible in some of the Rotalia and Rosalina, and also in the Textularia, I do not consider essential, but hold that the true channel of connexion has always a large diameter, and is simple for each single animal. The erroneous view of d'Orbigny and of all his followers becomes so complicated, that polyparies are held to be single animals, and consequently the various connecting openings to be those of a simple individual.

With respect to d'Orbigny's genus *Nummulina*, although it has derived advantage from his diligent investigations, I consider it as composed of very heterogeneous elements, which belong to quite different divisions of animals. Some species of the sub-genus *Assilina*, and perhaps all of them, may belong to the families *Soritina* and *Asterodiscina*, while the *Assilina nitida* of the Red Sea is assuredly Forskål's *Nautilus Orbiculus*, that is, *Sorites Orbiculus.*

I am of opinion that all those species which are provided with visible traces of mouths or openings, as in Lamarck's genus *Lenticulina* with d'Orbigny's character of Nummulina, are to be received among the Polythalamia; but that all such species as have the form of a lens or disc, and are provided with internal spiral cells, but without a trace of such mouths, the cells being moreover separated from the external surface by thick calcareous layers, are to be considered as internal bones. These mouthless Nummulina are rather to be ranged with the Velellida of the Acalepha along with *Porpita*, where similar internally cellular coin-shaped bones exist. The considerable size of many Nummulina is also striking and foreign to Polythalamia, but agrees very well with the family of the Velellida, as also in the want of traces of the attachment of muscles, and in the want of a sipho or channel of connexion between the cells. Until better informed, therefore, I decidedly exclude the mouthless Nummulina from the Polythalamia, and retain only Lamarck's Lenticulina in the sense attached to d'Orbigny's Nummulina in a young state.

The distinctive character of the Polythalamia, when compared with their nearest relatives the *Flustra*, *Eschara*, *Cristatella*, &c., consists in the shell, and in their freedom of motion. But with this may be combined the power of attaching itself to other bodies, just as in the *Cristatella* (or *Hydra* also) which often remains long attached, and then creeps again. Those bodies which are apparently Polythalamian, but are really adherent and immoveable, belong to the *Cellepora*,

Flustra, *Tubulipora*, and similar forms. The simplest Polythalamian form is the *Miliola* in Dujardin's sense, if there be really such self-existent animals, and they be not the young of others, or of many-celled forms most nearly related to Biloculina. And perhaps *Gromia oviformis* might be so viewed, should it not prove to be a *Difflugia* (an Infusoria). In this series I myself place provisionally, as doubtful, those numerous small globules of the sand of Rimini which have no distinct opening, or sometimes present a very minute one. The next simplest form is that of a simple straight row of cells, as in the *Nodosaria*, a jointed continued development of a simple body. *Textularina*, *Uvellina* and *Rotalina* (Lenticulina), may, as to external form, be viewed as Nodosarina developed in another manner, namely, in botryoidal or spiral forms.

I have here to make a remark that appears important. In the entire vast mass of known Polythalamia, a case or vestment prevails which is either cuticular or composed of a calcareous substance, while in Infusoria either a cuticular or siliceous substance prevails, so that hitherto no calcareous-shelled Infusoria nor siliceous-shelled Polythalamia had presented themselves. Yet among the fossil microscopic organisms of the chalk marl of Sicily, we find intermingled with the Infusoria shells bodies whose forms may be ranked with Polythalamia, namely, with Nodosarina, but the shells of which are siliceous, insoluble in acids, and which to the eye have a more transparent vitreous aspect than the calcareous shells when penetrated by balsam. I have hence been induced to place these siliceous-shelled forms, until a further knowledge may be acquired of their organization, among the polygastric Infusoria near the shelled Amoeba, in a separate family, under the name of *Arcellina composita*, or *Polycystina**. Such siliceous-shelled *Polycystina*, resembling calcareous-shelled Polythalamia, are the genera *Lithocampe*, *Cornutella* and *Haliomma*, with several species.

I wish here to draw attention to a small character hitherto unregarded, which is distinctive of true Polythalamia, and often even of their fragments. It consists in this, that in the tube or channel of connexion between the cells, the mouth of the tube which belongs to the earlier smaller cell is overgrown and surrounded by the succeeding larger cell. If the mouth of the last cell be prolonged in a beak-like form, we find in all the earlier smaller cells a distinct tube, quite similar to the hard remains of the sipho in the Nautilus; but so placed that the tube always projects forward from the smaller into the larger cell, and never backward from the larger into the smaller

* This view has been already indicated in the work "On the Infusoria as perfect organisms," 1838, p. 136.

cell. In the Nautilus, this projection of the tube of connexion is reversed, always proceeding from the larger to the smaller chamber, so that in the last, the greatest chamber, the body of the animal thus acquires a smooth foundation, upon which it can move more freely. In true Nautili also the base of the cells is concave or undulated in the forward direction, while in the Polythalamia it appears without exception to be either quite straight or convex in that direction. This character was also observed by Fichtel and Moll.

The tabular view which I have given of the Bryozoa, founded as it is on the new observations which I have made, is drawn up with special regard to a definite expression of fossil phænomena, the ancient names of d'Orbigny being mostly retained. This very diligent precursor in these studies first laid down a foundation rich in forms and systematically ordered, which may serve for all future investigations, and has given names to families which are well adapted to his purpose; but these I have been obliged to alter, yet not arbitrarily, inasmuch as from the difference of our views it became necessary to separate from each other the forms which constitute his families, according as they are either simple Polythalamia, or Polythalamia composing polyparies.

Since the foregoing pages were drawn out, a newer work by Dr. Ehrenberg has made its appearance, embracing communications made to the Berlin Academy, on the continued researches of the author between September 1839 and August 1840, and bearing the title, "On the numerous Living Species of Animals found in the Chalk Formation*." Of this very interesting publication I had designed presenting an abstract, but having learned that a complete English edition of the work is about to appear† accompanied by the engravings, I now confine myself to a few notices immediately connected with the preceding part of this paper.

In this memoir Dr. Ehrenberg repeats his objections to the views entertained by MM. Alcide d'Orbigny and Dujardin. It has been seen, that to the Polythalamia, whose minute and often microscopic calcareous shells compose in inconceivable numbers, and in now nearly 1000 known different forms, the principal mass of chalk rocks and of many sands of the sea, M. d'Orbigny had several years since ascribed an external animal bearing the form of a Sepia, the small shell itself, which

* *Ueber noch zahlreich jetzt-lebende Thierarten der Kreidebildung*, pp. 94, with four plates, Berlin, 1840.

† In the Scientific Memoirs of Mr. R. Taylor. Its publication cannot fail to prove very acceptable to British Naturalists in general.

often resembles an Ammonite or Nautilus, being considered as the internal bone. On the other hand, at a later period, M. Dujardin denied that these animals possessed any organic structure, stating that they consisted simply of an animated slime capable of extension, encased by an indurated external shell, and associating them with the pseudopodian Amoeba of the Infusoria. Dr. Ehrenberg now further demonstrates, by figures and descriptions, their true organic structure, thus fully establishing his former positions, both as to simple Polythalamia and Polythalamia forming Polyparies. He proves that they are not internal bones, but external shells encasing a soft body, the shell being perforated, as it were, in all parts by numerous pores, from which the animal projects long filaments, capable at will of extension, retraction and bifid division, and productive of locomotion. The author further observes: M. Dujardin has, in August 1840, presented to the Paris Academy a *Mémoire sur une Classification des Infusoires en rapport avec leur organisation*, in which a new arrangement of the Infusoria is exhibited, and in this the Polythalamia are again introduced as *Rhizopodes* in association with *Amoeba* and *Actinophrys* of the Infusoria, forming a separate family. If, however, anatomical and physiological details are to be taken into account when we proceed to the systematic arrangement of different organic bodies, and we are not governed merely by the relations of external forms, M. Dujardin's arrangement cannot be deemed a happy one. He has in no case shown a polygastric structure in the Rhizopodes, and that it is not polygastric is proved anew by my investigations now communicated.

It has been shown in a former part of this paper that Dr. Ehrenberg had recognized six species of Infusoria in the chalk formation, so closely resembling living species as not to be distinguished from them, and hence he was led to give to them the same names; namely, *Eunotia Zebra*, *Fragilaria rhabdosoma*, *Fragilaria striolata ?*, *Gallionella aurichalca*, *Navicula ventricosa*, and *Synedra ulna*. He had also referred, with a mark of interrogation, the following four species of calcareous-shelled Polythalamia to the white chalk, in which they are very extensively distributed, namely, *Globigerina bulloides*, *Globigerina helicina*, *Rosalina globularis*, and *Textilaria aciculata*, all of which were stated by M. d'Orbigny to have occurred in the living state only in the Adriatic Sea and the Ocean. If any doubt had existed as to the identity of all these fossil and living species, it has been completely removed by the later researches of Dr. Ehrenberg, by which the actual number of known species found in the chalk formation and in

the living state has been extended to fifty-seven, namely, of calcareous-shelled Polythalamia nine species, and of siliceous-shelled Infusoria forty-eight species. The following is a list of these species and of the localities in which they occur, both in the living and fossil state. In the fossil localities, W. C. signifies white chalk, C. M. chalk marl, and C. C. compact chalk.

Calcareous-shelled Polythalamia.

	Living.	Fossil.
1. Globigerina bulloides	In the Adriatic Sea and the Ocean	W. C. Denmark.
2. —— helicina	————	W. C. Cattolica.
3. Rosalina globularis	————	W. C. Gravesend.
4. Planulina (Synon. Rotalia) ocellata	North Sea, near Cuxhaven	W. C. Cattolica.
5. Rotalia globulosa	————	W. C. in Russia, Poland, Prussia, Denmark, England, France and Sicily; and C. M. in Greece, Zante, Sicily and Oran.
6. —— stigma	————	W. C. Cattolica. C. M. Caltasinetta.
7. —— (Synon. Planulina?) turgida	————	W. C. England, France, Prussia, Denmark. C. M. Oran. C. C. Egypt and Arabia.
8. Textilaria aciculata	————, and Adriatic and the Ocean	W. C. Prussia, Denmark, England and Sicily. C. M. Greece. C. C. Egypt and Arabia.
9. —— globulosa	North Sea	W. C. of all European countries, from Wolsk to Ireland. C. M. Sicily, Oran, and Greece. C. C. Egypt and Arabia.

Siliceous-shelled Infusoria.

10. Actinocyclus quinarius	North Sea, Tjörn Isle in the Cattegat	C. M. Caltasinetta.
11. —— biternarius	North Sea, Tjörn	C. M. Oran and Caltasinetta.
12. —— senarius	North Sea, Cuxhaven, Christiania, Tjörn	C. M. Oran, Caltasinetta, and Greece.
13. —— septenarius	North Sea in the Cattegat	C. M. Oran, Caltasinetta, and Zante.
14. —— octonarius	————	C. M. Oran and Caltasinetta.
15. —— nonarius	N. Sea, Cattegat near Tjörn.	C. M. Oran.
16. —— denarius	————	C. M. Oran.
17. —— undenarius	————, and Bay of Christiania.	C. M. Oran and Zante.
18. —— bisenarius	Cattegat near Tjörn	C. M. Oran.
19. —— quindenarius	————	C. M. Oran.
20. Amphitetras antediluviana	————	C. M. Oran and Greece.

	Living.	Fossil.
21. Biddulphia pulchella.	Baltic, N. Sea, Mediterranean, and Ocean near Cuba	C. M. Greece.
22. Cocconema lanceolatum	Brackish and fresh waters.	C. M. Greece.
23. Coscinodiscus Argus.	North Sea, Cuxhaven . .	C. M. Caltasinetta and Oran.
24. —— eccentricus . . .	——————, Tjörn in Cattegat, and Mexican Gulf, Vera Cruz.	C. M. Oran.
25. —— lineatus	North Sea, Cuxhaven . .	C. M. Caltasinetta.
26. —— minor	——————— . .	C. M. Caltasinetta, Oran, and Zante.
27. —— Oculus Iridis . .	——————— . .	C. M. Greece.
28. —— Patina	——————— . .	C. M. Zante.
29. —— radiatus	——————, and Baltic, Wismar.	C. M. Oran, Caltasinetta, and Zante.
30. Dictyocha sulcata . .	North Sea near Tjörn . .	C. M. Caltasinetta, Oran, Zante, and Greece.
31. —— Fibula	N. Sea, Christiania and Tjörn, & Baltic, Wismar	C. M. Oran and Caltasinetta.
32. —— Pentasterias . .	N. Sea, Christiania haven.	C. M. Zante.
33. —— Speculum . . .	N. Sea, Cuxhaven, Christiania and Tjörn, Baltic, near Kiel	C. M. Caltasinetta, Oran, Zante, and Greece.
34. Eunotia granulata . .	Brackish and fresh waters.	C. M. Greece.
35. —— Zebra	Berlin fresh waters	C. M. Greece.
36. Fragilaria rhabdosoma	Berlin, Halle, Copenhagen, Sweden	W. C. Gravesend
37. —— striolata	. . . . .	W. C. Gravesend.
38. Gallionella aurichalca	Berlin fresh waters, Leipzig, Thuringia, Franconia, Würzburg, Stuttgart, and on rocks near the Faroe Isles	W. C. Rügen.
39. —— sulcata	North Sea, Cuxhaven . .	C. M. Caltasinetta, Oran, Zante, and Greece.
40. Grammatophora africana	N. Sea, Heligoland, Tjörn	C. M. Oran.
41. —— angulosa	North Sea, Tjörn	C. M. Oran.
42. —— oceanica	Callao in Peru, Vera Cruz in Mexico, Tjörn in Cattegat, Wismar in Baltic, and the Mediterranean.	C. M. Oran.
43. —— undulata	Among marine Confervæ near Vera Cruz.	C. M. Greece.
44. Haliomma radians . .	North Sea, Cuxhaven . .	C. M. Greece.
45. Navicula Didymus. .	N. Sea, Cuxhaven, Baltic, Wismar	C. M. Caltasinetta.
46. —— Entomon	N. Sea, Christiania haven.	C. M. Greece.
47. —— norwegica . . .	———————	C. M. Greece.
48. —— quadrifasciata .	——————, and Tjörn Isle.	C. M. Greece.
49. —— ventricosa	Paris, Berlin, Saxony, Bohemia, Buchtarma in Altai, and Irtysch.	C. M. Oran.
50. —— viridula	Berlin fresh waters, Weissenfels in Saxony, and Wismar in Mecklenburg.	C. M. Greece.

	Living.	Fossil.
51. Peridinium pyrophorum	Baltic, near Kiel	Flints of the W. C. near Gravesend, and Flints of the plain of North Germany near Delitzsch.
52. Striatella arcuata . . .	Gulf of Flensburg, Breakers near Gothenburg.	C. M. Oran.
53. Synedra ulna	Baltic near Wismar, Berlin fresh waters, North of Germany, Denmark, Scotland, Holland, the Ural, and perhaps Isle of France, and Mascarene Isles	C. M. Oran.
54. Tessella Catena . . .	Breakers near Gothenburg and Berlin waters.	C. M. Caltasinetta.
55. Triceratium Favus . .	North Sea, Cuxhaven . .	C. M. Greece.
56. Xanthidium furcatum	Berlin	Flints of W. C. Gravesend, and Flints of Delitzsch.
57. —— hirsutum	Peat waters near Berlin.	Flints of W. C. Gravesend, and Flints of Delitzsch.

Of these fifty-seven species, thirty belong to the geologically acknowledged chalk and its Sicilian marls. The remainder from Oran, Greece (probably Egina), and Zante, though perhaps from beds not equally well defined by relative position as chalk marls, yet occurring, as they do, with numerous decided calcareous and siliceous animals of the chalk,—the geological relations of these species may also be considered as firmly established.

These new discoveries naturally lead to the conclusion that we have now no very definite boundary between secondary and tertiary tracts, and that the first dawn or eocene period of the present living organic creation, must be sought for deeper than the chalk formation; a view that appears to be confirmed by the occurrence of a living *Trochus* below the chalk, of the *Paludina vivipara* and *Cyclas cornea* in the Weald Clay, and of the *Terebratula caput serpentis* in the Upper Oolite. But as this and other interesting conclusions and views entertained by the author will be shortly laid open to the reader, with a full detail of the progressive researches made, I shall not now enter further upon the important matter contained in the volume.

Appendix.

Closely connected with the preceding subjects is the valuable Memoir of M. Alcide d'Orbigny, which has recently appeared, entitled, "On the Foraminifers of the White Chalk of the Paris Basin*." The subjoined extracts may serve to convey a view of the general scope of the work, which, placed in parallel with that of Dr. Ehrenberg, cannot but excite a double interest in the mind of the reader.

Previously to entering upon the direct object of the Memoir, M. d'Orbigny indulges in a few general reflections.

Let us, says the author, cast a rapid glance upon what has existed and upon what still exists in nature, in reference to the Foraminifers. We have found them distributed through the oolite series, extending from the lias to the uppermost beds; but in the cretaceous system they appear still more numerously and more varied in their forms. The Neocomian beds, those of the gault and the green sand, contain many; but in proportion as we ascend from the lower to the higher strata, they increase infinitely. In these latter the rock may be said to be often composed of them, and, as an example, we may mention the largest of the Pyramids of Egypt. In the white chalk the number is nearly as great as in those seas in which they now most abound. In a word, we have found Foraminifers in the cretaceous basins of the Seine, the Loire, the Gironde, and of the whole South of France, and in Belgium.

If we pass to the tertiary tracts, a whole world is opened to us. The multiplied Foraminifers which appear in the basins of Paris, Bourdeaux, Touraine, Italy, Austria, Germany, England, and Belgium, often form there the greater part of the mass. A bed of considerable thickness in the environs of Gentilly, near Paris, is entirely composed of them, the Foraminifers being in contact with each other, scarcely united by a slight cement. In a cubical inch of the rock we have found *fifty-eight thousand*, which is equal to *three thousand millions* in a metre, and shows what myriads may exist in the Paris basin. These small bodies, which we thus see forming entire beds in the lowest portions of the tertiary series, are not less common in the higher stages; for in Austria, and

* *Mémoire sur les Foraminifères de la Craie Blanche du Basin de Paris*, in the 4th vol. part 1 of the Transactions of the Geological Society of France, 1840.

in the environs of Sienna in Italy, they often constitute one-sixth of the fossil mass; they are also extensively distributed in the Crag of England* and of Belgium. So much in reference to what has existed; let us now throw a glance upon that which exists.

We are in the present day acquainted with Foraminifers from every region of the sea, and we know that they exist in extent from the equator to the frozen portions of continents. If we judge of the important part they play by their numbers in certain quarters, it will be impossible to doubt that their remains form the greater part of the banks of sand which impede navigation, obstruct gulfs and straits, fill up ports, and form with corals those isles which are daily rising in warm regions from the bosom of the ocean.

Thus these minute shells, which, anterior to our epoch, have assisted in leveling basins of immense extent, and in forming mountains, are now still constantly changing the depth of coasts and modifying the bottom. This view of their agency in nature is doubtless sufficient to prove the importance which attaches to their study.

We will add, that the comparative study of the fossil Foraminifers of all beds has proved to us a fact important to geology, namely, that each bed has its characteristic species, which serve to distinguish it, let the circumstances be what they may; and as these minute shells are infinitely more common than those of Mollusks, the knowledge to be derived from them is so much the more certain, and becomes extremely interesting.

Another fact no less curious has been demonstrated to us by the study of living species from every region of the globe†. Many genera are peculiar to the hottest zones of continents, while others, on the contrary, are found only in temperate or cold regions. Hence the geographical distribution of living genera and species offers to us a means of comparison of the highest importance with a view to the determination of the temperature of the waters in which fossil species lived,

* Mr. Lyell has communicated to us the species which he discovered in the Crag.

† We are acquainted at present with nearly *fifteen hundred* living and fossil species of Foraminifers; and how many important facts may be derived from the study of these small bodies may be seen in three works which we are now publishing: 1. the Fauna of the Antilles, printed in *l'Histoire politique, physique, et naturelle de l'Ile de Cuba*, by M. de la Sagra; 2. that of the Canaries, published in *l'Histoire Naturelle* of those islands, by MM. Webb and Berthelot; 3. the Fauna of the southern extremity of America, forming a part of our *Voyage dans l'Amérique Méridionale.*

and may lead to very satisfactory results in geology, if we may judge by the fruits of our observations in this respect.

We could have desired to establish some general facts of much greater extent, founded on new observations recently made by us on the class of the Foraminifers; but the present occasion not admitting such an extension, let us pass to the Foraminifers of the white chalk of the Paris basin.

The geological position of the white chalk of Paris is so well known that we have not thought it necessary to speak of it; yet, if we seek to determine its position relatively to the other cretaceous beds by means of the Foraminifers it contains, compared with living species, the *facies* of the genera and species proves to us, that the chalk of Maestricht, of Fauquemont (Belgium), of Tours, of Chavagne, and of Vendome, is above it; while, on the contrary, all the other beds are below it; thus in the chalk of Maestricht and the upper beds of the basins of the Loire, we recognize only genera still existing, or at least occurring in tertiary tracts, while the white chalk of the Paris basin already exhibits to us different genera, such as *Flabellina*, *Verneuilina*, and *Gaudryina*, and a great number of species quite distinct.

It would therefore be easy to establish, by means of the Foraminifers alone, the relative antiquity of the cretaceous beds; but we must previously make two geographical sections quite independent of each other, founded on the zoological forms; the first comprising the entire basin of the Seine, of the Loire, of Belgium, and of England, in which we find a striking analogy between the species found in all the beds, from the lowest to the highest, with a regular passage from one to the other; the second, comprising the West and South of France, in which the species of Foraminifers have not only no analogy with those of the other section, but in which, moreover, almost all the genera are different. If we seek an example of this fact, we shall find it on comparing the green sand of the environs of Mans with that of the mouth of the Charente. The first, which in fact contains species approximating to those of the white chalk of Paris, contains already several species analogous to those which have lived up to that bed; while the second, with perfectly distinct species, presents to us genera different from all that we know in the cretaceous beds of the North of France and of Belgium.

The Foraminifers are sufficient to establish the following descending order of superposition in the cretaceous beds:—

Group of the North of France and of Belgium.	*Group of the West and South of France.*
Upper chalk of Maestricht and Fauquemont (Belgium).	
Coral chalk of Valognes and Nehou.	
Coral chalk of the basin of the Loire, at Vendome (Loir and Cher), at Chavagne (Maine and Loire), at Tours (Indre and Loire).	
White chalk of Ciply (Belgium).	
White chalk of Paris, of the departments of Yonne and Aube, and of England.	
	Nummulite chalk of Royan (Charente Inférieure), of Saint Martory (Haute Garonne), of Saint Gaudens, &c.
	Coral chalk of Saintes (Charente Inférieure).
Chalk marl of the Loire, with *Gryphæa columba.*	Ammonite chalk of Martrous, near Rochefort (with *Gryphæa columba*).
	Caprine chalk of the Isle of Aix, of the Corbières (Aude).
Green sand of Mans (Sarthe).	Green sand of Fouras, of the Isle of Aix, and Corbières.
Gault of the environs of Troyes (Aube).	
Neocomian tract of Aube.	

To establish zoologically what we have advanced, let us pass in review the succession of the genera, and endeavour to convey an idea of the modifications which have taken place in the Foraminifers of the cretaceous system, in the ascending order of the beds.

At the epoch of the Neocomian formation we have hitherto found only the genus *Textularia*.

The green sand presents, as we have said, two series of genera nearly distinct. That of the mouth of the Charente contains the genera *Dentalina*, *Cristellaria*, *Lituola*, *Alveolina*, *Chrysalidina*, and *Cuneolina*; that of Mans, the genera *Dentalina*, *Citharina*, *Frondicularia*, *Flabellina*, *Cristellaria*, *Bulimina*, and *Guttulina*. Hence we see, that, with the exception of two genera common to both localities, all the rest are different in each of them.

If we follow our examination of the succession of genera in the cretaceous groups of the South and the North, we shall find—

1. That in the South the same genera of the green sand are reproduced in the Caprine chalk. By degrees they prevail at length in the upper beds, and are reduced to the *Cristellaria* alone in the environs of Saintes; but near the mouth of the Gironde (at Royan) they are accompanied by the genera *Nummulina* and *Guttulina*, as well as on the whole line of the foot of the Pyrenees, at Saint Martory, at Saint Gaudens, extending into the department of Aude; thus pre-

senting a zone well characterized by the abundance of Nummulina, of which we have not found the analogue in the cretaceous beds of the North of France.

2. That in the North the succession is far from taking place in the same manner; and that the Foraminifers, in much greater numbers, present a larger suite in superposition, with facts not less curious. The genus *Citharina*, which constitutes the greatest portion of the species in the oolite formation, ceases with the green sand of Mans, being found no further in the cretaceous beds. In the chalk marl of the banks of the Loire we meet for the first time with the genus *Lituola* with the *Dentalina*; but all at once, in the white chalk, we observe a great number of species, among which, with all the genera and even some analogous species of the green sand of Mans, there appear for the first time on the globe the genera *Nodosaria*, *Marginulina*, *Valvulina*, *Rotalina*, *Rosalina*, *Truncatulina*, *Uvigerina*, *Verneuilina*, *Gaudryina*, *Globigerina*, *Pyrulina*, *Sagrina*, *Flabellina*, and *Frondicularia*. These genera contain a considerable number of species; but with the white chalk the genus *Flabellina* ceases, which had continued hitherto from the green sand, and the genera *Verneuilina* and *Gaudryina*, which first appear in the white chalk, also terminate with it; while in its interior the Frondicularia abound, as well as species whose cells form a pile on a single line.

The white chalk of Ciply, although contemporaneous with that of the Paris basin, since it also contains Flabellina, does not present the same species, and may perhaps be a little higher in the series, but we have not as yet sufficient data to enable us to affirm this fact.

In the beds which we consider higher in the series than the white chalk of Paris, namely, in the coral chalk of Tours, of Chavagne, and of Vendome, we meet for the first time with the genera *Polystomella*, *Polymorphina* and *Globulina*, yet accompanied with the same genera as those of the white chalk, with the exception of those whose discontinuance we have noticed; again, in the upper chalk of Maestricht and Fauquemont we have, with the three genera just mentioned, also the genera *Nonionina*, *Faujasina*, and *Heterostegina*. All are found living at present, or at least occurring in tertiary tracts; but we arrive at the last beds of the cretaceous group without having seen a single species of the *Miliola* of Lamarck (our order of Agathistègues), which, as we ascertained in 1825, only commences with the tertiary beds, and may be considered as the most certain sign of a change of formation.

This rapid survey shows that in ascending from the lower

to the higher beds of the cretaceous group, the genera and species of Foraminifers progressively increase, and that the forms, at first very simple, analogous to those of oolitic tracts, afterwards more complicated and specially appropriate to the lower beds of the cretaceous system, have at last been replaced in the upper parts by forms still more varied, the whole recurring in tertiary tracts, and even in the living state; facts which it has appeared to us important to establish in the history of Palæontology.

M. A. d'Orbigny then proceeds to describe the species of Foraminifers found by him in the white chalk of the Paris basin. The following is a list of them, together with their localities:—

	Localities.
1. Nodosaria limbata	Meudon: very rare.
2. Dentalina aculeata	Common at Sens: more rare at Meudon and in England.
3. ——— communis	Meudon: rare. Its analogue is found fossil in the Subapennine tracts of Italy and Austria, and living in the Adriatic.
4. ——— gracilis	At Sens and in England.
5. ——— nodosa	Common at Sens, more rare at Meudon and St. Germain.
6. ——— Lorneiana	Only in the environs of Sens.
7. ——— sulcata	Very common at Sens, Meudon, and St. Germain, and in the chalk of England. Found also in the green sand of the environs of Mans (Sarthe).
8. ——— multicostata	Sens, St. Germain: rare. Also at Maestricht rarely.
9. Marginulina trilobata	Common at Sens, very rare at Meudon, St. Germain, and in England: found only in the young state.
10. ——— compressa	Meudon: very rare. Occurs also in the green sand in the environs of Mans.
11. ——— elongata	Common near Sens, very rare at Meudon and St. Germain. Occurs also in the chalk of Ciply.
12. ——— gradata	Only near Sens.
13. ——— raricosta	Meudon: very rare.
14. Frondicularia radiata	Meudon and St. Germain: very rare.
15. ——— elegans	Meudon and Sens: very rare.
16. ——— Verneuiliana	Common at Sens, on the banks of the Yonne; rare at St. Germain and Meudon.
17. ——— Archiaciana	Meudon and Sens: rare.
18. ——— ornata	Found only once at Meudon.
19. ——— tricarinata	Environs of Sens: seems to be rare.
20. ——— angulosa	Meudon: very rare.
21. Flabellina rugosa	Sens and Meudon: common.
22. ——— Baudouiniana	Only at Sens.
23. ——— pulchra	Meudon: very rare.
24. Cristellaria rotulata	Very common in the white chalk of Meudon, St. Germain, Sens, and in England. Occurs also in the green sand near Mans.
25. ——— navicula	Sens and Meudon: rare.
26. ——— triangularis	Sens: very rare.
27. ——— recta	Meudon and St. Germain: rather rare.

	Localities.
28. Cristellaria Gaudryana	Only at St Germain: rare.
29. Lituola nautiloidea	Very common at Sens in the complete state, at St. Germain only young, and adult very rarely at Meudon. Occurs also in the chalk of England.
30. Rotalina Voltziana	Very common at Meudon, St. Germain, and in England.
31. ——— Micheliniana	Common at St. Germain, Meudon, and in England; rare at Sens.
32. ——— umbilicata	Common at Meudon and St. Germain; rare at Sens and in England; common also in the tertiary tracts of Austria. Its analogue is found living at Rimini in the Adriatic, there being no difference between the fossil and living species.
33. ——— crassa	St. Germain, Meudon, and England: rather rare.
34. ——— Cordieriana	St. Germain, England, and upper chalk of Maestricht.
35. Globigerina cretacea	St. Germain and England.
36. ——— elevata	Common near Sens; rare in England.
37. Truncatulina Beaumontiana	Meudon and England: rare.
38. Rosalina Lorneiana	Common at St. Germain and Meudon; rare at Sens and in England.
39. ——— Clementiana	Rare at St. Germain, more common in England.
40. Valvulina gibbosa	St. Germain: rare.
41. Verneuilina tricarinata	St. Germain and Sens: rather rare.
42. Bulimina obtusa	Very common at Meudon; rare at St. Germain and in England.
43. ——— obliqua	Very common at Meudon, St. Germain, Sens, and in England.
44. ——— variabilis	Very common at Sens; rare at Meudon, St. Germain, and in England.
45. ——— brevis	Very common at Meudon, St. Germain, and Sens.
46. ——— Murchisoniana	St. Germain and England: rare.
47. Uvigerina tricarinata	Sens: very rare.
48. Pyrulina acuminata	Very rare at Sens and St. Germain; very common at Meudon.
49. Gaudryina rugosa	Meudon, St. Germain, and Sens: rather common.
50. ——— pupoides	Rather common at Meudon, Sens, St. Germain, and in England.
51. Textularia trochus	Only at Meudon.
52. ——— turris	Sens, Meudon, St. Germain, and England, without being common.
53. ——— Baudouiniana	St. Germain and Meudon: rare.
54. Sagrina rugosa	St. Germain and Meudon.

From the preceding list it appears, that of the fifty-four species found in the white chalk of the Paris basin, *thirty-eight* occur at Meudon, *thirty-three* at Saint Germain, and *twenty-eight* at Sens: of these numbers, *nine* are peculiar to Meudon, *two* to Saint Germain, and *six* to Sens, while all the others are simultaneously common to two or three localities, thus proving the perfect identity of the beds. It will be seen also, that of these fifty-four species, *twenty-two* are common to the white chalk of England also.

Of the fifty-four species, *seven* occur also in lower or higher beds: thus in the green sand of Mans are found three species, *Dentalina sulcata*, *Marginulina compressa*, and *Cristellaria rotulata*; in the coral chalk of Tours, which is higher in position than the white chalk, two species, *Bulimina obtusa* and *Textularia turris*; and in the chalk of Maestricht, being the highest in position, two species, *Dentalina multicostata* and *Rotalina Cordieriana*. We also find two species, the analogues of which occur both fossil in the tertiary tracts of Austria and Italy, and in the living state in the Adriatic, namely, *Dentalina communis* and *Rotalina umbilicata*. With these exceptions there still remain *forty-seven* species peculiar to the white chalk, showing clearly that it forms a bed distinct from all the rest of the cretaceous system, belonging to a small local fauna well-defined.

On comparing the above genera given by M. d'Orbigny with those named by Dr. Ehrenberg in his tabular view of the Bryozoa, inserted in the early part of this paper, it will be seen that Nodosaria, Dentalina, Marginulina, Frondicularia are included in the family of the Nodosarina of the latter author; Cristellaria, Rotalina, Truncatulina, included in his family of the Rotalina; Globigerina, Rosalina, Valvulina, Bulimina, Uvigerina, Pyrulina, in his family of the Uvellina; and Textularia in his family of the Textularina. The *Lituola nautiloidea* of Lamarck and d'Orbigny is the *Coscinospira nautiloides* of Ehrenberg, included in the Fabularina family of the latter.

If we now, observes M. d'Orbigny, compare the fauna of the Foraminifers of the white chalk with those of different seas, with a view of determining the analogy of composition, and of obtaining data respecting the temperature of that basin at the time when these species lived, we shall find this analogy more striking in the Adriatic Sea than anywhere else. There only, the same as in the chalk, are found in abundance Nodosaria, Dentalina, Marginulina, Frondicularia; there only occur a considerable number of species of Bulimina. This sea alone in the present day contains living Frondicularia; of Frondicularia so varied in the white chalk; and, to complete the approximation, it exhibits to us the only two living species, the analogues of which are found in the fossil state in the white chalk, namely, *Dentalina communis* and *Rotalina umbilicata*. This analogy of zoological forms would lead us to believe, 1st, that the basin in which is deposited the white chalk of Paris was subject to a warm temperature; 2nd, that it was circumscribed, protected from waves and from every violent current proceeding from a distance, since the bodies

are deposited there without having experienced the slightest wearing previous to their becoming fossil; 3rd and lastly, that it extended to the whole of the white chalk of England.

Concluding Remarks.

The preceding extracts from the labours of Dr. Ehrenberg and M. A. d'Orbigny show that microscopic Polythalamia are found in all calcareous formations from the lias upward; but in England they have been lately discovered in still deeper strata. Mr. Tennant was, I understand, the first to announce their discovery in 1839 in the mountain limestone of England. In 1840 they were also met with in the Kendal limestone, from which Mr. Lonsdale has prepared thin slices mounted on glass, which appear transparent under a strong light, exhibiting the crowded state of the microscopic Polythalamia in great perfection. Mr. Bowerbank also has been led to turn his attention to this subject by examining the siliceous bodies of the chalk, green sand, and oolites*.

I had written thus far, when an interesting article by the Rev. Dr. Buckland, in reference to the researches of Dr. Ehrenberg up to 1839, met my eye, entitled, "On the agency of Animalcules in the formation of Limestone†," which notices in particular the researches of MM. Tennant and Darker on this subject in the Derbyshire limestone and the Stonesfield slate, as well as the labours of Mr. Bowerbank, referred to above, and conveying judicious reflections. Dr. Buckland justly remarks, that in the application of the microscope from the living to the fossil Infusoria and Foraminifers we are commencing a new and important era in Palæontology. A very interesting branch of the inquiry will be to ascertain whether these microscopic bodies retain throughout a distinctive character in the several formations into whose composition they enter. In the unbounded field of nature presented to the consideration of the Microscopical Society of London lately established, no subject appears more worthy of their attention than an examination of the microscopic organic constituents of all the older limestone formations of the British Isles, as well as of other countries; and it is much to be desired that this attention may not be wanting, although the concurrence of many labourers may be required to reap a harvest of great promise, yet of indefinite extent.

* Proceedings of the Geological Society, March 11, 1840.

† Edinburgh New Philosophical Journal, January to April, 1841.

XLI.—*Report of the Results of Researches in Physiological Botany made in the year* 1839. By F. J. Meyen, M.D., Professor of Botany in the University of Berlin.

[Continued from p. 177.]

2. *In the Cryptogams.*

M. Unger * has published an interesting treatise on the structure and functions of the organs of fructification of *Riccia glauca*; he first notices the anatomical structure of the foliaceous substance, and shows that the want of stomata is made up for by the loose conjunction of the cells on the surface (this formation of the upper cells is particularly evident in *Riccia crystallina,* Meyen). Then follows the description of the observations of the development of both kinds of organs of fertilization; but the first stages of their appearance have not been observed, because, as M. Unger says, the proper time was already passed. The sporiferous organs (called Pistils, Meyen) always appear in a large air-cell, and are said to arise by the conjunction of a group of parenchymatous cells, which during their increase and enlargement form a cavity in their centre, which exhibited only one opening outwards. This bottle-shaped organ lengthens its neck until it reaches the surface of the thallus, and now the enlargement of the lower part of the sporangium commences (which is formed by the ovarium of the pistil). The contents of the sporangium appeared first as a homogeneous, colourless, fluid matter, and as a granular substance; this collected gradually in the middle, and then appeared as contents of that cellular tissue out of which the primitive cells of the spores are formed.

It appeared also as a general fact, that at the periphery one layer of cells produces no spores in their interiors (here also a similar case of cells as in the formation of pollen in the anthers of the Phanerogams, M.). In the structure of the spores, M. Unger confirms the statement that the outer brown skin is not composed of cells, but is only a reticulate deposition of cellular matter.

The other organs of generation, the so-called anthers, were not found in such great numbers; they were dispersed, and occurred singly. They are said to consist in a regular separation of the parenchymatous cells of the thallus: here also the contents form a granular substance, which appears in the

* Anatomische Untersuchung der Fortpflangungstheile von *Riccia glauca*, Linnæa, p. 1 to 17.

form of cells of extraordinary smallness, as in the anthers of the Mosses.

M. Unger draws the following results from his observations:—

1st. That the original development in *Riccia glauca* of both those organs is simultaneous, and that they therefore seem to have a nearer relation to each other. 2nd. That both organs represent cavities formed from cellular tissue, which are provided with lengthened openings, and that therefore a *material* communication of their contents is not improbable. 3rd. That the function of the neck-shaped passage of the sporangium is confined to the earliest period of its development, etc., and that, finally, the transference of the contents of the anthers to the sporangia is a cause of the formation of spores.

M. Mohl has published some new and very fruitful observations on the development of the spores of the *Jungermanniæ*: he chose for his experiments *Anthoceros lævis*, in which the primitive spore contains but few globules, which renders the progress of the formation easier to follow. The youngest primitive cells which M. Mohl found appeared as transparent, partly spherical cells, in which one could observe a cell-nucleus, as in the phanerogamic plants. Afterwards a gummy substance was formed round the disc of the nucleus, and this finally covers more than half of it; the green granules appear more plainly, and the mass divides into two parts. At the edges this green mass passes into a colourless, gummy, but fine granular substance, which forms larger or smaller meshes; M. Mohl compares this substance very correctly to the bladders of foam. After this divided green mass has gradually increased, these two halves divide again into two parts, and thus four nuclei, lying close to each other, are formed (grain-cells, M. Mohl calls them), in which change the true cell-nucleus takes no part, but lies separated by itself. At the same time the side of the primitive cells thickens, and adopts the form of the well-known mucous substance, and now follows the division of its cavity. Lines are formed on the inner surface of the primitive cell, which are correctly represented as projecting edges, which afterwards grow towards the middle of the cell between two masses of granules, and join together. After this division, nothing is visible of the nucleus. A short time after the division of the primitive cell, the formation of the spore-cuticle commences, namely, in each of the four compartments, and the granular masses lie in the interior of each of these new-formed cells, and are fastened by threads of gum to the

circumference of the spore-cuticle. The remaining observations agree with the results of former ones, and are already known. A series of excellent delineations accompanies the paper. M. Mohl then proceeds to compare his view of the formation of the spores with that of M. de Mirbel. According to the view of the latter, the formation of the spores depends principally on the primitive cell, for the contents are divided mechanically into four parts by the projecting partitions. According to M. Mohl's earlier idea, the development of four spores in a primitive cell depends solely on the organic change of the contents; but his late observations on *Anthoceros* appear to support an intermediate view, for the development of the partitions is produced by that of the contents of the primitive cell. Finally, M. Mohl endeavours to show that no great importance must be attributed to the circumstance of the four divisions of the primitive cell communicating with each other or not, and that we must not consider this process as a characteristic distinction between the primitive cells of the spores and those of the pollen-grains. In *Anthoceros lævis* M. Mohl could not observe this division; in *Anth. punctatus* he thinks he saw it, and also in *Jungermannia epiphylla*, but not in *Riccia glauca*. I have published the results of some new observations on the formation of the spores of *Aneura pinguis*, which may be regarded as a sequel to those spoken of in the third volume of my 'Physiology' (Berlin, 1839). In the first stages of the fruit there were found only very tender long cells, which were imbedded in a gummy matter; these cells enlarged, and at length lay close to each other, and at a later period it was seen that from these at first perfectly homogeneous cells, not only the elaters, but also the spores, were formed; some become elaters, and others undergo a series of changes, until at length the spores are produced. The cell out of whose division four spores are always produced, I have called primitive spore (Mutterspore), and of these primitive spores, three, four, or even five are formed in each tubular cell; whilst those neighbouring cells which afterwards produce the formation-tunic retain their granular contents unchanged, until the spores are perfectly developed. As soon as the primitive spores are formed, a gelatinous membrane appears at their periphery; this has been called primitive cell; I designate it as formation-tunic or skin (Bildungsbrülle). Some time afterwards I observed two, three, or even four primitive spores enclosed in their formation-tunics, connected with each other in a row, and occupying the place of the original tubular cell, but from want of material I could not determine whether these formation-

tunics were derived from the single members into which the primitive tubular cell may by transverse division be dissolved, or whether, as appeared in some cases, the primitive spores with their coverings make their appearance within the tubular cell, whose sides are then absorbed. The drawings accompanying the article will make this clearer. Sometimes only a part of the tube is changed into primitive spores, etc., and the rest remains undeveloped in one of the primitive cells of its own tube, by which the appearance of stalks sometimes seen on the single primitive cells is explained: as the primitive cell is absorbed, they also disappear. In several fruits of *Aneura pinguis* I was able to observe, at the time when the division of the primitive spore by the contraction of the sides takes place, the existence of a second formation-tunic (it was not the inner surface of the outer one), but neither of them took any part in the division of the spore, as is seen in the delineations. However, last winter I observed that they did take part in the division of the spores in individuals of *Aneura pinguis* (the large turf variety), inasmuch as the gelatinous membrane entered into the contractions of the membranes of the primitive spores, but was never completely separated, as is the case with *Pellia epiphylla.* Whether in *Aneura* the formation of nuclei precedes the division of the primitive spore into four others cannot be observed, inasmuch as these cells are filled with a green matter which prevents our seeing the internal process: I have also not been able to observe it in *Pellia epiphylla, Sphagnum palustre,* etc. Directly after the production of the spore by division, each one exhibited a peculiar formation-tunic, just the same as the pollen-grains; at a later period both the common formation-coverings, as also the special ones, are absorbed, and then the spores lie singly between the tubular cells, which at this time change into elaters *.

In the past year M. Klotzsch has described a series of Fungi, and accompanied his descriptions with excellent delineations†; in this work (to plate 473) we have a division of the *Hymenomycetæ* according to the new observations on the structure of the hymenium. The *Hymenomycetæ* may be divided into two groups: *Exosporæ,* with free stalked spores, and *Entosporæ,* with enclosed unstalked spores. The first division is resolved into the *Tetrasporidei,* where the straight

* The plant used for the above observations was the so-called *Trichostylium arenarium*; but I have convinced myself that Corda's genus *Trichostylium* is the same as *Aneura,* for the small column which occurs in *Trichostylium* also belongs to *Aneura.*

† Aeb. Dietrichs Florades Königreichs Preussen, vii., Berlin, 1839, tab. 457-476.

spores are developed in fours, and only by way of exception in twos, threes and sixes; and the *Monosporidei*, where the long bent spores are always developed singly on spike-formed supports: the genus *Enidia* belongs to this group.

Interesting is the information that many tuberose Fungi, as, for instance, the genera *Gauteria*, Vallad., *Hydnangium*, Wallr., and *Hymenangium*, Kl. (*Tuber album*, Bull.), belong to the true *Hymenomycetæ*, and indeed to the *Exosporæ*; in these Fungi the hymenium covers the surface of the cavities which are found in their fleshy substance.

In describing the *Moschella esculenta*, M. Klotzsch calls the paraphyses of authors anthers; and of *Sphærosoma* (*fuscescens*) he says, that the anthers, when they appear in the Octosporidei, always project above the surface of the tube-skin (Schlauchkant), and therefore he does not reckon the paraphyses of *Sphærosoma fuscescens* (plate 464) as anthers, inasmuch as they do not project above the surface. I must here call to mind Carus's notice of a difference of gender in *Pyronema Marianum*, where the yellow colour of the whole surface of the fungus is derived from the contents of the paraphysæ, or anther-like organs.

Dr. Redmann Coxe has sent to the Linnæan Society his 'Observations on some Fungi or Agarici*,' which by deliquescence forms an inky fluid, drying into a bistre-coloured mass, capable of being used as a water-colour for drawings, and of a very indestructible nature, by means of common agencies.

M. Morren† has communicated some observations on the structure and colouring of *Agaricus epixylon*, DeC. As regards the colour, he says that the colouring substance is formed quite differently in Fungi to what it is in other plants; in the above-mentioned *Agaricus* the blue colour of the pileus is produced by a few spherical globules contained in the tubes of the tissue. These globules are not changed by iodine. In the deeper-seated layers of cells the globules are less numerous, and in the tubes of the white flesh of the mushroom they are not to be found. The tissue of the above-mentioned fungus is said to consist solely of anastomosing vessels, which have sometimes nodular swellings, and are generally forked, but seldom triramified: these vessels are long, cylindrical, anastomosing tubes; they contain a fluid and globules, and have here and there partitions. The tubes are of great length, and form a woolly tissue, and cannot there-

* Annals of Natural History, June 1839, p. 258.

† Notice sur l'histologie de l'Agaricus epixylon. Bulletin de l'Académie Royale de Bruxelles, vi. No. 1.

fore be reckoned to the parenchym; they appear most similar to the lacteous vessels, and form a true vascular tissue. One might place this fungous tissue together with the lacteous vessels (to which M. Morren has given the name of Cinenchyme, κινησις); but as it differs from these in the want of the circulation, as well as in its woolly interwoven appearance, M. Morren has called it Dædalenchyme.

I cannot agree with M. Morren's views of the nature of the fungous tissue: I consider it as cellular tissue, and have already described it (Phytotomy, 30, p. 138) as a peculiar form of irregular cellular tissue under the name of Felt-tissue. The cells are often long and branched, but the partitions which change these tubes into cells cannot be overlooked. Several kinds of regular cellular tissue are found in Fungi. M. Morren observed a spontaneous motion in the spores of *Agaricus epixylon* as soon as put into water. [This motion has however been already observed, and has been seen even in dry fungus-spores.—*Meyen.*]

In the foregoing Reports we have often made mention of a fungus formation which of late years has attracted so much attention, viz. Fermentation fungus: I have often attempted to prove that it is improbable that this fungus should be the cause of fermentation, although always found in fermenting liquids; but the fact of their being plants appears, to me at least, to have been fully proved by the observations on their increase and growth. However, M. Liebig*, in a treatise on Fermentation, etc., has declared those statements of the vegetable nature of the fermentation formations to be a delusion; and considers that gluten and albumen, which, during the fermentation of beer and vegetable saps, are separated in a changed state, appear in the form of globules, which swim about either singly or several together, and that these globules have been mistaken by natural philosophers for Infusoriæ and Fungi. Indeed, says Liebig, the idea that they are animals or plants disproves itself, for in pure sugar-water the seeds of the plants disappear during fermentation; the fermentation takes place without the appearance of a development or reproduction of the seeds, plants or animals which have been regarded by philosophers as the cause of the chemical process.

I am not aware upon whose observations Liebig grounds these latter statements; probably they are his own, which, however, must evidently give way to the more correct ones of his predecessors.

* Uber Gährung Fäulniss und Verwesung und ihre Ursachen. Annalen der Pharmacie, 1839.

M. Balsamo Crivelli has published some new observations on the origin and development of *Botrytis Bassiana**, and of another parasitic kind of mould, a subject which was treated of in our Report for 1836 (Berlin, 1837, p. 107). M. Crivelli found that the vesicles of which the fat consists can pass into *Botrytis*, and he convinced himself that the "corps vésiculaires" of M. Audouin were nothing more than swimming fat globules. A cut was made in the side of a fat caterpillar, and the exuding sap exhibited the supposed vesicular bodies of Audouin, which were certainly nothing but globules of fat. The following morning the interior of the caterpillar was covered with *Ascophora mucedo.* The spores of *Ascophora* were introduced into the bodies of four chrysalises, and three days afterwards the grains of fat could be seen full of vegetating filaments. Finally, M. Crivelli retains his idea, that in the fat of the silkworm there can take place such changes as to render its component parts capable of spontaneously producing mould, which property the fat may then impart to healthy caterpillars.

M. Turpin† explains why butter which has been melted and allowed to cool becomes so seldom mouldy: the treatise is of great length, for he mentions a number of cases in which mouldiness was observed without being able to assume that the seeds proceeded from the air; also the microscopical structure of butter, both before and after its fusion, is most circumstantially described. The following points may be mentioned: the mould which, in common butter, is produced from the lacteous globules contained therein cannot be produced in melted butter, because these globules are then covered with the oil of butter. M. Turpin remarks, that the explanation of the production of mould on the surface of organic matter by a continual 'rain' of seeds of all kinds of mould must at present appear ridiculous; but that the explanation by 'generatio spontanea' must be very limited, and also more clearly defined. Nature produces the mould in two ways: either directly out of the globuline of organic matter when this has ceased to be under the influence of vitality, or from spores which it produces itself.

M. Hanover‡ has made 'Observations on a Contagious Conferva Formation on the Water Salamanders;' he saw the

* Communicated by Freiherr von Cesati in the Linnæa of 1839, p. 118-123.

† Sur le singulier caractère physique et microscopique que prend le beurre, etc. Comptes Rendus du 9 Dec., p. 748-762.

‡ Müller's Archiv für Anatomie, 1839, Heft 5.

production of Confervæ on an anatomized specimen of 'Triton punctatus' while under water. Similar formations were observed on a dead salamander, a dead fly, and on the surface of several wounds which were made on living salamanders; sometimes the formation took place without there being any injury, *e. g.* on the toes, by which the toes attacked were destroyed.

[The plant observed by M. Hanover is the *Achlya prolifera*, Nees v. Esenbeck; and if, as M. H. says, M. Carus's figures do not agree with his plants, perhaps those will which I gave to Göthe's 'Mittheilunger aus der Pflangenwelt' (S. Nova Acta Acad. C. L. C. tom. xv. pt. ii. p. 374, etc. tab. i. xxix.), and in other places. I have seen this fungus under similar circumstances on flies, spiders, earthworms, Planariæ, dead frogs, and even on putrifying *Viscum album*; and have shown, in Wiegmann's Archiv, etc., 1835, ii. p. 354, that the little fungus which is formed about autumn on the body of the common house-fly has spores which germinate, and in water grow out into *Achlya prolifera*. The seed-formation and the germination of the *Achlya* spores were observed and represented in the above plate, as also in my 'Physiology,' iii. tab. x. fig. 18 and 19.—*Meyen.*]

M. Hanover inoculated the above plant on the back of a healthy animal, and saw that the formation of Confervæ had commenced at the end of sixteen hours, but fell off with the epidermis. The experiments were frequently repeated, but it was always found that the development of the plant was not injurious to the life of the animal. Moreover, M. H. remarked that the inoculation succeeded better with unripe than with ripe Confervæ.

As I have occupied myself very considerably with this subject, I may be allowed to mention my observations without prejudice.

The inoculation effected by M. Hanover is nothing more than a common propagation; the ripe plants afforded seeds, out of which other plants were produced, and the so-called unripe Confervæ increased their single threads, as is done by the order *Achlya* among the water Fungi, and by *Vaucheria* among the Confervæ. The growth of the fungous threads from the mucous surface of the *Tritoniæ* cannot be injurious; they grow like mould from dispersed spores. But just as the lower moulds are produced not only from spores, but also in a manner as yet unknown to us, so it is the case with *Achlya prolifera* and the *Isariæ*; they are moulds, which are developed as a product of a sickly state of the animal; the disease itself is deep-seated, for the animals generally die of

it. When this mould is once formed, it propagates itself by spores. Such diseases are probably not rare, and only of importance to the animals. I have lately observed a disease of the Vibrio, out of whose body a very beautiful but small microscopical mould was developed, from which they died; the animals twist themselves in all directions, and try to get rid of the diseased product, but in vain; at length they become quiet and die.

[To be continued.]

XLII.—*On the* Urari, *the Arrow Poison of the Indians of Guiana; with a description of the Plant from which it is extracted.* By Robert H. Schomburgk, Esq.*.

More than two centuries have elapsed since the curiosity of Europe was raised to become acquainted with the plant from the juice of which the Indians make their celebrated Urari poison; and as the preparation has been enveloped in great mystery, all the attempts hitherto made have only added considerably to the wish of the learned in Europe to be able to sift the true from the fabulous accounts.

Raleigh appears to have been the first who heard of this substance, with which the Aborigines poisoned their arrows for war and the chase; and Father Gumilla observes, that "its principal ingredient was furnished by a subterraneous plant, a tuberose root, which never puts forth leaves, and which is called the *root* by way of eminence, *raiz de si misma*; that the pernicious exhalations which arise from the pots cause the old women to perish who are chosen to watch over this operation; finally, that these vegetable juices never are considered as sufficiently concentrated till a few drops produce at a distance a repulsive action on the blood. An Indian wounds himself slightly, and a dart dipped in the liquid Curare is held near the wound; if it makes the blood return to the vessels without having been brought into contact with them, the poison is judged to be sufficiently concentrated." Not less eccentric are the accounts which we receive from Hartzinck†, who was informed that, in order to try whether the poison be good, a poisoned arrow is shot into a young tree; if the tree shed its leaves in the course of three days the poison is considered strong enough. He observes further, that in the last rebellion of the Negroes in Berbice, a woman

* Communicated by the Author.

† Beschryving van Guiana, door J. J. Hartzinck, etc. Amsterdam, 1770, vol. i. p. 13.

who carried her child on her back was shot with a poisoned arrow, and though the child was not wounded, it began to swell, and died a short time after.

At the commencement of the 19th century Baron de Humboldt gave an authentic account of the preparation of that poison and its effects; but later travellers, not contented with the simple method of its preparation, covered it anew with the veil of mystery, and it was thought that "the vegetable extract was merely the medium through which the poison is conveyed—the common Wooraly owing its poisonous quality to the infusion of the large ants, called Muneery, and the stronger kind from the fangs of venomous reptiles, particularly the Coony Coochy, which is the most venomous of all known snakes*." The author of 'Wanderings in South America,' Mr. Charles Waterton, gives a similar account of its preparation. He says, "a day or two before the Macoushi Indian prepares his poison, he goes into the forest in quest of the ingredients. A vine grows in these wilds, which is called Wourali. It is from this that the poison takes its name, and it is the principal ingredient. When he has procured enough of this, he digs up a root of a very bitter taste, ties them together, and then looks about for two kinds of bulbous plants, which contain a green and gelatinous juice. He fills a little quake which he carries on his back with the stalks of this, and lastly ranges up and down till he finds two species of ants. One of them is very large and black, and so venomous that its sting produces a fever: it is most commonly to be met with on the ground. The other is a little red ant which stings like a nettle, and has its nest under the leaf of a shrub. After obtaining these, he has no more need to range the forest. A quantity of the strongest Indian pepper is used, but this he has already planted round his hut. The pounded fangs of the Labarri Snake, and those of the Conna Couchi, are likewise added. These he commonly has in store; for when he kills a snake, he generally extracts the fangs, and keeps them by him†." This is the adorned story of the ingredients for the preparation of the Urari, and rests upon the fictitious accounts which these travellers may have received, but surely not upon personal experience.

These various accounts, so contradictory as regards the mode of preparation and the origin of the poison, were well calculated to raise in me the desire of removing the mystery connected with it; and I was fortunate enough to accomplish my wish during my first expedition in the interior of British

* Montgomery Martin's 'History of the British Colonies,' vol. ii. p. 47.

† 'Wanderings in South America,' by Charles Waterton, Esq., p. 55.

Guiana. I collected at Pirara, the largest Macusi village I ever visited, every information on the subject, and the result was, that the plant grew on the Conocon or Canuku mountains. On our return from the cataract of the Rupununi, I ascertained at a settlement of Wapisiana Indians on the eastern bank of the Rupununi, in 3° north latitude, that a journey of one day and a half would bring me there.

After I had engaged some guides, I started, accompanied by Lieut. Haining of the 65th Regiment, in the morning of the 25th of December, in search of the mysterious plant. Our way led us first to the south, over pathless savannahs, until we met with a place in the Rupununi where we could ford it. As the mountains stretched their foot to the river's bank, we expected that the ascent would immediately commence. Our guide, however, led us through a mountain-pass, and before us was a large arid savannah. We turned now to the north, meeting with plains covered with wood, or low shrubs and coarse grass, bounded on both sides by the mountains; it was a wild road, crossed frequently by streams, some of which were dried up and others ran turbulently over numerous rocks: their banks were clothed with creepers and twiners, of the extensive families of *Convolvulaceæ*, *Bignoniaceæ* and *Eupatoriæ*: a beautiful reed raised its panicle high above the creeping plants; it was the *Gynerium saccharoides*, which the Indians use for their arrows.

At last, after we had walked more than five miles, the extent of the valley from the place where we entered it, the ascent commenced. It was by no means an easy matter: the path, Indian-like, quite narrow, led over fallen trees, between boulders of granite, and was often so steep that we had to use hands and feet. I wondered only how the Indians, with their burthens, could climb up. Mountain-streams had made their way over shelves of granite, forming frequent cascades, which during the rainy season must be grand indeed; at present, the water only trickled down the rugged sides, and was lost among numerous plants of the genera *Pothos*, *Heliconia*, *Gesneria*, *Peperoma* and *Canna*, which, favoured by the moisture, grew most luxuriantly. A *Justicia* with scarlet flowers, the beautiful *Petrea macrostachya* (*β.*), and the *Duranta* with its violet blossoms, added considerably to the beauty of the spot.

At three o'clock in the afternoon, after a most fatiguing march of eight hours and a half, we reached a few huts on Mount Mamesua, inhabited by Wapisianas, where we intended to rest for the night. We continued our inquiries, and learned from our host Oronappi, an old acquaintance,

whom we had met a few weeks ago in the valley, that he himself knew how to prepare the poison, and that he would willingly accompany our guide and bring the plant for our inspection.

This proposal did not agree with my plans. I was anxious to see the plant in its native growth, and when we gave him to understand that it was our intention to accompany him, he attempted by signs to make us desist from going with him. He told us that the path was very bad, and that it was so far that we could not reach the place till afternoon, and that we would have to sleep on the road; he repeated the same story in the morning, and as he observed that we were determined to insist on our first plan, he made a sour face and did not speak for a length of time. Whether he thought that we were not able to stand the fatigues, or whether he wished us not to learn the place where the plant grew, I know not: enough of his stories—we found the first only true; the path was wretched; all traces of it were frequently lost, and an Indian only could have guided us; and he directed his course mostly by broken branches, or marks cut in the trees, sometimes standing still for some moments to consider in which direction to turn.

Our path was over "hill and dale," mostly in a N.N.W. and N.W. direction. It became every moment wilder: we had to cross several mountain-streams, which flowed in deep beds, precipitating at their banks a ferruginous matter; underbush became scarce; it appeared as if Nature here delighted only in gigantic forms. Our Indians thought they had mistaken the track; but as we arrived at a stream which ran rapidly over the sloping ground, exhibiting granitic shelves, we observed that several paths united; and crossing the brook our guides stopped, and pointing to a ligneous twiner which wound itself snake-like from tree to tree, they called out "Urari," the name of the plant in the tongue of our guides*.

* Sir Walter Raleigh, in his table of names, rivers, etc. discovered in his second Guiana Voyage (Hakeluyt's Voyages, ii. 692), mentions even then, among the poisons used by the Indians of the Orinoco, the Ourari; and by that name it is almost exclusively called by the Indians of Guiana. The Caribs in pronouncing the *r* frequently exchange this letter with *l*, and it may thus have happened that the name Wurali has crept in. The Macusis, who are acknowledged to be the best manufacturers of this remarkable substance, call it decidedly Urari. The same name it bears among the Tarumas, Wapisianas, Aricunas, Woyawais, Atorais, and various other tribes of the interior whom I have visited. The substitution of the corrupted name Wourali is therefore, to say the least of it, gratuitous, and ought to be rejected. Von Martius and Von Spix, in their 'Travels in Brazil,' observe that, during their exploring tours up the Amazon, Yupura, Rio Negro, etc., they heard it pronounced Urari, but never Wurali. (See Reise in Brasilien München,

My wish was thus realized; and that plant which Baron de Humboldt was prevented from seeing, and which was one of the chief objects of Mr. Waterton's 'Wanderings,' but without success, I now saw before me. Baron de Humboldt, with his usual sagacity, observes, "The danger of the Curare, as of most other *Strychneæ* (*for we continue to believe that the Mavacure belongs to a neighbouring family*), results only from the action of the poison on the vascular system*."

Though I did not find the plant in flower, it was bearing fruit, and their inspection assured me that, as Von Humboldt suspected, the plant belongs to the genus *Strychnos*†. It forms No. 155 of my Guiana plants, and is thus characterized by Mr. Bentham:—"*Strychnos toxifera*, Schomb., Hook. Ic. Pl. t. 364 and 365; ramis scandentibus cirrhisque pilis longis patentibus rufis dense obtectis, foliis sessilibus ovali-oblongis acuminatis membranaceis trinerviis utrinque pilis longis rufis hirsutis, floribus . . . . . fructibus maximis globosis.—Folia 3—4-pollicaria."

The *Strychnos toxifera*, as I have called it, the Urari of the Macusi and Wapisiana Indians, is a native of South America, and a sporadic plant; and, as far as known to us, has been hitherto found only in the granitic mountains of Canuku or Conocon, in latitude 3° 10′ N., a group of mountains which border the extensive savannahs of the rivers Rupununi, Mahu and Takutu. It is a ligneous twiner: at its root, of the thickness of a man's arm, and covered with a rough ash-coloured bark, marked with fissures; winding itself to the neighbour-

1831, vol. iii. p. 1155.) The compound terms Uraricapara and Uraricuera (Parima), two rivers, the former the tributary of the latter, and which we find under these names in the oldest maps we possess of these regions, is another argument in favour of Urari. The arrow poison is generally known in England under the name of Wouraly, a name by which Mr. Waterton, in his 'Wanderings,' has described it; but interesting as his description may prove to the general reader, and however delightful the picture he draws of his various exploits, it is a work which never will be consulted as authority in scientific questions.

* Personal Narrative, vol. v. part ii. p. 527.

† The chief ingredient of the arrow poison of the Indians of the Yuppura is, according to Von Martius, the bark of a slender tree, which, in the Tupi tongue, is called *Urari-iwa*, the *Ronhamon gujanensis* of Aublet. A plant which forms one of the ingredients in the preparation of the Macusi poison, and which, in many respects, agrees with Aublet's figure, has been named by Mr. Bentham, in the enumeration of my Guiana plants, *Strychnos cogens*. However, the Urari plant of the Macusis, although belonging to the same genus, differs in numerous specific points. (Compare Von Martius, Reise in Brasilien, vol. iii. p. 1237.) I have little doubt, that the plant of which the Indians by Esmeralda prepare their poison, is Aublet's *Ronhamon*, and in this I am confirmed by a conversation with Dr. Kunth in Berlin, who, as is well known, determined Von Humboldt's plants.

ing trees, and reaches often a height of thirty to forty feet before it divides into branches. The latter are rounded and opposite, the branchlets densely covered with ferruginous hair. Between the branches and likewise between the leaves there appear spiral tendrils, mostly single, but sometimes divided. The branchlets prove sometimes abortive on one side, and are then replaced by the cirrhus, which in that case becomes leaf-bearing. Organs of a peculiar structure, apparently gemmulæ, are found below the base of the branchlets as well as on the branch itself; on the outside they are closely set with hair, on the inside smooth and coriaceous and of a spatulate form. They are not peculiar to every branch, but mostly to be found on the branchlet by which it is terminated. The leaves are opposite, ovate-oblong, acuminate, short-petioled, entire, three to five-nerved, ciliate, membranaceous, and covered with ferruginous hair, which is thicker set between each pair of petioles; the leaves differ in size from one inch and a half to four inches and a half, and are from one to two inches broad, the stalk being only two lines.

As already observed, the plant was not in flower in December, and had just begun to drop its fruit, which were on long stalks; and the rudiments of a five-cleft calyx and an inferior corolla were easily perceptible.

The fruit is a berry of the size of a large apple, being frequently twelve inches in circumference; it is globular, and covered with a smooth hard rind of a bluish green colour and filled with a soft jelly-like pulp, in which the seeds, ten to fifteen in number, are immersed. They are round, concavo-convex, about an inch in diameter, and five to six lines thick; from the circumference five rays extend towards the prominence in the middle. They are of a grey colour and rough; the internal kernel is a yellowish white, and tough, like horn. This substance, according to Indian information, possesses intense bitter and medicinal properties; it is used by the Indians against pain in the stomach, dysentery, and as a tonic.

We observed many heaps of the cut wood covered with palm-leaves, which we were told had been left by the Macusis, who come to this place from a great distance, as the plant is known to grow only in two or three situations at the Canuku mountains; they are therefore resorted to by the Indians from all quarters.

The Wapisianas and Macusis are generally acknowledged to be the best manufacturers of the poison; and from the corroborative testimony of these tribes, I have gathered the following particulars respecting its preparation.

It is only the bark of the woody parts and its alburnum

which are considered to possess the poisonous principle in the highest degree. The stem of the plant is therefore cut into pieces about three feet in length, of which the bark is stripped, and after having been pounded it is steeped in water, for which purpose a new earthen vessel is used; here they allow it to remain for some time, well covered, until the water is of a yellowish colour, when it is filtered through a funnel-shaped matappa lined with plantain-leaves. Several other plants have been meanwhile procured, and after their juice has been extracted in a similar manner, this extract is kept ready to be added to the former at the moment it has been concentrated on a slow fire to the consistency of a syrup. The addition of that juice gives a darker colour to the Urari, which, from the time of its becoming concentrated, has the appearance of tar: it is now put into small calabashes, which are covered with leaves to prevent the poison from coming in immediate contact with the air. The Indians pretend, that if it be well preserved it will keep its strength for a couple of years. If it is to be used, the quantity required is put into a separate calabash, and a little juice of the Cassada is added to it to make it more pliable. I was told that the addition of Cassada-water (as the expressed juice of the poisonous root of the *Jatropha manihot* is termed) reawakens the slumbering powers of the poison. After that juice has been added to it, the Indian buries the calabash with the poison for a day or two under ground.

This is the unadorned account of the preparation of the Urari, and the method which is followed by the Macusis at and about Pirara, and the Wapisianas of the Canuku mountains, where the plant grows. There appears to be no danger whatever in the preparation, and the vapours which are disengaged are entirely innocent; but the circumstance that it requires several days to watch the pot closely on the fire and to take off the scum, etc. before it is properly concentrated, as well as the superstitious customs with which the poison-maker, for his own advantage, surrounds the preparation of it, prevent the Indian, with his natural indolence, from making it more than once or twice a year.

I undertook in 1837 another expedition in the interior of Guiana, and found opportunity to revisit the regions which, in consequence of the arrow poison, had been previously of interest to me. That interest had not been abated—nay, it was increased. The belief continued to prevail among the colonists of Demerara, that the active poison of the Urari was "snake-teeth and stinging ants;" and my assertions, that the vegetable juice of the plant employed produced the

fatal effect, and that it contained no animal principle, were doubted. It became evident that the more mysterious accounts of former authors had taken too firm a root to give my plain tale a chance of finding credit. It was certainly true I had not been present at the time of preparation, and although in my own mind I doubted not the Indian's information, I could not implant that faith into others. During our stay in Pirara, a Macusi village on the classical soil of Raleigh's and Keymis's El Dorado, I ascertained that an Indian lived in the vicinity, who was far-famed for the preparation of the Urari poison. I induced him by presents of some consideration to prepare it in my presence, and he promised to do so. I accompanied him for that purpose to the Canuku mountains, partly with the object of being present at the gathering of the chief ingredient, and partly to see whether I might be fortunate enough to find the plant which is called Urari in blossom. In the latter object I was disappointed: I found it again, as during my first visit, fruit-bearing.

The mountain Ilamickipang had been named as the place nearest to Pirara where the plant grew, being about eighteen miles distant in a south-eastern direction from the spot where we collected it in 1835. We ascended the mountain for about 1500 feet, and though we observed numerous Urari plants at a less height, our sapient chemist, after having tried different pieces of the stem, pronounced it not to be in a state fit for preparation. After we had reached a saddle of the mountain, a spot was selected, where, with the assistance of our Indians, we built a hut of palm-leaves, and from hence short excursions in different directions were undertaken, to collect such plants as possessed the sap in a high degree. They were found generally in rocky places or glens, among heaped-up boulders of granite, places well selected by a plant which is so fatal in its effects. The branches and ligneous stems, which were in thickness less than the human wrist, were chosen and carried into the hut, where they were scraped, and the bark was preserved in small baskets made for that purpose. Three such baskets were filled, when our chemist considered that he had enough, and the baskets were delivered up to me, and we returned to Pirara. The manufacturing of the poison was however delayed for some days, for the object, as I was told by the chemist, of observing previously a rigid fast, in order to prepare himself for the important business. Meanwhile Kanaima, an influential Macusi chief from the Rupununi, arrived on a visit in Pirara, and for what purpose I know not: it is enough to state, that he knew how to prevail so far upon the manufacturer of the poison that he re-

tracted his promise, and refused to prepare it in my presence. However, the bark was in my keeping, and as I had paid for it, I considered myself to have a full right to it; and although he demanded it back, it was now my turn to refuse him. We were at that period so near our departure for Fort San Joaquim, that I was prevented from engaging a more willing concocter, and with the pure bark in my possession we departed.

The dreary "winter season," as the time when the tropical rains descend in torrents is called by the Brazilians, gave me sufficient leisure to enter into further inquiries with regard to this poison, and I resolved to make some experiments how far the pure bark of the Urari plant, *Strychnos toxifera*, unmixed with any other substance, might prove fatal to animal life. I took, therefore, two pounds of the bark shavings, and having poured a gallon of water on it, allowed it to remain in that state for twenty-four hours. Half of it was filtered off, and keeping a steady but gentle coal fire, it was boiled in a new pot, adding from time to time more of the infusion. After having concentrated it by boiling to the consistence of thin syrup, and having allowed it to cool, two arrows were poisoned with this substance, and two fowls wounded, one in the thigh and the other in the neck. The effects became apparent after five minutes: the first died in twenty-seven minutes after the wound had been inflicted; and the latter, which had been wounded in the neck, after twenty-eight minutes. The gentleman who accompanied me on my expedition, and Senhor Pedro Ayres, who had been sent by the commander of the district to welcome us at the Brazilian boundary, were present during these experiments, and it is therefore established beyond doubt, that the Urari plant alone, without any assistance of Indian charlatanism, or the addition of extraneous substances not likely to add to its efficacy, produces the fatal effect. The boiling process was finished in less than seven hours, while the Indians employ more than forty-eight hours for that purpose; and as it required a period rather longer to produce death in the fowls wounded with it than would have been necessary with good Macusi poison, this must be ascribed to our decoction being not sufficiently concentrated. The poison which I had thus prepared was of a brownish colour: good Macusi poison is jet-black, and I have no doubt that it receives this appearance from one of the ingredients which the Indians add to it.

When I left Pirara, foiled in my purpose to see the poison prepared by the Macusi, I arranged with the Rev. Thomas Yond, who laboured then as missionary of the episcopalian

church in that village, to try if he could induce any of the famed poison-makers to boil it in his presence; and although, on my return to Pirara in 1839, I had at last an opportunity of witnessing the preparation of the poison by my former recreant Macusi, I nevertheless prefer inserting here Mr. Yond's letter, as it is an additional evidence for henceforth rejecting "snake-teeth, stinging ants," etc. as component parts of the Urari poison.

"*To Robert H. Schomburgk, Esq.*

"Pirara, 4th October, 1838.

"My Dear Sir,

"Knowing as I do that your object in visiting these wilds is that of making general research, for the information and benefit of society at large, I take the present opportunity of presenting you with the promised statement of the manner how, and the ingredients from which, the much-famed Urary poison is made, of which there has been so much conjecture and erroneous accounts given in time past.

"Since the time that I have come to reside amongst the Macusi Indians as missionary, curiosity has led me to go to a little expense in procuring one of the Indians from the Canuku mountains, who is noted for his being able to make powerful poison, whom I prevailed upon to boil a quantity before me at the Mission House. I was fortunate enough in purchasing a quake or basket of Urary bark, as also a quantity of Arimāru, Tarireng, and Tararemu; the rest my Urary-maker procured in the space of three days. The ingredients being already procured, the next movement in course was the erecting of my tent, and enclosing three parts of it round with palm-leaves, which for the time being was called the Indians' Urary House. This temporary house was erected in the front enclosure, opposite the door, that I might see every movement. A buck-pot*, that would hold a little more than a gallon, and that had never been used, was then brought, as also four shallow plates: the first was to boil the ingredients in, and the others to expose the Urary liquid to the sun when boiled, in order to reduce it to a jelly.

"One large gooby†, stopped at the mouth or stall-end with loose cotton, was opened at the head-end sufficiently wide for admitting the contents of the Urary-pot through when poured out. A second small gooby was made, in the shape of a funnel, and stopped with silk grass, in order to pour the Urary through when moving it from one drying-plate to the other, that the scum which rises on the top during the time of drying might be kept back. The last receptacle is a small calabash‡, that will hold half a pint, into which the whole

* The earthen pots in which the Indians prepare their food, and which they manufacture themselves, are called in the colony buck-pots, buck being among the colonists a cognomen for Indian.—S.

† Gooby, the fruit of a species of pumpkin, which, after having been scoured out, is used in lieu of a flask.—S.

‡ The bowls prepared of the fruit of the *Crescentia cujete*, or calabash-tree.—S.

of the Urary is poured by degrees through the small funnel, after it has been brought to the consistency of thin starch. As soon as all things were set in order, and the wood split up in readiness for making the fire, the man set off in search of I could not conceive what, and therefore I asked one standing near me why the man had gone away. He said, 'He is gone to fetch his tinder-box, to make fire, for he will not take a light from any person's fire; you will see he will make his own.' I waited awhile, and then he came with a tinder-box and steel in his hand. I looked at the box and tinder, to see if there was anything remarkable in it, but found it to be simply a roll of loose cotton wound round with thread, about an inch in diameter, and seven in length, having for its case a piece of bamboo of the same length, which aids in protecting the cotton from getting damp, and also serves as an extinguisher to the burning tinder when put downwards in the bamboo-case. Mulatto then took his red flint-stone, such as the Indians commonly use, which is found in some of the distant mountains, and seems to be just as good as our flint-stone at home for such a purpose*, and struck several times, but the cotton having by some means got rather damp, he could not succeed in getting a light: he then went to my kitchen and lighted his cotton-roller. Now I thought I should find that he would make his fire from this burning tinder, that had certainly got its spark from my kitchen fire; but no, instead of this he pushed it into his bamboo extinguisher, and let it remain there until every spark was put out. He then struck a light from his own flint, and so began making a fire. Other fire than that made by the Urary-maker is not allowed to come under the roof of the Urary-house, lest the whole should be defiled. Neither may any water be used in drawing or cooking the Urary but that which is procured by the Urary-maker, and even that must not be put in any vessel, save his own sacred goblets.

"Mulatto began boiling the Urary about eleven on Friday the 19th of September, 1838. The ingredients used are as follows:—

Urary† bark from a vine	2 lbs.
Arimārn bark‡, vine	$\frac{1}{4}$ —
Tarireng	$\frac{1}{4}$ —
Yakkee	$\frac{1}{4}$ —
Wokarimo	$\frac{1}{4}$ —
Tararemu $\frac{1}{2}$ oz., from the root of the Tarireng vine	$\frac{1}{2}$ oz.
Muramu§, a bulbous root, not boiled, but soaked in the half-cooked Urary, and the slime is squeezed from it, to congeal the whole . .	$1\frac{1}{4}$ lb.
Manuca‖, the bark of a large tree, four small pieces.	

* The red flint-stone here alluded to is compact quartz (jasper), which is found in the vicinity of Mount Roraima, and along the banks of the rivers Coko and Cukenam.—S.

† Urari, or *Strychnos toxifera*, Schomb.—S.

‡ Arimaru, *Strychnos cogens*, Bentham.—S.

§ Muramu, a species of *Cissus*. I brought some of these roots with me, which have been planted with success at Messrs. Loddiges and sons, and at the Botanic Garden in Berlin.—S.

‖ Manuca, or Manica, an intensely bitter bark of a tree which I conceive

"Of these, however, he had to make two separate boilings, on account of his pot being too small to contain the quantity of bark necessary at once, for each of which he took a day,—for the first almost the whole of Friday, and the second the greater part of Saturday. The Urary was the first ingredient that was put in the pot, and the rest he every now and then kept adding by little and little, until the whole was used. He kept but a slow fire during the whole time of cooking, just sufficient to keep the liquid in a simmering state, which seemed to suck the virtue out of the bark well. Upon each additional handful of bark that he put in the pot during the time of cooking, he took special care to blow, informing me that that would give virtue to the Urary and make it strong. Of course I did not deem that to be a proper time for giving my opinion as to its real value or not, knowing that a little opposition would soon make him leave his work altogether, and I should be left with the ingredients unboiled, to muse over my own folly; I therefore told him he was welcome to do as he pleased, my only desire being to see everything that was done, and that the Urary should be strong, or painful as they term it. The whole of these two days (Friday and Saturday) had simply been to draw the poison out from the mixed quantity of bark, so as to form the Urary liquid, which in appearance was not unlike strong-drawn coffee. The whole liquid, consisting of a gallon and a half when first drawn, by this time had been reduced to about a quart, which was then poured into a gooby, the head of which had been cut out, and the tail-end stopped up with loose cotton, sufficiently tight to stop any thick sediment from passing through, acting as a sort of strainer, through which it passed into a large shallow plate and the pot which he had been using, in order to be exposed to the sun. This was on Monday morning. In course of two or three hours after the Urary had been exposed to the sun, I observed the powerful effect which the slime from the bulbous root Muramu* had in perceptibly congealing the liquid to a jelly. On Tuesday Mulatto began to pour the Urary into the more shallow plates, where it remained still exposed to the sun, until brought, as already stated, to the consistency of thin starch, and was from thence removed to the last receptacle, a small calabash, capable of containing near half a pint, to which small quantity the whole was brought.

"This process of drying continued from Monday until Thursday following, when Mulatto gave it over to me. Mulatto then asked me to come and see him try its strength, informing me that the first creature upon which it must be tried was a Tāpooya (a species of lizard found amongst the grass in the savannahs); for if it quickly

to belong to the *Xanthoxylaceæ*. It is said to have the quality of salivating when taken internally, and the inhabitants of the Rio Negro and the Amazon use it therefore in syphilitic complaints.

It is remarkable that all the ingredients which the Macusis use for the preparation of their poison are of an intense bitter. This may be the reason that it is used as a tonic. I am however unacquainted with the plants which they call Tarireng, Yakkee, and Wokarimo.—S.

* *Cissus* species?—S.

kills that the Urary must be strong, because of its being hard to kill, having but little blood. I was at a loss to know how he would catch such a swift little creature in so awkward a spot, and how he would find them at all; but the mystery soon was revealed, for, having taken a torch in his hand, he set fire to the dry grass, which spread abroad and made the poor Tāpooyas fly from their retreat, to hide in some distant tuft of grass or brushwood, which Mulatto keenly observed, and slily pounced upon and secured them. He then took a small piece of wood, about the thickness of a stocking-needle, poisoned it at the pointed end with a little of the new-made Urary, and then stuck it in one of the hind legs of the lizard. He then let it loose, when it ran a few yards; then, panting, lay down and died. A second and third he pierced in the tail, upon which it had much the same effect; they both died in a few minutes. A rat was then brought in by one of the Indians, and its thigh was slightly pierced with a needle-like arrow, which had such an effect upon the poor creature as scarcely to allow it to move ten feet before it lay down and expired. I then proposed, as I was about having a fowl killed for dinner, to have it slightly touched with Urary on the leg: to this Mulatto made some objection, saying he never tried his Urary on fowls, and to do so would spoil the whole; but as I pressed it, he said, 'Then let it be done.' Mulatto then made a small arrow on purpose, drying it a little over the fire; for, said he, 'the Urary is yet soft, and it will strip off from the arrow as soon as it comes in contact with the skin; but if it be dried it will not, and will get to the blood.' The noble cock was then shot in the thigh, when it ran for ten or twelve yards, then walked across the road, of twenty yards wide, and lay down in the grass, when its head fell as though its neck had been broken, and he soon after died.

"I wished to have tried the effects of the Urary on a deer, or some other wild animal, but have not yet had an opportunity; however I doubt not, from what I have seen, of its being sufficiently strong to destroy any animal with which we are acquainted in a short time. Having heard in time past that snake-teeth were a necessary ingredient of the Urary, I asked Mulatto whether they were not (happening to have a few by me that had been taken from the head of a large rattle-snake that had been taken a few days before, which were at his service), but he said they were not at all necessary, that he never used them, nor would they assist much in making the Urary strong, since the Urary poison did not depend either upon them or the stinging-ant, and that for himself he used neither. Mulatto did not fail to act according to their superstitions, in abstaining from meats; also in requesting me not to eat or drink sugar when I came to see him*, and that no person or woman especially might come near the Urary-house; and even on the Lord's day would he not altogether cease to boil the Urary, but kept a few sparks alive under the pot, notwithstanding my request that he should do nothing during the sabbath. He would not as usual come into

* This superstition no doubt arises from their believing sugar to be an antidote to the Urari poison.—S.

the chapel, but sat without, considering, as I suppose, that he would become defiled by congregating with the people, and thereby destroy the power of the Urary.

"I must now conclude, and beg your acceptance of the above observations, as coming from one who wishes you every success in your arduous undertaking, as also your welfare in general, both of soul and body.

"Remaining ever yours,
"T. Yond."

Bancroft, in his 'Natural History of Guiana,' gives us a description of the manner in which the Acawais prepare the "Woorara," as he calls it, which, in its general mode, agrees with Mr. Yond's and my own observations. He distinctly says, "the ingredients are all 'nibbees*' of different kinds." There is no doubt that different nations prepare their Urari in different modes, but the active principle subsists in one or the other species of *Strychnos*.

I have already alluded to Humboldt's account of the mode of preparation at Esmeralda, at the time of his journey the place most famed at the Upper Orinoco for making the arrow-poison. Von Humboldt's narrative is too generally known to demand a recital of his graphic account. However, Esmeralda is no longer what it was forty years ago; and when I visited it in 1839 I found it merely inhabited by an Indian patriarch and his family, who, on my inquiries, informed me that he bought his poison from the Indian tribes who inhabit the banks of the rivers Paramu and Ventuari, namely, the Guinaus and the Maiongkongs. These tribes, who were known to the Spaniards under the name of Maquiritares, call their poison Cumarawa and Markuri, and distinctly make a difference between it and the Urari, which they gladly prefer in consequence of its superior quality, and which they barter from the Macusis and Arecunas, giving in return the Curata, that admirable reed, sometimes sixteen feet long without an internode, and of which the celebrated blow-pipes or Sarbacans are made†. From what I learned when amongst these

* Lianas, or ligneous twiners, are called nibbees or bushropes by the colonists.—S.

† Vide Annals of Natural History, vol. v. p. 44, and Linnæan Transactions, vol. xviii. p. 557.—It is very remarkable that the plant of which the poison is made, and the reed which forms such an important part in the construction of the blow-pipe, with which the poisoned arrows are propelled, are plants not equally dispersed over these regions, but grow merely on isolated spots. The *Arundinaria* (*Arundinaria Schomburgkii*, Bennett), which furnishes that remarkable reed, appears to be limited to the chain of sandstone mountains which extends between the second and fourth parallel of north latitude. The only localities which I ascertained were Mounts

tribes, the chief ingredients for the preparation of their poison is either *Strychnos Ronhamon* or *Strychnos cogens* (B.), and although it resemble the Urari in appearance, we soon found that it was of inferior strength. The Curare of Esmeralda was prepared by Indians either related to or of the same tribe as the Guinaus and Maiongkongs; and when I showed them a specimen of the *Strychnos toxifera* from my herbarium they appeared to be entirely unacquainted with it, while they recognized the specimen of *S. cogens* as that plant of which they made the Cumarawa. I have already alluded to the similarity in general appearance between *Strychnos cogens* and *Strychnos Ronhamon.* It is therefore more than probable that the Curare and Cumarawa are prepared in a similar manner.

Von Martius relates the mode of preparation of the Urari as practised by the Juris, Passes, Miranhas and Ticunas, Indian tribes of the Amazons and Yupura (vide 'Reise in Brasilien,' iii. pp. 1155 and 1235); and as he had opportunity to be present at the preparation while among the Juri Indians of the river Yupura, I insert here his remarks. "The chief ingredient of the arrow-poison of the Indians of the Yupura is furnished by a slender tree, the *Ronhamon Guianensis,* Aubl. (a *Strychnos,* L.), which in the Tupi tongue is called Urari-iwa. The bark, after having been immersed in water, is pressed out by the Juri-Taboca with his hands, and the yellowish juice is concentrated in a flat plate, over a gentle fire, and other infusions extracted in a similar manner from the root of a pepper-shrub (*Piper geniculatum*); from a tree unknown to me, called Taraira-moira, that is, tree of the fish Taraira; the bark of a Cocculus plant (*Cocculus Juime,* M.), and a twining *Ficus,* are added in equal quantities. This compound extract, of the consistence of a thick syrup, had acquired over the fire a dark brown colour, when it was poured into small vessels, each containing about two ounces, and allowed to cool in the shade of the cabin. Previously, the Indian added to every vessel a small fruit of capsicum (Kiynha-avi), and with this the preparation of the Urari was finished. The Indians revive its strength when it has become weak, chiefly by adding the fruit of capsicum and the root of *Piper geniculatum.* There is little doubt that the extract of the four plants which have been named as additions are of less importance, and their place might be supplied by others. According to the information which I received from several Brazilians, other ingredients are added, namely, the milk of *Euphorbia*

Mashiatti, Marawacca, and Wanaya, on the rivers Ventuari, Paramu, and Orinoco.

cotinifolia, Hura crepitans, or the astringent fruits of *Guatteria veneficiorum,* M.; and superstitious Indians add the first frog which they hear croaking that day, the great black ant, or teeth of poisonous snakes." The addition of the teeth of poisonous snakes and the great black ants, rests here, again, not upon personal experience, but merely on the information of Brazilians, no doubt equally inoculated as our colonists with the wish to see through the mystic veil. Dr. Pöppig, in his 'Reise in Chili, Peru, und auf dem Amazonenstrome,' Leipzig, 1836, vol. ii. p. 456, observes, with respect to the arrow-poison of Peru, "The supposition occasionally met with in Peru, that animal poisons were mixed in the composition, has not met any confirmation."

M. Orfila, in his work on General Toxicology, M. Emmer ('De Effectu Venenorum veget. Americ.'), and others, have published able treatises on the effect of this poison. The results are, that when inspissated it may be rendered liquid by heat, and is soluble in water, in alcohol, in muriatic acid, and in volatile alkaline spirit. It unites with acids without emotion or change of colour. If it be mixed with alkalis, no ebullition is observable, but it changes its colour from a dark brown to a yellowish brown. "A few grains, mixed with as many ounces of human blood, warm from the veins, entirely prevents a separation of serum and crassamentum, and the whole mass continues in a state of fluidity similar to that in which it is drawn, until, after some days, it putrifies." (Bancroft.) The poison affects chiefly the nervous system. Its effect of destroying the vital functions is considerably quicker, as I have found by experiments, if it be brought in contact with a vein; and I am of opinion that no sure remedy is known as yet to counteract its effect, if it have entered the blood in sufficient quantity. I have seen the deer arrested in his fleet course, wounded by the poisonous arrow; I have seen the tapir, while swimming across the Rupununi, so slightly wounded that the spike had just penetrated through the thick skin; nevertheless it took effect, and the animal expired. Numerous are the birds of larger and smaller size which I have seen thus secured.

As much as I had heard of this fatal poison, I nevertheless cannot abstain from noting the astonishment by which I was seized when I saw it used for the first time. We travelled over the savannahs girt by the Pacaraima mountains; a deer was discovered browsing in the high grass before us. Lieutenant Haining, of the 65th regiment, my faithful travelling companion, was too far behind with his gun for us to await his coming up, and one of the Macusi Indians took a poisoned

spike from his sarima* and fixed it to his arrow. Cautiously he stole upon the unsuspecting deer, and shot the arrow into its neck; it made a jump in the air, fled with the speed of the wind over the savannahs, but it had scarcely run forty yards when it fell panting to the ground, and expired. Von Humboldt has already related that its effect is more or less sudden upon different animals. If the poison be good and the arrow has entered a sufficient depth, it has effect upon the strongest bull in four to five minutes, while a fowl may resist it double that time. The Indians say that monkeys and jaguars are easier killed with it than any other animal.

The poison keeps its efficacy for a length of time. I brought with me at my return to Europe in 1839 a small calabash of the Urari, which had been made in May 1839 in my presence. I made several experiments with it in August 1840, and I found that it killed a rabbit in four to five minutes. Mr. Sewell, veterinary surgeon in London, whom we thank for several experiments to apply the Urari as a remedy in tetanus of horses, received through me some of the same poison, and found it effective. While in Potsdam I gave a small quantity to M. Desenis, who wounded several animals with it, and found that it deprived of life a rabbit in eight minutes, a cat in four and a half, and a pigeon in six minutes†. On dissecting the animals which had been killed by means of the Urari, it will be generally found that there are no signs of inflammation either in the lungs, stomach, or any other part, which, with regard to medical jurisprudence, proves this poison to be the more dangerous, as, should it be employed for sinister purposes by man against his fellow-creature, it would be difficult to say by a *post mortem* examination of what the victim died. In some of the rabbits on which I tried experiments, Dr. Franz found a large quantity of blood in the brain and the spinal cord.

I have already alluded to Mr. Sewell's experiments, who, viewing the lock-jaw in horses as the result of irritation, conjectures that "if a horse in tetanus were destroyed by poison, which acts by suppressing nervous power, and life were then to be restored by artificial respiration, the nervous system, on reanimation taking place, might possibly be free of the original morbid irritation." Reasoning thus, Mr. Sewell tried the following singular practice: "A horse suffering from a

* Sarima, a small case made of bamboo, and covered with tapir- or deer-skin, and in which the Indian keeps the poisoned arrows until he stands in need of them. It is generally worn round the neck.

† I presented the small calabash with the remaining poison to the Berlin Museum.

severe attack of the tetanus and lock-jaw, the mouth being too firmly closed to admit the introduction of either food or medicine, was inoculated on the fleshy part of the shoulder with an arrow-point coated with the Wourali poison; in ten minutes apparent death was produced. Artificial respiration was immediately commenced, and kept up about four hours, when re-animation took place; the animal rose up, apparently perfectly recovered, and eagerly partook of hay and corn. He unluckily was too abundantly supplied with food during the night. The consequence was over-distention of the stomach, of which the animal died the following day, without however having the slightest recurrence of tetanic symptoms." ('Outlines of Human Pathology.') From this experiment, which has been repeated, it was considered that it might be successfully applied in hydrophobia; and in a distressing case, where Inspector Phelps, of Nottingham, was suffering under this dreadful disease, Mr. Waterton, of Walton Hall, was requested to attend for the purpose of directing the operation. He came too late, as Mr. Phelps had expired before his arrival: but, for the advancement of general information, he, with his usual kind feelings, agreed to exhibit the experiment upon animals. The proceedings which were carried on before the surgical and medical profession at Nottingham have been detailed in the Nottingham Journal of 12th April, 1839, and have been since likewise printed in several periodical journals, where they may be referred to by those who feel interested in it. It was attempted during these experiments to restore by artificial respiration two asses, after they had been wounded with the Urari poison. The one first operated upon, although apparently recovered from the effects, died four days afterwards of debility: with the fate of the second I am not acquainted. However this may be, it becomes evident, that the Urari, in the present state of our knowledge of its effects, could only be resorted to in the greatest extremity as a remedy against hydrophobia, and where there is no hope of recovery.

The poison has been hitherto only to be procured with difficulty, as the Indians who manufacture it are not easily induced to part with it; but as I have fully ascertained that the effective principle is the bark of the *Strychnos toxifera*, and that the additional herbs are of less importance, and no doubt serve merely to mystify its preparation, it will become easy to any one to prepare the Urari, provided the bark be in his reach. It will likewise assist to draw the attention of the faculty to the chemical properties of the genus *Strychnos*.

According to M. Chevreul, the *Strychnos nux vomica* consists of acidulous malate of lime, gum, vegeto-animal matter,

bitter matter, fixed oil, colouring matter, (which was yellow and probably starch, and which could not be directly extracted on account of its desiccation,) earthy and alkaline salts, woody hairs and wax, which latter appears to preserve the perisperm from humidity*. MM. Pelletier and Caventou have since discovered two vegetable alkalies, Strychnine and Brucine, in it.

It is known that where the Urari has not produced death, it has been followed by torpor and paralytic fits; and where it has taken effect, the victim dies under convulsions. It appears, when brought in contact with the blood, to have a direct power over the spinal cord. The same effect is produced by the nux vomica when taken internally. M. Orfila observes, "A person swallowed in the morning a scruple of nux vomica in powder, and drank afterwards a few glasses of cold water in order to diminish the bitterness occasioned by this substance. Half an hour after he appeared to be drunk; his limbs, especially his knees, were stiff and tense: his walk was staggering, and he was afraid of falling. He took some food and the symptoms disappeared. The administration of nux vomica and of the root of gentian to a woman affected with ague was followed by convulsions, cold and stupor, and almost every part of the body was torpid." (Scutter's Dissert.†)

It is remarkable that the poison proves innocent when taken internally, and is even recommended as a remedy in gastric disorders. While, during my late expedition in the interior of Guiana, I was suffering under all the horrors of a tertian ague, and our quinine had fallen short, I took frequently the Urari in doses of about as much as I could get on the point of the knife. After having taken it I felt generally a slight head-ache, but it did not remove the fever; and fearing there might be an excoriation of the tongue or throat, or bleeding of the gums, without being aware of it, my companions induced me to desist from the dangerous experiment. The Indian when he purchases the poison tastes it, in order to judge of its genuineness. It is well ascertained, also, that animals shot with the Urari are more savoury when prepared for food, and the meat is quite innocent. Generally, the game which we received from the Indians was killed with the poisoned arrow, and we never hesitated to eat of it. Dissection of those who have died of the nux vomica shows no organic lesions, which is likewise the case where death has been produced by the Urari coming in contact with the blood. The first is proved by numerous experiments of M. Orfila; the

* Medical Botany, etc., London, 1831, vol. ii. part lii. † *Ib.* part lii.

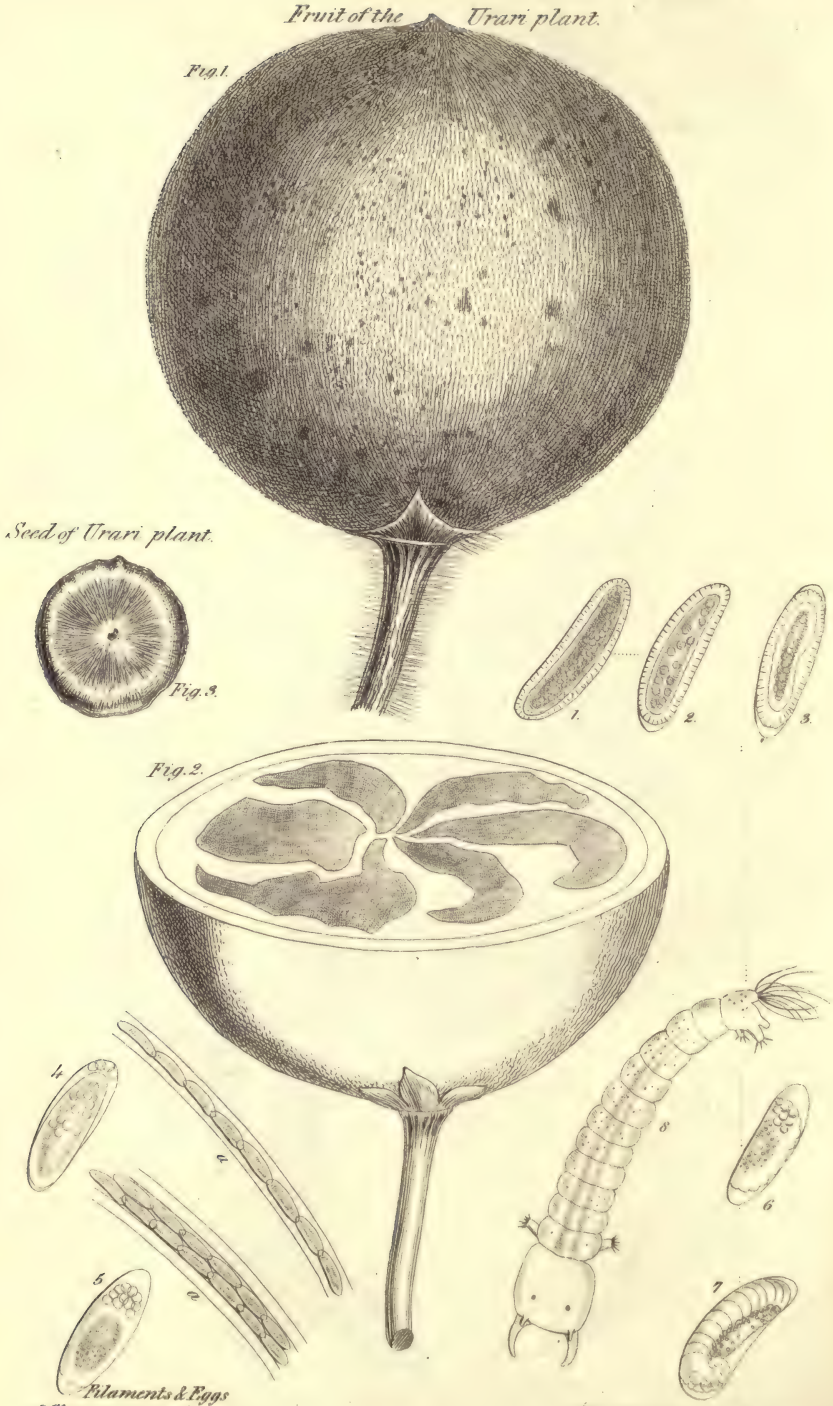
latter by those of Mr. Waterton in England, and several physicians in Demerara. The juice of the *Cassada* becomes innocent by being boiled, that of the Urari becomes poisonous after it has been concentrated by the action of fire: should the poisonous principle of the *Jatropha manihot* be entirely volatile? The Cassaripe is the concentrated juice of the *Jatropha manihot*, and is used as fish-sauce and for many culinary purposes, while in its pure state it proves poisonous to animal life; what then can cause the difference? I am not aware whether experiments have been made by inoculating animals with the juice of the nux vomica in its pure state, and likewise after having been concentrated.

Sir Walter Raleigh says, in his second Guiana voyage, "There was nothing whereof I was more curious than to find out the true remedies of these poisoned arrows..... And it is more strange to know that in all this time there was never Spaniard, either by gift or torment, that could attain to a true knowledge of the cure, although they have martyred and put to invented torture I know not how many of them." Raleigh recommends garlic as an antidote where the wound has been inflicted with an arrow of the ordinary poison, and advises them to abstain from drink, "for if they take any liquor into their body, as they shall be marvellously provoked thereunto by drought, I say, if they drink before the wound be dressed, or soon upon it, there is no way with them but present death." Irai, a Carib chieftain of the Rupununi, and the last descendant in direct line of the Cacique Mahanarawa, so far confirms Raleigh's account, that the thirst which ensues after a wound has been inflicted is intolerable. He pretended that the infusion from the root of a species of Wallaba (*Dimorpha*, W.), mixed with sugar, or the juice of sugar-cane, was an antidote. There is not much dependence to be placed on this remedy. While in Curasawake in 1838, we secured several Kings of the Vultures (*Sarcorhamphus Papa*) alive. A female which we had for several weeks succeeded in escaping out of the place where she was kept, and flew to a neighbouring tree. I was loath to lose her, and resolved to shoot her with weakened Urari poison. It took effect, and she fell from the tree. We immediately applied juice of the sugar-cane, but without avail; and after having lingered for half an hour, she died under convulsions. Humboldt observes, that an application of salt internally and to the wound would be found of importance; and Mr. Waterton informs us, that an ass which was poisoned by Wourali recovered by inflating his lungs with a pair of bellows*. In the 'Annals of Philosophy,' vol. xv. p. 389, we

* Waterton's 'Wanderings,' p. 83.

The Urari Plant. Strychnos toxifera.

Schomb. del. J.D.C. Sowerby sculp.



J. D. C. Sowerby sculp.

are informed that M. Drapiez has ascertained by numerous experiments that the fruit of the *Feuillea cordifolia* is a powerful antidote against vegetable poison. The genus *Feuillea* is common to South America, and the subject is of such interest that it deserves a trial.

EXPLANATION OF THE FIGURES.

PLATE XII. Branch of the Urari plant, *Strychnos toxifera*, Schomb., less than natural size.

PLATE XIII. *Fig.* 1. Fruit of the Urari plant, natural size.
Fig. 2. Do. cut transversely, natural size.
Fig. 3. Seed of do., natural size.

XLIII.—*A List of the Fossil Shells found in a Fluvio-Marine Deposit at Clacton in Essex.* By Mr. J. BROWN*.

GENTLEMEN,

THE fossils named in the accompanying list were obtained by searching the beds which compose the fluvio-marine deposit at Clacton, on the eastern coast of Essex, a section of which is given in the 'Mag. Nat. Hist.,' vol. iv. p. 199, N. S., with a description of the geological features of that formation.

In a note appended to that article, which accompanies the above-mentioned section, a promise is held out to the readers of the Magazine, that a list of the fossils, which have excited a peculiar and lively interest in the Clacton deposit, would at some future opportunity be furnished.

It is intended by the present communication to supply that deficiency; and as the greater number of the fossil shells, both of marine and freshwater species, collected from those beds, have been very recently submitted to the notice of Mr. J. D. C. Sowerby, the list is offered with the greater confidence.

Fossils of the Bed No. 4. *in Section fig.* 9. Mag. Nat. Hist. vol. iv. p. 194, N. S.

Marine.

1. *Balanus ovularis*? Lam.
2. *Tellina solidula.*
3. ——— *tenuis.*
4. *Mactra ovalis,* Sow. A crag fossil.
5. *Mytilus edulis.* Mostly very young.
6. *Cardium edule.*

* Vide Mag. Nat. Hist. vol. iv. p. 197, N. S.

7. *Littorina Ulvæ.*
8. *Flustra.* Encrusting shells and pebbles.

Freshwater Shells, etc. of No. 4.

9. *Pisidium amnicum,* Gray.
10. *Paludina impura ; Bithinia tentaculata,* Gray.
11. ——— *thermalis* ?
12. *Valvata piscinalis,* Gray.
13. ——— *cristata,* Gray.
14. *Cypris Faba.*
15. *Chara hispida* ?

Fossils of No. 6. *Section fig.* 9. *descending series.*

Marine and Freshwater, the same as in No. 4.

Freshwater Fossils found in Bed No. 7. *Sec.* 9.

1. *Limneus auricularius,* Gray.
2. *Paludina impura ; Bithinia tentaculata,* Gray.
3. ——— *minuta.*
4. *Valvata piscinalis,* Gray.
5. ——— *cristata,* Gray.
6. *Planorbis imbricatus.*
7. ——— *lævis.*
8. ——— *helicoides.* A new species. Sowerby.
9. ——— *marginatus.*
10. ——— *contortus.*
11. *Ancylus fluviatilis.*
12. *Pisidium amnicum,* Gray.
13. ——— *Henslowianum.*
14. ——— *pusillum,* Gray.
15. *Cypris Faba.*
16. *Cypris.* A larger species.
17. Vertebræ of small fish.

Land Fossil Shells, etc. from Bed No. 7. *Sec.* 9.

18. *Helix paludosa ; H. pulchella,* Gray.
19. ——— *rufescens.*
20. ——— *radiata ; Zonites rotundatus,* Gray.
21. ——— *alliaria.*
22. ——— *umbilicata ; Zonites umbilicatus,* Gray.
23. ——— *conoidea.* A new species. Pl. II. f. 4, 5.
24. *Pupa edentula.*
25. *Clausilia.*
26. *Bulimus lubricus.*
27. *Carychium minimum.*
28. Molar tooth of a Rodent, probably a Water Rat.
29. Seeds of *Chara.*
30. *Triloculina inflata* (Deshayes), figured in Lyell's 'Prin. of Geol.' vol. iii. This minute fossil occurs both at Clacton and Walton : it is the only marine shell in this bed.

Stanway, April 15th, 1841. JOHN BROWN.

The following are descriptions of the two new shells found in this deposit:—

Planorbis helicoides. Lenticular, shining, above slightly convex and minutely umbilicated; edge obtuse; whorls two and a half, concealed, the outer one large; beneath convex, a little depressed in the centre, where the whorls are visible.

Diameter about one-tenth of an inch. It resembles somewhat *Zonites* (*Helix*) *radiatulus,* but is flatter, having more the form of *Segmentina* (*Planorbis*) *lineata,* but wanting the septa.

Helix conoidea. Short, conical, finely striated; whorls about six, convex; base largely umbilicated, convex; aperture oblong-ovate, its upper half deeply impressed by the preceding whorl; its peristome confined to the lower half, prominent and straight.

This differs from *H. rufescens* in being regularly conical, and having a more elevated pointed spire. See Plate II. figs. 4, 5, in this volume.

BIBLIOGRAPHICAL NOTICES.

On the Relation between the Holy Scriptures and some Parts of Geological Science. By J. Pye Smith, D.D. 12mo. London, 1840. 2nd ed.

The Certainties of Geology. By W. Sidney Gibson, F.G.S. 8vo. London, 1840.

No two subjects would appear at first sight to be more disconnected than those of Geology and Revealed Religion. The one is engaged solely in examining the structure of the earth, and in thence deducing conclusions as to the physical causes which have brought it into its present condition; the other treats of the moral history of man, his relations to his Creator and to his fellow-creatures, and the whole sphere of his duties and his destinies. So wholly distinct indeed are these two studies, that they cannot be said in the slightest degree to aid each other. A geologist may reason with precisely the same accuracy on the facts of his own science, even should he unfortunately be a disbeliever in Revelation; and it is equally certain that a knowledge of the discoveries of modern Geology is not (except as connected with Natural Theology) in the remotest degree conducive to the all-important studies and devotions of the Christian. There seems, therefore, no reason why the two inquiries should not be successfully prosecuted without encroaching on each other's domain. The fact however is otherwise: Geology and Revelation have been very unnecessarily brought into collision by persons who seem to have but an imperfect notion of the true limits and ends of each. Volumes have been written accusing geologists as a body with being inimical to religion, and denouncing the science itself as a delusive and pernicious study. The geologist is hence compelled in self-defence, however unwilling he may be to desert the legitimate fields of his inquiries, to arm himself against these well-meaning, though

too often intolerant opponents, with the weapon of rational and temperate argument.

It is on these grounds that geologists may feel grateful to the authors of the two treatises which are under our notice. We trust they will have the effect of rescuing geology from the calumnies which have been cast upon it, and of allaying in the mind of the sincere believer any misgivings on the subject which may have arisen from the intemperate language used by some of the opponents of the science.

Dr. Pye Smith's little volume is written in a strain at once pious and philosophical. He has bestowed much diligence in consulting authorities, and in applying the resources of criticism to the elucidation of Scripture; and to these requisites he has superadded an element which is often wanting in the writings of those who have attempted this subject,—a complete practical knowledge of the details of geological science. Devoted to the truths of Revelation no less than to those of Science, and regarding them both as proceeding from the same Divine Source, he will allow of no compromise, distortion, or subterfuge, with respect to either.

The points at issue in this controversy may be thus stated. After a most extensive induction of facts collected in all parts of the globe by a numerous body of laborious and diligent observers, the more philosophical geologists have deduced from them a mass of new and most extraordinary results, all tending to prove the power and providential care of the Deity from the Creation to the present day, and thus widely extending the field of Natural Theology. Among the generalizations thus arrived at, there are two or three points on which nearly all geologists are agreed, but which are inconsistent with the *generally received interpretation* of certain passages in the book of Genesis. Now it is important to observe two things: first, that these apparent discrepancies relate to points wholly unconnected with the essential objects of Scripture, namely, the moral history and duties of Man; and secondly, that they refer to events long anterior to the commencement of written history. Subsequent to that period there is not one single circumstance recorded in Holy Writ which can in any way be brought into connexion either favourably or otherwise with the discoveries of modern geology. If then the passages in question relate to points foreign to the objects of the author of Genesis, and were compiled from local traditions or very ancient writings, even though secured by direct inspiration from the possibility of actual error, yet it is plain that there is a greater liability to obscurity of language and consequent erroneous interpretation in this portion of Scripture than in those later narrations which were recorded by eye-witnesses and contemporaries. And it is further evident that a very large allowance must be made for the necessity of adapting the language of Genesis to the people to whom it was addressed. Moses wrote indeed *prospectively* for all mankind, but *immediately* for the Jews, a nation just released from slavery, and in a state of mental advancement little superior to that of children. The utmost *condescension* of language was therefore necessary before the sublime truths of religion could be brought home to the comprehen-

sions of such a people—a point which is admirably elucidated by Dr. Pye Smith in his seventh Lecture.

The only points in which the discoveries of modern geology are at variance, not with the truths of Revelation, for that they never can be, but with the prevailing interpretations of the Pentateuch, are the three following: viz. the antiquity of the world; the existence of death before the fall of Adam; and the partial extent of the deluge. The facts unfolded by modern science unquestionably demonstrate that the earth is of far greater antiquity than the 6000 years usually assigned to it, and they prove with equal certainty that animal life was subject to death during periods long prior to the creation of Man; there are reasons also, though not of the same demonstrative nature as those above mentioned, yet hardly less convincing to a geologist, for supposing that the Noachic deluge, instead of covering the whole globe as is commonly believed, was confined to that portion of it which was then inhabited by man. Those friends to Revelation, therefore, who are not content to rest satisfied in the opinion of Dr. Paley, that Christianity ought not to be made answerable for the statements and opinions of every writer in the Old Testament*, will be anxious to seek for such an interpretation of the sacred text as will accord with the facts on which these conclusions of science are built.

Dr. Pye Smith, after reciting at considerable length and in a most candid spirit the various speculations of other authors on this subject, concludes with explaining his own views of the question.

* "To make Christianity answerable for the circumstantial truth of each separate passage of the Old Testament, the genuineness of every book, the information, fidelity, and judgment of every writer in it, is to bring, I will not say great, but unnecessary difficulties, into the whole system."—*Paley's Evidences of Christianity*, part iii. ch. 3.

"Our Scriptures afford a valuable testimony to those of the Jews. But the nature of this testimony ought to be understood. It is surely very different from, what it is sometimes represented to be, a specific ratification of each particular fact and opinion."—*Ib.*

Dr. Paley's view is in accordance with that of other distinguished theologians, as will appear from the following extracts:—

"To rectify men's sentiments in natural, historical, or chronological matters; to mend their logick or rhetorick where it was defective, but had no ill influence on piety, was not at all the business of Revelation."—*Bishop Chandler's Defence of Christianity*, p. 272.

"The Natural Philosophy of the Pentateuch ought not to induce us to reject it. It is not at all likely that God, in order to enable a man to be a lawgiver of the Jews, should reveal to him all the causes of the phænomena of nature."—*Lectures in Divinity, by Dr. Hey, Norrisian Professor, Cambridge*, vol. i. p. 196.

"Many serious and thinking Christians have judged that the first part of Genesis is not a literal description of fact, but allegorical."—*Ib.*, vol. iii. p. 152.

"Whether the beginning of Genesis is to be understood in a literal or an allegorical sense? Whether the book of Job be a history, or a parable? being points disputed between Christians, an infidel can have no right to argue from one side of the question in those and the like cases."—*Bishop Berkeley's Minute Philosopher, Dialogue* vi. § 29.

He meets the difficulty respecting the antiquity of the earth by supposing that all the geological formations discovered by modern science were deposited *after* the original creation of matter asserted in the first verse of Genesis, but *before* the particular series of events narrated in the rest of the chapter. These vast geological periods, being unconnected with human history, are wholly omitted by Moses. The narrative which follows he supposes to refer, not to the whole earth, but to a particular region, probably in Central Asia, which he considers to have been reduced by volcanic or other agencies to the state of darkness and desolation described in the second verse. The rest of the chapter relates, in the most simple and condescending language, the gradual restoration of this region to a state of fertility, and the consummation of the six days' work by the creation of Man. This hypothesis is perfectly consistent with geological facts, and may surely be considered as being calculated to give satisfaction to the mind of the Christian philosopher.

The question as to the existence of death before the fall of Adam is easily disposed of. When we are told that "by man sin entered into the world, and death by sin," it is evident from the whole context that it is only the death of man, not that of the inferior animals, which is spoken of. The testimony of geology as to the existence of animal death from the earliest times is corroborated by the voice of comparative anatomy no less than of common sense.

Dr. Pye Smith proceeds to show, that the objections which have been raised on geological grounds to the supposed universality of the deluge may be set at rest by assuming the Noachic flood, like the Adamic creation, to have been confined to a limited district. He quotes many texts in which the phrase "all the earth" is used figuratively for a particular region, and hence it is easy to suppose, that in the case of the deluge the same expression may have a similarly restricted meaning. And it is a remarkable fact that there is a vast region on the shores of the Caspian which is at least 100 feet below the level of the sea, an irruption of which would at this day inundate many thousand square miles and destroy millions of lives.

Dr. Pye Smith conjectures, that by volcanic disturbances the Indian Ocean gained access to this depressed region, where, aided by vast torrents of rain, a deluge was produced sufficient to destroy the human race of that period. The ark, containing a few favoured survivors, might thus easily be drifted, not indeed to the frozen summit* of the Armenian Ararat according to the common tradition, but to some of the lower ranges of hills connected with that mountain. This hypothesis of our author has certainly great plausibility, and we will only suggest as an amendment, that the tract in question was more likely to have been inundated from the Euxine than from the Indian Ocean. The Euxine and Caspian Seas are separated by a very low tract of land in South Russia, and if the Bosphorus were now to be blocked up by a volcanic eruption, the waters of the Euxine would rise to the height of 576 feet, and those of the Cas-

* Mr. Beke, however, contends that it must have been upon the highest point: see his 'Origines Biblicæ,' 1834.

pian to 677 feet above their present level, before they would find a vent over the lowest point of the Balcan range. An elevation of water to this extent would inundate the whole lower basin of the Danube, the South of Russia, Georgia, Bokhara, and a vast extent of Tartary, and a removal of the barrier would cause the waters speedily to subside. That such an event ever actually occurred it would be rash to assert; but it is certainly a remarkable fact, that both shores of the Bosphorus, where it joins the Euxine, *are* occupied by masses of volcanic rocks, and traditions of the damming-up of the Black Sea and the bursting of the barrier were current among the ancients, and are recorded by Diodorus Siculus and Strabo*.

We are conscious that justice is not done to Dr. Pye Smith's arguments by this brief abstract of their results, and we therefore the more strongly recommend his work to the profound attention of the philosophic theologian no less than of the Christian geologist. It is a work calculated to be eminently conducive to the best interests both of religion and of science at the present moment.

Mr. Sidney Gibson's work goes over the same ground as that of Dr. Smith, and arrives at nearly the same conclusions. Although not illustrated to the same extent with the treasures of learning, it is marked throughout by candour and sincerity no less than by soundness of reasoning. Like Dr. Pye Smith, he explains the antiquity of the earth by supposing a vast lapse of time between the *universal* and the *Adamic* creation, but to this assumption he superadds that of the six "days of creation" having been six indefinite periods. Many writers have had recourse to the same hypothesis; but if it should be thought right not to depart further from the strict letter of Scripture than the facts of the case require, it may be observed that these are already satisfied by the explanation given by Dr. Smith, as above announced.

Our space prevents us from noticing Mr. Gibson's work in greater detail, but we cordially recommend it as an excellent coadjutor to that of Dr. Smith in the laudable office of rendering science and religion mutually confirmatory of each other. And should there be any who may still entertain doubts with regard to the hypotheses proposed in them, we would again direct their attention to the opinion of so able a reasoner and so eminent an expositor of the evidences of Christianity as Dr. Paley.

Linnæa, ein Journal für die Botanik, etc. 1840.

[Continued from vol. vi. p. 148.]

PART I.

Scholium to Hampe's Prod. Floræ Hercyn.—Schlechtendal on Schiede's and Ehrenberg's Mexican plants.

PART II.

On *Tetradiclis*, Stev.; by Dr. A. Bunge.—On *Conferva Lehmanniana*; by Dr. Lindenberg.—On the structure of the stem of *Isoetes*

* Respecting the Greek traditions of the Deluge, see Mr. Kenrick's dissertations in the 'Philological Museum,' vol. ii., and in the 'Philosophical Magazine,' N.S. vol. v.

lacustris; by Prof. Mohl.—On the Dry Rot; by Schwabe.—Synopsis of *Desmidia*; by J. Meneghini.

PART III.

On the proper systematic place of certain families of Plants.—On some *Diatomaceæ*; by Lobarzewski.—On a true circulation in *Closterium Lunula*; by Lobarzewski.—Plants on sale from Bahia; by Luschnath.—Botanical Observations; by Schlechtendal.

PART IV.

Decades of new *Compositæ*; by Walpers.—Supplement to Prod. Fl. Herc.; by Hampe.—On the *Carices* of Thunberg's Flora Capensis; by Schlechtendal.—On a monstrosity in the leaves of *Trifolium repens*; by Walpers.—Four new *Mammillariæ*; by Ehrenberg.—Mexican Plants of Schiede and others; by Schlechtendal.

PART V.

Synopsis Thymelearum, Polygonearum, et Begoniarum Africæ australis; by Meisner.—Decade of new *Compositæ*; by Walpers.—Mexican Plants of Schiede and others; by Schlechtendal.—Observations on passages in Endlicher and Martius's Fl. Braziliensis; by Schwægrichen.

PART VI.

Scholium to Hampe's Prod. Fl. Hercyn.

Icones Fungorum hucusque cognitorum. Tomus 4. A. C. I. Corda. Pragæ, 1840.

Our object in noticing the present number, which in point of execution exceeds even the two preceding, is to call attention to the admirable figure of *Puccinia graminis*, or mildew. It is far more complete than that so often referred to of Bauer. Among the points elucidated in the present number, is the very interesting one that *Asterophora* is a mere parasite of the second order, its matrix having perfect sporidia. The author does not seem to have access to many well-known journals, or he would not have published as *Sporocybe Desmazierii* a plant altogether unlike that figured under that name in the 'Annales des Sciences Naturelles;' neither would *Sphæria Robertsii*, Hook., of which an admirable analysis is given, appear as an undescribed species, *Sp. Hügelii*.

PROCEEDINGS OF LEARNED SOCIETIES.

ENTOMOLOGICAL SOCIETY.

January 4th, 1841.—The Rev. F. W. Hope, F.R.S., President, in the Chair.

The President stated, in reference to Mr. Schomburgk's memoir, read at a previous meeting, that migrations of butterflies to a very great extent had been repeatedly observed in South America, instances of which had been recorded in Helme's account of Buenos Ayres.

Mr. Westwood corrected an error which had occurred in the printing of a memoir relative to the *Pediculus Melittæ* of Kirby, or

the larva of *Meloe*, in the Transactions of the Society, in which it had been stated that the specimens which he had found at large and dissected were identical with some reared by the Rev. L. Jenyns from the *larvæ* of the *Meloe*, whereas the latter had been reared from the *eggs* of that insect. This correction was especially required, because in the volume upon insects in the Cabinet Cyclopædia it had been suggested by Mr. Shuckard that the two insects were not identical.

A memoir was read by Mr. Westwood on the nomenclature of the genus *Chlorion* of Latreille (*Ampulex*, Jurine). From a review of Latreille's various works it appears, that although at the first he gave the *Sphex lobata*, Fabr. as the type of the genus, yet its characters were not derived from that insect, but agree with the *Sphex compressa*, Fabr. Fabricius, however, adopted and characterized the genus *Chlorion* from the former of these two species, but included in it also *Sphex compressa*. Jurine, however, finding the latter species not to agree generically with the former, proposed the name of *Ampulex* for the *Sphex compressa*, and figured an European species as an example, which however does not precisely agree with *S. compressa*. Under these circumstances the author considers that the name of *Chlorion* ought to be applied to the genus typified by *Sphex compressa*, that the *Chlorion* of Fabricius requires another name, and that the name *Ampulex* is strictly synonymous with *Chlorion*, the same species being the true type of both generic names. In allusion to the employment of synonymical names of genera, Mr. Yarrell stated that a calculation had been made by Messrs. Agassiz and De-Candolle, by which it appeared that no less than 300 generic names of plants and 800 names of zoological genera required changing, having been previously used in other branches, and it was insisted upon by several members that the inconvenience which would necessarily result from the change in such a number of names would far overbalance the occasional slight inconveniences at present felt in cases of such "double emploies," as the French term them. It was further suggested by Mr. Waterhouse, that as Latreille had erred in the first instance in giving as the type of *Chlorion* an insect which did not accord with the generic characters which he had detailed, we ought to adopt the nomenclature of Fabricius, who had given the real characters of the insect which Latreille had mentioned as its typical species.

Anniversary meeting, January 25th, 1841.—The Rev. F. W. Hope in the Chair.

At this Meeting the ordinary business of the annual meeting took place. W. Sells, G. R. Waterhouse, S. Stevens, and W. Bennett, Esqrs., were elected into the Council in the room of E. Charlesworth, W. E. Shuckard, J. F. Stephens, and F. Walker, Esqrs., and W. W. Saunders, Esq., F,L.S., was elected President, W. Yarrell, Esq., Treasurer, and J. O. Westwood, Secretary for the ensuing year.

In the address delivered by the Rev. F. W. Hope, after favourably commenting upon the character of the Society's Transactions, he

suggested the propriety of members taking up the old theses of Linnæus and bringing down the subjects therein treated upon to the present state of the science. The injurious effects of insects upon agricultural and horticultural productions ought also to engage the attention of the members. He would also recommend the formation of committees, taking up and annually reporting upon the entomology of the various geographical districts: and he alluded to the great loss the Society and science had sustained by the deaths of Dr. Goodall, Mr. Vigors, and Major Gyllenhal.

It was announced that the caterpillar of one of the *Noctuidæ* which devours the roots of turnips should be again proposed as the subject of the essay for the prize of ten guineas, offered by the Society in conjunction with the Saffron Walden Agricultural Society.

The Rev. F. W. Hope also announced his intention of giving a prize of £10 for the best essay on the insects which attack apple and pear trees, with the best remedy for their destruction.

LINNÆAN SOCIETY.

March 2, 1841.—Mr. Forster, V.P., in the Chair.

Read a "Note on the Preservation of Specimens of Natural History." By Hyde Clarke, Esq., F.L.S.

Mr. Clarke suggests the application of Payne's apparatus for the preservation of animal substances for domestic purposes, to the preservation of objects of Natural History. The apparatus consists of an iron cylinder, in which the subject for preparation is placed, and the air-tight cover screwed down. The air is then exhausted by means of an air-pump, and when a sufficient exhaustion has been effected, a cock is opened communicating with a vessel containing the antiseptic fluid, which, on being admitted, thoroughly penetrates the object to be preserved, impregnating even the marrow of the bones. He adds, that the process is useful not only for the prevention of putrefaction, but also in arresting its progress, the gases generated during putrefaction being expelled from the receiver along with the air, and their place supplied by the antiseptic.

March 16.—Mr. Brown, V.P., in the Chair.

Read "On an edible *Fungus* from Tierra del Fuego, and an allied Chilian species." By the Rev. M. J. Berkeley, M.A., F.L.S.

Mr. Berkeley describes these two species as constituting a new genus, which he characterizes as follows:—

CYTTARIA.

Receptacula carnoso-gelatinosa in stroma commune subglobosum, epidermide crassiusculâ vestitum, aggregata; basi stipitiformi granulatâ. *Cupula* peripherica, primò clausa, gelatinâ distenta, demùm epidermide ruptâ aperta. *Hymenium*, margine excepto, separabile. *Asci* ampli, demùm liberi, paraphysibus immixtis. *Velum* persistens, demùm ruptum, margine plùs minùs reflexo. *Sporidia* pallida.

Genus *Bulgariæ* affine, sed stromate pulvinato ex variis individuis composito *Sphæriam concentricam* quodammodo referens, et hymenio separabili valdè diversum. Certè ad seriem *Pezizarum* pertinet, perithecio spurio non obstante. Confer *Sphæriam monocarpam*, Schum. ad *Pezi-*

zam rhizopodam a clar. Friesio ascriptam. Nomen dedi a κυτταρος, ob superficiem fungi alveolatam.

1. *C. Darwinii*, vitellina globoso-depressa, cupulis parvis ore irregulari demùm apertis.

Hab. in *Fagum betuloidem* in Tierra del Fuego, Dec.-Jun.

2. *C. Berteroi*, pallidior irregularis, basi subelongatâ, cupulis majoribus; ore pentagono; margine fisso reflexo.

Hab. in Chili in *Fagum obliquam*, vere et æstate.

The first species is noticed by Mr. Darwin (from whom Mr. Berkeley obtained his specimens of both) at p. 298 of his 'Journal and Remarks,' forming the third vol. of the 'Narrative of the Voyages of the Adventure and Beagle'; and Mr. Berkeley gives from Mr. Darwin's MS. notes a more detailed account of his observations made upon the spot. The second species is referred to in a posthumous list of the plants collected by Bertero (originally published in the 'Mercurio Chileno,' and translated in Silliman's 'North American Journal,' vol. xxiii. p. 78), as forming, perhaps, "a new genus approximating to the *Sphæriæ*." A further account of this species also is extracted from Mr. Darwin's notes: it seems to be less eatable, and less frequently eaten than the first, which Mr. Darwin describes as forming a very essential article of food for the Fuegian.

Read also a "Letter from Joseph Woods, Esq., F.L.S., to Mr. Kippist, on *Crepis biennis* and *Barkhausia taraxacifolia*."

Mr. Woods is of opinion that the plant described by Sir James Smith in the 'English Flora' and 'English Botany,' by Sir W. J. Hooker in the 'British Flora,' by Mr. Babington in the Society's 'Transactions,' vol. xvii. p. 456, and by Mr. Mackay in his 'Irish Flora,' as *Crepis biennis*, is in reality *Barkhausia taraxacifolia*, distinguished especially by the long beak of its achenia, while those of *Crepis biennis* are, in the words of Gaudin, "neutiquam attenuata." The stem of *Crepis biennis* is also less branched and more leafy than that of *Barkhausia taraxacifolia*, the latter rarely producing a leaf except where there is a branch. Mr. Woods adds, that it is almost certain that we have the two species in England, though the difference has not been noticed. *Crepis biennis* grows in Kent and Surrey.

In a "Note" appended to Mr. Woods's letter, Mr. Kippist states that the authentic Linnean specimens of *Crepis biennis* from Scania, although too young to have ripe seeds, appear to confirm Mr. Woods's idea, the pappus being quite sessile even in those most advanced, and the stem moderately branched in the upper part, and very leafy below. The two specimens in the Smithian Herbarium, one from Mr. Crowe's garden and the other from Mr. Rose's Herbarium, have the stem much branched, and the pappus apparently sessile, but the achenia are immature.

The only developed specimen in Mr. Winch's herbarium is from Dartford in Kent, and has the pappus very decidedly stalked, the stem much branched in the upper part, and only a few scattered leaves in the lower, a branch being produced from the axilla of each cauline leaf with the exception of one or two of the lowermost,

Other specimens, gathered near Cobham and Ramsgate, in the same county, and near Moulsey in Surrey, agree with Mr. Winch's plant in their stalked pappus and branched stem, and probably therefore belong to *Barkhausia taraxacifolia*. The only British specimens in the Society's possession that Mr. Kippist believes to be referrible with certainty to *Crepis biennis* are two in the Hortus Siccus of Mr. Woodward, with ripe achenia and perfectly sessile pappus; the habitats of the plants are not given, but in all probability they were gathered either in Suffolk or Norfolk.

Read also an "Extract from a Letter to John Miers, Esq., F.L.S., from George Gardner, Esq.," dated Rio de Janeiro, Dec. 16, 1840, in which Mr. Gardner gives some account of his journeys in the interior of Brazil, and of the collections made by him subsequent to May last.

April 6.—Mr. Forster, V.P., in the Chair.

Read, an Extract of a Letter from J. Burnham, Esq., to Hyde Clarke, Esq., F.L.S., on a supposed new British *Juncus*.

Read also the commencement of "An Appendix or Supplement to a Treatise on the *Œstri* and *Cuterebræ* of various Animals." By Bracy Clark, Esq., F.L.S., Corresp. Memb. of the French Institute.

April 20.—Mr. Brown, V.P., in the Chair.

His Grace the Duke of Northumberland, F.L.S., sent for exhibition a specimen of the fruit of *Chrysophyllum monopyrenum*, Sw., from his living collection at Syon House.

W. Felkin, Esq., F.L.S., sent for exhibition specimens of Sea-Island Cotton grown in a cotton-mill situate in the centre of Manchester, accompanied by a Notice of the circumstances under which the experiment was made. The details have been given in the Transactions of the British Association.

Read the conclusion of Mr. Bracy Clark's "Appendix or Supplement to a Treatise on the *Œstri* and *Cuterebræ* of various Animals."

The first memoir to which this paper is intended as an Appendix appeared in the third volume of the Linnæan Transactions, published in 1796. This memoir was republished by the author with considerable additions in 1815, and a Supplement was added in the following year. Since that period much has been published on the subject, and Mr. Clark is desirous in consequence of making some additions and corrections to his former publications.

After adding to and modifying some of the passages contained in them, he examines the validity of several species of the genus *Œstrus* proposed by writers. He suspects *Œ. Trompe* of Modeer and *Œ. ericetorum* of Leach to be severally the males of *Œ. Tarandi* and *Œ. Bovis*. He believes *Œ. Pecorum* of Fabricius to be only a dark-coloured variety of *Œ. nasalis*, L. (*Œ. veterinus*, B. Cl.); and is satisfied by an examination of the original specimen, that Dr. Leach's *Œ Clarkii* is nothing more than a very light-coloured variety of the same species. He also regards *Œ. lineatus* of Villars as synonymous with *Œ. Bovis*.

Referring to Latreille's account of the genus in Cuvier's 'Règne

Animal,' he points out some omissions with regard to the habits and œconomy of *Œ. Equi* and *Œ. hemorrhoidalis*, and objects to the statement that the eggs of the latter are deposited on the verge of the anus of the animal attacked. He strongly deprecates the opinion of Pallas and Latreille, that there exists a proper human *Œstrus*, which he regards as altogether founded in error; and believes the larva figured in illustration of a supposed case of the kind published by Mr. Howship, to be that of *Œ. Bovis*.

Lastly, he describes three species, added to the genus *Œstrus* since the publication of his Treatise, viz. *Œ. pictus* of Megerle, *Œ. Libycus* of Rüppel, and *Œ. Clarkii* of Shuckard. The following are the characters of the latter species, figures of which, and of *Œ. Libycus*, accompany the paper :—

Œ. Clarkii, cærulescenti-fuscus, alis obscuris anticè sinuatis basin versus atro-bipunctatis.
Hab. ad Caput Bonæ Spei.

He adds also a description of a new species of his genus *Cuterebra*, with the following characters :—

C. fontanella, thorace atro lateribus albis, abdomine violaceo: segmentis ultimis albis nigro-punctatis.
Hab. in Illinois Americæ Borealis, cuniculis præcipuè infesta.

May 4.—Mr. Brown, V.P., in the Chair.

Read the commencement of "Remarks on some new or rare Species of Brazilian Plants." By Charles James Fox Bunbury, Esq., F.L.S.

May 24.—The Bishop of Norwich, President, in the Chair.

This day, the Anniversary of the birth-day of Linnæus, and that appointed by the Charter for the Election of Council and Officers, the President opened the business of the Meeting, and stated the number of Members whom the Society had lost during the past year. The following is a list of the Members who have died within that period, acccompanied with notices of some among them.

Francis Bauer, Esq., F.R.S., &c., was born at Feldsberg, in Austria, on the 4th of October, 1758. His father, who held an appointment as painter to Prince Lichtenstein, died while he was yet a boy, and the care of his education devolved upon his mother. So early was his talent for botanical drawing manifested, that the first published production of his pencil, a figure of *Anemone pratensis*, L., is appended to a dissertation by Störck 'de Usu Pulsatillæ nigricantis,' which bears date in 1771.

In 1788 he came to England in company with the younger Jacquin, and after visiting his brother Ferdinand, who was then engaged in completing the beautiful series of drawings since published in the 'Flora Græca,' was about to proceed to Paris. But the liberal proposals made to him by Sir Joseph Banks on the eve of his intended departure, diverted him from this resolution, and induced him to remain in England and to take up his residence in the neighbourhood of the Royal Garden at Kew, in which village he continued to dwell until the termination of his life. It was the opinion of Sir Joseph Banks, that a botanic garden was incomplete without a draughtsman

permanently attached to it, and he accordingly, with the sanction of His Majesty, fixed Mr. Bauer in that capacity at Kew, himself defraying the salary during his own life, and providing by his will for its continuance to the termination of that of Mr. Bauer. In fulfilment of this engagement with Sir Joseph, Mr. Bauer made numerous drawings and sketches of the plants of the garden, which are now preserved in the British Museum. A selection from his drawings was published in 1796 under the title of 'Delineations of Exotick Plants cultivated in the Royal Garden at Kew,' and this was intended to be continued annually; but no more than three parts, consisting wholly of Heaths, and containing thirty plates, were published.

In the early part of 1801, Mr. Bauer made for Mr. Brown, who had then been for some years engaged in a particular study of the Ferns, drawings of many genera of that family which Mr. Brown regarded as new. His drawings of *Woodsia*, made some years afterwards, were published in the 11th volume of our Transactions, in illustration of Mr. Brown's paper on that genus. At a later period he again directed his attention to that tribe of plants, his labours in which have within these few years been given to the world in Sir William Jackson Hooker's 'Genera of Ferns.' The 13th volume of our Transactions is enriched with his elaborate drawings accompanying Mr. Brown's memoir on *Rafflesia*; and the part published last year contains a paper by Mr. Bauer 'On the Ergot of Rye,' from materials collected between the years 1805 and 1809.

The plate which accompanies the last-mentioned paper is derived from drawings which form part of an extensive series in the British Museum, illustrative of the structure of the grain, the germination, growth and development of wheat, and the diseases of that and other *Cerealia*. This admirable series of drawings constitutes perhaps the most splendid and important monument of Mr. Bauer's extraordinary talents as an artist and skill in microscopic investigation. The subject was suggested to him by Sir Joseph Banks, who was engaged in an inquiry into the disease of Corn known under the name of "Blight," and the part of Mr. Bauer's drawings which relates to that disease was published in illustration of Sir Joseph's memoir on the subject, and has been several times reprinted with it. Mr. Bauer has himself given, in the volume of the 'Philosophical Transactions' for 1823, an account of his observations on the *Vibrio Tritici* of Gleichen, with the figures relating to them; and another small portion of his illustrations of the Diseases of Corn has since been published by him in the 'Penny Magazine' for 1833. His figures of a somewhat analogous subject, the Apple-blight and the Insect producing it, accompany Sir Joseph Banks's Memoir on the Introduction of that Disease into England, in the 2nd volume of the 'Transactions of the Horticultural Society.'

Before the close of the last century Mr. Bauer commenced a series of drawings of *Orchideæ*, and of the details of their remarkable structure, to which he continued to add, as opportunities offered, nearly to the termination of his life. A selection from these, which form one of the most beautiful and extensive series of his botanical drawings, was lithographed and published by Professor Lindley between

the years 1830 and 1838, under the title of 'Illustrations of Orchidaceous Plants.'

His other published botanical works are: 1. The first part, published in 1818, of 'Strelitzia Depicta,' a work intended to comprise figures of all the known species of that magnificent genus; 2. 'Microscopical Observations on the Red Snow' brought from the Arctic Regions by Capt. Ross, the globules contained in which, by some regarded as an *Alga*, he described in the 7th volume of the 'Quarterly Journal' of the Royal Institution as a species of *Uredo*; 3. 'Some Experiments on the *Fungi* which constitute the colouring matter of the Red Snow,' published in the 'Philosophical Transactions' for 1820; and 4. The Plates to the Botanical Appendix to Captain Parry's first Voyage of Discovery, published in 1821. One of the last productions of his pencil, illustrating the structure of a plant growing at Kew which produces perfect seeds without any apparent action of pollen, will appear in the forthcoming part of our Transactions.

In the year 1816 he commenced lending the assistance of his pencil to the late Sir Everard Home in the various anatomical and physiological investigations in which that distinguished anatomist was engaged; and in the course of ten or twelve years furnished, in illustration of his numerous papers in the 'Philosophical Transactions,' upwards of 120 plates, which were afterwards reprinted with Sir Everard's 'Lectures on Comparative Anatomy.' These plates, which form together the most extensive series of his published works, embraced a great variety of important subjects, chiefly in microscopic anatomy, and afford abundant evidence of his powers of observation and skill in depicting the most difficult objects.

It is this rare and previously almost unexampled union of the observer and the artist that has placed Mr. Bauer foremost in the first rank of scientific draughtsmen. His paintings, as the more finished of his productions may well be termed, are no less perfect as models of artistic skill and effect, than as representations of natural objects. Of all his predecessors, Ehret alone approaches him in these particulars; among his contemporaries, none but his brother Ferdinand can be regarded as his equal.

Mr. Bauer became a Fellow of the Linnean Society in 1804, and of the Royal Society in 1820. He died at his residence on Kew-Green on the 11th of December last, in the 83rd year of his age; and was buried in the church-yard of that parish on the 16th of the same month. [See also p. 77 of the present volume.]

Sir Anthony Carlisle, Knt., F.R.S., &c., a distinguished surgeon and physiologist, was born at Stillington, in the county of Durham, on the 8th of February, 1769, and received his early professional education partly at York and partly at Durham. He afterwards came to London, entered himself as a student at the Hunterian School under Cruickshank and Baillie, and became a resident pupil to Watson, whom he succeeded as one of the Surgeons of the Westminster Hospital in 1793. On the retirement of Sheldon, in 1808, he became Professor of Anatomy to the Royal Academy, and retained that office until 1824. He was also a member of the Council and of the Court of Examiners of the Royal College of Surgeons, of

which College he was twice President. At the accession of George the Fourth he was knighted as a mark of acknowledgment to his professional skill. He died at his house, in Langham Place, on the 2nd of November last, and was buried in the Cemetery at Kensal Green.

Mr. Carlisle became a Fellow of the Linnean Society in 1792, and of the Royal Society in 1804; and his most important contributions to Natural Science are contained in the Transactions of these Societies. His paper on the Structure and Œconomy of *Tæniæ*, in the second volume of our Transactions, is probably the first attempt to illustrate the structure of *Entozoa* by artificial injections, and established, among other points, the non-existence of an anus in the *Tæniæ*. At this early period, Mr. Carlisle anticipated M. Virey's idea of the state of the nervous system in the lowest animals, on which the chief character of Mr. MacLeay's *Acrita* is founded, ascribing to the *Tæniæ* a diffused condition of the nervous substance, and referring to John Hunter as having, in his lectures, applied that character to many of the lower tribes of animals.

Of his papers in the 'Philosophical Transactions,' the first in importance and originality is the memoir 'On the peculiar arrangement of the Arteries in Slow-moving Animals;' and it is on the striking discovery detailed in it that his memory as a comparative anatomist will chiefly rest. His paper on the Physiology of the Stapes, published in the volume for 1805, affords a good example of the application of Comparative Anatomy to the elucidation of a difficult physiological question; almost all the facts contained in it relating to the form and structure of the stapes in various animals were new. The Comparative Anatomy and Physiology of the Organ of Hearing formed the subject of his Lectures at the College of Surgeons in 1818.

His Lectures on Extra-vascular Substances, also delivered at the College of Surgeons, but of which an abstract only of a small portion was published in the 'Annals of Philosophy,' are alluded to in high terms by Mr. Lawrence. In 1820, and again in 1826, he delivered the Hunterian Orations at the College. The latter of these, containing the Anatomy of the Oyster, has been quoted in reference to the observations which indicate the sensibility of the Oyster to light. He also spent much time in experiments on the growth and reparation of Shell. In the prosecution of his various inquiries he enriched the Museum of the College with some unique examples of his peculiar anatomical skill.

Besides these contributions to Comparative Anatomy and Animal Physiology, Mr. Carlisle communicated to the Horticultural Society a memoir 'On the connection between the Leaves and Fruit of Vegetables, with other Physiological Observations,' and another paper published in the 2nd volume of the Transactions of that Society.

The Bishop of Chichester.

Lord Henry John Spencer Churchill.

Sir John William Lubbock, Bart.

The Rev. Thomas Rackett, M.A., F.R.S., &c., during a long life

successfully cultivated various branches of Natural Science and the liberal arts. Associated in his school-days with Hatchett, and afterwards with Maton, Pulteney and Cavallo, he became attached to the pursuits by which his friends were distinguished, and assisted warmly in the promotion of their views. In the years 1794 and 1796, he accompanied the two former in the tours which Dr. Maton subsequently published under the title of 'Observations relative chiefly to the Natural History, Picturesque Scenery, and Antiquities of the Western Counties of England,' and furnished with his pencil the embellishments of that work, which was inscribed to him in a friendly and grateful dedication. In conjunction with Dr. Maton, he published in the 7th volume of our Transactions 'An Historical Account of Testaceological Writers,' and in the 8th 'A Descriptive Catalogue of the British Testacea.' These works may be justly characterized as manifesting extensive research, careful comparison, and accurate observation: the latter long continued to be the text-book of British Conchologists. Dr. Maton and himself also published in our 8th volume 'An Account of some remarkable Shells found in cavities of a Calcareous Stone, called by the stone-masons *Plymouth-Rag*;' and he subsequently contributed to the 11th volume 'Observations on *Cancer salinus*,' and to the 12th, 'Observations on a Viper found in Cranborne Chace, Dorsetshire,' which he presumed to be *Coluber Chersea*, L. In addition to his skill in the use of the pencil, he was an accomplished musician, and devoted much of his time to antiquarian research, as well as to the prosecution of Natural and Experimental Philosophy.

Mr. Rackett became a Fellow of the Linnean Society in 1795, and of the Royal Society in 1803. In the year 1780 he was instituted to the Rectory of Spettisbury and Charlton, in the county of Dorset, and died on the 29th of November last, at the advanced age of 85, after an incumbency of more than sixty years.

The Rev. John Revett Sheppard, M.A.

Lord Viscount Valentia.

Nicholas Aylward Vigors, D.C.L., F.R.S., M.R.I.A., &c., one of the most eminent ornithologists of the present day, was born in 1787 at Old Leighlin, in the county of Carlow, where his family had long been settled. He was educated at Trinity College in the University of Oxford, and gave early proof of the diligence and success with which he pursued his classical and literary studies, by publishing in 1810 'An Enquiry into the Nature and Extent of Poetick Licence.' Towards the close of 1809 he purchased an Ensigncy in the Grenadier Guards, and was severely wounded in the action at Barrosa, in the early part of 1811. On his return to England in the same year he quitted the army, and for the next twenty years devoted himself to the study of Zoology, and especially of birds and insects. In both these departments he formed extensive collections, and at a subsequent period liberally presented them to the Zoological Society, of which he was the first Secretary and one of the most zealous and active promoters. On the death of his father he succeeded to the family estate, and in 1832 became the representative in Parliament of the borough of Carlow, for which, or for

the county of the same name, he continued to sit until the termination of his life on the 26th of last October.

Mr. Vigors became a Fellow of this Society in 1819, and is author of an important paper in the 14th volume of our Transactions, 'On the Natural Affinities that connect the Orders and Families of Birds.' In this elaborate memoir he applied to the whole Class of Birds the principles of the quinary arrangement propounded by Mr. W. S. MacLeay in the 'Horæ Entomologicæ,' of which he continued through life to be one of the most ardent supporters. In the succeeding volume he published, in conjunction with Dr. Horsfield, the first part of 'A Description of the Australian Birds in the collection of the Linnean Society, with an attempt at arranging them according to their Natural Affinities,' in which the same principles were further developed and applied to the illustration of the Raptorial and Insessorial Orders. His only other contribution to our Transactions consists of a 'Description of a new Species of *Scolopax* lately discovered in the British Islands; with Observations on the *Anas glocitans* of Pallas, and a description of the Female of that Species,' contained in the 14th volume.

The first of his papers in the 'Zoological Journal' appeared in 1824; in 1827 he became its principal editor, and so continued until its termination in 1834. Of his numerous ornithological memoirs published in that work, perhaps the most important is his 'Arrangement of the Genera of Birds;' which, although scarcely more than a bare enumeration of names, contains the most complete outline of his views on the subject of classification. Some of his notices in the 'Zoological Journal' are on Entomological subjects; and several valuable papers, written in conjunction with Dr. Horsfield, are descriptive of new or rare Mammalia in the collection of the Zoological Society. For several years before his death the active part which he took in politics precluded his paying much attention to Zoology, but he retained to the last a considerable interest in his former pursuits, especially in connexion with the Zoological Society. He contributed many valuable notices to the 'Proceedings' of that Society.

Major-General Viney.

Robert Montague Wilmot, M.B.

Rev. William Wood, B.D., and

Francis Boucher Wright, Esq.

Among the *Associates*

Henry Woods, Esq., a surgeon, formerly resident at Bath, and subsequently at Camden Town, near London, who was well versed in the study of the Mammalia, a 'Natural History' of which he was for many years engaged in preparing for the press. This work, which was intended to be on a very extensive scale, has never appeared. He was author of 'An Introductory Lecture on the Study of Zoology,' of a memoir 'On a new Species of Antelope,' in the 5th volume of the 'Zoological Journal,' and of one or two notices in the 'Proceedings of the Zoological Society.' A few years before his death he quitted the neighbourhood of London and returned to Bath, where he became Secretary to the Literary Institution, and died on the 18th of August last, at the age of 46.

MISCELLANEOUS.

Third Meeting of the Men of Science of Italy.—The men of science of Italy have selected Florence as the place of their third meeting, as well from its being the place which, after having given birth to the revival of literature and the arts, was the cradle of experimental philosophy, as from its being the royal seat where was first entertained the thought of this new and great institution, and in which a high-minded prince has raised to the divine Galileo a temple wherein his manuscripts and apparatus will be preserved as a large part of the glorious inheritance of Italy.

It occurred to every one that the friends of science assembled in Florence, in the midst of such numerous splendid monuments of art and science of past and present times, would feel incited by these recollections to pursue the course gloriously opened by our forefathers, and by so doing would pay the deserved tribute of their gratitude to the prince who encouraged the progress of the sciences, and promoted the honour of his country.

It is satisfactory to announce, that the Grand Duke, our sovereign, approving the selection of his capital for the place of the third meeting of the Italian Savans, and having promised to aid its objects in every manner with his royal bounty and patronage, permits that the meeting should commence the 15th of September, 1841, to continue to the end of that month.

The regulations determined on at the first meeting in Pisa have conferred the right of taking part in the scientific meeting on the Italians belonging to the principal academies or scientific societies for the advancement of natural knowledge; the professors of the physical and mathematical sciences; the directors of the higher branches of study, or of the scientific establishments of the various states of Italy; and the chief officers of the corps of engineers and artillery. Foreigners coming under any of the above descriptions will be also admitted to the meeting.

We feel sure that our brethren who enjoy the privilege of attending the meeting will gladly avail themselves of it, and thus contribute to the great advantages which it confers upon the whole body of speculative and practical sciences. It is hoped that the invitation to scientific foreigners will prove not less effectual, as the estimation in which they hold Italian science is a pledge that they will be anxious to witness all that Italy has done and is doing, and to afford their cooperation in the noble undertaking.

A future advertisement will announce the final and special arrangements for the meeting and for the accommodation of those who may attend it. In the mean time, it is satisfactory to state that there have been elected to the office of Assessors, Prof. Gaetano Georgini, Superintendent of the Studies of the Grand Duchy, and Cav. Giuseppe Gazzeri, Prof. in the University of Pisa.

Florence, Dec. 28, 1840.

The President General,
Marchese Cosimo Ridolfi.

The Secretary General,
Cav. Ferdinando Tarturi.

Dr. Lush on the Madi, or Chili Oil-seed, Madia sativa.—" We insert a paper by Dr. Lush, of the Medical Establishment of this Presidency, which brings to notice a new seed, called the 'Madi, or Chili Oil-seed,' which promises to be a valuable adjunct to the plants of that class in this country. It appears to flourish in a high and dry land, and will probably succeed in the Deccan and Southern Mahratta country. Dr. Lush has presented it to the Agricultural and Horticultural Society in Bombay, by whom it will be tested and its uses fully developed.

" The demand which now exists for oil-seeds from British India has caused much attention to be drawn towards such products as may be raised in sufficient quantities, and at such a price, as may ensure them a permanent place among Indian exports to England. On the western side, or the districts under Bombay, we find, that for field produce as oil-seeds we must look out for such articles of cultivation as will not require irrigation, seeing that the sesamum, the kerday, the linseed, and the castor-oil are all produced in different districts of our Presidency as dry crops. Besides those already mentioned, we find a quickly-growing plant in the Deccan, sown usually with the ordinary crops of bajree and pulse, viz. the *Verbesina sativa* (since called *Guizotia oleifera*), or Black Til. This plant is valuable to the natives from its quick and hardy growth in a dry climate and scanty monsoon; but from the small quantity of oil in proportion to the bulk, and the inferior quality of that oil, it is not a plant likely to attract attention beyond local wants.

" The Madi (*Madia sativa*) is a plant of the same habit, and allied in botanical characters to the *Verbesina*. It has lately been grown in England by one or two experimentalists, in the hope of obtaining an indigenous oil of a superior quality. Professor Lindley, who has grown a portion at the Horticultural Society's garden at Chiswick, is of opinion that the climate of England is too damp and cold for the Madi; and on my requesting to be furnished with seed for trial in the dry parts of India, he kindly sent me a liberal supply (which I have brought here overland), and agrees with me in the opinion that it will stand a good chance in the high and dry lands of the Deccan and other similar districts of India. A plant requiring no more care in the cultivation than the black til of the Deccan, and producing an oil second only to that of the almond and olive, and superior to the sesamum (the common 'sweet oil' of Western India), must prove a valuable addition to the produce of the country, and as such I commit it to the care of the Agricultural and Horticultural Society of Bombay without further recommendation, merely subjoining a notice of what has already been mentioned by authors about this hitherto neglected plant.

" DeCandolle, in his 'Prodromus,' gives a full description of the plant, and notices shortly that the seed is used for making an oil. This oil, however, does not seem to have attracted the notice of commercial persons, and the only account of it I could procure in London was kindly pointed out to me by my friend Professor Don, in a work published in the year 1711 (in the library of the Linnæan Society of

London), 'Histoire des Plantes Médicinales de Perou et de Chili,' by Mons. Feuillée. Of this account the following is a translation:

"'An admirable oil is made from the seeds of this plant throughout all Chili. The natives make use of it not only as a local application to assuage pain, anointing with it the parts affected, but also as a condiment, and besides for burning in lamps. I found it,' says M. Feuillée, 'sweeter and of a more agreeable taste than the greater part of our olive oils; its colour is the same. There are no olives in Chili, and whatever olive oil is found there is brought from Peru, where a large quantity is made.'

"I beg to present the Society with an original coloured drawing of this plant, made for me in August last at Chiswick, by Mr. Hart, lately draughtsman to the Botanical Register.—CHARLES LUSH, M.D." *Bombay Gazette, 26th November,* 1840.

Diurnea Novembris, November Dagger.—Several specimens of both sexes of this insect I have taken in this neighbourhood; the males fly in quest of the females towards midday. I could only find them in copulation upon the blades of grass, although at other times they rest upon the balls of the oaks. The 11th of October was the time when they first appeared, and continue for three weeks.—ROBERT S. EDSETON.

11 Derby Street, Cheetham, Manchester.

METEOROLOGICAL OBSERVATIONS FOR MAY 1841.

Chiswick.—May 1. Fine: very hot: clear. 2. Very fine: cloudy. 3. Rain. 4. Foggy: cloudy and fine: very heavy fall of rain at night. 5. Rain: cloudy and fine: lightning at night. 6. Rain: cloudy. 7. Fine: rain. 8. Heavy showers. 9, 10. Very fine. 11. Overcast: slight rain at night. 12. Cloudy and fine. 13. Fine. 14—16. Very fine. 17. Cloudy and windy. 18. Fine. 19. Rain with strong wind. 20. Boisterous: showery: cold at night. 21. Dry haze: rain. 22. Showery and mild. 23. Slight haze: cloudy and fine. 24. Fine. 25. Very fine. 26. Hot and dry. 27. Sultry: much sheet-lightning at night, with occasionally some of the zigzag and forked kind, together with thunder, and abrupt showers falling in large drops. 28. Sultry: very fine. 29. Very fine: lightning at night. 30, 31. Overcast and very fine.

Boston.—May 1. Fine: therm. 66° half-past 2 P.M. 2. Cloudy: rain with thunder and lightning P.M. 3. Cloudy. 4. Cloudy: rain early A.M. 5. Rain. 6. Cloudy: rain early A.M. 7. Cloudy: rain P.M. 8. Rain. 9. Fine. 10. Cloudy. 11. Fine: therm. 72° 3 o'clock P.M.: rain P.M. 12. Cloudy. 13. Fine. 14. Cloudy. 15. Fine: therm. 69° 3 o'clock P.M. 16. Fine. 17. Cloudy: rain P.M. 18. Cloudy. 19. Rain: stormy P.M. 20. Stormy: rain A.M. and P.M. 21. Fine. 22. Cloudy: rain early A.M. 23. Cloudy. 24—27. Fine. 28. Cloudy: therm. 79° 3 o'clock P.M.: rain P.M. 29. Fine. 30. Cloudy. 31. Fine. N.B. This May month has been warmer than any preceding May month since 1834.

Applegarth Manse, Dumfries-shire.—May 1. Fair and fine: thunder. 2. Drizzling afternoon. 3. Fair: frosty: hail. 4. Rain all day. 5. Rain occasionally. 6. Fair and fine. 7. Rain for four hours. 8. Rain P.M.: thunder. 9. Fair till night: rain P.M. 10. Fair but cloudy. 11. Wet A.M.: cleared up. 12—15. Fair and fine. 16, 17. Wet nearly all day. 18, 19. Showers A.M., then fine. 20. Showers. 21. Fair and fine. 22. Wet A.M.: fine P.M. 23. Fair but gloomy. 24. Fine summer day. 25, 26. Bright and cool. 27. Parching wind and hot sun. 28. Fine: rained a little. 29. Fair and fine. 30. Soft rain from eleven to four. 31. Fine summer day.

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. Roberton; *by* Mr. Thompson *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. Veall *at Boston, and by* Mr. Dunbar *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1841. May.	Barometer.						Thermometer.								Wind.				Rain.				Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dumfries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Self-register. Min.	Max.	Min.		Max.	Min.									
1.	30·040	29·998	29·794	29·44	29·90	29·68	57·8	67·2	47·0	76	42	58	65	40	NE.	E.	calm	SW.	...	...	...	...	52
2.	29·720	29·674	29·640	29·00	29·56	29·60	61·7	70·4	53·2	76	45	61	55½	45½	S.	SW.	calm	SE.	...	·25	...	...	57
3.	29·772	29·780	29·716	29·18	29·66	29·66	47·7	71·5	47·2	50	43	49	51	32½	N.	NE.	calm	SE.	·375	·30	·36	...	52
4.	29·628	29·609	29·480	29·13	29·48	29·25	53·7	54·8	45·3	69	50	46	51	40	E.	S.	SE.	SE.	·250	·70	·04	...	49
○ 5.	29·464	29·571	29·399	28·85	29·15	29·25	55·4	66·0	52·0	62	46	53	59½	49½	SE.	SW.	calm	SW.	·719	·15	·25	...	55
6.	29·556	29·774	29·495	28·91	29·31	29·42	57·8	61·3	53·0	65	43	57·5	55½	45½	S.	SW.	W.	S.	·077	·02	·08	...	55
7.	29·746	29·708	29·528	29·18	29·50	29·38	59·2	64·6	49·7	66	47	53	58	45	S.	S.	calm	SW.	·019	·10	...	...	56
8.	29·548	29·581	29·491	28·92	29·38	29·55	57·5	66·6	52·5	62	44	54	59	35	S.	SW.	W.	SSW.	·116	·16	·36	0·80	54
9.	30·094	30·097	30·008	29·44	29·75	29·80	56·3	72·2	47·3	65	50	56·5	55	37	S.	SW.	W.	SW.	·044	...	·02	...	52
10.	30·180	30·153	30·117	29·50	29·73	29·80	60·2	63·3	53·0	65	46	59	56	46	S.	SW.	W.	WSW.	...	...	...	...	53
11.	30·094	30·054	30·003	29·45	29·75	29·87	62·2	63·8	51·6	77	46	64	56½	50½	S.	S.	SW.	S.	...	·01	...	...	55
12.	30·190	30·247	30·128	29·55	30·06	30·19	57·0	70·7	53·0	62	39	55·5	57	40	NNW.	NE.	calm	WSW.	·019	...	·05	...	56
☾ 13.	30·388	30·330	30·314	29·77	30·25	30·26	55·7	63·4	47·5	66	36	58	60½	39	N.	NE.	calm	SW.	...	...	...	...	52
14.	30·424	30·364	30·262	29·83	30·23	30·11	53·7	63·6	46·3	65	40	55	62½	43½	NE.	NE.	calm	SW.	...	...	...	...	49
15.	30·244	30·194	30·043	29·59	30·00	29·84	59·7	69·4	48·7	74	40	61	59	44	S.	W.	calm	S.	...	...	...	...	52
16.	29·968	29·911	29·674	29·24	29·60	29·49	53·7	66·0	49·0	74	49	60	56½	46½	SSW.	SW.	W.	WSW.	...	...	...	0·64	50
17.	29·664	29·632	29·518	28·93	29·20	29·10	58·3	70·0	52·3	68	45	55·5	56	46½	S.	SW.	SW.	SW.	...	·01	...	...	55
18.	29·610	29·553	29·531	28·90	29·15	29·26	57·8	63·0	49·4	66	46	57	56½	46	S.	SW.	W.	SW.	...	·02	·02	...	54
19.	29·406	29·674	29·280	28·77	28·98	28·85	55·3	65·7	51·3	60	47	52	58	45	S.	S.	NW.	S.	...	·15	·06	...	53
● 20.	29·328	29·578	29·253	28·65	28·83	29·20	58·2	59·6	50·7	61	39	54	56½	45	W.	SW.	SW.	W.	·075	·06	...	...	53
21.	29·702	29·647	29·526	29·19	29·51	29·64	58·7	67·7	48·4	69	54	57·5	59	43½	ENE.	E.	calm	SW.	·044	·16	·09	...	52
22.	29·672	29·811	29·607	29·10	29·70	29·80	59·7	65·8	56·5	68	43	55	61	48	N.	S.	calm	SW.	·133	·01	·02	...	54
23.	30·040	30·159	29·994	29·45	29·90	30·05	58·3	64·2	53·7	75	46	56	61	49	S.	SE.	calm	E.	...	...	...	...	54
24.	30·242	30·180	30·137	29·61	30·10	30·10	63·5	70·3	53·6	70	51	65	65½	49	NE.	E.	calm	SW.	...	...	...	...	55
25.	30·220	30·165	30·133	29·69	30·25	30·27	63·5	70·6	55·8	73	54	65·5	64	43	N.	NE.	E.	E.	...	...	...	...	61
26.	30·146	30·070	29·955	29·58	30·17	30·03	67·7	70·0	55·0	80	58	61	67	46½	NE.	NE.	E.	E.	...	...	...	...	62
☽ 27.	29·960	29·882	29·823	29·35	29·95	29·85	71·7	79·4	62·0	82	60	69	78	51	NE.	NE.	calm	NE.	...	·03	...	...	66
28.	30·000	30·038	29·893	29·20	29·80	29·90	70·3	79·0	64·8	80	51	68	72	50	SSE.	SW.	calm	SW.	·116	...	...	1·80	65
29.	30·186	30·096	30·061	29·48	30·00	30·00	65·7	78·3	57·7	72	54	67	63	52½	NW.	N.	calm	SW.	...	·03	·05	...	55
30.	30·078	30·016	29·979	29·44	30·02	29·95	61·5	71·9	58·0	74	49	65·5	63	42	NW.	NW.	N.	SW.	...	...	...	...	59
31.	30·086	30·042	29·995	29·43	29·78	29·90	66·7	78·6	57·3	78	49	66	68	42	S.	W.	W.	SE.	...	...	...		62
Mean.	29·916	29·922	29·799	29·28	29·700	29·711	59·6	68·0	52·4	69·35	46·83	58·5	60·2	44·4					Sum. 1·987	2·16	1·42	3·24	Mean. 55

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 46. AUGUST 1841.

XLIV.—*On* Gloionema paradoxum. By the Rev. M. J. Berkeley, M.A., F.L.S.

[With a Plate.]

The genus *Gloionema* has been long considered as consisting of productions of a very doubtful nature. Some of its species indeed have been rejected as the ova of insects; but notwithstanding the communication of Roberge* to the Linnæan Society of Paris, who is stated to have proved by repeated experiments that *Gloionema paradoxum* is not a vegetable, the species is still retained by Agardh†. Kützing‡ also, who rejects the other species as ova, though he refers to Agardh's treatise, and therefore must have known of Roberge's experiments, still retains this, and has published it as an alga in his 'Decades.' Kützing, indeed, informs us that he kept his specimens in water for many weeks or even months without obtaining any positive result; and Prof. Nitzsch, to whom he communicated the production, was not more successful.

No detail of M. Roberge's experiments, as far as I am aware, has as yet been published; I have therefore no hesitation in offering to public notice my own observations, made at the end of last May, which completely confirm the report of Roberge, and which must be considered as quite decisive.

I have not indeed had an opportunity of comparing my individuals with authentic foreign specimens, but they agree so completely with Kützing's description, that I have not the least doubt of their identity.

So early as 1825 I found a small patch at Cherry Hinton, near Cambridge, and communicated a sketch to Dr. Greville. The production was however considered of so doubtful a nature that it was not published in my 'Gleanings of British Algæ,' nor is it included in the English Flora. I did not meet with it again till May 25, 1841, when I found a large mass at King's Cliffe, forming a loosely reticulated mass of tortuous, very elastic, yellow-green threads, several inches in extent,

* Linn. Soc. Par. 1827, p. 47.

† Conspectus Criticus Diatomacearum, p. 30.

‡ Bot. Zeit. 1833, vol. ii. p. 513.

suspended near the surface of the water on grasses and aquatic plants. The threads were of considerable length, sometimes invested with a transparent gelatinous sheath, sometimes naked. They contained one or two rows of boat-shaped bodies, $\frac{8}{1000}$ths of an inch long, $\frac{3}{1000}$ths broad, with one extremity a little broader. The broad extremities all pointed the same way, except by accidental circumstances a few had become transverse. The threads, with their gelatinous sheath, measured $\frac{12}{1000}$ths of an inch in diameter, without the coat about $\frac{6}{1000}$ths.

The grains contained a grumous mass, of a yellow-green colour, surrounded by a rather broad pellucid border. The external surface was perfectly smooth, but the border marked with little flexuous lines perpendicular to it, which are in fact seated on a membrane which intimately lines the outer coat of the grain. A portion of the mass was placed in a glass of water, and on the following morning a sensible change had taken place. At one or both ends the contents had contracted, leaving the outer shell at those points perfectly smooth and colourless, while the pellucid border still surrounding the central mass was marked with the above-mentioned lines, which, if I am not mistaken, are composed of very minute longitudinally-arranged granules. Meanwhile the grumous mass appeared more cellular*, with its margin light. In the afternoon of the same day the larger globules were confined to the broader or anterior end, while towards the other end the mass had become paler. Sometimes there were a few large globules, possibly air-bubbles, between the two membranes at the anterior end. On the following morning a dark patch appeared in the centre of the mass, and in some individuals seen laterally this patch was applied to the chord of the granule, while the upper margin was crenulated. In the evening of the same day the crenulations had extended to the dark mass, and the large globules were less visible, while in some individuals the contents were in motion and the parts greatly confused. The membrane was soon burst, and a larva disclosed, most probably belonging to the *Tipulidæ*. The larvæ were about twice as long as the eggs, and the posterior part, when *in situ*, wrapped in a somewhat spiral way, to allow of its being packed in so small a compass. On careful examination of other eggs, I could distinguish the red spots which mark the place of the eyes, but the whole too confused to admit of my making an intelligible figure.

The larva consists of thirteen articulations, including the head, decreasing slightly towards the hinder extremity. The

* This accords with the observations of Dumortier, Pouchet, &c., on the cellular formation of the vitellus.

last articulation, however, is not so strongly marked as the rest. The head is large, ovate, with two red eyes in front, and two short, conical, obscurely-articulated antennæ; the mouth is furnished with two strong maxillæ, which, when the animal is at rest, are completely retracted and out of sight. The first articulation of the body is furnished with two short feet, crowned at their extremities with a few short bristles. Down the centre of this and the following articulations is a dark line, marking the situation of the intestines. The last joint is also furnished with two short conical feet, or appendages crowned with short bristles, and a conical projection in the centre, crowned with about eleven pellucid cilia, which are undoubtedly the temporary lungs. I have frequently seen the animal comb them out with his large maxillæ. On each side of the branchial tubercle is a short conical appendage.

I must leave entomologists to decide the affinities of the little larva, and must beg them to pardon any errors in my description of it. I did not witness any further change, as the larvæ soon died, and the mass became clothed with mucedinous filaments.

EXPLANATION OF THE FIGURES IN PLATE XIII.

a. Portions of filaments, with eggs magnified.

1. Appearance of an egg, highly magnified, soon after the specimens were brought home.

2. } Ditto on the following morning.
3. }

4. Ditto at six o'clock P.M.

5. } Ditto the next morning at twelve.
6. }

7. Ditto with the articulations strongly marked, and the dark mass (= *vitellus*) which furnishes the intestines.

8. Larva just burst from its shell.

XLV.—*Supplement to descriptions of Exotic Fungi in 'Annals of Nat. Hist.,'* vol. iii. pp. 322 and 375. By the Rev. M. J. Berkeley, M.A., F.L.S.

Since the publication of the two memoirs cited above on the Exotic Fungi in the collection of Sir W. J. Hooker, the discovery of a packet of Dr. Richardson's Arctic Fungi which had been mislaid, and the publication of Fries's 'Epicrisis,' who had received many of the species from Klotzsch, makes it necessary to give a short supplement. I have also to thank Dr. Montagne for one or two suggestions, of which I have availed myself in the following notes:—

1. *Lentinus villosus,* l. c. p. 322 = *L. fasciatus,* Berk., Hook. Journ. of Bot. v. ii. p. 146. t. 5.

2. *Polyporus vesparius,* l. c. p. 323. The specific name, as Dr. Montagne very properly remarks, is too near that of *Pol.*

vespaceus, Pers., equally with which it belongs to the genus *Hexagona*, Fr. I beg therefore to substitute for it *Hexagona Gunnii.*

3. *Pol. dædaleoides*, l. c. p. 325, belongs to the genus *Trametes*, Fr., therefore it will stand as *Trametes dædaleoides.*

4. *Dædalea applanata*, l. c. p. 381 = *Dæd. Palisoti*, according to Dr. Montagne, who remarks that this species and *D. repanda* vary from two inches to a foot in diameter, and have the stem lateral, eccentric, or even central.

5. *Dædalea aspera*, l. c. = *Lenzites aspera*, nob.

6. *Dædalea latissima*, l. c. p. 382 = *D. sinulosa*, Fr. Ep. p. 495.

7. *Dædalea discolor*, l. c. = *Lenzites Klotzschii*, nob. Pileo sessili, suborbiculari, tenui, pluri-zonato, pallide ligneo demum subbrunneo, glabro, sub-nitido, plus-minus ruguloso. Hymenio obscuriore; lamellis tenuibus, rigidis, subintegris, antice furcatis, postice sinuoso-porosis.

Pileus 1—2 inches in diam. On oak. Allied to *Lenzites betulina. Dædalea discolor*, Fr., is a true *Dædalea.*

8. *Pol. Wightii*, l. c. p. 383 = *Hexagona Wightii*, Fr. Ep. This is referred in my paper to *Pol. sinensis*, Fr., but it appears erroneously. Fries informs us that the species which I have called *Pol. Klotzschii* is preserved in old Swedish herbaria as *Bol. favus*, L., but according to Klotzsch, *Bol. favus* of the Linnæan herbarium * is *Hex. tenuis.* Dr. Montagne informs me that he has *Pol. Klotzschii* from Cuba, and that he also has regarded it as new. *Pol. Klotzschii*, Berk., must therefore be now considered as *Trametes sinensis*, Fr.

9. *P. sericeo-hirsutus*, l. c. p. 384 = *Hexagona sericea*, Fr. Ep. p. 497.

10. *P. fraxineus*, l. c. p. 389. The only specimen of the species thus marked in Dr. Richardson's collection is certainly not *P. fraxineus*, but I think a young specimen of *P. fomentarius.*

11. *P. obtusus*, Berk. l. c. p. 390 = *Trametes obtusus*, nob.

12. *P. subcinereus*, Berk. l. c. p. 391 = *Pol. adustus.* I am obliged to Dr. Montagne for this correction.

13. *P. biformis*, l. c. p. 392. The two fungi which I regarded as what Klotzsch intended here, are named by Fries *Pol. arcticus* and *P. pergamenus.* Fries, however, had received something else under the name of *P. biformis*, with which I am not acquainted. The short observation added to Klotzsch's characters belongs to *P. arcticus* and *P. pergamenus.*

14. *P. occidentalis*, l. c. p. 393 = *Trametes occidentalis*, Fr. Ep.

* Since the above was in type I have examined the specimen and find that it is named by Sir J. E. Smith; it is therefore no authority for *Bol. favus*, L. It is certainly *Hex. tenuis.*

15. *Nidularia striata*, var. *pusilla* = *N. plicata*, Fr., according to Dr. Montagne.

The following species were not included in the list:—

16. *Trametes stuppeus*, n. s. Apus, suberosus, pileo dimidiato, convexo, azono, stuppeo-villoso, ochraceo-fulvo; intus hymenioque ligneo-pallidus; poris magnis, 5–6 angulatis, dissepimentorum acie tenuissima. Pileus $2\frac{1}{2}$ inches broad, about 1 inch long, clothed with long, dingy, pale, ochraceous tawny, tow-like down. Pores $\frac{1}{6}$th of an inch across, deep behind, shallow in front towards the acute margin.

Carlton House, N. A, Ap. 23. Dr. Richardson. Resembling *Trametes gallica*, but very distinct. The surface of the pileus resembles that of *Pol. leoninus*.

17. *Pol. hyperboreus*, n. s. Ungulatus, durus, ponderosus; pileo glabro concentrice sulcato; disco brunneo, margine obtuso, pruinoso, cervino; intus pallide cervino. Hymenio convexo ætate angustato, umbrino; poris minutis rotundis.

N. A., Dr. Richardson. Allied to *P. igniarius*, *ligneus*, and *australis*, but certainly distinct. The substance is equally hard, but of a much paler hue. Pileus 2 inches long, 4 inches broad, 2 inches deep, marked with a few concentric furrows; the older portion brown, the margin pale fawn-colour. Hymenium growing narrower with age.

18. *Pol. badius*, n. s. Crassus, durus, subponderosus, badius, intus ferrugineus; pileo parce concentrice sulcato, minutissime ferrugineo-tomentoso, demum glabrato; hymenio lævi, poris mediis angulatis, dissepimentis tenuibus.

N. A., Dr. Richardson. A very distinct species, with far larger pores than those of *Pol. igniarius*, with which it agrees in size, and to which it is allied. The surface of the pileus is in parts even and cracked, in parts rough, with small corrugations. The flatness of the hymenium probably arises from the specimen having been fixed by the vertex.

19. *P. lilacino-gilvus*, Berk.

A single specimen found by Dr. Richardson agrees exactly with the species from Van Diemen's Land, but is in a very early stage of growth. I saw this species in M. Desmazières' herbarium, marked "*Pol. versicolor*, var. *incarnata*, reçu par M. Fée du consul de France au Brazil an 1826." It is possibly the same then with *Pol. Feei*, Fr., Linn. v. p. 518.

20. *Pol. varius*, Fr., N. A., Dr. Richardson.

21. *Pol. ferruginosus*, Fr., N. A., Dr. Richardson.

22. *Exidia glandulosa*, Fr., N. A., Dr. Richardson.

23. *Nidularia striata*, Bull., N. A., Dr. Richardson.

24. *Lycoperdon pertusum*, Sow. Br. Fung. t. 412. f. 2. Subglobosum, peridio tenuissimo, membranaceo, furfuraceo-granuloso, demum lacunis plurimis irregularibus pertusum. Capil-

litio pallido. N. A., Dr. Richardson. About the size of a hazel-nut. Sporidia globose, equal in diameter to that of the flocci. Precisely the plant of Sowerby, except that his species is figured with a spurious stem. It is clearly no *Rhizopogon*, as asserted by Fries.

XLVI.—*A List of Plants collected by* Charles Fellows, Esq., *during his Tour in Lycia and Caria; with descriptions of the New Species.* By David Don, Esq., Prof. Bot. King's College*.

N.B.—*Those to which an asterisk is affixed are new species, and will be found described at the end.*

DICOTYLEDONES v. EXOGENÆ.

Ranunculaceæ.

Clematis cirrhosa, *L.*
Anemone coronaria, *L.*
—— apennina, *L.*
Adonis æstivalis, *L.*
Ficaria verna, *Huds.*

Berberideæ.

Bongardia Rauwolfii, *C. A. Mey.*

Papaveraceæ.

Papaver somniferum, *L.*
—— orientale, *L.*
—— Argemone, *L.*
Glaucium flavum, *Crantz.*
Rœmeria hybrida, *DeCand.*
Hypecoum procumbens, *L.*

Fumariaceæ.

Corydalis tuberosa, *DeCand.*
Fumaria capreolata, *L.*
—— parviflora, Lam.

Cruciferæ.

Erophila vulgaris, *DeCand.*
Alyssum fulvescens, *Sm.*
Fibigia clypeata, *Med.*
Aubrietia deltoidea, *DeCand.*
Arabis verna, *Br.*
Cardamine hirsuta, *L.*
Diplotaxis tenuifolia, *DeCand.*
Brassica Rapa, *L.*

Cistineæ.

Cistus cymosus, *Dun.*
—— salvifolius, *L.*
Helianthemum arabicum, *Pers.*

Violarieæ.

Viola tricolor *o*, *DeCand.*

Caryophylleæ.

Silene Behen, *L.*
—— vespertina, *L.*
—— orchidea, *L.*
—— linoides, *Otth.*
Dianthus prolifer, *L.*
Holosteum umbellatum, *L.*

Lineæ.

Linum angustifolium, *Sm.*
—— hirsutum, *L.*

Geraniaceæ.

Erodium cicutarium, *Sm.*
—— ciconium, *Willd.*
—— gruinum, *Willd.*
Geranium tuberosum, *L.*
—— molle, *L.*
—— lucidum, *L.*

Rutaceæ.

Ruta bracteosa, *DeCand.*

Rhamneæ.

Rhamnus oleoides, *L.*
Paliurus aculeatus, *Lam.*

* From Mr. Fellows's 'Account of Discoveries in Lycia, &c., 1841,' a work of the highest interest for the valuable and original information which it contains upon ancient art, history, and philology, as well as the present state of the country.

EUPHORBIACEÆ.

Euphorbia dulcis, *L.*
—— rigida, *Bieb.*
Mercurialis annua, *L.*
Ricinus communis, *L.*

TEREBINTHACEÆ.

Pistacia Lentiscus, *L.*

LEGUMINOSÆ.

Anagyris fœtida, *L.*
Calycotome villosa, *Link.*
Anthyllis tetraphylla, *L.*
Lotus creticus, *L.*
Melilotus sulcata, *Desf.*
Trifolium fragiferum, *L.*
—— spumosum, *L.*
—— subterraneum, *L.*
—— procumbens, *L.*
Hymenocarpus circinatus, *Savi.*
Medicago orbicularis, *All.*
—— uncinata, *Willd.*
—— minima, *Lam.*
—— marina, *L.*
Psoralea bituminosa, *L.*
Colutea arborescens, *L.*
Coronilla iberica, *Bieb.*
—— minima, *L.*
Faba vulgaris, *Mœnch.*
Vicia onobrychoides, *L.*
—— polyphylla, *Desf.*
—— hybrida, *L.*
Lathyrus Cicera, *L.*
—— angulatus, *L.*
Pisum fulvum, *Sm.*
Lupinus hirsutus, *L.*
Cercis Siliquastrum, *L.*

ROSACEÆ.

Poterium spinosum, *L.*

TAMARISCINEÆ.

Tamarix gallica, *L.*

CUCURBITACEÆ.

Bryonia dioica, *L.*

PARONYCHIEÆ.

Paronychia argentea, *Lam.*

CRASSULACEÆ.

Umbilicus pendulinus, *DeCand.*

UMBELLIFERÆ.

Scandix australis, *L.*
Caucalis daucoides, *L.*
Tordylium officinale, *L.*
Smyrnium perfoliatum, *L.*

RUBIACEÆ.

Asperula arvensis, *L.*
Galium brevifolium, *Sm.*

VALERIANEÆ.

Valeriana Dioscoridis, *Sm.*

COMPOSITÆ.

Tussilago Farfara, *L.*
Inula candida, *DeCand.*
—— limoniifolia, *Lindl.*
Asteriscus aquaticus, *Mœnch.*
Anthemis arvensis, *L.*
—— rosea, *Sm.*
Achillea cretica, *DeCand.*
Chrysanthemum segetum, *L.*
—— coronarium, *L.*
Senecio squalidus, *L.*
Gnaphalium luteo-album, *L.*
Helichrysum angustifolium, *DeC.*
Calendula arvensis, *L.*
Carduus crispus, *L.*
Centaurea montana, *L.*
—— Jacea, *L.*
Tragopogon porrifolius, *L.*

CAMPANULACEÆ.

Campanula drabifolia, *Sm.*

STYRACEÆ.

Styrax officinale, *L.*

OLEACEÆ.

Phillyrea latifolia, *L.*

JASMINEÆ.

Jasminum fruticans, *L.*

APOCYNEÆ.

Vinca minor, *L.*

CUSCUTEÆ.

Cuscuta epithymum, *L.*

BORAGINEÆ.

Myosotis sylvatica, *Hoffm.*
Lithospermum orientale, *Willd.*
Anchusa italica, *Retz.*

Anchusa tinctoria, *L.*
—— undulata, *L.*
Cynoglossum officinale, *L.*
Mattia staminea, *Rœm. & Schult.*
Onosma echioides, *L.*
Echium plantagineum, *L.*
—— creticum, *Sm.*

SOLANACEÆ.

Mandragora officinarum, *Bertol.*
Hyoscyamus niger, *L.*
—— agrestis, *Kit.*
—— aureus, *L.*

VERBASCINEÆ.

Verbascum Thapsus, *L.*

SCROPHULARINEÆ.

Veronica cuneifolia*.
—— triphyllos, *L.*
—— grandiflora*.
—— Cymbalaria, *Vahl.*
Linaria pelisseriana, *DeCand.*
Anarrhinum bellidifolium, *Desf.*
Scrophularia peregrina, *L.*
—— canina, *L.*

OROBANCHEÆ.

Orobanche caryophyllacea, *Sm.*

LABIATÆ.

Teucrium regium, *Schreb.*
Lavandula Stæchas, *L.*
Lamium moschatum, *Mill.*
—— purpureum, *L.*
Phlomis lycia*.
Salvia triloba, *L.*
—— Horminum, *L.*

PRIMULACEÆ.

Anagallis arvensis, *α* et *β*, *L.*
Cyclamen persicum, *L.*

PLANTAGINEÆ.

Plantago cretica, *L.*

CHENOPODIACEÆ.

Salicornia fruticosa, *L.*

POLYGONEÆ.

Rumex bucephalophorus, *L.*
—— Acetosa, *L.*

ELÆAGNEÆ.

Elæagnus angustifolia, *L.*

THYMELÆÆ.

Daphne collina, *L.*
—— argentea, *Sm.*
Passerina hirsuta, *L.*

LAURINEÆ.

Laurus nobilis, *L.*

PLATANEÆ.

Platanus orientalis, *L.*

BALSAMIFLUÆ.

Liquidambar orientale, *Mill.*

CUPULIFERÆ.

Quercus Ballota, *Desf.*
—— coccifera, *L.*
—— Ægilops, *L.*

CONIFERÆ.

Pinus Pinea, *L.*
—— carica*.
—— Laricio, *Lam.*
Cupressus sempervirens, *α* et *β*, *L.*
Juniperus communis, *L.*

MONOCOTYLEDONES v. ENDOGENÆ.

GRAMINEÆ.

Briza maxima, *L.*
Stipa tortilis, *Desf.*
Ægilops ovata, *L.*

MELANTHACEÆ.

Merendera Bulbocodium, *Ram.*

LILIACEÆ.

Fritillaria Meleagris, *L.*
Lloydia græca, *Endl.*
Gagea spathacea, *Rœm. & Schult.*
Hyacinthus orientalis, *L.*
Muscari moschatum, *Willd.*
—— comosum, *Willd.*
—— botryoides, *Willd.*
Bellevalia romana, *Lapeyr.*
Scilla bifolia, *L.*
Allium nigrum, *L.*
—— neapolitanum, *Cyr.*
—— triquetrum, *L.*
—— junceum, *Sm.*
Aloe vulgaris, *Sm.*
Ornithogalum umbellatum, *L.*

Ornithogalum nanum, *Sm.*
Myogalum nutans, *Link.*
Asphodelus ramosus, *L.*
Asparagus acutifolius, *L.*

SMILACEÆ.

Smilax aspera, *L.*
Ruscus aculeatus, *L.*

DIOSCOREACEÆ.

Tamus cretica, *L.*

AMARYLLIDEÆ.

Narcissus Tazetta, *L.*

IRIDEÆ.

Iris florentina, *L.*
—— Sisyrinchium, *L.*
—— tuberosa, *L.*
Trichonema Columnæ, *Reichenb.*
Gladiolus communis, *L.*
—— segetum, *Kit.*

ORCHIDEÆ.

Orchis papilionacea, *L.*
—— provincialis, *Balb.*
—— longibracteata, *Biv.*
—— longicornis, *Desf.*
Ophrys fusca, *Link.*
—— Tenoreana, *Lindl.*
—— mammosa, *Desf.*
—— Ferrum-equinum, *Desf.*
Serapias Lingua, *L.*
—— cordigera, *L.*

AROIDEÆ.

Arum Dracunculus, *L.*
Arisarum vulgare, *Schott.*

ACOTYLEDONES v. ACROGENÆ.

LYCOPODIACEÆ.

Lycopodium denticulatum, *L.*

FILICES.

Polypodium vulgare, *L.*
Ceterach officinarum, *Willd.*
Cheilanthes odora, *Sw.*
Adiantum Capillus Veneris, *L.*

LICHENES.

Evernia prunastri, *Ach.*

DESCRIPTIONS OF THE NEW SPECIES.

Veronica cuneifolia.

V. glanduloso-pubescens; racemis axillaribus, segmentis calycinis oblongis obtusis corollâ brevioribus, ovario suborbiculato scabro, foliis subsessilibus cuneatis inciso-crenatis, caule suffruticoso procumbente.

Habitat in Lyciæ rupibus ad Arycandum fluvium.

Fruticulus procumbens, ramosissimus, *V. saxatili* parùm major. *Rami* filiformes, purpurascentes, foliosi, fragiles, pube brevissimâ glandulosâ vestiti. *Folia* opposita, brevissimè petiolata, cuneata, inciso-crenata, coriacea, avenia, utrinque pubescentia, scabriuscula, subtùs costâ prominente subcarinata, 2–3 lineas longa, sesqui v. 2 lineas lata. *Petioli* pubescentes, vix lineam longi, latiusculi, suprà canaliculati, subtùs obtusè carinati, imâ basi subconnati. *Racemi* in ramis solitarii, axillares, multiflori, pedunculati. *Pedunculus* folio longior, filiformis, glanduloso-pubescens, purpurascens. *Bracteæ* pedicellis capillaribus longiores; *inferiores* inciso-crenatæ, foliis consimiles; *superiores* subspathulatæ, integerrimæ. *Calyx* copiosiùs glanduloso-pubescens, 4-partitus: *segmentis* oblongis, obtusis; 2 *anterioribus* majoribus. *Corolla V. saxatilis*, cyanea? calyce major: *tubo* brevissimo, violaceo: *limbo* 4-partito: *laciniis* rotundatis, integris, venulosis; *infimâ* duplò angustiore. *Stamina* corollâ breviora: *filamenta* filiformia, glabra, violacea: *antheræ*

subrotundæ, biloculares, flavæ. *Ovarium* compressum, orbiculare, asperè pubescens, integrum. *Stylus* capillaris, glaber, corollam superans. *Stigma* capitatum, exiguum.

This is a very distinct and well-marked species, with the habit of *V. saxatilis*, but there is none with which it can be confounded, and if introduced to our gardens it would prove an interesting addition to the rock-work. Its cuneiform, deeply crenate leaves, and rough pubescent fruit will serve to distinguish it from *saxatilis*, as well as from every other shrubby species.

Veronica grandiflora.

V. annua, erecta, glanduloso-pubescens; floribus solitariis, segmentis calycinis linearibus obtusis, corollâ calyce triplò longiore: laciniis rhombeo-ovatis subunguiculatis, foliis inferioribus petiolatis ovatis crenatis; superioribus sessilibus, pinnatifidis tripartitisve.

Habitat in Cariâ ad Meandrum fluvium, et prope Mylasam. Floret Martio.

Radix fibrosa, annua. *Caulis* erectus, filiformis, simplex v. ramosus, copiosè glanduloso-pubescens, purpurascens, bipollicaris. *Cotyledones* adhuc persistentes, subreniformes, integerrimæ, petiolatæ. *Folia inferiora* brevissimè petiolata, ovata, obtusa, crenata, 3–5 lineas longa, utrinque pilis brevissimis articulatis, at rarò glanduliferis, copiosè vestita; *superiora* sessilia, pinnatifida v. tripartita: *segmentis* linearibus, obtusis, integerrimis; *terminali* majori, subspathulato. *Flores* in apice caulis axillares, solitarii, pedunculati. *Pedunculi* capillares, copiosè glanduloso-pubescentes, foliis tripartitis ter longiores. *Calyx* copiosè glanduloso-pubescens, 4-partitus: *segmentis* linearibus, obtusis; 2 *anterioribus* majoribus. *Corolla* omnium maxima, diametro semuncialis et ultrà, cyanea: *tubo* brevissimo, luteo: *limbo* profundè 4-partito: *laciniis* rhombeo-ovatis, obtusis, basi angustatâ luteâ subunguiculatis; *anticâ* minore. *Stamina* corollâ multoties breviora: *filamenta* gracilia, glabra, lutescentia: *antheræ* cordato-oblongæ, obtusæ, violaceæ. *Ovarium* subrotundum, glabrum, integrum. *Stylus* corollâ longior, capillaris, glaber, supernè incrassatus, subclavatus. *Stigma* parvum, subcapitatum. Capsulam nondùm vidi.

A truly elegant little plant, well deserving of being added to the catalogue of ornamental annuals, from the size and beauty of its flowers. Its deeply pinnatifid and tripartite leaves, with entire linear or spathulate segments, will readily distinguish it from the *V. amœna* of Steven, and from *V. pumila*, from Mount Hæmus, described and figured in the second volume of Dr. Clarke's Travels, at page 559.

Phlomis lycia.

P. fruticosa, ferrugineo-tomentosa; foliis cordato-oblongis obtusis, verticillastris plurifloris, bracteis lanceolatis calycibusque mucro-

nato-spinosis densè albo-lanatis, dentibus calycinis uncinatis, filamentis inappendiculatis.

Habitat in Lyciæ septentrionalis sylvis montosis.

Suffrutex erectus, ramosus, pedalis, pube stellatâ rubiginosâ undique densè tomentosus. *Rami* 4-anguli. *Folia* petiolata, cordato-oblonga, obtusa, crenata, rugoso-venosa, utrinque tomento stellato copiosè vestita, pollicem longa, semunciam lata; *floralia* vix cordata. *Petioli* angusti, 3 lineas longi, suprà canaliculati. *Verticillastri* terminales, pluri- (6–8) flori. *Bracteæ* adpressæ, lanceolatæ, mucronato-spinosæ, lanâ longissimâ molli albâ densè vestitæ. *Calyces* bracteis vix longiores, extùs albo-lanati: *fauce* pilosissimâ: *dentibus* brevibus, subulatis, mucronato-spinosis, apice nudis, uncinatis. *Corolla* subuncialis, calyce vix duplò longior: *tubo* glabriusculo, infernè angustato, supernè parùm dilatato, intùs fasciculis 5 pilorum aucto: *fauce* intùs glabrâ: *limbo* extùs tomento fasciculato-ramoso flavicanti subadpresso vestito; *labio superiore* galeato, margine truncato, emarginato; *inferiore* longiore, trilobo; *laciniis lateralibus* ovatis, obtusis, conduplicatis, suprà glabris; *intermediâ* orbiculatâ, integrâ, suprà glabrâ, margine parùm undulatâ. *Filamenta* compressa, inappendiculata puberula. *Antheræ* glabræ. *Stylus* glaber. *Stigma* bifidum; *lobo superiore* latiore, obtuso; *inferiore* acutiusculo, parùm longiore.

This plant, Mr. Fellows informs me, is common in mountainous woods in the northern parts of Lycia. It is evidently nearly allied to the *P. ferruginea* of Tenore, but its lanceolate, spinously mucronate, woolly bractes, simple filaments, and subulate, spinous, uncinate calycine teeth, essentially distinguish it from that species as well as from *P. armeniaca.*

Pinus carica.

P. foliis binis prælongis tenuissimis rectis margine denticulato-scabris: vaginis abbreviatis subintegris, strobilis ovato-oblongis rectis lævigatis: squamis apice rhomboideis depressis truncatis rimulisque radiatis.

Habitat in Cariæ montibus.

Arbor magna. *Ramuli* scabriusculi, fusci. *Folia* bina, erecta, recta, tenuissima, mucronata, nunc levitèr tortilia, lætè viridia, subtùs convexa, lævia, nitida, suprà canaliculata, margine denticulato-scabra, 6–7-pollicaria: *vaginæ* 2–3 lineas longæ, cylindraceæ, fuscescentes, annulatìm rugosæ, ore subintegro nudiusculo. *Squamæ stipulares* (folia primaria) lanceolatæ, acuminatæ, coriaceæ, spadiceæ, margine filamentoso-ciliatæ, basi diu persistenti. *Strobili* ovato-oblongi, obtusi, recti, lævigati, nitidi, spadicei, 3–4 pollices longi, diametro 2-unciales: *squamis* apice depressis, rhomboideis, planiusculis, transversè subcarinatis, rimulis radiatìm notatis, medio truncatis, areolâ transversè ellipticâ cinerascenti umbilicatis.

I have ventured to propose this as a distinct species, although, from its near relationship to *halepensis,* I think it not unlikely that it may prove to be only a remarkable local form of that species. It is chiefly distinguished from *halepensis* by

its much longer leaves and larger cones, the apex of whose scales are broader, and marked with numerous radiating fissures. The leaves are double the length of those of the *maritima* of Lambert, and the cones are larger and more oblong.

XLVII.—*Report of the Results of Researches in Physiological Botany made in the year* 1839. By F. J. Meyen, M.D., Professor of Botany in the University of Berlin.

[Continued from p. 407.]

In the large and splendid works on Fungi which have been published by M. Corda in the past year, we find some observations which are of interest as regards the physiology of these productions. In describing a mould* called *Gonatobotrys simplex*, he says, that in the lower vegetable orders we often see forms represent a lower form of a more highly developed species; and that in the meeting at Prague (1837) he had directed attention to a considerable number of such types which frequently form parallel series, and endeavoured to show that in the inferior Fungi especially mathematical combinations can be formed if symbols are substituted for the separate organs of the mould or fungus; and that each of the members of the series of combinations produced by the combination of these symbols represents one of those groups of forms which we have hitherto been accustomed to regard as types of genera. M. Corda promises to explain these series, both historically and theoretically as well as practically, in a separate work, and hopes that the moulds of the tropical regions may afford several new groups which will fill up the place of the now missing types. In this work M. Corda has also given a plate with figures of *Syzygites megalocarpus*, and a full description of the formation of the fruit, which, as is well known, is here accompanied by the phænomenon of copulation; he observed that the two pyriform warts from which the fruit is produced not only touch each other, but completely coalesce, so that the contents of both can mix as soon as the partitions between them are absorbed. After the junction of these two branches follows the formation of the fruit; in the middle of these connate branches are formed one or two cells, which represent the sporangiolum, which in a ripe state is covered with large angular warts. This sporangiolum contains a thick fluid consisting of oil-globules, molecules, and from two to five spores. Frequently the two branches do not join, and then a spherical sporangiolum is formed at the apex of one or even of both of them.

* Prachtflora der europäischen Schimmelbildungen mit 25 Tafeln, 1839. A notice of this has been given by us in vol. iv. at p. 200.

M. Corda never saw the sporangium of this curious fungus fall off or open, and the seeds when sown did not succeed.

Finally, M. Corda remarks, that the copulation of these fertile branchlets has been compared to that of certain Confervæ, but that this comparison, on a critical examination of both cases, does not appear to be very correct. I also have compared the copulation of *Syzygites* with that of the Confervæ, and after I have carefully examined all the kinds of copulation which have been observed in Confervæ and Closteriæ, I cannot imagine how M. Corda can make such a statement; it evidently arose from the fact that M. Corda has not examined the phænomena of copulation of the Algæ with as much diligence as he has those of the mould, for, particularly in Closteriæ, the phænomena are quite similar; and in the Spirogyræ I have also seen that the usual spore produced by copulation again appeared as a sporangiolum, and contained several smaller spores, &c.

More important for us are the contents of the third volume of figures of Fungi* which M. Corda has published; we find therein new researches on the genus *Æcidium*, which is not as yet correctly understood. M. Corda refers *Æcidium* to the true Gasteromycetes, on account of its peridium: he sowed the spores of *Æcidium Tussilaginis* on leaves of the Colt'sfoot, which were kept moist, or were immersed in water, and he often succeeded in making them germinate; they developed on the spore-skin, by means of extension, a wart, which became a cellular filament, producing threads in every direction, as is the case with the spores of all Fungi. By degrees a fibrous net, or tissue, is formed out of these threads, similar to that produced by the spores of Fungi, Algæ and Moss; these are said to be true germinative threads, and M. Corda says he has seen them penetrate through the stomata of the epidermis into the parenchym of the leaf, and then commence dividing into branches.

Botanists will readily perceive the importance of these statements: the propagation of the Leaf-fungi has not yet been observed, but a number of hypotheses have been invented to explain it; these will, however, all be done away with, if M. Corda's statement, that the germinative threads of the spores of *Æcidium* pass into the parenchym of the leaf through the stomata, is found to be correct. M. Corda saw, moreover, that the little heaps of *Æcidium*, with their cellular stroma, are fastened on laterally to one of the bundles of vessels in the leaf. These points are illustrated by excellent figures.

The larger half of the volume treats of the *Hymenomycetæ*, to which M. Corda reckons not only the *Helvellaceæ*, *Pezizæ*

* Icones fungorum, &c., tom. iii. Prag. 1839. Noticed by us at p. 145, vol. vi.

and *Tremellinæ*, but also the *Tubercularinæ* and *Coryneaceæ*: however, according to the later observations on the mode of production of the spores, it is absolutely necessary to separate the *Octosporideæ* from the true *Hymenomycetæ* with free spores. It is, however, to be desired that this family of Fungi should receive another name, for the sporangia of the large *Sphæriæ* are also filled with eight spores, and their appearance has much similarity with that of the sporangia of the *Peziza*, etc. In speaking of the *Pezizæ* we have a description of the formation of the spores, from which it appears that the spore-skin is formed round the drops of oil which are found with larger and smaller grains in the asci. Here we also have a new theory of the formation of cells, which the spores of the Fungi, according to M. Corda, represent.

M. Corda treats very circumstantially of the structure of the hymenium in the true *Hymenomycetæ*, and he endeavours to show that the honour of the first exact observations on this subject belongs to him; for in the winter of 1833-34 he had sent to the Academy of Sciences of Berlin a treatise 'On the Structure of the Spores of Cryptogamic Plants,' accompanied with many figures, in which both the free quaternate spores, the antheridiæ, the spore-cuticle, the spore-nucleus and the oily globules, are described and delineated. The greater number of the members of the Academy are said to have thought highly of this work, but the greatest microscopical observer of Germany declared these observations to be incorrect: the free quaternate spores were false; the antheridiæ (and partly also the basidia) were, according to his observations, eggs of insects, &c. In the former Reports for 1836, p. 51—55, and 1838, p. 167, I have given a historical view of the observations made in this department, and I mentioned M. Corda's discoveries as published in the 'Flora' of 1833; however, according to the above, M. Corda shortly afterwards published a new work (that read in the Academy), which certainly gives him the justest claims to the confirmation and extension of Micheli's observations; and if his assertions could be confirmed by a member of the above-mentioned Academy, they are certainly to be put before those of M. Léveillé; the latter, however, states that he had communicated his results ten years ago to Persoon and others*.

* [Ascherson appears to have been the first who made any general examination of the naked spores of Hymenomycetes. Insulated figures and observations were made by several who did not understand the full importance of the facts before them. Corda certainly had no general notions on the subject when he figured in 1837 the structure of *Coprinus*. In the same year analyses of several true Agarics are given by him in Sturm's Deutschland's Flora, which repeat still the generally received erroneous notions as to their structure.—Edit.]

In the description of the hymenium the three usual layers are mentioned, and a circumstantial description of the lacteous vessels which are found in some of the *Agaricini* is given; a splendid figure of these vessels, with the whole hymenium of *Agaricus fœtens*, gives the best information on this subject. In *Ag. fœtens*, says M. Corda, there is found between the cells of the two different cellular systems (namely, the layer of tubes and that of spherical cells) a third system, which is interwoven with the others, and which consists of perfect, branched and anastomosing narrow tubes, which have walls proper to them, and contain a milk-like, half transparent, white granular sap, which appears to move slowly in the direction of the tubes. M. Corda believes he may truly say that he first clearly described and delineated this vascular system in the Fungi, for the drawing which M. Schultz has given of *Agaricus deliciosus* is very confused and unnatural. These lacteous vessels pass through all organs and tissues of *Agaricus fœtens*; they are equally distributed, only the gills and the outer layer of the stipes appear to contain more of them. The tubes are clear, almost always of equal thickness, generally serpentine and much branched: and often the cells of the large-celled parenchym are deposited in rays around the lacteous vessels, and surround them for some distance with a cylindrical layer of cells. Where these vessels approach the surface of a gill they send out peculiar, long, blind (closed) branches, which form with their conical ends the outermost layer of the gill and hymenium. The structure and formation of the organs of fructification are then fully described: the female ones are called, according to Léveillé, basidia; they consist of the body, the spore-supporters (Sterigmata of M. Corda, an appellation which has, however, already been used.—M.), the contents and the spores. The formation is the same as given in the former Report, p. 54. "Every sporophore," says M. Corda, "produces always but one spore at once, and afterwards several one after the other, exactly in the same manner as the terminal points of the fertile flocci of the *Hyphomycetæ*." Whether this assertion is grounded on actual observations is not stated; and I must beg leave to doubt that the formation of spores at the point of the spore-bearer is repeated after the first spores have fallen off. The spores consist, according to M. Corda, of a cuticle, a nucleus, and of oily globules, and where the spores are terminal they have a conical, pointed or blunt perforated wart, and this opening has been formerly called Hylus, window, navel, etc. Spores with the hylus at the side are to be called *sporæ pleurotropæ*, and those which have the hylus in the axis, *sporæ trepanotropæ*; and M. Corda promises to show at a future period in what

relation an orthotropic ovulum stands to a trepanotropic spore, &c. The oil-globules in the spores are composed, according to M. Corda's analysis, of fatty oil in large quantities and an acrid ætherial oil.

M. Corda also asserts, that in 1833 he pronounced the antheridia of the fleshy Fungi to be anthers, and I have shown in my last Report, that these bodies were first mentioned as generative organs by Bulliard: M. Corda is quite wrong in saying that I stated these organs to be paraphysæ, for such an idea never entered my mind. We have, however, often drawn attention to the curious fact, that the so-called anthers, if they really do effectuate the fertilization of the spores, do not appear more frequently and constantly; and to this M. Corda replies, that there are whole families among the Cryptogams where only spores are found. We may, however, say that this objection does not apply to the Fungi, for we at present know that in those families where male organs have been found, they make their appearance in all genera and all species; in the Fungi on the contrary, and let us only consider the pileiform and fleshy Fungi, these organs do not appear regularly in two very similar species.

M. Corda moreover compares these fungus-anthers with the single pollen-grains of the higher plants, and not with the anthers, a view held probably by most botanists who have written on this subject; he calls them Pollinaria, a denomination which has already been used in quite a different sense. One statement of M. Corda is very remarkable and worthy of further examination, viz. that the *Boleti*, during the development of the anthers, have no trace of the basidia and of the formation of spores, and that these are principally formed when the anthers are almost fully developed. [In *Agaricus* and *Polyporus* I have formerly directed my attention to this subject, but have not observed anything which could lead to this conclusion; and in some species of *Boletus* it is not uncommon to find fully-developed anthers in old, decaying individuals.] M. Corda correctly remarks, that the paraphyses of the *Ascomycetæ* are not to be compared to the anthers of the above-mentioned Fungi. The contents of the anthers are composed, according to M. Corda, of a consistent jelly, which sometimes contains molecules, but sometimes has no distinguishable structure; it is emptied in drops through the point of the cellular sac, and then covers the external surface with a layer of gum, which is often slightly coloured; by means of this substance the spores adhere: whether however, says M. Corda, this fluid fecundates the spore, cannot be ascertained.

Mr. Berkeley* has examined the structure of the fruit-bear-

* Ann. Nat. Hist. Nov. 1839, p. 155.

ing organs in the *Trichogastræ* and *Phalloidæ*, and found that these groups also belong to the true *Hymenomycetæ*. If a young plant of *Lycoperdon* is cut through, the internal fleshy mass is found to be intersected by small, long, retiform, branched and anastomosing cavities, whose whole surface is covered by an hymenium, which is similarly constructed to that of *Boletus* and *Agaricus*, but does not possess a trace of those organs which have been called anthers. Mr. Berkeley thinks that the genera *Geastrum*, *Scleroderma*, *Batarrea*, *Tulostoma*, etc., have a similar structure. In *Phallus* very young individuals must be examined if we wish to find the hymenium; it appears exactly as in *Lycoperdon*, only the basidia appear all of them to carry spores. If there be more than four spores on one basidium the additional ones are placed laterally. Here, as well as in *Lycoperdon*, the basidia collapse and are not to be found at a later period.

In our former Report* we mentioned a treatise of M. Léveillé's which had been laid before the Philomathic Society at Paris in 1837; it is now published†, although apparently a little altered; moreover there are unfortunately no figures, which are absolutely necessary to illustrate M. Léveillé's views. M. Léveillé contends against the idea of Turpin, that the Uredines are produced from diseased Globuline, by which name M. Turpin means all sap-globules of plants, however different they may be in their chemical composition. Moreover M. Léveillé condemns the view of M. Unger according to which the Uredines are produced by a diseased affection of the respiratory organs; for, according to the author's observations, they are true fungi, among which Persoon placed them. When, says M. Léveillé, these productions are observed in a very young state, there are seen under the discoloured epidermis very fine colourless ramified filaments which are interwoven with each other. When a Uredo is formed, there appears in the centre of this woven mass a fleshy spot or point, which may be compared to a *Sclerotium*, &c. &c; one surface of this nucleus reposes on the parenchym of the leaf, the other is in contact with the epidermis, and is covered with pedunculated, or more rarely with sessile spores. As the fungus increases the epidermis is extended and bursts, and the spores are exposed. The *Æcidia*, although possessing a more complicated structure, have a similar process of development, which M. Léveillé describes in that of *Euphorbia*; the peculiar peridium

* Berlin, 1838, pp. 162, 163.

† Recherches sur le développement des Urédinées.—Ann. des Sc. Nat. tom. xi. part. bot. p. 5—16.

distinguishes this genus from *Uredo*, so that they cannot both be comprehended under the name of *Cæoma*. M. Léveillé remarks, that Fries has rightly observed the difference between *Uredo* and *Æcidium*.

M. Leveillé says the granules of *Uredo* are generally considered as spores, but observations to prove this are very rare: M. Prevost was the first who saw that a byssus-like tissue was produced from spores of *Uredo caries*, De C., when exposed to moisture, and M. DeCandolle has made the same observation. [Even if the production of germinal filaments from the vesicles of the bunt [Schmierbrand] has really been observed, which I have as yet not succeeded in doing, still my own observations on the production of the bunt in *Mays* (see Report, 1838, p. 162.) show that it is a diseased formation in the interior of the cells, and may be regarded as a true *Entophyte*.] M. Léveillé also mentions the production of the bunt in *Mays*, and says that it is also produced by ramified filaments which are short and jointed, and from these the brown spores separate themselves, &c. [Did M. Léveillé mention these observations in 1837?]

Finally, there is a division of the Uredines into three smaller families: 1. *Æcidineæ*, with the genera *Rœstelia*, Reb.; *Æcidium*, Pers.; *Peridermium*, Link, and *Endophyllum*, Lév. 2. *Uredineæ* with *Phragmidium*, Link; *Puccinia*, Pers.; *Uredo*, Pers.; *Podisoma*, Link, &c. 3. *Ustilagineæ* with *Ustilago*, Link; *Sporisorium*, Ehr., &c.

Mr. W. Valentine* has laid before the Linnæan Society his observations on the structure and development of the organs of reproduction of *Pilularia globulifera*: they contain much interesting matter, and it is to be hoped the treatise will soon be published with delineations.

M. Alexander Braun† laid before the Meeting at Freiberg his observations on the germination of the spores of *Marsilea quadrifolia*. The fruit of *Marsilea* he considers as a part of the leaf on the stalk of which it is seated. The nervation [Berippung] of this fruit-leaf is pinnate, and on the side-ribs are formed the placentæ which bear the sporangia, which are of two kinds, and each sorus is covered with a closed indusium, &c. According to this view, the formation of fruit in *Marsilea* is similar to that of the Ferns, and these, as well as the *Equiseteæ* and *Lycopodia*, would then bear their sporangia on the leaves, herein differing from the Mosses.

* Annals of Nat. Hist. June 1839, p. 260. Linn. Trans., vol. xviii. p. 483.
† Flora von 1839, p. 297.

M. Braun* has also communicated his ideas on the growth of the *Ophioglosseæ*, particularly with regard to the cellular body from which the leaves are produced. This body is said to surround the centre of formation, and within it the leaves are produced in regular spiral succession until they unfold, which they do in the fourth year in the case of *Oph. vulgatum.* The spike of *Ophioglossum* is axillary. *Botrychium* does not possess this inclosing cellular body, but the leaves have a sheath.

In the Report of 1837†, the observation of M. Martens was mentioned, according to which hybrid forms are found among the Ferns; the new hybrid which M. Martens has observed, was called by Bory de St. Vincent *Gymnogramma Martensii*, and was said to be intermediate between *G. calomelanos* and *G. chrysophylla.* Mr. J. Riley‡ of Nottingham has made an excellent reply to this assumption of M. Martens, although he appears not to know that many botanists believe that the anthers of Ferns have been discovered, a subject which was discussed in the former Report, 1836, p. 104. Mr. Riley considers this supposed hybrid as *G. sulphurea*, Desv., and gives very sufficient reasons for supposing the formation of hybrids in the Ferns as altogether improbable.

Mr. G. Dickie§ has published some remarks on the appearance of amylum in plants; he notices particularly that in the Lichens; but it was unknown to him that many decisive observations have been already made on this subject. Mr. Dickie assumes that all those parts of Lichens which are coloured blue by iodine are amylum, and he found that even the sporangia (thecæ) are coloured blue; he compares the sporangium, with the spores which are produced therein, with the structure of the amylum globules; this however is founded on Raspail's description of the structure of Amylum, which is erroneous.

M. G. Körber|| has chosen as the subject for his inaugural dissertation a very circumstantial description of the green cells of the thallus of Lichens; these are the peculiar cells which Wallroth calls gonidia, and Meyer germinal grains.

The author has given the various statements of the two above-mentioned lichenologists with all possible brevity and clearness, has criticized them, and sometimes added his own views, which are grounded on observations of nature. The *gonidia* were observed in three different stages: 1. as *gonidia*

* Flora von 1839, p. 301.

† See Mr. Francis's translation: London, R. and J. E. Taylor, 1839, p. 81.

‡ Reply to M. Martens's Paper on the Hybridity of Ferns. Proc. of the Bot. Soc. of London, 1839, p. 60.

§ Annals of Nat. Hist. 1839, p. 165.

|| De Gonidiis Lichenum. Diss. Inaug. Berolini, 1839.

synthetica in statu primario seu primitivo, that is, when they were still in the thallus in their natural position; 2. as *gonidia synthetica in statu secundario,* i. e. when they have risen above the surface of the thallus and form soridia, the appearance of which in the different genera is described. Finally, 3. the *gonidia* are considered as reproductive organs. What Wallroth and Meyer have observed on this subject is correctly stated to be not satisfactory; and the author describes his own experiments, which were made with great care in order to observe the germination or development of the *gonidia,* which however were all unsuccessful. It is to be hoped that M. Körber will continue his observations, for with the help of our improved microscopes, there is doubtless much in this field which remains to be discovered.

Mr. Valentine* has communicated to the Linnæan Society his observations on the development of the organs of fructification of Mosses; they contain, however, nothing that has not been already made known. Mr. Valentine draws attention to the analogy between the spores of Mosses and the pollen-grains of higher plants.

Dr. Stiebel† has written a treatise on the *Oscillatoriæ* which is full of discoveries. According to his observations, the *Oscillatoriæ* are not only animals, but they possess also perfectly-formed heads; they have a mouth, and when the *Lysogonium,* which Dr. Stiebel has described and delineated, lies on its back, it opens its mouth so that it assumes a triangular form. Out of this mouth there comes a rostrum, which moves rapidly in the water and creates a vortex; it moreover possesses muscles, which spring from the lateral margin of the animal. Generally at one end, or in young animals even at both ends, are seen very peculiar tentacula or feelers which execute a motion like that of oars; they assume different forms for the support of the rostrum and determinate purposes, and exhibit a nerve. In the member which is connected with the head-end is a kind of stomach with black hooks, which are perhaps masticatory organs, and the bag of the stomach is continued on like a rectum. The animal appears to live upon small monads. Moreover the animal has at both ends projecting shining globules with black dots; these are the eyes, which can be turned round like snails' eyes, and have a nerve. The *Lysogonium* did not appear to have two rostra, although

* Annals of Nat. Hist. 1839, p. 456. Linn. Trans., vol. xviii. p. 499.

† Uber den Bau und das Leben der grünen Oscillatorie *Lysogonium tæniodes* Stieb.—Museum Senkenbergianum III. No. I. Frankfurt a M. 1839, pp. 79—90.

it has two heads. The propagation takes place in several ways; sometimes the first joint is as it were vomited (ausgespieen), &c. The description of the muscles of the eyes and feelers, as also of the nervous system, Dr. Stiebel intends to give at a future period.

I have perused the above treatise* several times, but cannot determine whether it is meant as a hoax or in earnest—the former appears most probable; for with any microscopical practice the above observations could certainly not have been made with so excellent an instrument as Dr. Stiebel possesses. Notwithstanding the wonderful description, it is quite evident that *Lysogonium* is only an *Oscillatoria* whose structure M. Stiebel has altogether mistaken; he did not even see the fine rings which lie between the spores like the so-called intercellular substance, and which, when the spores escape, either separate or still adhere to each other. These rings however have led Dr. Stiebel quite astray, even the eyes have arisen out of them. What other philosophers have considered as the head of *Oscillatoriæ* Dr. Stiebel has not seen, for in *Lysogonium*, which appears to be *Oscillatoria limosa*, there is nothing of the kind.

In the Report for 1835 I have already mentioned the genus *Chionyphe* which M. Thienemann has observed in granular snow. We have now a full description of those interesting plants, which must be classed with the *Algæ*, but decidedly belong to different genera†. Three species are described; namely, *Chionyphe micans*, *nitens* and *densa*, and the whole genesis of *C. nitens* is given. The development of this plant is quite similar to that of other jointed Confervæ. M. Thienemann observed at first on the snow simple spherical vesicles, which extended lengthwise and became divided in halves by a partition, after a lively movement of previously invisible atoms had taken place in their interior. The halves of the divided vesicle kept increasing, and constantly when the molecular motion again appeared, another division took place, but subsequently only the terminal cell of each side was divided, while the central ones merely extended themselves.

Finally, a lively molecular motion arises in these terminal cells; the atoms enlarge and appear like vesicles which cause the terminal cell to swell, so that when ripe it forms a head filled with germinal globules. I must remark, that the formation of the partitions during the above-mentioned molecular motion, as well as the production of the spores by the enlarge-

* The figures are very beautifully executed, and can scarcely be altogether imaginative.—Ed.

† Uber ein neues Geschlecht von Schneepflanzen *Chionyphe*.—Nov. Act. Acad. c. L. C. vol. xix. part 1. pp. 20—26.

ment of the atoms in the terminal cells, does not agree with previous observations made on this subject, and that a repetition of them is therefore necessary.

M. Morren* has also observed infusoria in the interior of the bags or tubes of *Vaucheria clavata*; it was *Rotifer vulgaris*, and he therefore believes that the animal formations which M. Unger had also seen in this plant, may also have belonged to the same animal. I may here remark, that the appearance of animals in the interior of the *Vaucheriæ* was first observed by Vaucher; they were the *Cyclops Lupula*, Müll.; and in 1834 M. Wimmer observed living infusoria in *Vaucheria*, which, from the short description, appear to have been Radiatæ; even the eggs of this animal were observed.

How these animals got into the interior of the *Vaucheriæ* has not been observed by any one: indeed M. Morren asserts that his plants were not at all injured; there were no openings in them through which the animal could enter. M. Morren observed the lively motion of the *Rotifer* in the interior; he saw how it ran along the sides, pushing the green matter away from it, &c.; he saw the deposition of eggs and the increase of the animals, and it appeared to him that they then descended in the tubes and remained in the new mass, where they cause, like parasitic bodies, those excrescences on the sides of the *Vaucheriæ*, just in the same manner as insects produce the gall-nuts. Once M. Morren opened the *Vaucheria* and let the animal come out, but it tried to return into its old prison.

M. Wimmer† has continued his observations on the above subject as well as on the development of the spores of *Vaucheria clavata*, and will shortly publish his results.

In the Carlsbad Almanac for the past year there is a paper by M. Corda:—"Observations sur les Euastrées et les Cosmariées." The greater part is full of violent replies to the numerous attacks which Ehrenberg has made on M. Corda in his large work on Infusoria‡. M. Corda is much dissatisfied with the manner in which his systematic labours, his accurate observations, and his accurate drawings, as he denominates them, have been treated by M. Ehrenberg; and he endeavours

* De l'existence des Infusoires dans les plantes.—Bullet. de l'Acad. R. de Bruxelles, VI. No. 4. Ann. Nat. Hist. vol. vi. p. 344.

† Jahresbericht der schlesischen Gesellschaft für vaterländische Kultur, 1839, p. 123.

‡ I must here remark that these *Euastreæ* and *Cosmarieæ* are not Infusoria, as M. Ehrenberg also states, but simple *Algæ*, as I have sufficiently proved in my latest work to all those philosophers who are acquainted with the structure of *Algæ*. M. Corda up to the winter of 1833 also held them to be plants.

to show that Ehrenberg has been guilty of the greatest arbitrariness. In the last nine pages we have a view of the genera which M. Corda has made for his family of the *Euastreæ* and *Cosmarieæ*; and all botanists who have occupied themselves with observations on this subject, will be somewhat surprised at the by no means small number.

[To be continued.]

XLVIII.—*Descriptions of new or little known* Arachnida. By Mr. Adam White; Assistant in the Zoological Department of the British Museum.

Having been favoured by Mr. Darwin with the whole of the extensive collection of Arachnida, made by him on the voyage of H.M.S. Beagle, I intend describing them occasionally in this journal, as well as several others from Van Diemen's Land, collected by Mr. Gunn. From Mr. Bracy Clarke I have received a collection of spiders made by him in Switzerland during his travels and residence there in 1798, along with MS. notes drawn up at the time; Mr. Swainson, before setting out for New Zealand, also kindly gave me a bottle of spiders from St. Vincent's, collected by the late Lansdowne Guilding. They are all preserved in spirits of wine, as spiders should always be if possible, and, to some of Mr. Darwin's, notes are occasionally added, which I have that gentleman's permission to extract from his copious manuscript journal*. I describe them without any systematic order, but having necessarily numbered each species, intend afterwards giving a classified index: the descriptions are in many instances prolix, and I have in most cases given the *generic* character of each species. I have done this because, at present, I am unwilling to propose new names if I can possibly refer the species I describe to any of the established genera. I need hardly say, that in spiders the colours are so fugitive, that unless notes or even drawings are taken from live specimens, but little dependence is to be placed on the colours assigned in descriptions taken from the best-preserved specimens†. Travellers should be particular in doing this, as well as in taking notes of their habits, whether land or aquatic; whether they hunt for their prey by running after it—jumping upon it—or whether they conceal themselves in holes,

* These notes, there is no use saying, were always made amid the hurry and bustle of a campaign in which annulose animals formed but a small part of the subjects of research. I prefer giving them as I find them, as there is a *freshness* about them which would be *rubbed off* were I to attempt to improve them.

† For an example, see the first description (*Linyphia argyrobapta*).

tubes, or cells made by themselves, and should also describe the nature of these abodes when possible; whether they wander about without any fixed residence, walking or running sideways; whether they make a web or threads for entrapping their prey, or whether they are sedentary, constructing close webs, or extending them with regular geometric accuracy or in irregular large meshes*. Spiders are frequently found in a very perfect state in several of the nests of the fossorial Hymenoptera. Mr. Abbot mentions, in the notes accompanying his unpublished drawings of Georgian *Annulosa*, that *Pelopæi* are the best spider-collectors he ever met with, and save the arachnologist a great deal of trouble, as he has frequently found, in the nests of these insects, species he has been unable to meet with elsewhere,—the specimens in the most beautiful condition, as the Spider-wasps do not kill, but in some way paralyse with their stings the destined food of their young; and were British arachnologists to look into the nests of our native *Pompili*, "rare captures" might often be made. As the note alluded to is very interesting, I transcribe it here *verbatim* from the original in the British Museum. Those who have consulted Walckenaer's first volume, and know how much science is indebted to Abbot for his discoveries of new species of Arachnida, will excuse its length. Drury (Ill. i. pp. 105, 106) and Darwin (Journal of Researches, p. 40) mention similar instances. "*Sphex lunata*, Fab. (*Pelopæus lunatus*, Fab. Syst. Piez.), called in Savannah Black and Yellow Mason, and likewise Dirt-daubers: they make oblong cases of clay, which they plaster in layers to roofs, ceilings, and other convenient places; when finished they lay an egg inside at the end, then fill it with spiders and plaster them up. The worm (larva), by the time it eats them all, is full fed, and spins round itself a thin case like gold-beater's skin, in which it changes into chrysalis; it begins to build in May and continues all the summer. What is remarkable, they have the art to embalm these spiders alive, or rather enchant them. Upon opening one, the spiders are alive, but unable to walk or make the least resistance, being just able to move a little, sometimes a leg, and they appear plump and (of a) fresh colour. I imagine they do this by stinging the spiders: this is a wonderful property and provision of nature to provide the worms with fresh and proper food as long as is needful. Upon putting some of these spiders in a box, they continued plump and fresh several days before they began to alter. One

* Remarks of this kind or of a similar nature would often prove extremely interesting, as the Baron Walckenaer has shown that in most cases the family may be ascertained by the habit, and *vice versâ* the habit by the family.

fly continues to build several cells alongside and upon each other: they destroy an amazing number of spiders; they commonly put all, or the most part of one particular species together in one cell, many of them of very rare species, and such I imagine must live chiefly on the tops of branches of the loftiest trees, as I could never afterwards meet with these specimens of spiders. Upon opening several of these cases at once, it affords (as you may judge) a most curious and pleasing sight—such a large number of spiders of the most beautiful colours and rarest species. Could it be possible still to continue to preserve them in their beauty and freshness, they would make a wonderful collection of natural history." It is much to be desired that the other volumes of Baron Walckenaer's elaborate work were published*. I may add, that specimens of all the species here described, unless otherwise intimated, will be found in the collection of the British Museum, and that I have made figures of most of them, which I intend to publish hereafter.

1. *Linyphia* (*Leucauge*) *argyrobapta*, n. s.

Brownish yellow; chelicera darker, at end blackish brown; claws black. Abdomen silvery, with five brownish black (when alive red) longitudinal lines all meeting at the end, the middle one alone taking its origin from the base, and having a lineolet of the same colour extended nearly to the lateral black line, and two small approximating parallel lines directed backwards, arising from about the middle, and extending to the irregular line on each of its sides; the end of the abdomen, where all the lines meet, is brownish black, and there are two distinct silvery spots; the body beneath is brownish black, with a whitish line on each side, and a dot beneath it.

Chelicera vertical, oblong, cylindrical, shining; first joint with one or two teeth at end, upon which the long hooked claw closes inwards; this claw is straight at the base and then hooked.

Eyes eight, on two transverse lines; four placed in the middle, the two posterior further apart; the side eyes of last lines are in pairs.

Maxillæ dilated at end, the outside with a few hairs.

Palpi slender; fifth joint as long as second, ending apparently in a claw, and hairy.

Mentum small, not very distinct from the heart-shaped sternum.

Cephalothorax depressed, narrowed in front, dilated on the side, sinuated behind, with a deep impression beyond the middle, in front of which are two impressed lines directed sideways, and extending forwards to the base of the narrowed part.

* July 2. Since this paper was written the 2nd volume of Walckenaer's work has been published.

Abdomen oblong, smooth, or, at most, only shagreened, with four distinct spinnerets.

Legs, at least first two pairs, very long.

Our specimen, in this respect, was much mutilated: in Mr. Darwin's MSS. I find that the first pair of legs is much the longest, then the second and fourth, and that the third is shortest.

"Web very regular, nearly horizontal, with concentric circles; beneath, but sometimes above, the concentric web, there is an irregular or thin tissue of network; the animal rests in the centre, on the inferior surface: abdomen brilliant; the red colour like a ruby with a bright light behind." The subgeneric name is one proposed for it in Mr. Darwin's MSS.—Brit. Mus.

Hab. near Rio de Janeiro. May 1832. Charles Darwin, Esq., F.R.S., etc.

2. *Linyphia* (?) *leucosternon*, n. s.

Body and sternum shagreened; the sternum and body above grayish white; body beneath grayish black, spotted with white (there are four principal spots in the middle).

Cephalothorax, palpi and legs yellowish, the joints of the latter darker; cephalothorax behind margined with whitish; the sides hairy: claws of chelicera port-wine colour: eyes black.

Chelicera short, swollen, smooth, nearly of equal breadth throughout, with a few (3) teeth inside at the end, and armed with a short strong claw folding inwards.

Eyes eight, not very unequal in size, arranged in two transverse lines, the first bending outwards and shorter than the second; the lateral eyes are the closest and oblique; the two central of each line form nearly a square.

Maxillæ somewhat spatulate.

Palpi with the second and fifth joints nearly equal, the fifth being somewhat hairy at end, and apparently terminating in a short claw.

Mentum semioval.

Sternum cordato-sagittate.

Cephalothorax narrowed and truncated in front, dilated and nearly as broad as abdomen behind; this is of a long, oval shape, overlapping the cephalothorax at the base. The legs are long and slender; first pair the longest, then the second, the third being much shorter than the fourth.

Spinnerets distinct.

Hab. Brazil, near Rio de Janeiro. C. Darwin, Esq.

3. *Epeira* (*Singa**) *leucogramma*, n. s.

Cephalothorax ferruginous; space about the eyes dark brown; body and legs grayish brown, darkest on the sides of the body; body above with three white longitudinal lines proceeding from the base and terminating just before the tip; the middle one

* A subgenus founded by Koch, with the beautiful European *Epeira Herii* of Hahn as the first species. (Uebers. des Arachnidensyst. p. 6.)

somewhat interrupted; all three are margined with black, which is deepest (thickest) at base; beneath with two abbreviated, somewhat distant, longitudinal white lines margined with black; legs ringed with black.

Chelicera vertical, rather longer than they are broad (at base), smooth, somewhat swollen, armed with an incumbent short claw.

Eyes eight, arranged transversely in two lines; the first very short, containing two eyes; the second, with two in the middle, forming nearly a square with those of first line, which square is on a projection of the cephalothorax; the two lateral eyes are so close together that they seem as one; they are placed somewhat behind the middle pair, and are somewhat further removed from them than these are from each other.

Maxillæ short, rounded; base giving insertion to palpi, which are weak, and have the fourth and fifth joints nearly equal; (fifth armed with a minute claw ?).

Mentum short, rounded, distinct from the heart-shaped sternum.

Legs short; last pair the longest; third shorter than the first and second, which are nearly equal in length.

Cephalothorax longish, narrowed in front, and not much more than half the width of the abdomen, which is of a fine oval shape.

Hab. Brazil, near Rio de Janeiro. C. Darwin, Esq.

4. *Tetragnatha bicolor*, n. s. Type of genus Anelosimus in Thal. Ve Sieoff. Trans. N. 2. p. 1743.

Legs, cephalothorax and palpi brownish yellow (in some the palpi are dark brown); body shagreneed above, griseous, with three or four indistinct brownish lines; a lighter band on the side, beneath darker; two greenish gray lines run down the middle, parallel to each other till just before the spinnerets, where they somewhat converge; eyes black.

In the male the abdomen is nerved or shagreened with brownish, and is not so distinctly marked beneath; a brownish line, somewhat interrupted, and emitting a few equal, narrow, brown lineolets directed backwards, runs down the middle.

Chelicera large, very prominent, loose, smooth, subcylindrical, as thick at the end as at the base, and only slightly gibbous on the inner edge, which is furnished with a double row of tooth-like processes, upon which the strong and long claw folds inwards; this claw is more than half the length of the first joint, and at base is straight, and then suddenly bent.

Eyes eight, placed on two lunated parallel lines: the two intermediate of the first line smallest and closer to each other than they are to the side-eyes of the same line, while the two intermediate eyes of the second line are somewhat more distant from each other than they are from the side-eyes of the same line.

Maxillæ oblong, somewhat bent outwards at the end, which makes the outer margin sinuated; the inner margin is clothed with a

line of short thick-set hairs; the maxillæ approximate by their inner edge.

Palpi slender, with the second joint curved, and rather longer than the fourth and fifth, which are nearly equal; the last joint seems to end in a claw, and is rather hairy: in the male the fifth joint is dilated on its under side; at base there is a smooth, roundish, globular process; sternum longish heart-shaped, sides somewhat irregular.

Cephalothorax of a long, slightly depressed oval shape, which is as broad as the abdomen at base.

Abdomen long (two-and-a-half times the length of the cephalothorax), narrow, subcylindrical; at base somewhat swollen, the swollen part overlapping the end of the cephalothorax; at the end it tapers abruptly, being roundish and slightly recurved: it is covered with close and short hairs.

Legs slender; first pair the longest; second as long, if not a little longer than the fourth; the third pair is very short, half the length of the second; one of the joints is somewhat swollen and curved.

Hab. Van Diemen's Land. R. Gunn, Esq.

Walckenaer figures two species, *argentea* and *zorilla*, both with a longish oval body. Guérin (Encycl. Méth. x. *sub voce*) alludes to two or three other species of this genus, from Africa and America, and Koch describes two others in his 'Uebersicht,' (p. 5); but this is, I believe, the first species described as coming from Van Diemen's Land. As will be seen in the description, there are some characters which would constitute it, at least, another section of Latreille's genus, if not a subgenus.

5. *Eripus heterogaster*, Walck. *Thomisus heterogaster*, Latr. Guérin, Iconogr. Arachn. pl. I. fig. 4.

"Evidently, by its structure and habits on the leaf of a tree, this species is a Laterigrade; it differs, however, most singularly from that tribe, and is, I think, a new genus.

"Anterior eyes red; maxillæ rounded, inclined; mentum thinly arrow-shaped; chelicera powerful, with large aperture for poison; abdomen encrusted with five conical peaks; thorax with one small one; crotchets to tarsi very strong.

"Colour snow-white, except tarsi and half of leg bright yellow; the tops of the abdominal points and line of eyes black: it must, I think, be new. Taken in the thick forests near Rio de Janeiro, May 1832." Darwin's MSS.

Salticus (*Homalattus**) *pustulatus*, n. s.

Upper side black, with greenish reflections.

Eyes eight, on short elevations of thorax; may be considered as placed on three lines, two of which are approximate, the third

* *Homalattus*, a new subgenus, now proposed for the first time; the legs are unfortunately destroyed.

being distant; the first line, which is somewhat bent, contains four eyes, placed on the front margin of the cephalothorax at nearly equal distances from each other; the two intermediate eyes are much the largest. The second line contains two very minute eyes, somewhat removed from the edge of the thorax; they are placed rather nearer the outer eye of the first line than the outer is to the intermediate; the third line contains two eyes, one on each side the margin of the thorax, the space between the outer eye and the first line being equal to the distance between the outer eyes of the first line.

Cephalothorax flat, transverse, not so wide as the body, covered like it with papillæ.

Abdomen as broad as long; in front straightish; behind somewhat pointed, the sides rounded; it is flat and compressed, and somewhat convex above.

Hab. Sierra Leone. Rev. D. F. Morgan.—Brit. Mus.

Pholcus geniculatus, n. s.

Body above yellowish, with at least twelve blackish brown spots, eight in the centre, arranged in pairs, and decreasing in size as they approach the apex: sternum and broad line down the centre of body: beneath blackish brown: legs reddish yellow; at the first joints ringed with blackish and pale whitish yellow; last joint pale, without two blackish rings.

Maxillæ of a long triangular shape, and almost meeting over the mentum; the palpi proceed from the nearly right angle at base, and have the terminal joint much shorter than the fourth and second, which are almost equal in length.

The mentum seems somewhat square.

Cephalothorax nearly circular, rather broader than long, somewhat truncated behind, and deeply impressed in middle; it is as wide as the longish oval abdomen: legs very long and slender, nearly smooth, except last joint; first longest; third shorter than second and fourth, which are nearly equal.

Hab. Brazil, near Rio de Janeiro. C. Darwin, Esq.

XLIX.—*Additions to the Fauna of Ireland.* By Wm. Thompson, Esq., Vice-Pres. Natural History Society of Belfast.

Of the few vertebrate animals treated of in the present communication, one only can be announced with the certainty that is desirable, as Irish: the others are noticed to induce further attention to them, and at the same time to enable any one interested in the subject to form his own opinion respecting the propriety of their introduction, even with doubt, into the Fauna.

Mammalia.

Mus messorius, Shaw? Harvest Mouse. May 12, 1838.—Mr. Adams, gamekeeper at Shane's Castle Park (co. Antrim), mentioned

to me what he had heard of a remarkably small kind of mouse and its nest; the description of which would apply to this species. The nest was built nearly as high from the ground as the narrator's knees, and suspended between stalks of wheat, in a field of this grain: the old animals scarcely bent the stalks of wheat when running up them. The observer, a schoolmaster and farmer, resident within a mile of Shane's Castle, related the above to Mr. Adams as an extraordinary fact which had come under his notice last autumn.

Aves.

Falco Groenlandicus, Linn., Hancock. Greenland Falcon. In a letter from John Vandeleur Stewart, Esq., dated Rockhill, Letterkenny, Feb. 3, 1837, I was favoured with a minute description of a bird in his collection, believed to be an Iceland Falcon. At the meeting of the British Association held at Newcastle in 1838, Mr. John Hancock of that town read a paper (admirably illustrated by specimens in various states of plumage) with the view to show that the Iceland and Greenland Falcons are distinct species. This was subsequently published in the second volume of the 'Annals of Natural History.' On referring to the description of Mr. Stewart's bird, I felt certain that, according to Mr. Hancock's views, it must be the *F. Groenlandicus*, and having submitted the description to this gentleman, I had the satisfaction of receiving his testimony to the same effect.

Pyrrhula Enucleator, Temm.? Pine Bullfinch. In the manuscript journal of that eminent naturalist, John Templeton, Esq., is the following note.—"December 20, 1819. Yesterday heard from Mr. Montgomery of Belfast [a discriminating ornithologist], that Mr. Bradford had received a specimen of the *Loxia Enucleator* which was shot at the Cave-hill [vicinity of Belfast], and on showing the figure in the Naturalist's Miscellany, he recognised it to be the bird."

Coracias garrula, Linn.? Roller. For some years I have had a note from Mr. R. Ball to the effect that—In the middle of September 1831, when he was walking through the demesne at Carton—the seat of the Duke of Leinster—his attention was attracted by a bird pursued by a great number of Rooks, which, instead of flying off to avoid them, continued for a considerable time, or so long as he had patience to remain, to dash in amongst them apparently for the sake only of annoyance. From the size, brilliant plumage, and singular flight of this bird, my friend was satisfied of its being a Roller. Mr. Walker of Granby Row, Dublin, states that one of these birds, shot in the county of Sligo some years ago, was preserved for a relative of his who resides there. Another Roller has been mentioned to me as obtained in the South of Ireland some years since, but as yet no example of the bird unquestionably killed in this island, has to my knowledge come under the inspection of the naturalist.

Amphibia.

Lissotriton palmipes, Bell? Palmated Smooth-Newt. On questioning Mr. William McCalla of Roundstone, Connemara (a most

intelligent collector of objects of natural history), respecting the species of Newts observed by him, he replied—"I am positive of there being two species of *Triton* in this country, one of which is the *T. punctatus* of Jenyns's 'Manual,' and the rarer with us; the more common species is by far larger and of a richer colour; it is nearly double the size of *T. punctatus*; the crest is far larger and is not notched; the feet are webbed. To convince you that I have not confounded the young and adult of the same species, I may state that I observed them in the breeding season, and met with females of both species." A fair inference from these remarks, I think, is that *Lissotriton palmipes* is the animal alluded to. My correspondent had not seen Mr. Bell's work on British Reptiles.

Pisces.

Scomber maculatus, Couch? Spanish Mackerel. Mr. McCalla having mentioned the occurrence of this fish on the coast of Connemara, replied to my queries as follows:—"The fish which I consider to be this, is found with the Mackerel, and, in some seasons, not uncommonly. It is known by the name of Spanish Mackerel, which was no doubt first applied to it here by the Coast Guard, many of whom have been in the navy. I have not seen any specimens of *S. maculatus* this year (1840), but on carefully looking to the characters given by Couch (Jenyns's 'Manual') am of opinion that it is the above species. I am quite positive that we have two species of *Scomber* on this coast. *Caranx trachurus* has been scarce here this year."

Silurus Glanis, Linn.? Sly Silurus. That this species has in a single instance been taken in Ireland I am disposed to believe on the following testimony. On inquiry (October, 1840) of William Blair, who has for many years been fisherman, etc. at Florence Court, whether he had ever met with any rare fish, he described an extraordinary one, of which he could never learn the name, that he took twelve or thirteen years ago in a tributary of the Shannon, near its source, and about three miles above Lough Allen. His description was so graphic and particular, that Lord Enniskillen on hearing it immediately suggested its applicability to the *Silurus*, and on Yarrell's figure being shown to the intelligent captor of the specimen, he at once identified it as in all respects representing his fish, except in the head and mouth not being large enough. Professor Agassiz, who was present, on being appealed to, stated, that these parts were certainly not represented of sufficient size in the figure. The fish was seen struggling in a pool in the river after a flood, and "with the long worm-like feelers from its mouth;" and its general appearance was looked upon as so hideous that the persons who first saw it were afraid to touch it. The specimen was at least $2\frac{1}{2}$ feet in length, and 8 or 9 lbs. in weight. Although unfortunately "lost to science," it, for two or three years, or until the skeleton fell to pieces, adorned a bush near the scene of its death. The species was not known as an inhabitant of any of the neighbouring waters by the persons of the district.

The distribution of the *Silurus Glanis* on the continent of Europe is somewhat anomalous, as I learn from M. Agassiz. In Central Europe it is found in the lakes of Neuchatel, Bienne, and Morat only:—in no other lakes or rivers connected with the Rhine does it occur. It inhabits the rivers flowing into the Baltic and Black Sea.

Mollusca.

Tritonia bifida, Flem., Brit. Anim.

Doris bifida, Mont., Linn. Trans., vol. xi. p. 198. t. 14. f. 3. August 25, 1840.—An individual of this species taken by Mr. Getty and Mr. Hyndman, when dredging in Belfast Bay, was brought to me. It agrees critically with Montagu's description, except in the following points. There are just 12 appendages on each side, three of which are larger than the rest, but placed at unequal distances from each other on both sides, and not opposite as shown in Montagu's figure. The colour is better defined than in the figure; the marginal line, whence the appendages issue, is strongly marked and reddish, as they likewise are; foot plain flesh-colour.

The animal is extremely agile, and *planaria-like* is one moment twice the length it is the next; it often moves about with the foot upwards, and in its motions several times had the long tail thrown quite under the head.

Melibœa fragilis, Forbes, Malacologia Monensis, p. 4. pl. 1. fig. 4. July 20, 1840. Three examples of this species were taken on *Antennularia antennina*, dredged in Clew Bay (co. Mayo), by Mr. R. Ball, Mr. Forbes, and Mr. Hyndman.

Eolidia Zetlandica, Forbes, Athenæum, 1839, p. 647. July 29, 1840. This species was taken by Mr. Forbes and myself between tide-marks at Lahinch, county Clare.

Euplocamus pulcher. (See Annals Nat. Hist., vol. v. p. 91. *note*.)

Tergipes pulcher, Johnston, Mag. Nat. Hist., vol. vii. p. 490. f. 59.

Triopa claviger, Johnston, Annals Nat. Hist., vol. i. p. 124. At the same time with the *Eolidia Zetlandica*, an individual of this species occurred to us.

Chiton lævigatus. Obtained in Strangford Lough by Mr. Hyndman and myself. On oysters brought to Belfast market from Carlingford and Greencastle (co. Londonderry), W. T.; Bangor, co. Down, Mr. R. Patterson.

"*Pleurobranchus plumula*. Malbay (co. Clare), very rare," W. H. Harvey, Esq.

Turritella subtruncata.

Turbo subtruncata, Mont., p. 300. t. 10. f. 1. Of this species a single specimen was obtained at Bundoran (co. Donegal), in 1840, by Mrs. Hancock.

Rissoa calathisca. Among shell-sand which I obtained at Bantry Bay in 1834, was an individual of this species.

Rissoa rupestris, Forbes, Ann. Nat. Hist., vol. v. p. 107. pl. 2. f. 13. Dublin coast, T. W. Warren, Esq.; North-east coast, Mr. Hyndman and W. T. Not rare.

Lacuna rufa. Belfast and Strangford Loughs, Mr. Hyndman and W. T. Rare.

Brocus striatus, Brown's Illus., pl. 1. f. 13. Among shell-sand brought from Bantry Bay in 1834, W. T.

Lima subauriculata. Two odd valves dredged in Strangford Lough, in Aug. 1837, by Mr. Hyndman and W. T.

Modiola tulipa, Lam. A shell so named by Mr. Forbes was obtained in Belfast Bay by Mr. Hyndman.

——— *Gibbsii,* Leach. Obtained by dredging, etc. in Clew Bay (co. Mayo) during an excursion made to the west of Ireland in July 1840, by Mr. R. Ball, Mr. E. Forbes, Mr. Hyndman, and myself.

Crenella decussata.

Mytilus decussatus, Laskey, Wern. Mem., vol. i. p. 394. pl. 8. f. 17. A few odd valves dredged in Strangford Lough in Aug. 1837, by Mr. Hyndman and W. T. Captain Brown has applied the name of *Crenella elliptica* to this species.

Mactra cinerea, Mont. Magilligan and Portmarnock, Mr. Hyndman.

——— *elliptica,* Brown. Portmarnock, W. T.

Donax rubra, Mont. In shell-sand from Portmarnock. Bundoran, Mrs. Hancock.

ZOOPHYTA.

Hydra viridis, Linn. Obtained at Bandon (co. Cork) by Mr. Geo. J. Allman.

Actinia viduata, Mull., Zool. Dan. Observed between tide-marks at Lahinch (co. Clare) by Mr. Forbes and myself. We consider it distinct in species from *A. mesembryanthemum.*

Anthea cereus, Johnst. Gærtner, Phil. Trans., vol. lii. p. 78. t. 1. f. 1. In September 1835, I made a note of this species as being the most common *Actinia* at Ballyhome Bay (co. Down), where it was gregarious, forming in some places a continuous fringe round large rock-pools and stones, exposed to view at low water. In such quantity it is not now to be seen there, having become gradually scarcer since the period mentioned. In Dublin Bay and on the western coast this species likewise prevails. It is commonly of a dull ash-colour throughout, but wherever I have remarked it, some few individuals were to be found of a green colour, with the tentacula partially or wholly red. The *A. cereus* is doubtless one of the species mentioned under another name by Mr. Templeton as found at Ballyhome Bay (Mag. Nat. Hist., vol. ix. p. 303.), but in uncertainty which of his should be referred to, I have thought it better to notice the subject again.

Cellepora ramulosa, Linn. Johnst., Brit. Zoop., p. 274. pl. 32. f. 4, 5. Obtained at Youghal by Miss Ball; Portmarnock, 1835, W. T.

Cliona celata, Grant. "In perforations of the shell of the oyster (*Ostrea edulis*)" taken in Belfast Bay and elsewhere on the north-east coast, W. T.

ANNELIDA.

Nemertes gracilis, Johnst., Mag. Zool. and Bot., vol. i. p. 534. pl. 17. f. 1. Nov. 12, 1840. I received a specimen of this worm taken at Cultra, Belfast Bay. It is larger than Dr. Johnston's, but agrees in every character with his description and figure.

——— *lactiflorea*, Johnst., Mag. Z. and B., vol. i. 535. pl. 17. f. 2. With the last species, two examples of this were procured. The eyes are as described by Dr. Johnston, and consequently the worm would seem to be distinct from *Planaria rosea*, Mull. My specimens when extended are each about two inches in length and of a yellowish flesh colour. The characters are all as given by Dr. Johnston.

Phylline Hippoglossi, Lam. Johnst., Annals Nat. Hist. vol. i. 431. pl. 15. f. 1—3.

Hirudo Hippoglossi, Mull., Zool. Dan., vol. ii. p. 18. t. 54. For some years past this species has commonly occurred to me on Halibut (*Hippoglossus vulgaris*) brought to Belfast market, and captured on the coasts of Down and Antrim.

Carinella trilineata, Lined Worm. Johnst., Mag. Nat. Hist., vol. vi.

Gordius annulatus, Mont., Linn. Trans., vol. vii. p. 74. This beautiful worm has been dredged by Mr. Hyndman and myself on different occasions in Strangford Lough and in the open sea at Ballywalter on the Down coast: in every instance it was *free*. Belfast Bay, Dr. Drummond.

Glossipora tuberculata, Johnson (J. R.). Neighbourhood of Coleraine, Mr. James Bryce, jun.

CRUSTACEA.

Pisa tetraodon, Leach, Mal. Brit., pl. 20. Mr. R. Ball has in his cabinet a specimen found at Roundstone by Mr. McCalla. This species is given in Mr. Templeton's catalogue of Irish Crustacea, but I have reason to believe by mistake.

Ebalia Cranchii, Leach, Malac., tab. 25. f. 7—11. July 1840. A single specimen dredged in Roundstone Bay, Connemara, by Mr. R. Ball and Mr. Forbes. Several since obtained by Mr. Ball, thrown on shore at Portmarnock by a storm.

Inachus leptochirus, Leach, Malac., tab. 22. B. A specimen dredged in Clifden Bay, Connemara, about the same time with the last. Belfast Bay, Mr. R. Patterson.

Athanas nitescens, Leach, Malac., t. 44.

Cancer nitescens, Mont. M.S. A specimen taken between tide-marks at Lahinch, co. Clare, Mr. Forbes and W. T.

Æga tridens, Leach. An *Æga* agreeing in the few characters assigned to this species by Dr. Leach is in my collection. It was taken alive on a cod-fish in Belfast market.

L.—*Description of two new Genera of Irish Zoophytes*.* By Arthur Hill Hassall, Esq., Corresponding Member of the Natural History Society of Dublin.

Order ZOOPHYTA ASCIDIOIDA.

Family Alcyonidulæ.

Genus Cycloum.

Character.—Polypidom fleshy, encrusting, covered with numerous imperforate papillæ: polypi ascidian; *ova in clusters.*

Cycloum papillosum.—Polypi with eighteen tentacula disposed in the form of a bell.

This species is almost invariably found investing the frond of *Fucus serratus*, over the surface of which it spreads in patches of from one to two inches in extent, more frequently of one, and seldom exceeding two inches. The crust is fleshy, and rather thick: it is covered with numerous papillæ very closely set together. The polypi do not issue from these papillæ, which are imperforate, but from larger eminences of irregular form and size, in the centre of which a puckered depression is seen. The polypi have eighteen tentacula, describing a cup or bell. The ova lie in clusters, each cluster containing six or seven ova arranged in a circle. The clusters are irregularly scattered through the polypidom, and each is inclosed in a space somewhat larger than is sufficient to contain it, the remainder of the space being occupied by a fluid in which numerous small particles are seen which are kept in constant action by the motion of the cilia on the ova. Each ovum is of a circular form, but is depressed, one side more so than the other: round its edge a fringe of cilia is apparent; these may be seen in motion long before the ova are ready for becoming disengaged. I have discovered in this, as well as in the succeeding and some other genera, a body of a very peculiar nature, but concerning the uses of which I can at present only hazard some conjectures. It is, in this species, and in *Alcyonidium gelatinosum* and *hirsutum*, in which I have also met with it, of an oblong form, and composed of a transparent matter, in which numerous small dark brown granules, circular in shape and not unlike ova, are imbedded. I at first imagined that they were nothing more than particles of lime lodged in a soft jelly-like substance, but this opinion was disproved by the application of hydrochloric acid, which did not cause effervescence. These bodies are far more numerous than the ova, and are not more than one-tenth their size. The most probable conjecture which I have been able to form as to

* Communicated to the Dublin Nat. Hist. Society, Feb. 1841.

their nature is, that they are organs destined to contain the ova until they have arrived at a certain degree of maturity, in fact, ovaries, and if not ovaries, the ova themselves in a very early stage of their formation.

I have been induced to raise this species to a generic rank, principally from the arrangement of the ova in circles, which is, I believe, peculiar to it. Some weeks ago, when at Belfast, Mr. Thompson pointed out this species to my notice, saying, at the same time, that he had forwarded it long since to Dr. Johnston as new; its distinctive characters had however been made out by myself long previous to this interview with Mr. Thompson, and reference is made to it in my Catalogue*.

This zoophyte, as well as the succeeding species, exhibits in a very remarkable degree that "close adhesion to life," the usual accompaniment of a low organization, which renders this class of animals so patient of injuries which would be fatal to beings of greater complexity of structure. I have on more than one occasion seen the polypidoms of this and the following species enveloped in a firm coating of ice; on immersion of either of these in sea-water the coating has become dissolved, and the polypi have protruded their feelers, and have appeared as active as though they had never been exposed to such a very low degree of temperature as would have destroyed the life of more highly organized animals. From this it is apparent that their sensibility cannot be very great.

Dublin bay, on *Fucus serratus*; not uncommon.

We now come to the description of the second genus.

Order ZOOPHYTA ASCIDIOIDA.

Family ALCYONIDULÆ.

Genus SARCOCHITUM.

Character.—Polypidom encrusting, fleshy, covered with numerous prominences of irregular form and unequal size, from which the polypi issue; ova circular, scattered singly throughout the polypidom; a dark brown body of a *circular* form filled with small round granules is apparent in great numbers through the polypidom.—Polypi ascidian.

Sarcochitum polyoum.—Polypi with twenty tentacula.

This species is also usually found investing *Fucus serratus*, the frond of which it sometimes covers to the extent of several inches. The crust is thin and fleshy, and covered with numerous large eminences of irregular form and unequal size, which exhibit a puckered appearance in the centre, and from

* Published in the 'Annals' for Nov. 1840, p. 170.

which the polypi issue; these have twenty tentacula. The polypidom, when found on one side of the weed, is generally also present on the reverse side; and this is somewhat curious, as the crust almost constantly terminates on each side of the weed at some distance from its edge, so that it cannot reach the one side from the other by a continuity of growth.

The ova in this species are exceedingly numerous, and vary in colour from white to yellow; they present much the same form and appearance as those of the preceding genus. If a quantity of the sea-weed, with the zoophyte upon it, be placed in salt-water for a few hours, great numbers of the ova will become liberated, and may plainly be seen with the unassisted eye moving about in almost ceaseless action; now gliding rapidly along the surface of the water, now wheeling round upon their axes; at one time elevating themselves in the fluid, again as rapidly sinking in it:—these elevations and subsidences seeming to depend upon the form of the ovum, which is seen to change with these movements. The facility and rapidity with which these little bodies seem to perform their evolutions is very striking. They may often be seen to run along the water in a straight line for several inches, at a pace which would far outstrip the fleetest Newmarket racer—the relative sizes of the two creatures being taken into consideration;—and it is not a little curious to observe, that no matter how many ova be moving about in the same space, still they never come in contact, appearing to avoid each other as carefully as though they were possessed of eyes.

The thought then occurred to me, that the minute, frail, and delicate ova of these species must have made their way unscathed and uninjured through from twenty to thirty miles of the troubled and stormy ocean, and have fixed themselves to our rocks—the vibratile cilia on their surfaces being mainly instrumental in effecting their transportation.

The polypidoms of this and the preceding species are often so mixed up in their distribution upon the same piece of sea-weed, that it requires a practised eye to distinguish them. I have been induced to consider this species as distinct from the genus *Alcyonidium*, to which it bears a near relation—for the following reasons: 1st. The number of the tentacula, a character which I have found to be constant, it being twenty in this and but sixteen in *Alcyonidium*; 2nd. This species never rises from the surface of attachment in the form of an independent polypidom; it is invariably encrusting, whereas all the species of the genus *Alcyonidium* do form elevated polypidoms; and 3rd. There is a difference in the form of the body or organ to which I have referred in the description of

the genus *Cycloum*;—it being circular in this, while it is oblong in the genus *Alcyonidium.*

I have frequently noticed a species of zoophyte lining the interior of old shells of *Buccinum undatum*, and covering the under surface of stones, which I consider to be identical with this. If a portion of the polypidom of this species, in a living condition, be suddenly plunged into spirits, an instantaneous protrusion of the polypi takes place, having their feelers arranged, as in life, in the form of a graceful bell. In this state they may be kept, for a time, for the purposes of future examination. The cause of this protrusion is readily explained. The polypes being already contracted within their cells,—on the application of the irritating spirit are compelled to start outwards;—the only motion of which they are capable when folded up within these cells*.

I have, in conclusion, to acknowledge the assistance I received from the classical attainments of my talented and valued friend, G. J. Allman, Esq. of Bandon, in the naming of the genera.

LI.—*Notes on Birds.* By T. C. Eyton, Esq., F.L.S.

No. III.

Merops Melanura, Vig. and Horsf.

Tongue long, pointed, but soft at the extremity and without bristles, posteriorly armed with two strong spines on each side, between which there are a few smaller ones.

Œsophagus small, of nearly uniform diameter; proventriculus large, nearly globular, and slightly contracted at its entrance into the stomach, which is somewhat oval and slightly muscular, with the epithelium hardened.

The intestinal canal was much damaged, but appeared to be of rather large diameter. I could not perceive any cæca: liver large, bilobed, right lobe nearly twice the size of the left.

Sternum rather elongated, with a deep keel considerably produced anteriorly, and much rounded on its inferior edge. The posterior margin of the sternum indented on each side with two very deep fissures, the lateral ones deepest, broader posteriorly than anteriorly; the manubrial process not distinct and prominent, but merged into the keel, which is continued forwards between the coracoids.

Os furcatum with the rami much flattened laterally, strong and slightly arched, without any process at the point where it approaches the sternum; coracoids of moderate length and strength, with a very broad articulation to the sternum.

Pelvis very broad; obturator foramen linear, nearly obliterated;

* Drawings of these two genera have been forwarded by myself to Dr. Johnston, and will, I suppose, appear in his Supplement.

ischiadic foramen oval, of moderate size. Cotyloid cavities placed near the centre of the pelvis; os pubis not continued far downwards, with the extremity inclined upwards and inwards.

Scapulars broad, widest near their extremities, which are pointed.

The skeleton was too much injured to enable me to make out the numbering of the vertebræ with certainty.

Remarks.—In the anatomy of the soft parts, as far as I could make them out from a much damaged specimen, and in the skeleton, a great preponderance is shown in favour of the genus *Merops* being classed with the Kingfishers, which indeed might be expected from the external structure; and in those points in which it differs it appears to approach the Humming Birds, a group which I think must also be classed among the fissirostral or volitorial division of birds.

The sternum, in having two posterior fissures on each side, agrees with the Kingfishers, but is altogether longer and has a deeper keel in proportion to its length, and the inferior edge of it is more rounded than in that family, in which particulars it appears to approach the Humming Birds.

The coracoids and humerus are proportionally shorter, although of nearly the same form as among the *Alcedinidæ*: these portions of the skeleton are found remarkably short among the Humming Birds.

In the structure of the pelvinal bones, the os furcatum, and ribs, *Merops* agrees precisely with the typical Kingfishers.

LII.—*A Catalogue of Fossil Fish in the Collections of the* Earl of Enniskillen, F.G.S., &c. *and* Sir Philip Grey Egerton, Bart., F.R.S., &c.*

Genus and Species.	Formation.	Locality.
Acanthoderma spinosum ...	Black schist.....	Engi.
Acanthopleurus serratus ...	Do.	Ib.
Acanus arcuatus	Do.	Ib.
—— oblongus	Do.	Ib.
Acipenser Toliapicus	London clay ...	Sheppy.
Acrodus Anningiæ	Lias	Lyme Regis.
—— Braunii.....	Grés bigarré ...	Deux Ponts.
—— Gaillardoti	Muschelkalk ...	Bayreuth.
—— gibberulus	Lias	Lyme Regis.
—— latus.....	Do.	Ib.

* This Catalogue has been printed for private distribution by Sir Philip Grey Egerton, to whose kindness we are indebted for permission to insert it.

Genus and Species.	Formation.	Locality.
Acrodus leiodus	Great Oolite	Stonesfield.
—— minimus	Muschelkalk ?	Axmouth.
—— nobilis	Lias	Lyme Regis.
Acrolepis asper	Kupfer-schiefer	Mansfeld.
—— Sedgwickii	Mag. Limestone	Ferry Hill.
Ætobates irregularis	London clay	Sheppy.
Amblypterus eupterygius	Coal formation	Lebach.
—— lateralis	Do.	Ib.
—— latus	Do.	Ib.
—— macropterus	Do.	Ib.
Amblyurus macrostomus	Lias	Street.
Anenchelum dorsale	Black schist	Engi.
—— Glarisianum	Do.	Ib.
—— heteropleurum	Do.	Ib.
—— isopleurum	Do.	Ib.
—— latum	Do.	Ib.
Aspidorhynchus acutirostris	Oolite	Solenhofen.
—— Anglicus	Lias	Whitby.
—— Comptoni	Chalk ?	Brazil.
—— mandibularis	Oolite	Solenhofen.
Asteracanthus ornatissimus	Kimmeridge clay	Shotover.
—— semisulcatus	Great Oolite	Stonesfield.
Asteroptychius ornatus	Carb. Limestone	Armagh.
Atherina macrocephala	Eocene	Monte Bolca.
Aulolepis typus	Chalk	Kent.
Belonostomus acutus	Lias	Whitby.
—— leptosteus	Great Oolite	Stonesfield.
—— Münsteri	Oolite	Solenhofen.
—— tenellus	Lias	Lyme.
Beryx microcephalus	Chalk	Kent.
—— ornatus	Do.	Ib.
—— radians	Do.	Ib.
Blochius longirostris	Eocene	Monte Bolca.
Carangopsis dorsalis	Do.	Ib.
—— latior	Do.	Ib.
Carcharias grosseserratus	Tertiary beds	Maryland.
—— macrodon	Do.	Ib.
—— megalodon	Do.	Malta.
—— megalotis	Do.	Maryland.
—— minor	Do.	Ib.
—— polygyrus	Do.	Ib.
—— productus	Do.	Malta.
—— subserratus	London clay	Sheppy.

Genus and Species.	Formation.	Locality.
Caturus furcatus	Oolite	Eichstadt.
—— macrodus	Do.	Solenhofen.
—— macrurus	Do.	Ib.
—— maximus	Do.	Ib.
—— microchirus	Do.	Ib.
—— pachyurus	Do.	Ib.
—— pleiodus	Great oolite	Stonesfield.
Ceratodus altus	Muschelkalk ?	Aust.
—— gibbus	Do.	Ib.
—— planus	Do.	Ib.
Cheiracanthus microlepidotus	Old Red	Lethen.
—— minor	Do.	Stromness.
Cheirolepis Cummingiæ	Do.	Lethen.
—— Traillii	Do.	Stromness.
Chimæra Agassizii	Green sand	Maidstone.
—— brevirostris	Galt	Folkstone.
—— Colei	Great Oolite	Stonesfield.
—— Egertoni	Kimmeridge clay	Shotover.
—— Mantellii	Chalk	Sussex.
—— neglecta	Great Oolite	Stonesfield.
—— Owenii	Do.	Ib.
—— Townshendii	Purbeck stone	Garsington.
Chomatodus cinctus	Carb. Limestone	Bristol.
—— linearis	Do.	Ib.
—— truncatus	Do.	Armagh.
Chondrosteus acipenserides	Lias	Lyme.
Cladocyclus Gardneri	Chalk ?	Brazil.
—— Lewesiensis	Do.	Kent.
Cladodus mirabilis	Carb. Limestone	Bristol.
—— striatus	Do.	Armagh.
Clupea Beurardi	Tertiary beds	Lebanon.
—— brevis	Black schist	Engi.
—— catopygoptera	Eocene	Monte Bolca.
—— megaptera	Black schist	Engi.
—— minuta	Eocene	Monte Bolca.
—— Scheuchzeri	Black schist	Engi.
—— tenuissima	Pleistocene	Sicily.
Cobitis cephalotes	Tertiary beds	Œningen.
Coccosteus latus	Old Red	Stromness.
—— oblongus	Do.	Lethen.
Cochliodus acutus	Carb. Limestone	Armagh.
—— contortus	Do.	Bristol.
—— magnus	Do.	Armagh.
—— oblongus	Do.	Ib.
—— striatus	Do.	Ib.
Cœlacanthus gracilis	——	——

Genus and Species.	Formation.	Locality.
Cœlacanthus granulatus ...	Mag. Limestone	Ferry Hill.
—— lepturus	Coal shale	Leeds.
Cœlopoma Colei	London clay ...	Sheppy.
—— læve	Do.	Ib.
Conodus ferox	Lias	Lyme.
Cottus brevis.....	Tertiary beds ...	Œningen.
Ctenacanthus brevis.....	Carb. Limestone	Bristol.
—— heterogyrus	Do.	Armagh.
—— major	Do.	Bristol.
—— tenuistriatus.....	Do.	Ib.
Ctenolepis cyclus	Great Oolite ...	Stonesfield.
Ctenoptychius apicalis	Coal shale	Stafford.
—— dentatus	Carb. Limestone	Armagh.
—— marginalis	Do.	Ib.
—— pectinatus	Coal shale	N. Wales.
—— radicans	Carb. Limestone	Armagh.
—— sagittatus	Do.	Ib.
—— serratus	Do.	Ib.
Cybium-macropomum	London clay ...	Sheppy.
Cyclurus minor	Tertiary beds ...	Œningen.
Dapedius arenatus	Lias	Lyme.
—— Colei.....	Do.	Ib.
—— granulatus	Do.	Ib.
—— micans	Do.	Whitby.
—— orbis	Do.	Barrow.
—— politus	Do.	Lyme.
—— punctatus.....	Do.	Ib.
Dentex breviceps	Eocene.....	Monte Bolca.
Dercetis elongatus	Chalk	Kent.
Diodon erinaceus	Eocene.....	Monte Bolca.
—— Scillæ	Tertiary beds ...	Malta.
Diplacanthus crassispinus .	Old Red	Stromness.
—— longispinus	Do.	Lethen.
—— striatulus	Do.	Ib.
Diplodus gibbosus	Coal shale	Staffordshire.
Diplopterus borealis	Old Red	Stromness.
—— carbonarius	Coal shale	Leeds.
—— macrocephalus.....	Old Red	Lethen.
Dipterus macrolepidotus ...	Do.	Caithness.
Ductor leptosomus	Eocene.....	Monte Bolca.
Enchodus halocyon	Chalk	Kent.

Genus and Species.	Formation.	Locality.
Ephippus longipennis	Eocene.....	Monte Bolca.
Esox lepidotus	Tertiary beds ...	Œningen.
Eugnathus chirotes	Lias	Lyme.
—— fasciculatus	Do.	Whitby.
—— microlepidotus	Oolite	Solenhofen.
—— minor	Lias	Lyme.
—— ornatus.....	Do.	Ib.
—— orthostomus	Do.	Ib.
—— polyodon	Do.	Ib.
—— scabriusculus	Do.	Ib.
—— speciosus	Do.	Ib.
—— tenuidens	Do.	Street.
Eurynotus crenatus	Coal formation .	Burdie House.
Fistularia Kœnigii.....	Black schist.....	Engi.
—— tenuirostris	Eocene.....	Monte Bolca.
Galeus aduncus	Molasse	Soleure.
—— appendiculatus.....	Plänerkalk	Stickla.
—— falcatus	Chalk	Kent.
—— pristodontus.....	Do.	Maestricht.
—— semiserratus.....	——	——
—— serratus	Molasse	Soleure.
Gasteronemus rhombeus ...	Eocene.....	Monte Bolca.
Glyptocephalus radiatus ...	London clay ...	Sheppy.
Glyptolepis leptopterus ...	Old Red	Lethen.
Gobio analis	Tertiary beds ...	Œningen.
Goniognathus coryphænoides	London clay ...	Sheppy.
—— maxillaris	Do.	Ib.
Gyracanthus formosus	Coal shale	N. Wales.
—— tuberculatus	Do.	N. Shields.
Gyrodus angustus	Chalk	Maidstone.
—— lævior	London clay ...	Sheppy.
—— trigonus	Great Oolite ...	Stonesfield.
—— n. s.	Do.	Ib.
Gyrolepis Albertii	Muschelkalk ? ...	Axmouth.
—— Rankini	Coal shale	Leeds.
—— tenuistriatus.....	Muschelkalk ? ...	Axmouth.
Gyrosteus mirabilis	Lias	Whitby.
Helodus didymus	Carb. Limestone	Armagh.
—— lævissimus	Do.	Bristol.
—— mammillaris	Do.	Armagh.
—— planus	Do.	Ib.
—— simplex.....	Coal shale	Staffordshire.
—— turgidus	Carb. Limestone	Armagh.

Genus and Species.	Formation.	Locality.
Hemipristis serra	Molasse	Soleure.
Holocentrum pygæum	Eocene	Monte Bolca.
Holoptychius granulatus	Coal shale	Rhuabon.
—— Hibberti	Coal formation	Burdie House.
—— minor	Coal shale	Leeds.
—— sauroides	Do.	Ib.
Hybodus acutus	Kimmeridge clay	Shotover.
—— carinatus	Lias	Lyme.
—— dorsalis	Great Oolite	Stonesfield.
—— ensatus	Lias	Lyme.
—— formosus, —— grossispinus	Do.	Ib.
—— grossiconus	Great oolite	Stonesfield.
—— homoprion, —— medius	Lias	Lyme.
—— longiconus	Muschelkalk	Bayreuth.
—— marginalis	Great Oolite	Stonesfield.
—— minor	Muschelkalk ?	Axmouth.
—— plicatilis	Do.	Ib.
—— polyprion	Great Oolite	Stonesfield.
Hybodus reticulatus, —— curtus, —— incurvus	Lias	Lyme.
—— strictus	Purbeck stone	Purbeck.
Hypsodon Lewesiensis	Chalk	Kent.
—— oblongus	London clay	Sheppy.
—— Toliapicus	Do.	Ib.
Isurus macrurus	Black schist	Engi.
Labrax schizurus	Eocene	Monte Bolca.
Lamna acuminata	Chalk	Sussex.
—— contortidens	Molasse	Soleure.
—— cuspidata, —— denticulata	Do.	Ib.
—— elegans	London clay	Sheppy.
Lates gracilis	Eocene	Monte Bolca.
Lebias cephalotes	Tertiary beds	Sinigaglia.
—— crassicaudus	Do.	Aix.
Lepidotus fimbriatus	Lias	Lyme.
—— Fittoni	Wealden	Tilgate.
—— Mantellii	Do.	Ib.
—— minor	Purbeck stone	Purbeck.
—— notopterus	Oolite	Solenhofen.
—— palliatus	Kimmeridge clay	Boulogne.
—— punctulatus	Chalk	Kent.
—— semiserratus	Lias	Whitby.
—— serratulus	Do.	Barrow.
—— unguiculatus	Great Oolite	Stonesfield.

Genus and Species.	Formation.	Locality.
Lepracanthus Colei	Coal shale	N. Wales.
Leptacanthus semistriatus	Great Oolite	Stonesfield.
—— serratus	Do.	Ib.
—— tenuispinus	Lias	Lyme.
Leptolepis Bronnii	Lias	Lyme.
—— caudalis	Do.	Ib.
—— contractus	Oolite	Solenhofen.
—— dubius	Do.	Ib.
—— filipennis	Lias	Street.
—— Knorrii	Oolite	Solenhofen.
—— latus	Do.	Eichstadt.
—— paucispondylus	Green sand	Kelheim.
—— polyspondylus	Oolite	Solenhofen.
—— pusillus	Green sand	Kelheim.
—— sprattiformis	Oolite	Solenhofen.
—— Voithii	Green sand	Kelheim.
Leuciscus gracilis	Tertiary beds	Wurtemburg.
—— latiusculus	Do.	Œningen.
—— macrurus	Papier-kohl	Rhine.
—— Œningensis	Tertiary beds	Œningen.
—— papyraceus	Papier-kohl	Rhine.
Lichia prisca	Eocene	Monte Bolca.
Macropoma Egertoni	Galt	Speeton.
—— Mantellii	Chalk	Sussex.
Macrosemius brevirostris	Great Oolite	Stonesfield.
Mallotus villosus	Recent beds	Greenland.
Megalichthys Hibberti	Coal shale	Burdie House.
Megalops priscus	London clay	Sheppy.
Microdon hexagonus	Oolite	Solenhofen.
—— radiatus	Purbeck stone	Purbeck.
Mugil princeps	Tertiary beds	Aix.
Myliobates angustus	London clay	Sheppy.
—— gyratus	Do.	Ib.
—— marginalis	Do.	Ib.
—— nitidus	Do.	Ib.
Myliobates Stokesii	——	——
—— Studeri	Molasse	Soleure.
—— subarcuatus	London clay	Sheppy.
—— Toliapicus	Do.	Ib.
—— ——	Crag	Norfolk.
Myriacanthus paradoxus	Lias	Lyme.
—— retrorsus	Do.	Ib.
Myripristis homopterygius	Eocene	Monte Bolca.
—— leptacanthus	Do.	Ib.

Genus and Species.	Formation.	Locality.
Nemacanthus brevispinus...	Great Oolite ...	Stonesfield.
—— filifer.....	Muschelkalk ? ...	Aust.
Nemopteryx crassus	Black schist.....	Engi.
—— elongatus	Do.	Ib.
Notagogus Pentlandi.....	Jura Limestone	Torre d'Orlan- [do.
Nothosomus octostychius...	Lias	Lyme.
Notidanus microdon.....	Chalk	Kent.
—— primigenius	Molasse	Soleure.
Odontaspis rhaphiodon.....	Chalk	Maestricht.
Onchus plicatus.....	Carb. Limestone	Armagh.
—— rectus	Do.	Ib.
—— subulatus	Coal shale	Rhuabon.
Ophiopsis dorsalis.....	Purbeck stone ...	Purbeck.
Oracanthus Milleri	Carb. Limestone	Bristol.
—— minor	Do.	Armagh.
—— pustulosus	Do.	Bristol.
Orodus ramosus	Do.	Ib.
Osmeroides Glarisiensis ...	Black schist.....	Engi.
—— Lewesiensis	Chalk	Sussex.
Osteolepis arenatus	Old Red	Gamrie.
—— macrolepidotus	Do.	Orkney.
—— major	Do.	Lethen.
—— microlepidotus	Do.	Orkney.
Otodus appendiculatus ...	Chalk	Sussex.
—— crassus	——	——
—— latus	Chalk	Maestricht.
—— macrotus	London clay.....	Sheppy.
—— obliquus	Do.	Ib.
—— ——	Crag.....	Norfolk.
Oxyrhina hastalis	Molasse	Soleure.
—— Mantellii	Chalk	Sussex.
—— quadrans	Molasse	Soleure.
—— xiphodon	Tertiary beds ...	Malta.
Pachycormus acutirostris...	Lias	Whitby.
—— gracilis	Do.	Ib.
—— latipennis	Do.	Lyme.
—— latirostris	Do.	Whitby.
—— latus	Do.	Ib.
—— leptosteus.....	Do.	Lyme.
—— macrurus	Do.	Ib.
—— n. s.	Do.	Whitby.
Palæoniscus Blainvillei ...	Coal formation .	Muse.
—— catopterus	New Red	Roan Hill.
—— comtus	Mag. Limestone	Ferry Hill.

Genus and Species.	Formation.	Locality.
Palæoniscus Duvernoy	Coal formation .	Zweibrücken.
—— Egertoni	Coal shale	Staffordshire.
—— elegans	Mag. Limestone	Ferry Hill.
—— Freieslebeni	Kupfer-schiefer .	Mansfeld.
—— glaphyrus	Mag. Limestone	Ferry Hill.
—— longissimus	Do.	Ib.
—— macropomus	Zechstein	Ilmenau. [way.
—— macrophthalmus	Mag. Limestone	Clarence Rail-
—— magnus	Kupfer-schiefer .	Mansfeld.
—— Monensis	Coal shale	Anglesea.
—— Robisoni	Coal formation .	Burdie House.
—— Vratislaviensis	New Red	Ruppersdorf.
Palæorhynchum Colei	Black schist.....	Engi.
—— Egertoni	Do.	Ib.
—— Glarisianum	Do.	Ib.
—— latum	Do.	Ib.
—— longirostre	Do.	Ib.
—— medium	Do.	Ib.
—— microspondylum	Do.	Ib.
Palimphyes brevis	Do.	Ib.
—— longus	Do.	Ib.
Perca Beaumontii	Tertiary beds ...	Aix.
Petalodus Hastingsiæ	Carb. Limestone	Ticknall.
—— psittacinus	Do.	Armagh.
—— lævissimus	Do.	Ib.
—— rectus	Do.	Ib.
Pholidophorus Bechei	Lias	Lyme.
—— fusiformis	——.....	Castellamare.
—— Hastingsiæ	Lias	Barrow.
—— latimanus	Oolite	Solenhofen.
—— latiusculus	Lias	Lyme.
—— latus	Oolite	Solenhofen.
—— leptocephalus	Lias	Street.
—— limbatus	Do.	Lyme.
—— macrocephalus	Oolite	Eichstadt.
—— minor	Great Oolite ...	Stonesfield.
—— onychius	Lias	Lyme.
—— radians	Oolite	Eichstadt.
—— radiatopunctatus	Do.	Solenhofen.
—— Stricklandi	Lias	Barrow.
—— Taxis	Oolite	Solenhofen.
—— tenuiserratus	Green sand	Kelheim.
—— uræoides	Oolite	Solenhofen.
Phyllodus irregularis	London clay.....	Sheppy.
—— medius	Do.	Ib.
—— Toliapicus.....	Do.	Ib.
Physonemus subteres	Carb. Limestone	Armagh.
Pisodus ——.....	London clay.....	Hampshire.
Placodus gigas	Muschelkalk ...	Bayreuth.
—— Münsteri	Do.	Ib.

Genus and Species.	Formation.	Locality.
Platax Woodwardii	Crag	Norfolk.
Platygnathus paucidens ...	Old Red	Orkney.
Platysomus gibbosus	Kupfer-schiefer .	Eisleben.
—— parvulus	Coal shale	Leeds.
—— striatus.....	Mag. Limestone	Ferry Hill.
Pleionemus macrospondylus	Black schist ...	Engi.
Pleuracanthus planus	Coal shale	Leeds.
Pleurodus affinis	Do.	Rhuabon.
Pœcilodus Jonesii	Carb. Limestone	Armagh.
—— obliquus	Do.	Ib.
—— parallelus	Do.	Ib.
—— sublævis	Do.	Ib.
—— transversus	Do.	Ib.
Pristis Hastingsiæ	London clay.....	Hampshire.
Psammodus cornutus	Carb. Limestone	Armagh.
—— porosus.....	Do.	Ib.
—— rugosus	Do.	Ib.
Pterichthys cornutus	Old Red	Lethen.
—— latus	Do.	Ib.
—— Milleri	Do.	Gamrie.
—— productus.....	Do.	Lethen.
Pterygocephalus paradoxus	Eocene.....	Monte Bolca.
Ptychodus acutus	Galt	Folkstone.
—— altior	Chalk	Sussex.
—— decurrens.....	Do.	Ib.
—— gibberulus	Do.	Ib.
—— latissimus.....	Do.	Ib.
—— mammillaris	Do.	Ib.
—— polygyrus	Do.	Ib.
—— spectabilis	Do.	Ib.
Ptycholepis Bollensis	Lias	Whitby.
Pycnodus biserialis	Great Oolite ...	Little Gibraltar.
—— Bucklandi	Do.	Stonesfield.
—— didymus	Do.	Ib.
—— discoides	Do.	Little Gibraltar.
—— gigas	Jura Limestone	Jura.
—— Hügii	Great Oolite ...	Stonesfield.
—— latirostris	Do.	Ib.
—— Mantellii	Do.	Tilgate.
—— obtusus	Great Oolite ...	Stonesfield.
—— ovalis	Do.	Ib.
—— parvus	Do.	Ib.
—— rhombus	Jura Limestone	Torre d'Orlan- [do.
—— rugulosus	Great Oolite ...	Stonesfield.
Pygæus Coleanus	Eocene	Monte Bolca.

Genus and Species.	Formation.	Locality.
Pygopterus Humboldtii ...	Kupfer-schiefer .	Mansfeld.
—— mandibularis	Mag. Limestone	Ferry Hill.
Raia antiqua	Crag.....	Norfolk.
Rhacolepis brama	Chalk ?.....	Brazil.
—— buccalis	Do.	Ib.
—— latus	Do.	Ib.
Rhodeus elongatus	Tertiary beds ...	Œningen.
Saurichthys apicalis	Muschelkalk ? ...	Axmouth.
Saurocephalus lanciformis .	Chalk	Sussex.
Sauropsis mordax	Great Oolite ...	Stonesfield.
Sciænurus Bowerbankii ...	London clay.....	Sheppy.
—— crassior	Do.	Ib.
Scilliodus antiquus	Chalk	Kent.
Semionotus rhombifer	Lias	Lyme.
—— striatus	Do.	Seefeld.
Semiophorus velicans	Eocene.....	Monte Bolca.
Serranus microstomus	Do.	Ib.
—— occipitalis.....	Eocene	Ib.
Smerdis micracanthus	Eocene	Ib.
—— minutus	Tertiary beds ...	Aix.
—— pygmæus	Eocene.....	Monte Bolca.
Sparnodus altivelis	Do.	Ib.
—— macrophthalmus	Do.	Ib.
—— micracanthus	Do.	Ib.
—— ovalis	Do.	Ib.
Sphærodus gigas	Kimmeridge clay	Shotover.
—— n. s.	Jura Limestone	Jura.
Sphenolepis squamosseus...	Tertiary beds ...	Aix.
Sphenonchus hamatus	Lias	Lyme.
Sphyræna gracilis.....	Eocene.....	Monte Bolca.
Sphyrænodus crassidens ...	London clay.....	Sheppy.
—— priscus	Do.	Ib.
Spinacorhinus polyspondylus	Lias	Lyme.
Strophodus favosus	Great Oolite ...	Stonesfield.
—— magnus	Do.	Ib.
—— reticulatus	Kimmeridge clay	Shotover.
—— subreticulatus	Inferior Oolite...	Dundry.
—— sulcatus	Green sand	Maidstone.
—— tenuis	Great Oolite ...	Stonesfield.

Genus and Species.	Formation.	Locality.
Tetragonolepis confluens ...	Lias	Lyme.
—— dorsalis	Do.	Gloucestersh.
—— heteroderma.....	Do.	Lyme.
—— Leachii.....	Do.	Ib.
—— leiosomus.....	Do.	Ib.
—— monilifer	Do.	Barrow.
—— ovalis	Do.	Whitby.
—— pholidotus	Do.	Lyme.
—— pustulatus	Do.	Ib.
—— radiatus	Do.	Ib.
—— speciosus	Do.	Ib.
—— striolatus	Do.	Barrow.
Tetrapterus priscus	London clay.....	Sheppy.
Thrissops formosus	Green sand	Kelheim.
—— salmoneus	Oolite	Solenhofen.
Thyellina prisca	Lias	Lyme.
Tinca furcata	Tertiary beds ...	Œningen.
Vomer longispinus	Eocene.....	Monte Bolca.
Zygæna dubia	Molasse	Soleure.
New genus	Eocene.....	Monte Bolca.
N. S.	Chalk	Kent.
N. S.	Tertiary beds ...	Aix.
N. S.	Black schist ...	Greenland.
N. S.	Eocene.....	Monte Bolca.

BIBLIOGRAPHICAL NOTICES.

Natural History as a Branch of General Education. By Robert Patterson. Belfast. 8vo, 28 pp. 1840.

There are perhaps very few persons who are not sensibly alive to the objects of study which Natural History presents, and yet the proportion of those who pursue any department of it as a science is but small. We may probably find an explanation of this circumstance in the operation of two causes. In the first place, the scientific pursuit of zoology or botany cannot be so profitably applied to the arts by which wealth is accumulated as many other departments of science, amongst which we may mention chemistry and the various branches of natural philosophy. Men of science must live as well as other people; and it is the lot of a few only to be able to pursue science independently of their means of subsistence.

In the second place, Natural History has never occupied a pro-

minent place in the courses of education which have been prescribed in British Universities. Latin and Greek and Mathematics have been the sole passports to Professors' chairs, and the highest prizes that the church has had to bestow have been conferred on the greatest adept in Greek metres or in the abstractions of algebraical analysis. Such a state of things has been long exploded on the continent, and Natural History there occupies a position which it ought always to hold, wherever the true end and aim of science is known and appreciated.

We are, however, differently situated in this country. The changes that may be judged by a few to be desirable cannot be enforced on the many without suspicion of interest; and the prejudices of the few often oppose the enlightened demands of the many. In this state of things all that can be done is to wait patiently till the time come when the advantage and propriety of some change will be recognised by all. In the mean time, we think those naturalists do well who take every opportunity of enforcing on the attention of the public the importance of cultivating a taste for Natural History; and we feel much satisfaction that Mr. Patterson of Belfast has appeared as a labourer in this field, well known as this gentleman is to many of our readers as a popular writer on Natural History, and as an active and efficient member of the Natural History Section of the British Association. The pamphlet before us is an address delivered before the Natural History Society of Belfast, and was printed at the request and expense of the Society.

At the commencement our author meets the humiliating question *cui bono*, which we are so often obliged to hear from quarters where we might least expect it.

"What, it may be asked, is the use of Natural History? And by the word *use*, in such a question, is understood—In what way will Natural History increase a man's profit, protect him from loss, or augment his personal comfort? I pause not here to consider whether or not the question of *cui bono* is not at the present time put too frequently and too pertinaciously; whether we do not sometimes leave the higher regions of science uninvestigated, while we try to wring some practical application out of a partially-revealed truth. The desire of testing the utility of every pursuit by some speedy and profitable result prevails so universally, that it might perhaps be needful to show, that, even on this ground, the study of Natural History is deserving of attention.

"If so, it would only be necessary to quote from published works a few well-authenticated instances of loss, danger, or inconvenience, arising from the want of that information, which even an elementary knowledge of Natural History imparts. Such blunders are but too numerous; and though occasionally they may seem ludicrous, afford on the whole melancholy examples of the evils produced by ignorance, of time and labour misemployed, money uselessly squandered, and, sometimes, a temporary annoyance or loss, increased tenfold by the injudicious effort made for its removal. If to the weight of such evidence we add the fact, that the whole of our food, clothing, and habitations, are of necessity derived from the animal, vegetable, or mineral kingdoms, there will not, it is presumed, be any one hardy enough to deny that a correct knowledge of such things must be both desirable and advantageous."

The whole subject is arranged under four heads :—

1. Effects of the study of Natural History on the mental faculties. We quote the following very just observations which the author makes upon this part of his subject :—

" The study of Natural History, though suitable for manhood, is highly attractive to youth; and bends itself, with easy adaptation, to the varying intellectual capacities of its votaries. To the very young—to children only four or five years old, its objects are perhaps among the most pleasing that can be presented to their notice. At that age, when the observant faculties are in constant action, and the reasoning powers are as yet immature, the flowers, the shells, the birds or quadrupeds, by which the child is surrounded, form naturally the primary subjects of his admiration and inquiry. Those who have had any experience in the management of children will testify with what delight they listen to stories about such things, when the narrator possesses the art of making himself intelligible to the capacity of his auditors. How frequently is he again and again asked for the recital, while each repetition serves only to enhance its charms! Should the teacher be collecting flowers in spring, or gathering the shells which are scattered over the strand, he will find in children his most delighted and zealous assistants, and will mark with what facility they can be taught to discriminate the several kinds, and to recollect the names of those which are the most attractive. And if the same individual—whether a parent or a teacher—be speaking on the subject to the same children some weeks afterwards, he will find, as I have often done, that the facts of which he knew they had been cognisant, were, in truth, but a small portion of those actually observed, and that a whole host of concomitant circumstances, and vivid, though sometimes fantastic associations, had been connected, by the children, with the visible objects to which he had supposed their entire attention had been directed. From such facts it may be fairly inferred, that *Natural History is a study peculiarly well adapted for early youth.*

" By thus directing the attention to various external objects which are regarded with interest, we learn the very useful habit of 'having our eyes about us.' We have all read in our school-boy days the story of 'Eyes and no eyes;' and we all know the difference which exists among educated people, as to the power of observing what is actually before their view. One sees a part only, and that imperfectly; another, at a glance, takes in everything peculiar to the scene, almost by intuition. That prompt perceptive powers are desirable, and that they, to a great extent, are dependent on cultivation, every one will admit. The objects which Natural History embraces are well adapted to call these powers into action, and train them to promptitude and vigour. Hence I rank among its intellectual effects, the *beneficial influence it exerts on the observant faculties.*

" But this influence is not limited to quickness in using our eyes. As we advance a little beyond childhood, it takes in a wider sphere of usefulness. It teaches us to note resemblances among objects; thus enabling us, in some degree, to group them together by their apparent affinities; and it accustoms us also to mark the differences among those which, in many particulars, are alike. On this all classification among external objects must depend: on this must rest the divisions of classes, families, genera, and species, so indispensable to the naturalist. To discover resemblances, to detect differences, are processes totally distinct from the mere power of observing. They are not acts of the perceptive, but of the reflective faculties. They require not merely the exercise of our eyes, but of our powers of comparison and judgment. In other words, *by the study of Natural History we acquire habits of discrimination.*

"The pupil soon, however, discovers that many of his hastily-formed ideas and rapid generalizations are erroneous. He finds that, to draw his conclusions with any certainty, the observations on which they are founded must be perfectly accurate; and not only accurately made, but accurately expressed, otherwise they will convey false impressions to other minds. *It enforces, therefore, accuracy in every particular.*

"And to make knowledge available, it is needful that its facts be systematically arranged. Without arrangement all is a chaos—'*rudis indigestaque moles.*' With arrangement, knowledge becomes at all times ready for service, and each accession enriches, not encumbers, its possessor. Whether he seek to acquire or to impart information, the student of nature is compelled to be methodical; and if he desire to illustrate any department of study by suitable specimens, they must be arranged before they can be rendered available. *Natural History, therefore, directly promotes the formation of orderly and systematic habits.*

"But, in the next place, it benefits the mind, by vesting with new and increasing interest the objects by which we are surrounded; thus furnishing agreeable trains of thought in the hours of relaxation. Time to the naturalist never appears long. He groans not under the load of ennui by which others, in such circumstances, are occasionally oppressed. He finds active, healthy, cheerful occupation for every moment; and still the thirst for knowledge 'but grows by what it feeds on.' *To stimulate a constant desire for improvement, and to foster a buoyant activity of mind and spirit,* no pursuit is more serviceable than that now under consideration."

Mr. Patterson speaks here as one who has truly felt the ennobling influence of the pursuit of science, independent of the lower motives of gain and ambition which may imperceptibly obtain an influence over the mind, and against which the man of science cannot too carefully watch*.

2. Intellectual pleasures derivable from the study of Natural History. These are not peculiar to Natural History, and must be evident to all who take delight in the exercise and cultivation of the intellect.

3. Moral and devotional effects. Under this head the elevating influence of a study of the works of creation is pointed out and enforced. The author well observes—

"But the mental effect is not limited to the production of a transient emotion of pleasure: it is the prelude of a long train of thought, and of the most grateful and reverential feeling towards the Great First Cause. The structural arrangements, admirable as they are, should never be regarded merely as examples of mechanical skill, as evidence of the operations of an Intelligence, as proofs of the existence of a God. They testify not only his existence, but his wisdom, his goodness, and his omnipotence; and should ever be studied with a direct and constant reference to Him. The naturalist who, in this humble and truth-seeking spirit, explores the world around him, will ever feel what the poet has expressed,

> 'These are THY glorious works, Parent of Good—
> Almighty!'

---

* As an illustration of this subject, we would refer to an essay by Schiller intitled 'The Philosopher and Trader in Science,' translated by Mrs. Austin, in a charming little volume just published, called 'Fragments of German Literature.'

"If viewed in this light, the actions of the inferior animals become elevated into so many manifestations of the Almighty Intelligence, from whom they derive their being. Hence Bonnet says, in a brief but happy metaphor, 'When I see an insect working at the construction of a nest or a cocoon, I am impressed with respect; because it seems to me that I am at a spectacle where the Supreme Artist is hid behind the curtain*.'"

4. Natural History as a branch of education. There can, we think, be little question of the desirableness of early instilling into the minds of the young a taste for those sciences which are capable of contributing so much to their happiness in mature years, and of thus rendering them useful members of society. Some may suppose that great difficulties exist in the way, on account of the want of teachers and books; but let the system be once adopted, and we believe that there will be no lack of those capable of teaching, or of books fitted for the use of the beginner. In botany and geology we have already a good supply of elementary works; and if we are not so well off in zoology, it is only because there has been at present no demand for such works.

The following remarks, although intended to apply to Irish institutions, may be adopted by many in England:—

"To raise Natural History to a higher rank and more prominent station in our Irish colleges would be most desirable. I believe a wish that such should be the case prevails in many influential quarters; and as that wish increases, it will find means and opportunity for its fitting expression. Meantime, I respectfully suggest that something might be done in our own province and in our own town, by directing public attention to the subject. Some of the proprietors of our Royal Academical Institution are sincerely desirous of seeing the course of education there revised and enlarged. Some learned and reverend members of the Presbyterian body are persuaded, that an increase of the term of study at present prescribed to their students would be highly desirable; and, also, that such a change should be accompanied by the introduction of new matter, and a revisal of that at present taught. This would seem, therefore, an auspicious time for bringing forward the views now submitted to your consideration. That a precedent may not be wanting for the change which I hope will in time be effected in the course of college education in Ireland, I may be permitted to refer to the University of London. Botany and Zoology form part of the matriculation examination; and in that for the degree of Bachelor of Arts, a comprehensive outline of Animal Physiology, Vegetable Physiology, and Structural Botany is prescribed."

It gave us pleasure to know, that recently, when the Senate of the University of London were requested by the heads of some College connected with it, to remit that part of their matriculation examination that referred to Natural History, they refused to do so. However little we should wish to see the study of the Classics or of Mathematics neglected, we are convinced that the study of Natural History bears too importantly on the welfare and happiness of mankind to be wisely excluded from the educational institutions of our country.

We conclude our notice with one more extract, referring our read-

* 'Contemplation de la Nature.'

ers to the pamphlet, to which we wish as wide a circulation as possible:—

"If we look beyond the boundaries of Great Britain, and note the practice of our continental neighbours, we shall find it gives, in support of the course here recommended, the unanswerable testimony of *experience*. On this subject we have recently been put in possession of a well-arranged mass of information, in the Report by Professor Bache. This gentleman had been selected by the Trustees of the Girard College of Orphans, Philadelphia, to procure information with respect to the system of instruction pursued in similar establishments in Europe. For this purpose he visited England, Scotland, Ireland, France, Belgium, Holland, Switzerland, Italy, and the principal states of Germany. It was not until two years had been thus spent, and 278 schools of various kinds had been personally inspected, that Dr. Bache prepared his very valuable Report. From it we learn that, in the great majority of the continental schools, Natural History forms a regular part of the course of instruction, and usually occupies from two to four hours in the week. In some places it is connected with physical geography or with physics; in others it stands out as a distinct branch of education, and attention is given to its different departments in successive years. The entire Report gives unequivocal evidence of its good effects in awakening 'habits of observation and reflection;' and also of its being 'eminently calculated to promote early religious impressions.' It also states that the experience of the Prussian Gymnasia may be appealed to 'as proving the entire compatibility of such instruction, with an otherwise sound system; and the entire possibility of accomplishing it without neglecting other more important branches.'"

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

August 25, 1840.—W. H. Lloyd, Esq., in the Chair.

Specimens were exhibited of five new species of Kangaroo, forming part of the collection made by Mr. Gould, who had just returned from Australia, after an absence of two years and a half spent in the investigation of the habits and œconomy of the animals of that continent.

The first of these Kangaroos to which Mr. Gould drew attention was a large species, but little inferior in size to the *Macropus major*, inhabiting the summits of the mountain ranges in the interior of New South Wales. Mr. Gould observed, that it is a most powerful animal, and very dangerous to approach. The unusual strength and size of the limbs suggested the specific name of *robustus*, and Mr. Gould accordingly characterized it as

MACROPUS (PETROGALE*) ROBUSTUS. *Macr. artubus anticis magnis et prærobustis; vellere e fusco cinereo, apud partes inferiores pallidiore; tarsis fuscis; digitis anticè nigris; antipedibus, et carpis, nigris; capite fuliginoso levitèr tincto; utráque genâ lineâ albescente notatâ; gulâ, guttureque albidis; caudâ supernè fuscâ, subtùs pallidiore.*

* The *Petrogale* of Gray is probably identical with *Heteropus* of Jourdan.

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	47	0
——— *caudæ*	25	6
——— *tarsi digitorumque* (sine unguibus)..	11	0
——— ab apice rostri ad basin auris	8	0
——— *auris*	3	7

Fœmina differt vellere ex argenteo cinereo, corpore subtùs ferè albo. Long. corporis cum capite, 33 unc.; *caudæ*, 26; tarsi digitorumque, 10 unc. 2 lin.

The second species has a remarkably elegant appearance, being of a slender delicate form, and adorned with two white stripes, which commencing at the *occiput*, run down the back of the neck on to the shoulders, where they are recurved. Mr. Gould proposed to designate this species

MACROPUS FRÆNATUS. *Macr. elegans, et gracilis; vellere molli brevi, colore e fusco cinereo; corpore subtùs albo; ab occipite utrinque super humeros lineâ angustâ albâ currente; interspatio obscuro, et apud occiput nigrescente: caudâ tuberculo parvo corneo ad apicem instructo, pilis nigrescentibus abscondito; tarsis, artubusque anticis ferè albis, digitis pilis obscuris paulò adspersis.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	23	0
——— *caudæ*	20	0
——— *tarsi digitorumque* (sine unguibus)..	5	6
——— ab apice rostri ad basin auris	4	2
——— *auris*	2	3

Hab. Interior of New South Wales.

The third species is about the same size as the last. The most remarkable character in this animal consists in its having a nail at the tip of the tail: this nail is hidden by the tuft of hair with which the end of the tail is furnished, and greatly resembles a finger-nail, both in texture and form, but is of a black colour. The name proposed for this species was

MACROPUS UNGUIFER. *Macr. corpore gracili, caudâ perlongâ; vellere perbrevi, et mediocritèr molli: colore fulvo, parte corporis anteriore, et collo albescentibus; capite ferè toto, nec non artubus abdomineque albis: notâ fuscâ longitudinali, apud dorsum; caudâ albidâ, apicem versus, pilis longis et fuscis indutâ, ad apicem cum ungue nigrescente, ferè magnitudinem et figuram unguis exhibente, ut in digito hominis videtur, instructâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	25	0
——— *caudæ*	26	0
——— *tarsi digitorumque* (sine unguibus)..	7	0
——— ab apice rostri ad basin auris	4	0
——— *auris*	2	6

Hab. North-west coast of Australia.

To the fourth species, having two crescent-shaped white marks on the shoulders, Mr. Gould gave the name of

MACROPUS LUNATUS. *Macr. capite brevi, auribus magnis; artubus anticis parvis; tarsis mediocritèr elongatis et gracilibus; colore cinereo, collo humerisque ferrugineo pallidè tinctis; corpore subtùs e cinereo albo; lineâ arcuatâ albâ in utrinque latus, ab humeris extensâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	18	0
——— *caudæ*	0	0 ?
——— *tarsi digitorumque* (sine unguibus)..	4	6
——— ab apice rostri ad basin auris	3	0
——— *auris*	2	0

Hab. West coast of Australia.

The fifth species resembles the Common Hare in size, and in the texture of the fur; so much so, indeed, that a portion of its skin could not be distinguished from that of a Hare. The fore-legs and feet of this animal being very small, Mr. Gould proposed to describe it as

MACROPUS LEPORIDES. *Macr. pro magnitudine et velleris colore nec non texturâ,* Lepori timido *assimilis; capite breviusculo; antibrachiis pedibusque parvulis; caudâ breviusculâ et gracili; corpore supernè nigro, fusco et flavido variegato; apud latera, et circum oculos colore pallidè fulvo prævalente; abdomine e cinereo albo; artubus anticis ad basin nigris.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	19	6
——— *caudæ*	13	0
——— *tarsi digitorumque*	4	9
——— ab apice rostri ad basin auris	4	0
——— *auris*	2	0

Hab. Interior of Australia.

Mr. Gould also exhibited a remarkable spiny Lizard, allied to the Agamas, which he had procured from Swan River.

Mr. Gould then called the attention of the Members to an extraordinary piece of Bird-architecture, which he had ascertained to be constructed by the Satin Bird, *Ptilonorhynchus holosericeus*, and another of similar structure, but still larger, by the *Chlamydera maculata*. These constructions, Mr. Gould states, are perfectly anomalous in the architecture of birds, and consist in a collection of pieces of stick and grass, formed into a bower; or one of them (that of the *Chlamydera*) might be called an avenue, being about three feet in length, and seven or eight inches broad inside; a transverse section, giving the figure of a horse-shoe, the round part downwards. They are used by the birds as a playing-house, or "run," as it is termed, and are used by the males to attract the females. The "run" of the Satin Bird is much smaller, being less than one foot in length, and moreover differs from that just described in being decorated with the highly-coloured feathers of the Parrot tribe; the *Chlamydera*, on the other hand, collects around its "run" a quantity of stones, shells, bleached bones, etc.; they are also strewed down the

centre within. Mr. Gould spent much time in observing the habits of those birds, and was fully satisfied that the "runs" were actually formed by them, and constructed for the purposes described.

Sept. 8.—James Whishaw, Esq., in the Chair.

An extensive series of new species of the genus *Cardium* was exhibited by Mr. Cuming, and the following account by Mr. G. B. Sowerby, Jun., of their characters, was read.

Cardium Sinense, Conch. Illustr. f. 35. *Card. testâ rotundatâ, posticè subrostratâ paulò ringente, ad marginem subexpansâ, omninò (anticè præcipuè) minutissimè granulatâ, pallidè fulvâ; costis 23 validis, rotundatis, quarum 8 postremis angustioribus, posticè subangulatis, fimbriatis; margine dorsali inflato; ventrali internè fortissimè dentato.*

Long. 1·55; lat. 1; alt. 1·40 poll.

Hab. ad mare Sinense, et ad insulas Philippinas, invenit H. Cuming.

Slightly resembling *C. Asiaticum*, from which it is distinguished by having larger and fewer ribs, and a small fringe on the posterior ribs. Found in sandy mud.

Cardium striatulum, Conch. Illustr. f. 16. 45. *Card. testâ tenui, rotundatâ, posticè subrostratâ minutissimè radiatim striatâ; pallidè fulvâ rubro radiatim fasciatâ; intùs albâ, fasciis binis rubris radiatâ; striis postremis denticulatis; epidermide fuscâ.*

Long. 1· ; lat. 0·60; alt. 0·90 poll.

Hab. ad Australiam et ad Novam Zelandiam. G. Bennett legit.

The pink-striped bands which give so much brilliancy to this shell when in a young state, are scarcely to be traced in the older specimens. The doubt as to their identity, which this circumstance at first created, was only removed by the most careful comparison.

Cardium Australe, Conch. Illustr. f. 12. *Card. testâ obliquè ovatâ, tenui, albâ, purpureo-rubro fuscoque præcipuè ad umbones maculatâ, purpureo ad latera fasciatâ; umbonibus lævibus; lateribus marginibusque tenuissimè sulcatis; cicatrice ab apice ad marginem posticum decurrente.*

Long. 1·20; lat. 0·85; alt. 1·30 poll.

Hab. ad Australiam, et ad mare Sinense.

This species differs from *C. tenuicostatum* and *C. papyraceum* in its proportions, being longest from the apex to the ventral margin; and also from the latter in the narrowness of the posterior ribs, and in having a distinct groove on the posterior side. Since the application of the above name, specimens have been met with in Mr. Cuming's Collection, named *C. sauciatum* by Dr. Beck, who, however, to the best of our knowledge, has not published it.

Cardium ringiculum, Conch. Illustr. f. 11. *Card. testâ longitudinalitèr ovali, tenui, utrinque hiante; posticè elongatâ, subaspersâ; costis anterioribus angustis, inconspicuis; tribus centralibus latis, planulatis ad marginem valdè dentatis; decem postremis angustioribus, paulò elevatis, ad marginem dentatis.*

Var. *testâ pallidè flavidâ.*

Var. *testâ ad latus posticum rubro tinctâ.*

Hab. ad insulam Ceylon.

A pretty little species, differing from *C. bullatum* in the strongly toothed posterior margin.

Cardium Siculum, Conch. Illustr. f. 31. *Card. testâ tenui, subquadratâ, ventricosâ, anticè angustâ, posticè latâ, subangulatâ; albâ, fusco maculatâ; costis numerosis, planulatis, 5 anticis crenulatis; interstitiis angustis.*

Long. 0·50; lat. 0·40; alt. 0·45 poll.

Hab. ad mare Siculum.

Cardium Arcticum, Conch. Illustr. f. 26. *Card. testâ ovali compressâ, subæquilaterali; costis 27, angulatis, subcrenulatis; epidermide crassâ, olivaceo-fuscâ, ad umbones ætate erosâ; ligamento elongato; cardine dentibus centralibus obsoletis, lateribus distantibus.*

Long. 1·55; lat. 0·90; alt. 1·40 poll.

Hab. ad mare Arcticum.

Differing from *C. Gröenlandicum,* in having ribs, and from *C. Icelandicum,* in being less ventricose and in the ribs being angular.

Cardium paucicostatum, Conch. Illustr. f. 20. *Card. testâ rotundatâ, ventricosâ, subæquilaterali, tenui; albido-flavicante, fusco undatâ; costis 16, planulatis, lævibus, distantibus, tuberculis acutis in medio armatis; interstitiis planulatis.*

Long. 1·30; alt. 1·30; lat. 1 poll.

Hab. ad mare Adriaticum (Malta).

This species differs from *C. echinatum* in being comparatively smooth, and having very few ribs, with wide interstices.

Cardium multispinosum, Conch. Illustr. f. 38, 38 *a*. *Card. testâ rotundatâ, ventricosâ, tenui, posticè paulò hiante, pallidè fulvâ, ad margines roseâ, intùs albâ; costis 33 lævibus, utrinque angulatis; spinis numerosis, acutis; interstitiis granulatis, ad marginem elongatis; margine dorsali tumidâ.*

Long. 2·10; lat. 1·70; alt. 2·20 poll.

Hab. ad insulam Mindanao, Philippinarum. H. Cuming legit.

In shape and general appearance, this beautiful shell resembles *C. Asiaticum,* from which, however, it differs widely, in having small spines on the ribs instead of the fringe. Found in sandy mud, at 25 fathoms.

Cardium exasperatum, Conch. Illustr. f. 37. *Card. testâ ventricosâ, rotundato-subquadratâ, albâ, ad margines roseo-tinctâ; tenuiter sulcatâ; inter sulcos spinis numerosis acutis ornatâ.*

Long. 1· ; lat. 0·70; alt. 0·95 poll.

Hab. ad oras Australiæ (Swan River).

An extremely delicate and beautifully wrought shell, and quite distinct from others of the group to which it belongs.

Cardium variegatum, Conch. Illustr. f. 57. *Card. testâ ovali, subventricosâ, roseâ, aurantiaco, rubro-fusco-albo-que maculatâ; costis 48, quarum anticis rotundatis, crenulatis; posterioribus*

valdè angulatis, lævibus ; postremis subplanulatis, tuberculis obliquis ornatis.

Long. 1·70; alt. 1·80; lat. 1·20 poll.

Hab. ad insulam Leyte, Philippinarum. H. Cuming legit.

The ribs are much more numerous and close than in *C. muricatum,* and *C. Radula* is described as having the ribs angular on both sides, which is not the case with this species.

Cardium Unicolor, Conch. Illustr. f. 29. 42. *Card. testâ ovali ventricosâ, posticè subelongatâ, paulò emarginatâ, albâ, purpureo obscurè maculatâ, epidermide fuscâ tenui indutâ; costis numerosis, anticis, mediis, et posterioribus rotundatis, minutè crenulatis; extremis planulatis.*

Long. 1·50; lat. 1·10; alt. 1·70 poll.

Hab. ad ins. Ticao. H. Cuming legit.

Found in sandy mud, at five fathoms. A slightly mottled variety is brought from the Brazils.

Cardium impolitum, Conch. Illustr. f. 6. 66. *Card. testâ crassâ, cuneiformi, subæquilaterali ad marginem dorsalem angustiore, ad ventralem rotundatâ; albâ, fusco obscurè maculatâ, posticè purpureo-fasciatâ; costis* 35 *impolitis, subcrenulatis; epidermide fuscâ.*

Long. 1·50; lat. 1·10; alt. 1·90 poll.

Hab. ad mare Sinense.

Remarkable for its wedge-like, nearly equilateral shape.

Cardium oxygonum, Conch. Illustr. f. 9. *Card. testâ ovali, subventricosâ, ad umbones angustâ; albâ, rubro fuscoque maculatâ, intùs albâ; costis* 35, *quarum* 18 *anterioribus validis, acutangulatis, ad latera antica atque ad angulos crenulatis; deinde* 9 *posterioribus acutangulatis ad angulos crenatis, ad latera lævibus; extremis angustis, lævibus, tuberculis obliquis ornatis.*

Long. 1·20; lat. 0·90; alt. 1·40 poll.

Hab. ad mare Sinense.

This species resembles *C. maculosum* of Wood in form, but in sculpture it more nearly approaches *C. angulatum* of Lamarck, from which, however, it is distinguished by being narrower towards the umbones, less ventricose, and having the ribs more distinctly angulated.

Cardium subelongatum, Conch. Illustr. f. 61. *Card. testâ ovali, subventricosâ, elongatâ, crassâ, posticè paulò hiante; albâ, fusco rubroque maculatâ, epidermide flavicante indutâ; costis* 32, *quarum anticis biangulatis, crenulatis; mediis lævibus, biangulatis; posticis rotundatis, lævibus, tuberculis obliquis ornatis.*

Long. 1·85; lat. 1·40; alt. 2·35 poll.

Hab. ad Sanctæ Thomæ insulam (Ind. occidentalis).

The above name has been given, to indicate the near alliance between this species and the true *C. elongatum* of Brug., with which it has been confounded. Our shell resembles some of the figures to which Lamarck refers for his *C. marmoreum,* and which Bruguière quotes for *C. elongatum.* It is much longer and smoother than the

former, and does not agree with the description. The true *C. elongatum* is described by Brug., from a specimen in the collection of M. de Lamarck, as an elongated, ventricose shell of 39 or 40 ribs, and attaining a large size. It seems to have been a matter of dispute between the two conchologists, whether the above-named species were identical. We were unable to meet with a shell agreeing with Bruguière's description, until the arrival of Mr. Cuming with fine specimens sufficiently characteristic to set the matter at rest. The present species has fewer ribs and is less ventricose.

Cardium enode, Conch. Illustr. f. 51. *Card. testâ ovali, ventricosâ, posticè subexpansâ, fortissimè dentatâ; pallidè fulvâ roseo fasciatâ, intùs albâ, sub umbonibus flavidâ, ad marginem purpureâ; costis* 38, *planulatis, anticis levitèr crenatis; interstitiis angustissimis.*

Long. 2·30; lat. 1·60; alt. 2·60 poll.

Hab. ad insulam Ceylon.

Much more spread than *C. elongatum*, with the ribs flatter, and terminating in very strong overwrapping teeth.

Cardium subrugosum, Conch. Illustr. f. 34. 71. *Card. testâ crassâ ovali ventricosâ, ætate posticè subacuminatâ; costis* 33, *quarum* 25 *anterioribus rotundatis, crenulatis; extremis lævibus vix elevatis; epidermide fuscâ.*

Var. *testâ albâ, purpureo maculatâ.*

Var. *testâ posticè albâ, anticè flavidâ.*

Long. 2·30; lat. 1·70; alt. 2·40 poll.

Hab. ad insulam Ceylon.

The ribs are not so deep as in *C. rugosum*, and the eight posterior ones are so little raised as to leave the surface nearly smooth.

Cardium alternatum, Conch. Illustr. f. 64. *Card. testâ obliquè ovali, compressâ, posticè subexpansâ, albâ, luteo vel fusco-flavescente fasciato-maculatâ; epidermide fusco indutâ; costis* 32, *anticis crenulatis, subangulatis; deindè posterioribus angulatis anticè lævibus; extremis muricatis; interstitiis convexis, utrinque sulcatis.*

Long. 2·40; lat. 1·30; alt. 2·60 poll.

Hab. Ticao, Philippinarum. H. Cuming legit.

A beautiful pale-coloured specimen of this species has existed for some time in the well-selected cabinet of Miss Saul, who, however, possesses no information as to its locality. With this we have been supplied by Mr. Cuming, who collected some richly coloured individuals from the above-mentioned island: they were found in coral sand, on reefs, at low water.

Cardium attenuatum. *Card. testâ lævi, cuneiformi, compressâ, obliquè elongatâ, posticè subcomplanatâ, omninò obscurè striatâ, ad marginem dentatâ; flavâ, rubro maculatâ, maculis posterioribus validis; intus albâ.*

Long. 1·80; lat. 1·20; alt. 2·60 poll.

Hab. ad insulam Ceylon.

A good figure of this species is found in Wood's 'General Con-

chology,' accompanied by the following erroneous statements: first, that it is *C. biradiatum* of Brug.; and second, that *C. biradiatum* of Brug. is only a variety of the British species (*C. serratum*), which is improperly named *C. lævigatum* by him and some other authors. From the apex to the ventral margin, it measures longer in proportion than any other species.

Cardium Elenense, Conch. Illustr. f. 58. *Card. testâ tenui, lævi, ovali, posticè subacuminatâ pallidè fulvâ, fusco et purpureo minutè maculatâ, intùs fuscâ rubro fasciatâ; umbonibus inconspicuis, purpureo maculatis.*

Long. 0·75; lat. 0·50; alt. 0·75 poll.

Hab. ad Sanctam Elenam. H. Cuming legit.

Very nearly resembling *C. Brasilianum*, but not coloured in radiating lines, as in that species, and not so much elongated at the posterior ventral margin. Found in sandy mud, at seven fathoms.

Cardium lyratum, Conch. Illustr. f. 40. *Card. testâ ventricosâ, rotundatâ, subæquilaterali, pallidè fulvâ, epidermide rubro-purpureâ indutâ, intùs aureâ; anticè decussatim plicatâ; costis numerosis; anticis tenuissimis; mediis validioribus; posterioribus distantibus, angulatis.*

Long. 1·70; lat. 1·40; alt. 1·70 poll.

Hab. Dumaguete, ins. Negroes, Philippinarum.

The *C. Æolicum* of Born (*C. pectinatum*, Linn., according to Brug.) has a space on the posterior side of the shell entirely free from ribs in either direction. Bruguière describes it as characterised by "trois faces distinctes," of which the first (*the posterior*) is "lisse, sans côtes ni striés," and the figures in Chemnitz represent the same peculiarity. In the shell before us, the whole of the posterior side is covered with radiating ribs, no space being left smooth. In other respects it exactly resembles the "Janus" celebrated by ancient naturalists, and it is now almost as frequently met with in cabinets. The difference between the two species has been long observed, although they have not hitherto been separately described. Mr. Cuming has taken specimens of this species in sandy mud, at the depth of seventeen fathoms.

Cardium parvum, Conch. Illustr. f. 33. *Card. testâ ovali, subquadratâ, posticè subangulatâ, anticè rotundatâ, pallidè fulvâ, fusco rubescente angulatim maculatâ; costis numerosis, subplanulatis; sulcis angustis.*

Long. 0·50; lat. 0·40; alt. 0·43 poll.

Hab. ——— ?

Cardium fornicatum, Conch. Illustr. f. 50. *Card. testâ subquadratâ, posticè angulatâ, anticè rotundatâ; albâ, purpureo-maculatâ, intùs aurantiacâ, ad margines purpureo-rufescente maculatâ: costis* 35, *quarum anteriorum* 23 *biangulatis, imbricatis, ad latera minutissimè spinoso-crenulatis.*

Long. 1· ; lat. 0·75; alt. 1· poll.

Hab. ——— ? Mus. F. J. Stainforth.

A very beautiful shell, in some respects resembling *C. medium*,

but not so angular, and having the ribs richly ornamented by vaulted imbrications in the centre, and very minute crenulations raised into points at the sides. Unfortunately, we possess no information respecting the locality.

CARDIUM IMBRICATUM, Conch. Illustr. f. 48. *Card. testâ crassâ, ventricosâ, anticè rotundatâ, posticè subquadratâ, angulatâ; albâ, intus aurantiacâ, purpureo maculatâ: costis* 28, *quarum* 19 *anterioribus valdè imbricatis, postremis sublævibus, subangulatis, imbricatis propè umbones, angulatis, fornicatis, propè marginem ventralem obtusis.*

Long. 1·20; lat. 1·05; alt. 1·30 poll.

Hab. ad oras Australiæ (Swan River).

Like *C. medium* in general form, but having vaulted imbrications on the ribs. These are much thicker and larger than in *C. fornicatum*, and the sides of the ribs are not crenulated as in that species.

CARDIUM SUBRETUSUM, Conch. Illustr. f. 24. *Card. testâ albâ, obliquè subquadratâ, ventricosâ, posticè subcarinatâ, acuminatâ; anticè subrotundatâ; post angulum complanatâ, levitèr sulcatâ; costis ante angulum sex, tuberculatis; interstitiis punctatis; ante umbones cavernulâ cordiformi, intùs levitèr callosâ.*

Long. 0·90; lat. 1·20; alt. 1·30 poll.

Hab.

Thus we have three species presenting the character in common, of having a callosity within a heart-shaped cavity, close under the *umbones*, namely, the true *C. retusum*; the var. "(2.) testâ punctis sanguineis pictâ" of Lam., which has been named *C. auricula* by Forskäll, and the present species, which resembles the original *C. retusum* in general appearance, but it is more elongated and smoother behind the angle, the cavity is not so deep, and the callosity is more strongly marked.

CARDIUM FRAGILE, Conch. Illustr. f. 68. *Card. testâ rotundatâ, tenui, lævi, subequilaterâ, posticè paulò inflatâ, albâ, fusco-lineatâ, epidermide fulvâ indutâ; intùs albâ ad marginem rubescente; ad umbones flavâ; margine levitèr sulcato.*

Long. 1·05; lat. 0·65; alt. 1· poll.

The only specimen at present known is in the collection of the Rev. F. J. Stainforth. We have no information as to its locality.

CARDIUM FOVEOLATUM, Conch. Illustr. f. 65. *Card. testâ subrotundato-ovali, compressâ, albâ, costis* 43, *quarum* 25 *anterioribus rotundatis, crenulatis, deinde posterioribus* 10 *lævibus, subangulatis, extremis concavis, ad latera crenulatis.*

Long. 1·45; lat. 0·90; alt. 1·55 poll.

Hab. ad oras Australiæ (Swan River).

The last ribs on the posterior side are hollow, with crenulations crossing them so as to form little pits. This species belongs to the same section as *C. muricatum*, but it is much flatter and has a greater number of ribs.

GEOLOGICAL SOCIETY.

Nov. 18, 1840.—Mr. Lyell's memoir "On the Geological Evidence of the former existence of Glaciers in Forfarshire," was read.

Three classes of phænomena connected with the transported superficial detritus of Forfarshire, Mr. Lyell had referred, for several years, to the action of drifting ice; namely, 1st, the occurrence of erratics or vast boulders on the tops and sides of hills at various heights, as well as in the bottoms of the valleys, and far from the parent rocks; 2ndly, the want of stratification in the larger portion of the boulder formation or till; and 3rdly, the curvatures and contortions of many of the incoherent strata of gravel or of clay resting upon the unstratified till*. When, however, he attempted to apply the theory of drifting ice over a submerged country to facts with which he had been long acquainted in Forfarshire, he found great difficulty in accounting for the constant subterposition of the till with boulders to the stratified deposits of loam and gravel; for the till ascending to higher levels than the gravel, and often forming mounds which nearly block up the drainage of certain glens and straths; for its constituting, with a capping of stratified matter, narrow ridges, which frequently surround lake-swamps and peat-mosses; and for the total absence of organic remains in the till.

Since, however, Professor Agassiz's extension to Scotland of the glacial theory, and its attendant phænomena, Mr. Lyell has re-examined a considerable portion of Forfarshire, and having become convinced that glaciers existed for a long time in the Grampians, and extended into the low country, many of his previous difficulties have been removed. There are, nevertheless, facts connected with the ridges of stratified materials resting upon till, which he is unable to explain. He also states, that though he had for years inferred from the evidence of fossil shells sent to him from Canada by Capt. Bayfield, that the climate of North America, in the latitude of Quebec, was far more intensely cold at one period than it is now†, yet, that his thoughts had been diverted from the consideration of a long-continued covering of snow on the Scottish mountains, by the knowledge that the climate of Great Britain, during the several tertiary epochs, was warmer than it is at present. He is of opinion that, during a period immediately antecedent to the existing, several oscillations of temperature may have occurred in the northern hemisphere.

Forfarshire, Mr. Lyell divides geologically into three principal districts: 1st, the Grampians, composed of granite, gneiss, mica-slate, and clay-slate, flanked by a lower range of vertical beds of old red sandstone, associated with trap; 2ndly, the great synclinal trough of Strathmore, occupied by the middle and newer mem-

* See Mr. Lyell's paper on the Norfolk Drift, Phil. Mag., May 1840, and the Abstract of the paper in the Proceedings of the Society, vol. iii. p. 171.

† See Proceedings, vol. iii. p. 119 [or L. & E. Phil. Mag. vol. xv. p. 399].

bers of the old red sandstone; and 3rdly, the anticlinal chain of the Sidlaw Hills, consisting of the inferior or grey beds of the old red sandstone, usually accompanied by trap. He further states, that it represents, on a small scale, both geologically and physically, the portion of Switzerland where erratic blocks are most abundant, the Grampians with their crystalline rocks being comparable to the Alps, the secondary chain of the Sidlaw Hills to the Jura, and Strathmore to the great valley of Switzerland; and that the resemblance is increased by the occurrence in Strathmore and on the Sidlaw Hills of angular and rounded blocks of Grampian rocks.

The superficial detritus of Forfarshire, Mr. Lyell divides into three deposits: 1st, the thin unstratified covering on the Grampians, derived from the disintegration of the subjacent strata, with a slight intermixture of pebbles traceable to rocks at a higher level, not far distant; 2ndly, the unstratified materials enclosing boulders which occur at the base of the hills on both sides of every glen, and not due to taluses formed by landslips, but constituting terraces of transported debris, with a nearly flat top, and sometimes with two steep sides, one towards the river, and the other of less height towards the mountain; and 3rdly, the stratified gravels, sands and clays which overlie the unstratified detritus. Mr. Lyell confines his observations principally to the second and third divisions.

The terraces or lateral mounds very generally increase in width and depth as they descend from the higher to the lower glens, attaining in the latter sometimes a thickness of 100 feet, and occasionally so great a breadth as to leave only sufficient room for the river to pass. The inferior part is always unstratified, consisting of mud and sand, in which large angular and rounded fragments of rocks are imbedded. These boulders are more and more rounded as their distance increases from the hills whence they could have been detached; but they are more frequently flat-sided than pebbles which have been rounded by water; and they become more diversified in character by the junction of every tributary glen. In the upper part the mounds often consist of 40 to 80 feet of the same materials as the lower, but regularly stratified. Mr. Lyell then proceeds to illustrate his subject by describing in detail the phænomena presented by the valley of the South Esk and those of its tributaries.

The South Esk springs from a shallow lake nearly 3000 feet above the level of the sea, and twenty miles from Strathmore. For six miles the river flows through a district composed partly of gneiss, traversed by veins of granite or eurite, and partly of granite. The fragments derived from this high region may be traced downwards continuously for twelve miles to Cortachie; and as a proof that the detritus forming the lateral mounds has followed the same downward course, Mr. Lyell states that it preserves throughout, as well in the main as in the lateral glens, an uniformly grey colour; while the detritus of the lower zone of mica-slate is invariably tinged red, this colour being also imparted to the debris of the still lower portions of the glens, notwithstanding the intermixture of pale brown

materials obtained from the clay-slate of that district. Another proof of the detritus not having been drifted upwards, is the absence in the higher portions of the glens of the blocks of pure white quartz which abound in the region of mica-schist, and have been derived from the numerous veins and beds of quartz belonging to that formation. The chief exception to this arrangement is a boulder of conglomerate in the bed of the Proson, evidently derived from hills two miles to the south, but which are considerably above the level of the glen. A few other similar exceptions have been noticed, but the distances to which the stragglers have been traced are inconsiderable. The phænomena exhibited by the lateral mounds, Mr. Lyell states, agree well with the hypothesis of their being the lateral moraines of glaciers; and he adds, that he had never been able to reconcile these phænomena, particularly the want of stratification, with the theory of the accumulations of the detritus during submergence, and the removal by denudation of the central portions of a deposit which had by that means filled the glens. The distribution of an enormous mass of boulders on the southern side of Loch Brandy, and clearly derived from the precipices which overhang the Loch on the three other sides, is advanced as another proof in favour of the glacial theory. It is impossible to conjecture, Mr. Lyell says, how these blocks could have been transported half a mile over a deep lake; but let it be imagined that the Loch was once occupied by a glacier, and the difficulty is removed. Loch Whorral, about a mile to the east of Loch Brandy, is also surrounded on its north, east and western sides by precipices of gneiss, and presents on its southern an immense accumulation of boulders with other detritus, strewed over with angular blocks of gneiss, in some instances twenty feet in diameter. This moraine is several hundred yards wide, and exceeds twenty feet in depth, terminating at the borders of the plain of Clova in a multitude of hillocks and ridges much resembling in shape some terminal moraines examined by Mr. Lyell in Switzerland.

The great transverse barrier at Glenairn, where the valley of the South Esk contracts from a mile to half a mile in breadth, and is flanked by steep mountains, Mr. Lyell formerly regarded as very difficult of explanation. Seen from below, this barrier resembles an artificial dam 200 feet high, with numerous hillocks on its summit. On the eastern side it appears to have been denuded to the extent of about 300 yards by the Esk. Its breadth from north to south is about half a mile. The lower part, 30 feet in depth, laid open in the river cliff, consists of impervious, unstratified mud, full of boulders; but the total vertical thickness of this deposit is stated to be from 50 to 80 feet; and the upper part of the barrier is composed of from 50 to 100 feet of very fine stratified materials. It is not possible, Mr. Lyell observes, to account for the accumulation of this barrier by the agency of water, particularly as no tributary joins the Esk at this point; but if the barrier be supposed to be the large terminal moraine of a receding glacier, then its form and position, he says, are easily to be understood. M. Agassiz, in his work on glaciers, shows, that when these masses of ice enter a nar-

row defile from a broader valley, the lateral moraines are forced towards the centre, and the mass of transported matter is spread more uniformly over the whole. Such a terminal moraine left by a receding glacier in a defile, Mr. Lyell states, would dam back the waters of the glacier, and produce a lake; and the phænomena presented by the barrier of Glenairn, and the plain which extends in its rear, are fully explicable on the assumption of their having been produced by a glacier. The stratification of the upper portion of the barrier is also shown to be partly in accordance with the effects produced by the formation of ponds of water on the surface of moraines; but Mr. Lyell states, that the accumulation of so great a capping of stratified materials is still the most obscure character of the deposits under consideration.

At Cortachie, about four miles below the barrier of Glenairn, the South Esk enters the country of old red sandstone, and a mile and a half lower it is joined by the Proson, and a mile yet lower by the Carity. In the district in which these streams unite there is a considerable thickness of unstratified matter full of Grampian boulders, and covered for the greater part with stratified gravel and sand. In some cases the latter exhibit the diagonal laminæ common in subaqueous formations; and in others the strata are so contorted, that a perpendicular shaft might intersect the same beds three times. In the latter instances the surface of the subjacent red boulder clay has not partaken of the movement by which the stratified deposit was contorted; and in consequence Mr. Lyell ascribed the effect, when he first beheld it in 1839, to the lateral pressure of large masses of drifted ice repeatedly stranding upon a shoal of soft materials*. In the middle of the tract between the South Esk and the Proson is a dry valley, and to the south of this valley, near the Proson, an excavation was made ten years ago, which exposed extremely contorted beds overtopped by others perfectly horizontal, having been formed by tranquil deposition after the disturbance of strata previously deposited. The phænomena exhibited by the till in this district, Mr. Lyell conceives, might be well accounted for by supposing the union of three or four large glaciers; but he considers it difficult to explain the accumulation of the overlying stratified materials, the top of which must be 600 feet above the level of the sea, and facing the Strath. In following out the narrow ridge which intervenes between the Proson and the Carity, during last October, in company with Dr. Buckland, the latter drew the author's attention to a spot half a mile south-west of the House of Pearsie, where the surface of a porphyry rock was polished, furrowed and scratched. The quarrymen of Forfarshire also state as a general fact, that rocks of sufficient hardness, when first laid bare, are smooth, polished and scored; and Mr. Blackadder has found on the Sidlaw Hills large boulders of sandstone grooved and polished. Another general fact mentioned by Mr. Lyell is, that the unstratified boulder-clay becomes more and more impervious in the lower part of the Grampian glens, not in

* See Proceedings, vol. iii. p. 178.

consequence of the influx of distinct materials, but in the author's opinion of the grinding down by the ice of the mud and other detritus.

Mr. Lyell then describes the phænomena of the second district, or Strathmore. Though this district may be considered as one great strath, yet it is divided into many longitudinal ridges and valleys. The former, sometimes 300 feet in height, are for the greater part parallel to the strike of the old red sandstone, and are generally covered to the depth of sixty or more feet with till and erratics, derived from the Grampians and the subjacent strata. This covering is so general, that the structure of the district can be detected only in the ravines through which the principal rivers pass. The till constitutes invariably the oldest part of the detritus. The boulders which it contains sometimes exceed three feet in diameter: on the north muir of Kerriemuir is a block of trap-rock, six feet by five feet, and near it is a mass of mica-schist, nine feet long by four feet wide and three high. The till has been ascertained by Mr. Blackadder to fill, in many places, deep hollows in the sandstone, which would become lakes or peat-mosses if the till were extracted. This distribution of the detritus, Mr. Lyell observes, may be explained on the supposition that, if the cold period came on slowly, the advance of the glaciers would push forward the detritus accumulated at their termination, and fill up, wholly or in part, the lakes or other cavities which they would encounter in their progress. Along most of the river-courses, and in the lowest depressions of Strathmore, the till is covered by stratified sand and gravel.

One of the most remarkable peculiarities of the transported materials of Forfarshire and Perthshire is a continuous stream, from three to three and a half miles wide, of boulders and pebbles, traceable from near Dunkeld, by Coupar, to the south of Blairgowrie, then through the lowest part of Strathmore, and afterwards in a straight line through the lowest depression of the Sidlaw Hills from Forfar to Lunan Bay, a distance of thirty-four miles. No great river follows this course, but it is marked everywhere by lakes or ponds, which afford shell-marl, swamps, and peat-mosses, commonly surrounded by ridges of detritus from fifty to seventy feet high, consisting in the lower part of till and boulders, and in the upper of stratified gravel, sand, loam and clay, in some instances curved or contorted. The form of the included spaces is sometimes oval, sometimes quadrangular. The finest examples are in the lower tract, which has the Dean for its southern boundary, and the road from the bridge of Ruthven to the south of the grounds of Lindertis for its northern. The Grampian boulders are throughout the same; but there are associated with them masses of actinolite schist, which Mr. Blackadder has ascertained could be derived only from the valley of the Tay. The fragments of secondary rocks belong to the formations of the districts in which they occur. Though the country occupied by these marl-loch lakes is not traversed longitudinally by any river, yet it is so low, that if the transported matter were removed, a very slight depression would cause the sea to flow from

Lunan Bay by Forfar to Blairgowrie and Dunkeld. Mr. Lyell therefore formerly conceived that an estuary might have extended in that direction, and that the till might have been drifted by masses of ice floated from the Grampians and contiguous hills. The overlying ridges of sand and gravel he thought might have been bars formed one after the other, in the same manner as the bar of sand and shingle, which now crosses the mouth of the Tay. The inland ridges of sand with boulders, which Mr. Lyell noticed in Sweden, and certainly produced under the sea, confirmed him in this view. These Swedish ridges are from fifty to several hundred yards broad, but sometimes so narrow on the top as to leave little more than room for a road; they are from fifty to a hundred feet high, and they may be often traced in unbroken lines for many leagues, ranging north and south. In his account of these ridges, in a memoir published in the Philosophical Transactions*, Mr. Lyell states his belief that they were thrown down at the bottom of the Gulf of Bothnia, in lines parallel to the ancient coast, and during the successive rise of the land. They usually consist of stratified sand and gravel, the layers being often at high inclinations; but where they are composed of boulders, no stratification is observable. After a long search, Mr. Lyell succeeded in finding shells in a layer of marl belonging to a ridge in the suburbs of Upsala, about twelve feet below the summit of the ridge, and eighty above the sea. The shells consisted of *Mytilus edulis, Cardium edule, Tellina Baltica, Littorina littorea,* and *Turbo ulvæ,* the most common species in the Baltic, and they constituted the greater part of the layer. On the summit of the ridge, at a short distance, he noticed angular masses of gneiss and granite, from nine to sixteen feet long, which had evidently been lodged when the ridge was submarine.

In Forfarshire Mr. Lyell never succeeded, as in the above case in Sweden, in finding marine shells in the ridges of sand; nor does he remember to have seen in Sweden transverse ridges at right angles to the north and south. The glacier theory, the author states, appears to offer a happy solution of the problem of the marl-loch gravels, the longitudinal banks being regarded as lateral and medial moraines, and the transverse ridges as terminal. The chief objections are the stratification of the upper part of the banks, and the necessity of assuming a glacier thirty-four miles in length, with a fall of only 300 or 400 feet of country.

It has always appeared to Mr. Lyell and Mr. Blackadder remarkable, that the marl-loch gravels at Forfar are nearly 100 feet above the tract of till which separates them from the valley of South Esk, in Strathmore. In the present configuration of the country, water could not deposit the Forfar gravels without extending to the South Esk, the detritus of which is distinct, and separated by a low district of till without gravel. The only explanations of these phænomena Mr. Lyell considers to be either that the till is the moraine of a glacier, or that there has been a local change of relative levels of

* 1835, pp. 15, 16.

lands, by which the gravel of Forfar was uplifted, or the till to the northward depressed.

Another line of stratified detritus ranges at a higher level from the Loch of Lundie, along the Dichty Water, to the sea at Moray Firth, a distance of thirteen miles; and it is stated that many others might be enumerated. It is only on the coast to the east and west of Dundee, at heights varying from twenty to forty feet, that stratified clay and gravel have been found by Mr. Lyell to contain marine shells, all belonging to known existing species, except a *Nucula*. Although these remains prove a certain amount of upheaval subsequent to the deposition of the till, or to the commencement of the glacial epoch, including an equal movement in the interior, still Mr. Lyell objects to a general submergence of that part of Scotland, since the till and erratic blocks were conveyed to their present positions; as the stratified gravel is too partial and at too low a level to support such a theory; and he would rather account for the existence of the stratified deposits, by assuming that barriers of ice produced extensive lakes, the waters of which threw down ridges of stratified materials on the tops of the moraines. With respect to the geological age of the beds containing the marine shells, Mr. Lyell is of opinion that it is synchronous with that of the older of the recent formations on the Clyde, examined by Mr. Smith of Jordan Hill, and Mr. E. Forbes; and with respect to the age of the till and stratified gravel last formed, he is of opinion that it is very modern, because these accumulations constitute exclusively the dams of certain marl-lochs to the very bottom of the sediment formed, in which all the Testacea and skeletons of quadrupeds, as well as the remains of plants which have been found, are of existing species.

The third district, or that of the Sidlaw Hills, claimed Mr. Lyell's attention more particularly on account of the Grampian boulders with which it abounds. This range, whose greatest height is 1500 feet above the sea, is composed of anticlinal strata of grey sandstone, belonging to the old red sandstone, with associated trap. It is covered, as well as the whole of the country between Strathmore and the Tay, with the impervious till, containing Grampian boulders and fragments of the subjacent grey sandstone. The finest instances of erratics observed by Mr. Lyell occur on Pitscanly Hill, 700 feet, and the adjacent hill of Turin, 800 feet above the level of the sea. About forty feet below the summit, on the southern side of the former, is a block of mica-slate thirteen feet long, seven broad, and seven in height above the ground. Four smaller and equally angular masses, from three to six feet in diameter, lie close to its north end, as if severed from it. One of the nearest points at which this gneiss occurs *in situ*, is the Craig of Balloch, fifteen miles distant, on the northern extremity of the Creigh Hill, and between these points intervenes the great valley of Strathmore and the hills of Finhaven. Other Grampian boulders, from three to six feet in diameter, occur on the hills between Lumley Den and Lundie, at the height of 1000 feet; and Mr. Blackadder has found fragments of mica-schist one foot in

diameter on the summit of Craigowl, the highest point of the Sidlaw Hills, and exceeding 1500 feet above the level of the sea.

In conclusion, Mr. Lyell offers some remarks on the conditions under which glaciers may have existed in Scotland, and the differences between them and those of the glaciers of Switzerland. He states that the glaciers of the latter country being situated 11° further to the south, they can present but an imperfect analogy with permanent masses of ice in Forfarshire, and that it is to South Georgia, Kerguelen's Land and Sandwich Land that we must look for the nearest approach to that state of things which must have existed in Scotland during the glacial epoch. In those regions of the southern hemisphere the ice reaches to the borders of the sea, and the temperature of summer and winter being nearly equalized, the glaciers probably remain almost stationary, like those of the Alps in winter, and can be diminished by only the first two of the three causes which tend to check an indefinite accumulation of snow in Switzerland; viz. 1st, evaporation without melting; and 2ndly, the descent of glaciers by gravitation, considered by M. Agassiz to be not very influential:—the third cause, the descent of glaciers arising from alternate liquefaction and freezing, he conceives must be wholly suspended in these regions.

As the tertiary strata prove that a warm climate certainly preceded the assumed glacial epoch in the northern hemisphere, and as a mild climate has since prevailed, Mr. Lyell says, there are three distinct phases of action to be considered in studying the supposed glaciers of Scotland: 1st, the coming on of the epoch; 2nd, its continuance in full intensity; and 3rd, its gradual retreat. At the commencement of the first condition, only the higher mountains would send down glaciers to be melted in the plains below, as at present in Switzerland, and in Chili between the 40th and 50th degrees of latitude. The ice would therefore thus be constantly advancing and retreating, but progressively, century by century, gaining ground, in consequence of diminishing summer heat; and pushing its terminal moraines forward, it would fill up lakes and other inequalities, till it finally reached the sea. During the second condition, when the motion of the ice would be very small, there would be, Mr. Lyell states, vast accumulations of snow filling the plains and valleys to a great height, and leaving bare only the higher peaks and precipices of the mountains. From these points, he conceives the erratic blocks were detached and conveyed almost imperceptibly along the surface of the frozen snow to great distances. Lastly, at the breaking up and gradual retreat of the glaciers during the third period, he is of opinion, the boulders were deposited in the various situations in which they are now found, and that moraines, or lateral and transverse mounds, were successively deposited, and lakes formed by which stratified materials were accumulated in certain positions.

LIII.—*Information respecting Zoological and Botanical Travellers.*

Mr. Forbes and Mr. Thompson.—We have just seen Mr. Thompson, who after visiting Constantinople, Smyrna, Athens, &c., has returned from the Archipelago in consequence of the survey of Candia being abandoned for the present year, or until the island becomes more settled. We are happy to hear from him that he left Mr. Forbes very well on the 10th of June at Port Nousa, in the island of Paros, where he had then been for a month most successfully engaged in his researches, especially in marine zoology. Mr. Forbes hopes to be able to visit all the islands composing the Cyclades group during the summer and autumn of the present year.

We have received from him descriptions of some new and very remarkable marine invertebrate animals, which we shall soon lay before our readers.

Mr. Schomburgk.—Recent letters from Mr. Schomburgk, dated Demerara, 12th of April, mention his safe arrival at that place, and that he was about to start on the following day to the westward to the mouth of the Wayina, where would be his head-quarters for a short time. All the party were well with the exception of Mr. Walton the draughtsman, who not finding himself strong enough for a tropical climate was about to return to England. Mr. Schomburgk expected to start for the interior of Guiana about the beginning of August.

Mr. W. S. MacLeay.—"As might be expected, the time spent on the long voyage from England to Sydney was not lost; the ocean indeed is a rich domain to the philosopher. Mr. MacLeay mentions having fallen in with the American Scientific Expedition, which left the United States about eighteen months ago, in two corvettes and four schooners. They had visited, when Mr. MacLeay met them, the Cape de Verds, Brazil, Patagonia, Terra del Fuego, Chili, Peru, and the South Sea Islands, and had made extensive collections in all departments of natural history. The following are the scientific men who compose the expedition, and their duties. Titian Peale for mammalia and birds; Dr. Pickering for insects, reptiles, and fishes; Mr. Coulter for mollusca, and Mr. Dana for crustacea, pelagic animals, and geology; Mr. Rich for botany; two gardeners, and two artists, complete the scientific corps. The expedition is creditable to the United States, and we trust will prove highly important to the advancement of science. Extensive collections were making in every department of nature, which were forwarded to Philadelphia as opportunities offered. With regard to Mr. MacLeay himself, it is his intention to remain four or five years in New South Wales, where he thinks he will have occasion to publish some of the results of his investigations without waiting for the remote prospect of his return to England. He had made one journey to the Hunter river; there

are bones, he observes, in limestone caves of Wellington valley, which prove to be those of gigantic marsupials, now extinct; but with the exception of these, few fossils have been found in New South Wales. The impressions of a fern and of a fish, some corallines, molluscous shells, and a few radiata, are all that he has yet seen or heard of. No crustacea or annulosa or cirripedous shells have yet been found, nor reptiles or birds. Indeed, he observes, this *new* country is in reality a very old one, if we may judge from the low organization of its fossil remains.

"Mr. MacLeay asks many questions regarding India, which perhaps we shall do better by publishing than by attempting to answer ourselves. He is particularly interested in those fossil remains which, as he himself expresses it, 'fill up gaps in the chain of living nature,' and asks if we have any Trilobites. They occur, he says, at the Cape of Good Hope, and might be expected in Silurian rocks. He is desirous of being informed if leeches abound in the dark damp forests of India, and also if there be any insects parasitical in ants' nests, and whether bees and wasps are infested with parasites in India. He is desirous of having some of the Hymenopterous and Dipterous insects of India, with all the parasitical kinds, and the names of the animals they infest. We had sent a small collection of the commoner insects collected in the cold season, but Mr. MacLeay is now desirous of having some of those which are found on plants of various kinds during the rains; and in making collections during winter, he recommends stones to be turned, and the bark of trees to be removed in search of the rarer sorts. Calcutta is not the most favourable place for making collections of any kind, but we shall procure what we can; we shall also be very happy to forward to Mr. MacLeay any collections that may be entrusted to us for the purpose by friends in the *Mofussil*."—*Calcutta Journal of Natural History*, No. 2.

MISCELLANEOUS.

A new Genus of Mexican Glirine Mammalia.—Mr. John Phillips, who has lately returned from Real del Monte, Mexico, has, at the recommendation of Mr. John Taylor, sent to the British Museum the skins of some very rare and interesting birds, of a *Bassaris*, and of the new animal which I shall now proceed to describe. This animal is very interesting, as having all the external form and colouring of a *Gerboa*; and it is doubtless the American representative of that African genus, though differing from it very essentially, in being provided, like some other American genera, as *Saccophorus*, *Saccomys*, and *Heteromys*, with large cheek-pouches, which open externally on the side of the cheeks. I propose to call it

Dipodomys.

Body covered with soft hair. Head moderate, with large cheek-pouches opening externally on the side of the cheeks. Ears and eyes rather large; the fore-legs short; the hind tarsus long and

slender; the hind feet very long; the soles covered with hair; toes 5—4. The tail much longer than the body, covered with rather short hair, and with a dilated brush at the end; the upper cutting teeth grooved in front. Grinders ——?

This genus differs from all those above cited in the tail being elongated and covered with hair, with a pencil at the ends like the *Gerboas*, and from *Saccomys* in the soles of the hind feet being hairy.

DIPODOMYS PHILLIPII, *Gray*.

Grey-brown, with longer black hairs; sides sandy; side of the nose, spot near the base of the ears, band across the thigh and beneath, pure white; nose, spot at the base of the long black whiskers, and at the base of the tail, black; tail black-brown, with the band on each of its sides and tip white; penis ending in a long spine. Length: body and head 5 inches; tail $6\frac{1}{2}$ inches; hind feet $1\frac{1}{2}$ inch.

Inhab. Mexico, near Real del Monte. John Phillips, Esq.

I may here remark, that *Bassaris*, like the Weasels, has the soles of the feet covered with hair, and appears to be more allied to that genus than to the Gluttons (*Gulo*).—J. E. GRAY.

ON A NEW EUROPEAN GENUS OF FRESHWATER FISH. BY F. HECKEL*.

If we cast a view on the numerous new species of freshwater fish with which the ichthyologists of England, Scandinavia, Russia, France, Germany, and especially those of Italy, have of late, after careful comparison, made us acquainted, there needs no great foresight to suspect new species also in the western and south-eastern districts of Europe, which, in this respect, may nearly be regarded as *terra incognita*. But if it had been asserted that there might still occur on land or in fresh water in Europe a remarkable vertebrate animal which had hitherto remained unknown which would deserve to form an absolutely new genus, this assertion would have met with no favourable reception, as much too hazardous, and as a phænomenon which, after such great progress in Natural History, might have been expected only in distant regions far removed from all cultivation. But that which was so little to be expected is now established as a fact. An ichthyological journey in Dalmatia which I had occasion to undertake towards the close of last summer, in which it was my chief purpose to examine most accurately all the fresh waters of this highly interesting country, afforded me not only several hitherto unknown species, but, to my great joy and astonishment, an animal so remarkable even in a physiological respect, that it fully claims to be regarded as a peculiar and highly characteristic genus. It occurs near the frontiers of Bosnia, and also in Bosnia, pretty frequently, and belongs to the large family of the *Cyprinidæ*. The principal character by which it is distinguished among the latter, is a fleshy canal which coheres longitudinally with the first ray of the anal fin, and represents an external tubular appendix of the anus, by which the anal

* Translated by Mr. W. Francis from the original, communicated by J. E. Gray, Esq.

aperture terminates at the extremity of this fin-ray or rather at the end of the fin itself. Among all hitherto known fishes, the curious *Anableps tetrophthalmus*, from the rivers of Brazil and Surinam, alone possesses anything analogous. In other respects our fish approaches most nearly in general habit those of the genus *Barbus*, Cuvier, but has decidedly *no* scales. The more complete description of it will appear next spring in my intended work on the freshwater fish of Austria, on which occasion all the new species will be most perfectly and truly represented with the aid of my ichthyometer. In the mean time, I will call this highly remarkable new genus *Aulopyge*, and feel greatly honoured in dedicating the same to my highly honoured Mecænas Baron von Hügel, by giving his name to the only species as yet known.

FORBES'S STARFISHES—ECHINUS LIVIDUS.

Cork, June 25, 1841.

"Upon looking into the above interesting work, I find it stated, in the description of *Echinus lividus*, that the animal bores into limestone *only*. Now I can say that it is by no means confined to that rock, as all those that occur on the coast of the county Clare, south of the Islands of Arran, an extent of several miles, to the mouth of the river Shannon, are imbedded in a transition slate? much harder than any limestone with which I am acquainted. The specimen which was sent, some years past, to the late Mr. Bennett by my friend J. D. Humphreys here, and described in the 'Linnæan Transactions,' is composed of the same kind of rock.—SAMUEL WIGHT."

Speaking Canary Bird.—In the notice at p. 238. vol. i. of the 'Annals,' the faculty of imitating articulate sounds was noticed as not having been before observed in the Canary Bird. A similar fact, however, is recorded by Madame Roland in the very interesting memoir of her life. Speaking of the good nun, Sœur Sainte Agathe, from whom she had received great kindness when at the convent school, she says, "Elle m'emmenait quelquefois dans sa cellule, où elle avoit un Serin charmant, familier, caressant, à qui elle avoit appris à parler."

BIRDS OF KENT.

Mr. Mummery has communicated the following notices of Birds lately taken in the Isle of Thanet:—

"May 6th, at Sacket's Hill, about a mile from Margate, I shot a beautiful specimen of the *Oreolus galbula*, or Golden Oreole, a female in fine plumage. On dissection it was found to contain sixteen small eggs. On the same day I shot a beautiful specimen of the *Lanius rufus*, or Wood Chat Shrike. I have also seen at Sacket's Hill a beautiful bird, the *Nucifraga Caryocatactes*, or Nutcracker: I kept in sight of it for about two hours without being able to get a shot at it.

"Several *Limosa rufa*, or Bar-tailed Godwits, have been captured in this neighbourhood, especially at North Shore, near Sandwich. A friend of mine shot fourteen in one shot, the largest number at one time I have heard of. I have shot several, some of them being very splendid birds in full plumage, several of which are in skins for sale.

"I have also shot a very fine *Totanus glareola*, or Wood Sandpiper; and a pair of *Charadrius Cantianus*, or Kentish Plover, male and female, very beautiful birds: the female is in the Margate Museum."

3, Bath Road, Margate, Kent.

Mr. Mummery, who is now on his way to the Orkney Islands, on an ornithological expedition, also informs us that two Porbeagle Sharks, a male and a female, have just been taken at Margate in a mackerel-net, and are designed for the Museum there.

EMBERIZA HORTULANA.

Henfield, Sussex, May 29.

Sir,—As it appears to me that the occurrence of every rare animal ought to be made known to those who take an interest in Natural History, I send you the following notice, thinking that the Editors may probably consider it worthy of insertion in their Magazine.

On the 29th of April a very perfect specimen of the Ortolan Bunting, *Emberiza Hortulana* of Jenyns, 'Brit. An.' p. 132, was shot whilst sitting on the parapet of the viaduct of the Brighton and London Railway, near the Brighton terminus. When first seen it was very restless, flitting about and uttering an incessant shrill chirping note. This specimen, which is now in my possession, agrees in every respect with the descriptions of Mr. Jenyns and of Mr. Yarrell, except that the tail has a portion of the inner webs of *three* of the outer feathers white instead of *two*.

This is, I believe, at most only the sixth specimen which has hitherto occurred in Britain.

I am, Sir, yours obediently,

Richard Taylor, Esq. Wm. Borrer, Jun.

Diluvial Scratches.—"Large areas of this rock being uncovered for the purpose of quarrying, it is found planished as if by the friction of some heavy body moving over it, and marked by parallel grooves, which are regarded by Dr. Locke as 'diluvial scratches*;' they are found at 'Light's quarry, east of the Miami, and seven miles above Dayton, thus rendered particularly interesting by the discovery in it of 'diluvial grooves,' a circumstance which I had thought probable from the fact of the planishing or grinding down of the strata' first observed at Col. Partridge's quarry, 'where the upper surface, especially at the apex of its convexity, has its roughness nearly worn off, not by corrosion or by decomposition, nor by the attrition of sand and gravel, but by the grinding of a flat surface, making the work, so far as it went, a perfect plane, and leaving the pits of the deepest cavities entirely untouched†.' 'Light's quarry has been 'stripped' of soil, more or less, over ten acres, and the upper layer of stone is

* [They will now, perhaps, be claimed by some of our geologists as *glacial*.—Ed.]

† These cavities are found, where another layer of the rock lies upon this, to answer to salient points in the upper one, and the "natural surface of the stone is within certain limits as rough as can be conceived, there being sharp teeth, an inch long, projecting from one layer and entering the contiguous one."

in most places completely ground down to a plane, as perfectly as it could have been by a stone-cutter by polishing.' 'In many places, grooves and scratches in straight and parallel lines are distinctly visible, evidently formed by the progress of some heavy mass, propelled by a regular and uniform motion. The grooves are in width from lines scarcely visible to those three-fourths of an inch wide, and from one-fortieth to one-eighth of an inch deep, traversing the quarry from between north 19°, to north 33° west, to the opposite points in lines *exactly straight*, and in fascicles of sometimes ten in number, *exactly parallel*: clearly in compact limestone, without seam or fault of any kind, and in a surface ground down to a perfect plane.' To illustrate these appearances, a portion of the stone was taken, and by the process of 'medal ruling,' a perfect engraving was made by the tracer, and a picture is given in the report (p. 230) of great distinctness. The blue limestone abounds with the *Strophomena* of Raf., while the cliff has few of them. The shell of the fossils is often preserved in the blue, while in the cliff limestone only the cast is found."—*Silliman's American Journal, Jan.* 1841.

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

"What can we reason but from what we know?"—*Pope.*

Differences of Neuters in Ants.—In the account of the Proceedings of the Entomological Society of the 1st of June, 1840, published in the last Number of this Journal, it is said,—"Mr. Shuckard also stated his opinion, that there was never more than one kind of Neuter among the Ants." As this might be understood to imply that I am ignorant of what has been stated by Huber, Lund, and others, of there being different classes of Neuters—viz. Soldiers and Workers—I request to state, that my observation was the result of the careful study of an extensive collection of the Social Heterogyna, in which, with but one exception, and that in a rare genus, I have detected only one description of neuters, for mere differences of size are of no importance, knowing as we do how much most insects vary in this respect. To this I alluded at the time. Where a functional difference exists, we are prepared, from analogy, to expect corresponding structural differences; but not finding these, I apprehend we may more correctly attribute what has been observed either to an enlarged instinct peculiar to certain genera of this tribe of insects, capable of being alternately exercised by all their individuals under certain influences, and not restricted to a certain class, or perhaps to the preoccupied imagination of the observers themselves. It has been said, that the heads of the soldiers are proportionally larger: if such be the case, it is remarkable that describers have not given the descriptions of two kinds of neuters, especially in the European genus *Atta*. The respective types of the two distinct forms of a neuter which I mentioned above as the only exception to the generality of my observation, are the *Formica* (*Eciton*) *hamata*, Latr., and *curvidentata*, Latr.

Under the date of October 5th likewise, in the same Number of this Journal, it is stated that Mr. Smith exhibited *the two* distinct kinds of neuters of *Formica sanguinea*, but it is not said whether any

distinction exists beyond differences of size. This I should much like to know, as I was not present at that meeting of the Society.

Obscurity will necessarily involve the natural history of the Social Heterogyna until competent observers pursue its investigation in tropical climates; and it is very much to be regretted that Lund should either not have availed himself of his skill and opportunities, or that their results should still be withheld from the entomological public.—W. E. S.

Doubtful identity of Miscus campestris and Ammophila sabulosa.—Under the date of September 7, it is mentioned that Mr. Smith exhibited specimens of *Miscus campestris* and *Ammophila vulgaris*, taken *in copulâ*, whence he was led to consider the former only as a variety of the latter species. From the known interest I take in the Fossorial Hymenoptera, I may be excused for observing that I cannot participate in Mr. Smith's opinion; for notwithstanding the *possibility* of *generic* identity in the two insects, there cannot be the least doubt of their *specific* distinction. I might just as confidently state that *Osmia hirta* and *Chelostoma maxillosa* are identical, because I took them under the same circumstances. Besides, many well-authenticated instances are known of widely dissimilar insects being found in equally suspicious conjunction.—W. E. S.

Reports of Discussions.—I wish to remark upon the reports of the discussions that succeed the reading of papers at the Entomological Society, that *vivâ voce* expressions of opinion ought to be submitted, prior to publication, to their several originators to ensure accuracy; and indeed, even if the *report be correct*, a man may not care to have an opinion go forth to the world which was struck out only in the heat of argument. I think the Geological Society acts far more wisely by prohibiting the publication of their *extempore* discussions, as this and other journals present adequate means for all who desire to announce their views.—W. E. Shuckard.

Chelsea, April 22, 1841.

OBITUARY:—C. S. RAFINESQUE.

"Constantine S. Rafinesque-Schmaltz, a Sicilian by birth, first went to North America in the year 1802, where he remained for three years; and returning from his native land in 1815, continued to reside in the United States until his decease in September last (1840). The name of this eccentric, but certainly gifted person, has been connected with the natural history of this country for the last thirty-five years; yet, from the manner of their publication, many of his scattered writings are little known to men of science. It is chiefly as a naturalist that Rafinesque is known, although his attention has by no means been restricted to Natural History; since works on Antiquities, Civil History, Philology, Political Œconomy, Philosophy, and even a poem of nearly six thousand lines, have proceeded from his pen. Botany, however, was his favourite pursuit, and the subject of a large portion of his writings. Our task," says his biographer, "although necessary, as it appears to us, is not altogether pleasing; for while we would do full justice to an author,

who, in his early days, was in some respects greatly in advance of the other writers on the botany of this country, and whose labours have been disregarded or undervalued on account of his peculiarities, we are obliged, at the same time, to protest against all of his later and one of his earlier botanical works. * * * * *

"A gradual deterioration will be observed in Rafinesque's botanical writings from 1819* to about 1830, when the passion for establishing new genera and species appears to have become a complete *monomania*. This is the most charitable supposition we can entertain, and is confirmed by the opinions of those who knew him best. Hitherto we have been particular in the enumeration of his scattered productions†, in order to facilitate the labours of those who may be disposed to search through bushels of chaff for the grain or two of wheat they perchance contain. What consideration they may deserve, let succeeding botanists determine; but we cannot hesitate to assert that none whatever is due to his subsequent works."—*Silliman's American Journal, April* 1841.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1841.

Chiswick.—June 1, 2. Very fine. 3, 4. Fine, with very dry air. 5. Slightly overcast. 6. Very fine: slight rain. 7. Cold and dry: showery and cold. 8, 9. Cloudy and cold. 10. Very fine. 11. Cloudy. 12. Slight rain: clear. 13. Cloudy and cold: clear at night. 14. Very fine. 15. Slight drizzle: cloudy and fine. 16, 17. Very fine. 18. Sultry: rain, with distant thunder and lightning at night. 19. Sultry: rain. 20. Very fine: rain. 21. Heavy showers, with sultry intervals. 22. Very fine: cloudy. 23. Overcast and fine: very heavy rain at noon. 24. Showery: heavy rain at night. 25. Rain. 26. Cloudy. 27. Showery. 28. Rain. 29. Cloudy: showery. 30. Fine.—The mean temperature of the month was about 2° below the average.

Boston.—June 1—4. Fine. 5, 6. Cloudy. 7. Cloudy: rain A.M. and P.M. 8. Cloudy: rain early A.M. 9. Cloudy. 10. Fine. 11—13. Cloudy. 14—17. Fine. 18. Fine: therm. 3 o'clock 74°. 19. Cloudy: rain early A.M.: rain P.M. 20. Fine: rain P.M. 21. Cloudy: brisk wind. 22, 23. Fine. 24. Fine: rain, with thunder and lightning P.M. 25. Rain. 26. Cloudy: rain P.M. 27. Fine. 28. Rain: rain P.M. 29. Fine: rain with thunder and lightning P.M. 30. Fine.

Applegarth Manse, Dumfries-shire.—June 1. Clear and warm. 2. Bright and cool. 3. Hail-showers: thunder. 4. Cloudy. 5. Cloudy: rain P.M. 6. Fine but cloudy. 7. Dry and cool. 8. Dry and cool: withering. 9—11. Dry and cool. 12. Dry and cool, but warmer. 13. Dry and cool. 14. Slight showers. 15, 16. Dry and droughty. 17. Dry and droughty: cloudy. 18. Fine rain and thunder. 19. Rain P.M. 20. Very warm: rain P.M. 21. Heavy showers. 22. Fair all day. 23. Fair and fine. 24. Fair and fine: thunder. 25. Wet nearly all day. 26. Slight showers: thunder. 27. Fair till 4 o'clock: rain. 28. Showery all day. 29. Showery all day: thunder. 30. Rain P.M.

---

* "It was in this year (1819)," remarks Dr. Silliman, "that I became alarmed by a flood of communications, announcing new discoveries by C. S. Rafinesque, and being warned, both at home and abroad, against his claims, I returned him a large bundle of memoirs, prepared with his beautiful and exact chirography, and in the neatest form of scientific papers. This will account for the early disappearance of his communications from this Journal. The step was painful, but necessary; for, if there had been no other difficulty, he alone would have filled the Journal, had he been permitted to proceed."

† Our readers will find these contained in an article of twenty-one pages in Silliman's Journal.

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTON; *by* Mr. THOMPSON *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. VEALL *at Boston, and by* Mr. DUNBAR *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1841. June.	Barometer.						Thermometer.								Wind.				Rain.				Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dum-fries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Self-register. Min.	Max.	Min.		Max.	Min.									
1.	30·214	30·137	30·122	29·50	29·98	30·00	64·3	80·5	56·2	72	47	65	62	51	S.	NE.	W.	W.	...	...	...	...	61
2.	30·272	30·177	30·167	29·55	29·98	30·08	65·0	82·3	55·3	75	53	66	56	41½	S.	W.	W.	W.	...	...	...	...	62
3.	30·250	30·254	30·157	29·62	29·98	30·05	63·0	73·4	56·5	73	41	63	55	38½	N.	W.	W.	SW.	...	...	...	...	59
○ 4.	30·440	30·357	30·300	29·79	30·15	30·11	62·7	73·6	52·2	72	46	57	56	47½	W.	NW.	NW.	SW.	...	...	...	...	53
5.	30·250	30·210	30·004	29·65	30·00	29·92	62·2	73·6	52·0	73	46	58	58	48	W.	W.	W.	SW.	...	·03	...	...	54
6.	30·036	29·981	29·923	29·55	29·95	29·92	55·3	69·0	51·3	59	40	51·5	61	40½	WNW.	NE.	NW.	N.	·019	·01	...	...	54
7.	29·964	29·956	29·921	29·40	30·00	30·04	51·3	60·0	45·3	57	46	49	56½	41	NW.	N.	NW.	N.	...	·02	...	0·06	50
8.	29·996	29·974	29·958	29·48	30·09	30·04	51·0	56·4	47·6	56	46	51·5	59½	43½	NW.	N.	N.	NE.	...	...	·25	...	51
9.	29·970	29·947	29·911	29·47	30·01	29·95	50·3	57·2	47·4	57	39	51·5	61	44	NNW.	NE.	N.	NE.	...	...	...	...	47
10.	29·838	29·815	29·669	29·27	29·87	29·69	52·3	57·6	47·8	71	41	57	76	50	NW.	N.	N.	NW.	...	...	...	...	47
11.	29·722	29·775	29·687	29·22	29·74	29·84	50·5	68·7	49·3	54	45	50	59	46½	NW.	N.	N.	NE.	...	...	...	...	50
☾ 12.	29·850	29·973	29·807	29·37	29·89	29·88	50·7	54·7	46·8	53	37	50	63½	41½	N.	NE.	N.	SW.	...	·01	...	...	47
13.	30·064	30·040	29·944	29·53	30·00	29·96	50·2	55·2	47·0	65	37	57	61	38	NW.	NW.	calm	NW.	...	...	...	...	47
14.	30·100	30·047	29·906	29·47	29·93	29·78	57·3	72·6	46·7	72	53	59·5	54	39	W.	NW.	calm	W.	...	...	...	0·04	48
15.	29·940	30·097	29·895	29·25	29·81	30·00	57·4	66·0	55·6	69	36	57	61	47½	W.	NW.	W.	W & E.	...	·01	...	...	53
16.	30·274	30·208	30·111	29·65	30·02	29·97	60·5	67·8	47·7	72	41	59	61½	44	S.	S.	calm	SW&S.	...	...	...	...	50
17.	30·136	30·079	29·875	29·39	29·91	29·83	61·7	80·3	51·5	70	41	66	61	52½	S.	S.	calm	S.	...	...	...	...	56
18.	29·822	29·788	29·605	29·18	29·70	29·61	64·3	76·4	53·6	80	54	65	59½	53½	NNW.	S.	calm	SE.	...	·24	...	...	56
● 19.	29·650	29·689	29·607	29·05	29·58	29·58	60·7	75·0	58·2	69	45	60	63	51½	W.	W.	calm	E.	·111	·08	·38	...	59
20.	29·842	29·759	29·724	29·22	29·58	29·40	64·3	87·0	51·2	66	54	63	65½	52	S.	SW.	calm	E.	·027	·02	·08	...	57
21.	29·848	29·959	29·769	29·18	29·42	29·62	64·2	71·0	56·3	71	47	65	61	52½	S var.	SW.	W.	SSE.	...	·26	·06	0·88	57
22.	30·118	30·059	29·994	29·50	29·78	29·80	61·7	70·2	53·7	73	46	64	61	49½	S.	W.	W.	SSE.	·366	·01	...	...	56
23.	30·030	30·028	29·812	29·42	29·81	29·75	62·0	69·7	53·4	73	46	64	64	50	S.	S.	calm	SSW.	...	·40	...	...	56
24.	29·800	29·741	29·639	29·25	29·70	29·68	63·0	69·4	53·8	72	54	66	67	46	E.	W.	calm	SE.	...	·49	...	...	55
☽ 25.	29·542	29·543	29·494	29·10	29·61	29·50	55·7	68·4	56·2	70	54	57	54	47	E.	SW.	E.	E & SE.	·525	·04	1·08	...	58
26.	29·686	29·774	29·605	29·10	29·43	29·51	64·0	78·0	56·2	67	52	64	66	48½	S.	SW.	S.	S.	·133	...	·32	...	59
27.	30·012	30·128	29·951	29·38	29·73	29·89	62·5	67·6	56·4	70	52	67	64	49½	W.	W.	W.	WNW.	...	·10	·34	...	59
28.	30·012	29·981	29·773	29·44	29·65	29·60	58·3	68·7	55·3	62	50	58	57	51	S.	S.	W.	S.	·430	·65	·01	1·00	58
29.	29·820	29·817	29·743	29·22	29·58	29·70	61·3	67·4	52·8	69	48	63	64	47½	S.	SW.	W.	E.	·675	·07	·30	...	57
30.	30·046	30·093	29·927	29·43	29·88	29·86	59·7	73·6	52·7	67	52	63	60	50½	W.	NW.	calm	W.	·022	·01	·23	...	56
Mean.	29·985	29·979	29·866	29·38	29·825	29·818	58·9	69·7	52·2	67·30	49·56	59·5	61	47·4					Sum. 2·308	2·45	3·05	1·98	Mean. 54

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

SUPPLEMENT TO VOL. VII. SEPT. 1841.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

FEBRUARY 18, 1841.—A paper was in part read, entitled, "Memoir on a portion of the Lower Jaw of an Iguanodon, and other Saurian Remains discovered in the strata of Tilgate Forest, in Sussex." By Gideon Algernon Mantell, Esq., LL.D., F.R.S.

When the author communicated to the Royal Society, in the year 1825, a notice on the teeth of an unknown herbivorous reptile, found in the limestone of Tilgate Forest, in Sussex, he was in hopes of discovering the jaws, with the teeth attached to it, of the same fossil animal, which might either confirm or modify the inferences he had been led to deduce from an examination of the detached teeth. He was, however, disappointed in the object of his search until lately, when he has been fortunate enough to discover a portion of the lower jaw of a young individual, in which the fangs of many teeth, and the germs of several of the supplementary teeth, are preserved. The present paper is occupied with a minute and circumstantial description of these specimens, and an elaborate inquiry into the osteological characters and relations presented by the extinct animals to which they belonged, as compared with existing species of Saurian reptiles; the whole being illustrated by numerous drawings. The comparison here instituted furnishes apparently conclusive proof that the fossil thus discovered is a portion of the lower jaw of a reptile of the Lacertine family, belonging to a genus nearly allied to the Iguana. From the peculiar structure and condition of the teeth it appears evident that the *Iguanodon* was herbivorous; and from the form of the bones of the extremities it may be inferred that it was enabled, by its long, slender, prehensile fore-feet, armed with hooked claws, and supported by its enormous hinder limbs, to pull down and feed on the foliage and trunks of the arborescent ferns, constituting the flora of that country, of which this colossal reptile appears to have been the principal inhabitant.

Some particulars are added respecting various other fossil bones found in Tilgate Forest, and in particular those of the *Hylæosaurus*, or Wealden Lizard (of which genus the author discovered the remains of three individuals), and of several other reptiles, as the *Megalosaurus*, *Plesiosaurus*, and several species of *Steneosaurus*, *Pterodactylus*, and *Chelonia*, as also one or more species of a bird

allied to the Heron. All these specimens are now deposited in the British Museum.

April 22.—"Remarks on the Birds of Kerguelen's Land." By R. McCormick, Esq., Surgeon R.N. of H.M.S. Erebus. Communicated by the Lords Commissioners of the Admiralty.

The birds usually met with by the author in this island were petrels and penguins; and besides these, he found two species of gull, a duck, a shag, a tern, a small albatros, and a species of Chionis; and also a remarkable nocturnal bird allied to the Procellaria. Brief notices are given of the forms and habits of these birds.

"Geological Remarks on Kerguelen's Land." By R. McCormick, Esq., Surgeon R.N. of H.M.S. Erebus. Communicated by the Lords Commissioners of the Admiralty.

The northern extremity of the island is described as being entirely of volcanic origin. The trap rocks, of which the headlands are composed, form a succession of terrraces nearly horizontal. Basalt is the prevailing rock: it assumes the prismatic form, and passes into greenstone, and the various modifications of amygdaloid and porphyry. The general direction of the mountain-ranges inclines to the south-west and north-east, and they vary in height from 500 to 2500 feet. Many of the hills are intersected by trap dykes, usually of basalt. Several conical hills, with crater-shaped summits, are found, evidently the remains of volcanic vents. Three or four very singular isolated hills, composed of an igneous slaty sandstone, occur in Cumberland Bay, presenting very smooth outlines, and consisting of piles of broken fragments, through which the mass protrudes, in places, in prismatic columns. Vast quantities of *débris* are accumulated at the base of the hills, in many places to the height of 200 or 300 feet or more, affording strong evidence of the rapid disintegration this land is undergoing, from the sudden atmospheric vicissitudes to which it is exposed.

The whole island is deeply indented by bays and inlets, and its surface intersected by numerous small lakes and water-courses. These, becoming swollen by the heavy rains, which alternate with frost and snow, rush down the sides of the mountains and along the ravines in countless impetuous torrents, forming, in many places, beautiful foaming cascades, wearing away the rocks, and strewing the platforms and valleys below with vast fragments of rocks and slopes of rich alluvium, the result of their decomposition.

The most remarkable geological feature in the island is the occurrence of fossil wood and coal, and what is still more extraordinary, these are imbedded in the igneous rocks. The wood, which is for the most part highly silicified, is found enclosed in the basalt; whilst the coal crops out in ravines, in close contact with the overlying porphyritic and amygdaloidal greenstone.

A few outline sketches of the rocks and scenery, in various parts of the island, accompany this paper.

LINNÆAN SOCIETY.

June 1, 1841.—Mr. Forster, V.P., in the Chair.

Read the conclusion of Mr. Bunbury's "Remarks on certain Plants of Brazil, with descriptions of some which appear to be new."

The following are the characters of the species described as new:

Lasiandra calyptrata, ramis teretibus ferrugineo-tomentosis, foliis petiolatis ovato-oblongis acutis 5-nervibus subsetoso-hirsutis subtùs dense villosis, racemis terminalibus paucifloris, pedicellis oppositis 1–3-floris, bracteis hispido-pilosis convolutis calyptriformibus, calyce sericeo, filamentis styloque hirsutis.

Hab. prope Gongo Soco, in prov. Minas Geraes.

Clidemia ? glabrata, ramulis subtetragonis glabris, foliis petiolatis oblongo-lanceolatis subcordatis acuminatis serrulato-ciliatis 5-nervibus utrinque glabris: petiolis ciliatis, paniculâ terminali trichotomâ divaricatâ glabrâ, floribus verticillato-aggregatis sessilibus ebracteatis, petalis lanceolatis.

Hab. prope Gongo Soco, in prov. Minas Geraes.

Clidemia deflexa, ramis subtetragonis petiolis paniculisque setoso-hispidissimis, foliis ovatis acuminatis quintuplinervibus subdenticulatis ciliatis utrinque hispidis, paniculâ terminali elongatâ oppositè ramosâ deflexâ nutante, floribus ad ramulorum apices congestis ebracteatis, lobis calycinis obtusis concavis dorso appendiculatis.

Hab. prope Gongo Soco.

Cremanium ? cordifolium, undique glanduloso-pilosissimum, foliis petiolatis latè cordatis acuminatis inæqualiter denticulatis ciliatis sub-7-nervibus, paniculâ subterminali nutante laxâ oppositè ramosâ, calyce subrotundo-turbinato: lobis subulatis, petalis lanceolatis acuminatis.

Hab. prope Gongo Soco.

Hiræa cinerea, foliis lanceolatis acutis supernè glabris subtùs fructibusque adpressè sericeo-pilosis canescentibus, paniculâ terminali trichotomâ foliosâ, calycibus eglandulosis adpressè pilosis, fructûs alis semiorbiculatis crenatis undulatis.

Hab. in sylvis montis Corcovado prope Rio de Janeiro.

Tetrapteris mutabilis, ramis paniculisque velutino-tomentosis, foliis obovato-ellipticis obtusis rugosis utrinque tomentosis: petiolis apice biglandulosis, paniculâ terminali laxâ divaricatâ multiflorâ, alis fructûs inæqualibus.

Hab. in sylvis montis Corcovado.

Abutilon benedictum, ramis sulcatis petiolis pedunculis calycibusque floccoso-tomentosis, foliis lanceolatis acuminatis basi acutiusculis obtusè serratis rugosis suprà glabris subtùs incano-velutinis, pedunculis axillaribus unifloris folium æquantibus.

Hab. in sylvis cæduis (*capoeiras* dictis) prov. Minas Geraes.

Rubus longifolius, caule angulato petiolis pedunculisque densissimè glanduloso-setosis aculeatis, foliis quinato-palmatis: foliolis petiolatis oblongo-lanceolatis acuminatis basi subcordatis argutè serratis utrinque glabris, stipulis setaceis, calyce subsericeo-tomentoso reflexo.

Hab. prope Gongo Soco.

Lupinus nitidissimus, suffruticosus erectus ramosus aureo-sericeus, foliis simplicibus ovatis acutis, stipulis petiolo adnatis breviter acuminatis, racemis subterminalibus elongatis, floribus verticillatis, calycis labiis integris: inferiore elongato.

Hab. in campis altis prov. Minas Geraes, prope Capao et Ouro Preto.

Achyranthes paludosa, caule herbaceo subramoso fistuloso, foliis obovato-

lanceolatis acutiusculis glabris, pedunculis axillaribus folium subæquantibus, spicis abbreviatis capitatis glaberrimis.
Hab. prope urbem Buenos Ayres.

Desmochæta? sordida, caule herbaceo prostrato ramosissimo lanato, foliis subrotundis mucronulatis in petiolum attenuatis glabriusculis, capitulis sessilibus axillaribus ovatis, calycis foliolis 3 exterioribus majoribus; interioribus carinatis conniventibus: setis uncinato-barbatis.
Hab. ad vias prope urbem Buenos Ayres.

Schultesia pallens, culmo erecto subramoso, foliis ovatis ellipticisque acutiusculis: summis lineari-lanceolatis acuminatis, floribus terminalibus subsolitariis, alis calycis dilatatis semiovatis, corollæ laciniis obovato-rhombeis breviter acuminatis integerrimis.
Hab. prope Gongo Soco in prov. Minas Geraes.

Solanum graveolens, suffruticosum inerme glanduloso-pilosum viscosum, foliis pinnatis: foliolis petiolulatis oblongo-lanceolatis acuminatis membranaceis, racemis longè pedunculatis multifloris subcorymbosis unilateralibus, corollâ quinquefidâ.
Hab. prope Gongo Soco.

Solanum reptans, herbaceum inerme hispido-hirsutum, foliis pinnatis: foliolis petiolulatis oblongis subacuminatis: petiolis alatis, racemis lateralibus folio brevioribus, caule prostrato radicante.
Hab. prope Gongo Soco.

Mr. Bunbury believes *Lasiandra fissinervia*, DeC., to be merely a variety of *L. Fontanesiana*; and *Clidemia urceolata* and *C. biserrata* to be one species. He describes variations in character occurring in *Lasiandra proteæformis*. DeC., *Clidemia urceolata*, DeC., *C. longibarbis*, DeC., *Tetrapteris acutifolia*, Cav., *Bignonia venusta* and *Neurocarpum angustifolium*, Kunth. He thinks it possible, however, that his plant may differ from the latter, as the flowers are resupinate, a character which could hardly have escaped M. Kunth; he therefore proposes for it the following character, should it prove to be distinct:—

Neurocarpum resupinatum, frutescens erectum, foliis trifoliolatis: foliolis ellipticis oblongisque retusis mucronulatis suprà glabris subtùs pallidis pilosiusculis, pedunculis subbifloris folio brevioribus, floribus resupinatis.
Hab. ad Botafogo, prope Rio de Janeiro.

Specimens of the plants noticed in this memoir were included in a collection presented to the Society by Mr. Bunbury some years ago.

Read also a "Synopsis of the Coleopterous family *Paussidæ*, with descriptions of a new Genus and some new Species." By J. O. Westwood, Esq., F.L.S.

This paper contains a brief enumeration of the species of the remarkable family of *Paussidæ*, with some additions and corrections to Mr. Westwood's Monograph of it, published in the 16th volume of the Society's Transactions.

He proposes to exclude from the family the genus *Trochoideus*, an examination of the cibarian organs having proved that genus to belong to the *Endomychidæ*; and states that he is now acquainted with four, if not five, species belonging to it, viz. 1. *Troch. cruciatus*, Dalm.; 2. *T. Dalmanni*, Westw.; 3. *T. Desjardinsii*, Guér.; 4. *T. Americanus*, Bucqu.; and 5.? *T. Hopei*, Westw. The last-named species he has seen in Mr. Hope's collection: it is from New Grenada, and is possibly identical with *T. Americanus*.

Mr. Westwood gives the following as a synopsis of the genera belonging to the family in its present state:—

Antennæ quasi biarticulatæ.
Caput thorace haud immersum, collo distincto, ocellis nullis.
Palpi labiales articulo ultimo elongato ..... 1. *Paussus.*
—— —— articulis æqualibus ..... 2. *Platyrhopalus.*
Caput thorace immersum ocellis duobus ..... 3. *Hylotorus.*
Antennæ quasi sexarticulatæ.
Prothorax angulis anticis valdè productis..... 4. *Pentaplatarthrus.*
—— transversus, angulis anticis rotundatis, posticis valdè emarginatis..... } 5. *Lebioderus.*
—— truncato-cordatus ..... 6. *Ceratoderus.*
Antennæ quasi decemarticulatæ..... 7. *Cerapterus.*

1. Paussus, *Linn.*

Sect. A. Thorax quasi bipartitus.

a. Antennarum clavâ posticè haud excavatâ.

1. *P. microcephalus*, L. Africa?
2. *P. Jousselinii*, Guér. Rangoon.
3. *P. Linnæi*, Westw. Habitat unknown.
4. *P. Burmeisteri*, Westw. Cape of Good Hope.
5. *P. rufitarsis*, Westw. Habitat unknown.
6. *P. pilicornis*, Donov. Bengal.
7. *P. Turcicus*, Frivaldsk. Balkan Mountains.

b. Antennarum clavâ posticè excavatâ.

8. *P. thoracicus*, Donov. Bengal.
9. *P. Fichtelii*, Donov. Bengal.
10. *P. fulvus*, luteo-fulvus subopacus, elytris magis rufescentibus, antennarum articulo basali thoracis lateribus posticè femoribusque obscurioribus, capite suprà profundè impresso.—*Long. corp. lin.* 3.
Hab. in Indiâ Orientâli.
11. *P. tibialis*, castaneus nitidus, elytris singulis plagâ magnâ nigrâ, tibiis 4 anterioribus elongatis; posticis multò latioribus compressis, antennarum clavâ posticè profundè excavatâ.—*Long. corp. lin.* 2¾.
Hab. in Bengalâ. In Mus. D. Westermann.
12. *P. excavatus*, Westw. Senegal.
13. *P. ruber*, Thunb. Cape of Good Hope.
14. *P. cochlearius*, Westw. South Africa.
15. *P. Klugii*, Westw. Cape of Good Hope.

Sect. B. Thorax subcontinuus.

a. Species Africanæ.

16. *P. sphærocerus*, Afzel. Sierra Leone.
17. *P. armatus*, Dej.; *P. cornutus*, Chevrol. Senegal.
18. *P. curvicornis*, Chevrol.; *P. cornutus, var.?*, Chevrol. Senegal.
19. *P. Shuckardi*, Westw. South Africa.
20. *P. lineatus*, Thunb. Cape of Good Hope.
21. *P. affinis*, Westw. On the authority of the British Museum Catalogue Mr. Westwood is now enabled to give Africa as the habitat of this species; but he suggests that there may be some mistake as to locality, and that the insect may really be Indian, and not specifically distinct from the following, *P. cognatus*.

b. Species Indicæ.

22. *P. cognatus*, rufo-castaneus nitidus punctatus, elytris singulis plagâ magnâ nigrâ, capite anticè lineâ tenui impressâ: vertice impressionibus duabus semicircularibus, antennarum clavâ subovatâ basi extùs in hamum productâ.—*Long. corp. lin.* 4.

Hab. in Bengalâ. In Muss. D. D. Melly et Westermann.

23. *P. Hardwickii*, Westw. Nepaul.

24. *P. Saundersii*, fulvo-rufescens subnitidus punctatus, capite thoraceque obscurioribus, antennarum clavâ oblongo-ovatâ basi extùs in hamum setigerum productâ.—*Long. corp. lin.* 3½.

Hab. in Indiâ Orientali. Mus. D. W. W. Saunders.

25. ——— (Sp. ined.), Latr. Isle of France.

Obs. P. ruficollis, Fabr., is given by Dr. Erichson as one of the *Malachii*, and as identical with his *Collops 4-maculatus*.

2. Platyrhopalus, *Westw.*

1 (26). *P. denticornis*, Westw. East Indies.
2 (27). *P. unicolor*, Westw. East Indies.
3 (28). *P. acutidens*, Westw. Nepaul.
4 (29). *P. Westwoodii*, Saund. East Indies.
5 (30). *P. angustus*, Westw. East Indies.
6 (31). *P. Melleii*, Westw. Malabar.
7 (32). *P. aplustrifer*, Westw. Bengal. Certainly belonging to this genus.
8 (33). *P. ? lævifrons*, Westw. Senegal.
9 (34). *P. ? dentifrons*, Westw. Senegal.

3. Hylotorus, *Dalm.*

1 (35). *H. bucephalus*, Gyll. Sierra Leone.

4. Pentaplatarthrus, *Westw.*

1 (36). *P. paussoides*, Westw. South Africa.

5. Lebioderus, *Westw.*

1 (37). *L. Goryi*, Westw.

6. Ceratoderus.

Corpus oblongum, depressum. *Caput* transverso-quadratum, posticè collo instructum, disco inter oculos bi-impressum. *Antennæ* quasi 6-articulatæ, articulis 4 intermediis transversis planis, ultimo semiorbiculari. *Maxillæ* minutæ, planæ, corneæ, apice acutæ curvatæ, intùs sub apice dente acuto armatæ. *Palpi maxillares* 4-articulati, articulo magno ovato, 3tio 4toque minoribus subcylindricis; *labiales* articulo ultimo præcedente haud multò majori ovato apice truncato. *Prothorax* capite vix latior, cordato-truncatus, trans medium lineâ impressâ notatus. *Elytra* oblongo-ovata, depressa. *Pedes* breviusculi; femoribus tibiisque compressis, his apice haud calcaratis; tarsis distinctè 5-articulatis, articulo basali sequenti longiore.

1 (38). *C. bifasciatus*.

Paussus bifasciatus, *Kollar in Ann. Wien. Mus.* 1836, t. 31. f. 7. a, b; *Westw. in Trans. Ent. Soc.* ii. p. 91. pl. 10. f. 3.

Hab. in Indiâ Orientali.

7. Cerapterus, *Swederus.*

1 (39). *C. latipes*, Swed. Bengal.
2 (40). *C. Horsfieldii*, Westw. Java.
3 (41). *C. 4-maculatus*, Westw. Java.

4 (42). *C.* (Orthopterus) *Smithii*, MacL. South Africa.
5 (43). *C.* (Arthropterus) *MacLeaii*, Donov. New Holland.
6 (44). *C.* (Phymatopterus) *piceus*, Westw. New Holland.
7 (45). *C.* (Homopterus) *Brasiliensis*, Miers. Brazil.
8 (46). *C.* (Pleuropterus) *Westermanni*, Westw. Java.

ENTOMOLOGICAL SOCIETY.

February 1st, 1841.—G. R. Waterhouse, Esq., in the Chair.

The Secretary called the attention of the Meeting to the condition in which the fine painting of the Raising of Lazarus, by Sebastian Del Piombo, in the National Gallery, was stated by Professor Waagen to be in at the present time; the picture having been transferred to canvass, on which it was affixed with *paste*, which material was now attacked by insects, regarded by Mr. Westwood as the *Anobium paniceum*, an insect well known to attack preparations of flour, such as wafers, &c. The plans suggested at a former meeting for the destruction of insects which attack paintings on panel, or the stretching-frames, would be inapplicable to the present case, and it would be very dangerous to saturate the back of the picture with any solution which would affect the paste so as to render it unpalatable to the insects, or to destroy them. Mr. Gutch considered that in the case of so valuable a picture as this is, it would be most advisable to reline the picture with fresh canvass, employing paste in which a little corrosive sublimate had been mixed; he had constantly used that material, and had always found it perfectly effectual in preventing the attacks of insects. Mr. Waterhouse, however, strongly objected to the use of corrosive sublimate, and suggested that an air-tight frame or flat box should be placed behind the entire picture, a space of about an inch being left between the picture and the frame-work; and that the inclosed air should be strongly impregnated with prussic acid, which he had no doubt would destroy the insects.

A letter from the Rev. A. W. Griesbach to the Secretary was read, relative to the Economy of the Pea-beetle (*Bruchus granarius*), which he had found to undergo its transformations within the pea, and not in the earth, as had been stated by Mr. Westwood in an article in the Gardener's Magazine. Mr. Westwood stated that he had himself had several previous opportunities of discovering the error, having received a quantity of peas and other leguminous seeds from Mr. Loudon and Dr. Lindley, some of which contained Bruchi in the perfect state.

The completion of a memoir on the *Evaniidæ* and some allied genera of Hymenopterous insects, by J. O. Westwood, F.L.S., was read.

In this extended memoir, commenced in 1836, the author, after tracing the characters and relations of the family *Evaniidæ*, and noticing the views entertained respecting it by various authors, gives a detailed account (illustrated with numerous figures of the typical

species and the generical details) of each of the genera of which it is composed, as well as of some others of anomalous character allied thereto, adding under each species a complete synopsis of all the known species, including also numerous new ones.

In Evania (including *Brachygaster*, Leach, *Hyptia*, Ill.) he introduces twenty-four species, amongst which the following are new :—

Evania princeps. *Nigra, facie argenteo-sericea longitudinaliter striata, thorace et petiolo rudè punctatis, alarum anticarum fuscarum vena radiali ad apicem recurva, furca metasterni brevissima.* Long. corp. lin. 7. Nova Hollandia.

Evania Abyssinica. *Rufa, thorace et petiolo abdominali rufis, pedibus piceis, facie punctata, mandibulis nigris, apice piceis, femoribus* 4 *anticis subtus rufis.* Long. corp. lin. $3\frac{3}{4}$. Abyssinia.

Evania Tasmanica. *Nigra, capite thoraceque punctatissimis, facie tenuiter longitudinaliter striata, furca metasterni brevi recta, petiolo striato, alis hyalinis.* Long. corp. lin. $4\frac{1}{2}$. Terra Van Diemenii.

Evania Javanica. *Tota nigra punctata, petiolo brevi, obliquè striato, facie rugosa, alarum venis cubitali et discoidali obliteratis.* Long. corp. lin. 3. Java.

Evania (Brachygaster) bicolor. *Ferruginea, abdomine piceo, antennis pedibusque nigris, capite piceo, vertice rufescente.* Long. corp. lin. $2\frac{1}{2}$. In Mus. Brit.

In Pelecinus a full description of the male is given for the first time, and nine species noticed, most of which will be described by Dr. Klug in the next number of Germar's Zeitschrift.

Monomachus, Klug, n. g. *Caput crassum, genis plus minusve dilatatis; mandibulæ intus* 1-*dentatæ; antennæ* ♂ 14-*articulatæ,* ♀ 15-*articulatæ, articulis apicalibus sensim crassioribus; alæ anticæ area unica marginali, duabus submarginalibus; abdomen* ♂ *clavatum,* ♀ *valde elongatum, curvatum in medio, subinflectum; oviductus occultus.*

Seven species, all inhabitants of Brazil, including the following.

Monomachus Klugii. *Ferrugineus, abdomine piceo-nigro, pedunculo ferrugineo, alis pallidis cum macula fusca terminali, genis valde dilatatis, antennis fuscis, pedibus rufescentibus.* Long. corp. lin. $10\frac{1}{2}$. Brazil.

Monomachus lateralis, *Klug. ined. Niger, mandibulis luteo-fuscis, pedibus* 4 *anticis luteo-fuscis, coxis albidis, femoribus in medio obscurioribus, pedibus* 2 *posticis nigro-fuscis, abdomine luteo-marginato, alis hyalinis immaculatis* ♂. Long. corp. lin. $5\frac{1}{2}$. Brazil.

Monomachus segmentator. *Obscure flavescens, vertice fusco-vario, collare macula sublunata fusca, mesothorace fusco, metathorace nigro, punctato, pedunculo flavido, segmentis reliquis abdominis piceis, flavido-marginatis, abdomine setis tribus minutis terminato, corpore subtus flavido, pedibus posticis fuscis, antennis corpore longioribus* ♂. Long. corp. lin. 4. In Mus. Brit.

The genus Fœnus, Fabr., contains sixteen species, of which the following are described as new :—

Fœnus Esenbeckii. *Piceo-rufus, mesothoracis tergo rugosulo, antennis rufis, articulo 3tio fusco, alis lutescenti-hyalinis, areola minuta, discoidali, subconica. Syn. F. affectator var. β Esenbeck.* Germany.

Fœnus Guildingii. *Gracilis, niger, thoracis et abdominis lateribus rufescentibus, oviductu fere corporis longitudine, vaginis et terebra apice albidis, tibiis et tarsis 4 anticis albis* ♂ ♀. Long. corp. lin. 5½. Island of St. Vincent.

Fœnus dorsalis. *Ferrugineus, capite suprà medio mesonoti scutelloque nigris, abdomine piceo, segmentis apice rufescentibus, pedibus piceo-rufis, femoribus tibiisque 4 anticis in medio nigris* ♀. In Mus. Brit.

Fœnus terminalis. *Niger, thorace lævi, opaco, lateribus rufo-piceis, tibiis 4 anticis albis, linea interna nigra, posticis nigris, clavatis, annulo basali albo, tarsis albis apice fuscis, oviductu longitudine corporis, vaginis apice latè albis* ♀. Long. corp. lin. 9¾. Nova Hollandia.

Fœnus unguiculatus. *Niger, rufo-piceo-varius, areola minuta discoidali obliterata, unguibus tarsorum maximis (in pedibus posticis dimidium tarsorum longitudine æquantibus* ♂). Long. corp. lin. 5½. Nova Hollandia.

Fœnus Darwinii. *Piceo-niger rufo-varius, pedibus rufo-fulvis, areola discoidali magna* ♂. Long. corp. lin. 3. Nova Hollandia.

Fœnus rufus. *Totus rufus, capite thoraceque punctatis, alarum areola discoidali mediocri* ♂. Long. corp. lin. 5½. West Australia.

In the genus Aulacus, of Jurine (of which the male as well as the mouth organs are described in detail), fifteen species are introduced, including the following as new :—

Aulacus obscuripennis. *Niger, capite lævissimo, thorace anticè irregulariter striato, posticè rugoso, abdomine medio rufo, alis hyalinis, nubila parva media, fascia substigmaticali apiceque tenui fuscis* ♀. Long. corp. lin. 5¾. Poland.

Aulacus Erichsonii. *Gracilis, niger, antennarum articulo 1mo subtus fulvo, petiolo nigro, abdominis dimidio basali rufo, fascia tenui transversa nigra, apice nigro, coxis nigris, pedibus 4 anticis flavido-rufescentibus, femoribus 2 posticis fuscis, tibiis obscuris, apice rufescentibus, tarsis omnibus albidis, alis nubila substigmaticali apiceque parùm fuscis* ♂. Long. corp. lin. 5½. Prope Berolinum.

Aulacus thoracicus, *Klug. ined. Niger, collari et mesothoracis dorso sanguineo, striato, alarum costa, areola marginali et 1ma submarginali fuscis* ♂ ♀. Long. corp. lin. 5. Cap. Bon. Spei.

Aulacus Stephanoides. *Niger, capite et antennarum articulo basali luteis, abdomine elongato gracili, oviductu abdomine duplò longiore, terebra rufa, vaginis nigris apice albis, alis apice parùm fuscis* ♀. Long. corp. lin. 7. Brazil.

Aulacus hyalinipennis. *Niger, facie et articulo* 1mo *antennarum fulvis, alis hyalinis, stigmate nigro, apice fusco, pedibus* 4 *anticis fulvis, femoribus posticis fuscis, tibiis rufescentibus, tarsis fulvis* ♂. Long. corp. lin. 5. Mexico.

Aulacus ater. *Totus ater, alis pallidè fuscescentibus, areola externo-media plaga parva postica, alteraque minuta cum stigmate connexa fuscis* ♀. Long. corp. lin. 7. Nova Scotia and North America.

Aulacus Abbottii. *Niger, abdomine versus basin rufo, pedibus rufis, alis striga parva versus basin maculaque pone stigmata fuscis* ♀. Long. corp. lin. 7. Georgia.

Aulacus rufus. *Rufus, antennis (basi excepto) et abdominis basi nigris, alarum apice fusco.* Long. corp. lin. 8. Van Diemen's Land.

Aulacus cingulatus. *Rufus, antennis piceis, articulo* 7mo *albo* ♀. Long. corp. lin. 5¾. Swan River, New Holland.

Aulacus apicalis. *Rufus, capite abdomineque nigris, hoc lunula versus basin flavescente, alarum apice lato nigro* ♀. Long. corp. lin. 5. New Holland.

A detailed description is then given of the genera Megalyra, W., composed of one Australian already described species (*M. fasciipennis*) and *Trigonalys*, both of which, as well as *Stephanus*, are shown to offer a more intimate relation to the preceding genera than to any other family of Hymenopterous insects.

Trigonalys, *W.* (Proceedings of the Zool. Soc. 1835*), is composed of the five following species:—

Trigonalys melanoleuca, *W.* (op. cit.).

Trigonalys obscura. *Nigra, obscura, capite plano, nitido, abdominis segmento* 1mo *margine postico luteo, alis obscurè fuscis.* Long. corp. lin. 7. Surinam.

Trigonalys Servillei. *Nigra, parte postica thoracis et abdominis basi pallidè luteis, alis immaculatis hyalinis.*

Trigonalys Leprieurii (Seminota Lep., *Spinola*).

Trigonalys Hahnii, *Spin.* (Tr. anglicana, *Shk.*).

The genus Stephanus of Jurine comprises nine species, of which the following are new:—

Stephanus bicolor. *Piceo-niger, capite thoraceque rufis, rugosis, oviductu fascia lata alba subapicali, tarsis posticis brevissimis, crassis, ferrugineis* ♀. Long. corp. lin. 9. Georgia.

Stephanus Indicus. *Niger, gracillimus, antennis basi rufis, facie flavo-lineata, tibiis tarsisque basi albidis, petiolo longissimo, alarum venis discoidalibus obsoletis* ♂. Long. corp. lin. 6½. ♀ *capite rufo.* Malabar.

Mr. Waterhouse exhibited and read detailed descriptions of two

* I consider *Lycogaster pullatus*, Shk., to be the male of another species of *Trigonalys*.—J. O. W.

new Lamellicorn beetles, brought from the Philippine Islands by H. Cuming, Esq. The first is allied to *Scar. longimanus*, but being a female, it does not exhibit the elongated fore-legs from which that species derives its name.

Euchirus, applied by Kirby (Introd. to Ent., vol. iv., Index *Coleopt.*), was, I believe, the first name given to this group. M. Laporte applies the name *Porropus*. *Cheirotonus*, Hope, and *Propomacrus*, Newm., are decidedly closely allied to the present insect.

Euchirus quadrilineatus, *Waterh. Obscure nigro-æneus; thorace punctulato, elytris lævibus, lineis quatuor fusco-flavescentibus ornatis, corpore subtus pilis fuscis instructo.* Long. corp. 2 unc. 5 lin.; lat. 1 unc. $2\frac{1}{2}$ lin.

Xylotrupes pubescens, *Waterh. Nigrescenti-fuscus, supra et infra pilis decumbentibus vestitus, capite cornu ad apicem bifido, paullo recurvo, thoraceque anticè in cornu robusto et elongato antrorsum ducto, ad apicem bifido, armatis.* Long. corp. 1 unc. 9 lin.; lat. 11 lin. Allied to *S. Gideon* and *Oromedon*.

ZOOLOGICAL SOCIETY.

September 8, 1840.—James Whishaw, Esq., in the Chair.

Mr. Gould read a paper on that most singular and anomalous bird, the Brush Turkey (*Talegalla Lathami*) of New South Wales. The author began by giving the opinions of various ornithologists as regards its affinities, and especially quotes Mr. Swainson's account, in which that author attempts to prove, that the bird in question is a Vulture. Mr. Gould proceeded to detail, from his own observations, some interesting facts connected with its habits. The most remarkable circumstance connected with the bird is, that it does not hatch its own eggs, but employs for that purpose similar means to those now in use for artificial incubation. For some weeks prior to the period of laying, the Brush Turkey collects together an immense mass of vegetable matter, varying from two to four cartloads, with which it forms a pyramidal heap; in this heap it plants its eggs, about eighteen inches deep and from nine to twelve inches apart. The eggs, which are always placed with the large end upwards, being carefully covered, are then left to hatch by the heat engendered by the decomposition of the surrounding matter. The heaps are formed by the labours of several pairs of birds, and frequently contain as many eggs as would fill a bucket. The eggs are white, about three inches and three quarters long by two and a half in diameter, and, having an excellent flavour, are eagerly sought after. A specimen of the Brush Turkey, which Mr. Gould had an opportunity of observing in Mr. MacLeay's garden at Sydney, had formed a heap in a shrubbery similar to that which it would have made in its native woods. Around and over this heap the bird was seen to strut in the same way as the domestic cock; at the same time frequently uttering a clucking noise. The flesh is of a pale salmon colour, juicy and tender. After all he had seen of the bird in a state of nature, he

had no hesitation in assigning it a place among the Gallinaceæ, among which it has a nearer alliance to *Cracidæ* than to any other group; at all events, it is in no way allied to the *Vulturidæ*, and is equally distant from *Menura*, with which it has been classed by some writers. Mr. Gould's paper was illustrated by five skins, an egg, and also a skeleton of the bird.

A skeleton of the *Talegalla* was exhibited, and Prof. Owen drew attention to its peculiarities.

"On comparing the osteology of the *Talegalla* with that of other birds," says Prof. Owen, "it exhibits all the essential modifications which characterize the Gallinaceous type, and among the Rasores it most nearly resembles the genera *Penelope* and *Crax*.

"In all the main points the skeletons of these birds agree; their differences are those of proportion only; whereas in the Raptores, and especially in the *Vulturidæ*, the following important differences present themselves. The spines of the dorsal vertebræ are detached; the upper transverse processes of the sacrum are separated by oblique elliptical vacuities; the plough-share bone, which terminates the coccyx, has double the relative vertical extent; the cervical vertebræ are shorter and broader; twice the number of the ribs, as compared with *Talegalla*, give off vertical processes, and these are longer and stronger: but the most striking and decisive differences occur in the sternum; this important bone, in the *Talegalla*, very closely corresponds with that of the two Gallinaceous genera above mentioned; the chief difference occurs in the greater breadth which separates the costal from the external posterior notch. In the Vultures the contiguous margin of the sternum forms part of the same nearly straight line with the rest of the lateral margin of the sternum behind it. In the *Cathartes*, which has the least complete sternum in the tribe of *Raptores*, to which some Quinarian Zoologists have assigned the *Talegalla*, there is a shallow notch and a small foramen in each half of the posterior margin of the sternum; the whole sternum is broader and more convex; the coracoid grooves, and the corresponding extremities of the bones adapted to them, have twice the breadth of those in the *Talegalla*. The *furculum* presents more than six times the thickness of that bone in the *Talegalla* and allied *Gallinacea*; its space is wider, and its superior extremities much more recurved. Equally striking are the differences which the bones of the wing present: in *Cathartes Aurea*, in which the costal and sacral regions of the vertebral column measure five inches, the length of the humerus is five inches and a half, that of the ulna is six inches eight lines, and the bones of the hand are nearly six inches in length: the strength of all these bones is proportionate to their length. The produced angle of the lower jaw is a character which is most conspicuous in the Gallinaceous birds, in some of the species of which, as in the Wood-grouse, it is excessive. Now this process is altogether wanting in the Raptorial birds, and consequently in the *Vulturidæ*; its presence in the *Talegalla* (where its form and size closely agree with those in *Penelope* and *Crax*) coincides with

the decisive Gallinaceous characters which are pointed out in the sternum, vertebral column, and bones of the anterior extremity.

"The presence of the *broncho-tracheales*, which alter the length and tension of the bronchial tubes, widen the lateral diameter of the lower larynx, and influence its position, coincides with the observations which Mr. Gould has made respecting the voice of the *Talegalla*; and at the same time establishes another important structural difference between this bird and the *Vulturidæ*, which are precisely those Raptorial birds in which there are no true vocal muscles.

"From all the *Raptores* the *Talegalla* essentially differs, in its gizzard and elongated cæca: in the one we have all the characters of the Gallinaceous structure of that important part of the digestive system: in the form and proportions of the lower appendages—the cæca, the *Talegalla* most closely corresponds with the genera *Crax* and *Penelope*."

Mr. Gould exhibited some new species of birds about to be figured in the forthcoming part of his work on the "Birds of Australia;" and characterized a new and beautiful *Cinclosoma*, from the belts of the Murray, as

CINCLOSOMA CASTANOTUS. *Cincl. lineâ albâ à mandibulæ inferioris basi per genas excurrente: guld pectoreque nigris; humeris et uropygio castaneis.*

Total length, 9 inches; bill, 1; wing, $4\frac{1}{4}$; tail, $4\frac{1}{2}$; tarsi, $1\frac{1}{4}$.

A new Halcyon, as

HALCYON PYRRHOPYGIA. *Hal. plumis capitis viridibus, angustè albo marginatis; humeris tectricibusque alarum majoribus cæruleis, uropygio, tectricibusque caudæ flavescenti-rubris.*

Crown of the head dull green, intermingled with white, giving it a striated appearance; a broad black stripe commences at the base of the bill, passes through the eye, and encircles the back of the head; upper part of the back and scapularies green; remainder of the wings bluish green; lower part of the back, rump, and upper tail coverts red; tail green, tinged with blue; throat, a broad collar encircling the back of the neck, and all the under surface white; bill black, the base of the lower mandible flesh white; irides blackish brown; feet dark olive brown.

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

Hab. Interior of New South Wales.

A new species of *Rhipidura*, which has hitherto been confounded with the *Motacilla flabellifera* of Latham, Mr. Gould proposed to characterize as

RHIPIDURA ALBISCAPA. *Rhi. nigrescenti-fusca; rectricibus caudæ ad apices, et per scapos albis.*

All the upper surface, ear-coverts, and a band across the chest, sooty-black, slightly tinged with olive, the tail and crown of the head and pectoral band being rather the darkest; stripe over the eye, lunar-shaped mark behind the eye, throat, tips of the wing coverts, margins of the secondaries, shafts, outer webs and tips of all but the

two middle tail feathers, white; under surface buff; eyes black; bill and feet brownish black.

Total length, 6 inches; bill, $\frac{3}{8}$; wing, 3; tail, $3\frac{1}{2}$; tarsi, $\frac{5}{8}$.

Hab. Van Diemen's Land and the southern coast of Australia.

A new and highly interesting Pigeon as

COLUMBA (PERISTERA) HISTRIONICA. *Col. capite nigro; fronte, spatio circum plumas auriculares necnon notâ semilunari apud gulam albis; corpore supernè e cinnamomino fusco; subtùs cærulescenti-cinereo.*

Forehead, a stripe from behind the eye forming a circle round the ear-coverts, and a crescent-shaped mark across the throat, snow-white; the remainder of the head, throat and ear coverts, jet black; all the upper surface, wing coverts, flanks, and two centre tail feathers, deep cinnamon brown; edge of the shoulder dull white; spurious wing bluish gray, slightly margined with white; primaries brownish gray, margined on their outer webs with rufous, at the base of the inner web largely marked with the same, forming a conspicuous patch on the under surface of the wing; and with an oval spot of white at the tip of each feather; secondaries by a beautiful band of deep crimson-bronze on the outer webs near the tip; lateral tail feathers bluish gray at the base, passing into black toward the extremity, which is white; breast and centre of the abdomen bluish gray; under tail coverts light buff; nostrils and bill black; irides dark brown; frontal scales of the legs and feet lilac-red; hind part of the legs flesh-red.

Total length, $10\frac{1}{2}$ inches; bill, 1; wing, 8; tail, $3\frac{1}{2}$; tarsus, 1.

Hab. Plains of interior of Australia.

And a Rasorial bird of an entirely new form, about half the size of a Quail, and which, were it not for the presence of a hind toe, might be taken for a diminutive Bustard.

Mr. Gould proposed to make it the type of a new genus, with the following appellation and characters:—

Genus PEDIONOMUS.

Gen. Char.—*Rostrum* tàm longum qùam caput, apicem versus compressum, ferè rectum, naribus valdè elongatis, in foveâ basali positis. *Alæ* valdè concavæ, remigibus primo, secundo, et tertio, inter se ferè æqualibus, remigibus tertiariis perlongis, et primarios transeuntibus. *Tibiæ* super suffraginem nudæ. *Tarsi* mediocritèr elongati, scutis undiquè tecti, his, reticulis minutis, sejunctis. *Digiti* quatuor; horum posticus, debilis, et apud partem internam tarsi, sursùm positus.

PEDIONOMUS TORQUATUS. *Ped. vertice et pectore rufis, singulis plumis prope apicem lunulâ nigrâ notatis; collari lato, albo, crebrè maculis nigris guttato.*

Crown of the head brown speckled with black, sides of the head and the neck light buff speckled with black; neck surrounded by a broad band of white thickly spotted with black; all the upper surface reddish brown, each feather having several narrow, transverse, crescent-shaped marks in the centre and margined with buff; tail buff, crossed by numerous narrow brown bars; centre of the breast

rufous, the remainder of the under surface buff; the feathers on the breast marked in a similar manner to those on the upper surface, and the flanks with large irregular spots of black; irides straw-yellow; bill yellow, passing into black at the point; feet greenish-yellow.

Total length, 7 inches; bill, $\frac{3}{4}$; wing, $3\frac{5}{8}$; tail, $1\frac{3}{8}$; tarsi, $\frac{7}{8}$.

Hab. The plains of the interior of South Australia.

Sept. 22.—William Yarrell, Esq., V.P., in the Chair.

The following paper was read, in which Mr. G. B. Sowerby proceeds with his descriptions of the new species of Shells collected by H. Cuming, Esq., in the Philippine Islands.

Helix Iloconensis. *H. testâ obovatâ, crassiusculâ, lævi, coloribus variis variè pictâ; spirâ elevatiusculâ, obtusâ; anfractibus quinque, rotundatis, ultimo maximo; aperturâ rotundato-subtrapezoidali, intùs albâ; peritremate lato, incrassato, rotundato, reflexo, albo; labio columellari lato, albo, subplanulato, posticè emarginato.* Long. 1·3, lat. 0·9, poll.

Hab. in foliis arborum prope Sanctum Nicolam, Provinciæ Iloconis septentrionalis ad Insulam Luçon, Philippinarum.

The varieties of this species, in colour and size, are very numerous; many of them are remarkable for an apparent interruption of their growth, shown by a band of colour darker than the general ground-colour of the individual across the second, third, or fourth volution; the recommencement after which suspension is marked by an apparent want of colouring matter to produce the usual spiral bands.

The following is the enumeration of the varieties which have occurred:—

a. Apex reddish brown, softened down into a greenish yellow ground-colour, which becomes more intense, and is speckled with brown on the last volution, particularly toward the aperture; posterior edge of each volution brown, softened down with pink; circumference of the shell with a greenish brown narrow band behind a brownish pink band; columellar band and back of the lip reddish brown. From St. Nicolas.

b. Nearly similar to *a.*; anterior circumferential band yellowish. Found on Pandanus Palms at Curimao, in the province of North Ilocos.

c. Apex pale reddish brown; ground-colour greenish yellow, speckled on the last volution; antesutural band light reddish brown; posterior circumferential band greenish brown, anterior circumferential band pale yellow; columellar band rose-colour; back of the lip brownish red. From St. Nicolas.

d. Apex reddish brown; ground-colour grayish rose; antesutural band and back of the lip reddish brown; posterior circumferential band pale olive-brown, anterior circumferential band pinkish yellow; circumference of the *columella* rose softened into the ground-colour. From St. Nicolas.

e. Apex dark brown; ground-colour gray-brown; suture white or yellowish; antesutural band red-brown; circumferential band

white at its commencement, but becoming yellowish, and yellowish pink upon the last volution; posterior circumferential band indistinct, olive-brown; circumference of the *columella* red-brown; back of the lip dull red. The lip of this variety has a slight reddish tinge. From St. Nicolas.

f. Apex brownish black; ground-colour yellowish olive-brown; posterior circumferential band darker; suture pale, yellowish, or nearly white; anterior circumferential band pale yellowish at its commencement, increasing in intensity until it is nearly lost in the ground-colour near the aperture; columellar band blackish, suffused with pinkish; back of the lip yellowish brown. From Sinait, in the province of South Ilocos.

g. Apex brownish black, softened down into the gray-brown ground-colour; sutural band yellow-brown; posterior circumferential band olive-brown; anterior circumferential band whitish at its commencement, then yellowish, and at length grayish; back of the lip yellow; border of the *columella* brownish yellow. From Sinait.

h. Nearly similar to *g*, but smaller, and the circumferential bands nearly obsolete toward the back of the aperture. From Sinait, in the province of South Ilocos.

i. Apex blackish, softened down into a pale greenish gray; suture white; antesutural band dull and pale yellow-brown; posterior circumferential band of the same colour, and very narrow; anterior circumferential band dull yellowish white; back of the lip pale yellow.

k. Apex pale reddish brown; ground-colour pale fawn-colour; sutural band rather obsolete, reddish; circumferential band yellowish white; columellar band rose-colour, and back of the lip duller; last volution speckled. From Saint Nicolas.

l. Apex pale reddish brown; ground-colour yellow; antesutural band yellow-brown, pink in front; a very narrow dull greenish band near the circumference; back of the lip brownish red; columellar band rose-colour. This is a small variety from Curimao, in the province of North Ilocos.

m. Apex and circumference of the *columella* rose-colour; ground-colour dull yellow, suffused at the posterior part of each volution and toward the mouth with pink; antesutural and circumferential bands yellow-brown. A very pretty small variety from Sinait, in the province of South Ilocos.

n. Apex pink; ground-colour yellow-brown, increasing in intensity, darker toward the suture; columellar circumference pink. A small, somewhat lengthened variety from near Sinait.

o. Apex nearly black, soon softened down to nearly colourless, and then gradually into the pale grayish green ground-colour; antesutural band rather indistinct, brownish yellow; posterior circumferential band brownish yellow, very slight and indistinct at its commencement, but becoming gradually more and more distinct: the reverse is the case with the anterior circumferential band, which is distinct and nearly white at its commencement, but becomes gradually darker, until it is nearly lost in the ground-colour; back of the lip dull yellow; last volution speckled. From Saint Nicolas.

p. Apex very pale pink; circumference of the *columella* rose-colour; ground-colour pale yellow, darker towards the front; antesutural band yellowish brown. A small and very pale variety from Curimao.

q. Apex white; ground-colour pale yellow, darker toward the front; antesutural and circumferential bands yellow-brown. Another small variety from Curimao.

r. Colours the same as *q*, but altogether paler. This is a large variety, from St. Nicolas.

s. Apex white, softened down into a pale yellow ground-colour; antesutural band yellow-brown.

A paper by E. Lewis, Esq., entitled "Desultory Observations on Subjects having relation to Zoology," was also read.

The author in this paper comments on the different systems of classification, and proposes that the various groups of animals should be defined with more simplicity than they at present are; he is of opinion, that although the members of a group may resemble each other in many characters, yet one of these characters should be selected, and used for distinction; "and it is hoped," observes Mr. Lewis, "that divisions thus formed will be found practicable, precise and sufficient; because, as each is formed from a single common character, the necessity of admitting subfamilies and subgenera is obviated; for it is evident the necessity for forming those divisions has arisen from the family or genus from which they have been deducted having been formed from the notice and combination of too many particulars. It may be mentioned as a recommendation of the proposed method of using one character, as essential for distinction of divisions, that it has been in part virtually, if not expressly used, by many eminent zoologists. Linnæus makes use of the organs of manducation for generic distinctions in the class *Mammalia*, and in so doing is followed by most naturalists. The Rev. W. Kirby, in his enumeration of the characters of *Apis* and *Melitta*, mentions the form of the tongue as the one essential character." The cells of the wings has been selected by Jurine in the Hymenopterous insects; and numerous other instances of a single peculiarity having been selected for the definition of a group are mentioned by the author, who asks, "Will it not therefore be better, if only for the sake of uniformity and the advantage of fixing a character, which, from its singleness, can be easily retained in the memory, and therefore always be ready for application, to adopt the same plan throughout?

"The *Vertebrata* and *Invertebrata* may be divided into four stirps; the first will contain the *Hæmatherma* (Latr.), or warm-blooded animals, as the *Mammifera* and *Aves*, and the *Hæmacryma*, or cold-blooded animals, such as the Reptiles and Fishes. The *Invertebrata* may be divided into the *Cephalidea*, containing the Insects and Mollusca, or *Palliata* (Latr.), and the *Acephala* (Latr.), which last are the *Vermes Zoophyta* and *Infusoria* of Linnæus, or '*les Animaux Apathiques*' of Lamarck."

Mr. Gould exhibited a Drawing of the Brush Turkey of New South Wales.

October 13.—James Whishaw, Esq., in the Chair.

A paper by W. J. Broderip, Esq., was read. In this paper the author resumes his descriptions of the new species of shells collected by H. Cuming, Esq. in the Philippine Islands.

Bulinus Fulgetrum. *Bul. testâ ovato-pyramidali, anfractibus 5 subventricosis, ultimo longè maximo, labio et aperturâ ovatâ albis; columellâ callosâ basi subsinuatâ.*

Var. *a. Cinereo-flavescens strigis longitudinalibus albis, nunc rectis, nunc sinuatis, nunc angulatis pulcherrimè strigata.*

Hab. ad insulam Negros.

Legit H. Cuming in sylvis.

Var. *b. Castaneo-brunnea, lineis parvulis brevibus haud frequentibus a suturis albo-lineatis anfractûs ultimi et penultimi descendentibus.*

Hab. cum præcedente.

Legit H. Cuming.

Var. *c. Tota cinereo-fusca, obscurè et rarò albido-strigata, apice subrubro.*

The brown under covering appears to be overlaid with a dull pale ashy *epidermis,* which sometimes presents the appearance of oblique obscure stripes in the direction of the lines of growth. On the lower part of the penultimate whorl the brown and shining under covering is exposed, so as to produce a basal fillet. The sutural line of the last or body-whorl is obscure white.

Hab. ad insulam Guimaras.

Legit H. Cuming in sylvis.

Var. *d. Albida, strigis longitudinalibus sub-flavescentibus, nunc rectis, nunc sinuatis, nunc angulatis, ornata.*

Hab. cum præcedente.

In this variety the shining subflavescent under covering appears to be overlaid with a dull chalky-white *epidermis,* through intervals of which the lightning-like stripes of the ground-colour appear. A somewhat obscure deep brown stripe borders the outside of the *columella.*

Var. *e. Brunneo-flavescens, strigis vividè albis conspicua, fasciis suturalibus anfractuum superiorum rubro-brunneis submicantibus, fasciâ suturali anfractûs ultimi albo suturam versus limbatâ fasciâque submediâ haud micantibus.*

Hab. ad insulam Negros.

Legit H. Cuming in sylvis.

In this variety the white lightning-like stripes passing over the transverse red-brown bands of the body-whorl have a striking effect. A deep-brown stripe borders the outside of the *columella.*

Var. *f. Flavescens, strigis (in anfractu ultimo frequentibus) albis.*

Hab. cum præcedente.

On the penultimate whorl the rudimentary longitudinal stripes are but obscurely seen; on the body-whorl they gradually increase from lines to irregular stripes of a full white. A blackish stripe borders the *columella.*

Var. *g. Brunneo-flavescens albo latè strigata et albido-fucata.*
Hab. ad insulam Guimaras.
Legit H. Cuming in sylvis.

Var. *h. Flavescens, albo-strigata, fasciis suturalibus et fasciâ anfractûs ultimi transversâ subpurpureis.*
Hab. ad insulam Negros.
Legit H. Cuming in sylvis.

The white stripes passing over the sutural bands give them a tessellated appearance, but these lightning-like stripes are much more widened where they pass over the transverse band of the body-whorl, which is seen through the shell on looking at the aperture. A reddish brown stripe borders the *columella.*

Var. *i. Productior, subflava, fasciis suturalibus rubro-brunneis, strigis irregulariter longitudinalibus latis valdè angulatis albidis, subflavo-limbatis.*
Hab. in insulâ Pannay ad Ilo Ilo.
Legit H. Cuming in sylvis montanis, Igbaras dictis.

This mountain-variety, which is longer in proportion, is dashingly marked: in the intervals between the zigzag stripes an ashy pellicle covers the ground-colour. A reddish stripe borders the *columella.*

Var. *k. Productior, subflava cinereo cooperta, fasciis suturalibus rubro-purpureis; fasciâ suturali et submediâ latis, obscuris; strigis longitudinalibus irregularibus, albis, sparsis.*
Hab. cum præcedente.

A purplish red stripe borders the *columella* of this curious variety, and the bands of the body-whorl may be seen faintly through the shell on looking into the aperture.

This beautiful and greatly varying species ranges from about 2 inches in length and $1\frac{1}{4}$ in breadth, to very nearly $2\frac{1}{2}$ by $1\frac{4}{8}$ inches.

They were all found by Mr. Cuming on the leaves of trees, and he informs me that they lay soft eggs. Variety *a* was most abundant, and the mountain-varieties *i* and *k* are the longest and largest.

Bulinus Pictor. *Bul. testâ ovato-productâ, anfractibus sex, ultimo cæteros æquante; aperturâ ovatâ, cæruleo-albente, labio rubro-brunneo limbato; columellâ graciliori subrectâ.*

Var. *a. Brunnea strigis longitudinalibus latis vividè albis picta.*
Hab. in insula Pannay.
Legit H. Cuming in sylvis.

This beautiful variety will remind the observer of the colouring of *Achatina Zebra.*

Var. *b. Albida, strigis longitudinalibus brunneis.*
Hab. cum præcedente.

Both varieties were found by Mr. Cuming at Dingle, in the province of Ilo Ilo.

The length ranges from about $2\frac{4}{8}$ by $1\frac{2}{8}$ inch to $2\frac{5}{8}$ inches in length, and 1 in breadth.

Bulinus nimbosus. *Bul. testâ productâ, elongato-pyramidali, lineis incrementi striatâ, anfractibus sex, gradatim majoribus, ulti-*

mo maximo sed haud valdè ventricoso, anticè subangulato, columellâ subrectâ, subgracili.

Var. *a. Brunnea, strigis latis undulato-angulatis, ochraceo-albis nubilosa.*

Var. *b. Brunnea, sparsim lineis ochraceo-albis a lineâ suturali præcipuè descendentibus picta; fasciâ sub-basali nigricante obscuriore.*

Var. *c. testâ totâ brunneâ.*

Hab. ad insulam Negros.

Legit H. Cuming in sylvis.

The throat of this species is bluish white, and the lip is bordered with dull pinky-brown.

The largest specimen which I have seen (var. *a.*) is about 3 inches long and $1\frac{1}{2}$ broad.

Var. *d. Subflava, epidermide quasi cretaceâ, lineis angulatis subflavis inscriptâ.* Long. 3 unc. circiter: lat. $1\frac{1}{2}$ unc.

Hab. ad Ilo Ilo insulæ Pannay.

Legit H. Cuming in sylvis.

Through the chalky *epidermis* which covers this shell, appear the irregular angulated lines of the light amber ground-colour. An old shell.

Helix (Cochlostyla) sarcinosa. *Hel. testâ ovato-rotundatâ, subdiaphanâ, productâ, anfractibus $4\frac{1}{2}$ ventricosis, ultimo cæteros longè superante, lineis incrementi obliquis frequentissimè substriatâ, columellâ incrassatâ, callosâ, subrectâ, aperturâ albâ.*

Var. *a. Ochraceo-alba fasciis frequentibus castaneo-nigris cincta, labii limbo subrosaceo.* Long. $2\frac{7}{8}$; lat. $2\frac{5}{8}$ unc.

Hab. in montibus Tanhay insulæ Negros.

Legit H. Cuming in sylvis.

Var. *b. Brunneo-virescens, fasciis subnigricantibus cincta, albido-ochraceo interruptè tessellato-maculata, labii limbo pallidè subrosaceo.*

Hab. ad insulam Negros.

Legit H. Cuming in sylvis.

The size of this variety is about the same as that of the last. Mr. Cuming found it on bamboos as well as on the leaves of trees.

Var. *c. Viridi-brunnea fasciis interruptis ochraceo-albis et nigro-brunneis alternis cincta, labii limbo pallidè subrosaceo.* Long. $2\frac{5}{8}$; lat. $2\frac{3}{8}$ unc.

Hab. ———?

A sutural band of ochreous-white, interrupted by the greenish-brown stripes, ornaments the upper part of the penultimate and last whorl.

Var. *d. Flavo-virescens, strigis latis ochraceo-albis longitudinaliter obliquis picta et fasciis brunneo-virescentibus cincta, labii limbo albo.* Long. $2\frac{4}{8}$; lat. $2\frac{3}{8}$ unc.

Hab. ad insulam Guimaras.

Legit H. Cuming in sylvis.

Var. *e. Brunneo-virescens, anfractu basali fasciâ obscurè subrubrâ*

tæniâ subalbidâ tessellatim interruptâ infernè limbatâ cincto, labii limbo subrosaceo. Long. 3; lat. $2\frac{4}{8}$ unc.

Hab. in insulâ Masbate.

Legit H. Cuming in sylvis.

Var. *f. Virescens, anfractu basali fasciâ supernè subrubrâ infernè albido-tessellatâ cincta, columellâ subrosaceâ, labii limbo subrosaceo vix tincto.* Long. 3; lat. $2\frac{4}{8}$ unc.

Hab. cum præcedente.

This fine variety is blotched with irregular, obscure, ochraceous-white markings, through which pass narrow greenish fillets. On turning up all the varieties, the space polished by the animal strongly contrasts with the rest of the shell, and in all, the reddish band which girds the body-whorl may be traced at the bottom of the upper whorls. In the two varieties last described this band may be clearly seen through the shell on looking into the aperture. In all the varieties the two first whorls are plain, and not much differing in colour, viz. brownish or yellowish white.

The banded varieties, when deprived of the *epidermis* (in which the other variations of colour reside in all the varieties), appear to me to be *Helix* (*cochlostyla*) *sarcinosa* of Férussac. This species is not noticed in the last edition of Lamarck, by M. Deshayes, and indeed I can find no description of it in Férussac, excepting "No. 323, *sarcinosa, nobis; a. spira conica. Hab.* L'Amerique? Com. D'Orbigny." If the habitat be correctly stated, there would be some ground for supposing that the Philippine shells which we have described are of a different species; but the locality is named with a mark of doubt, which the form itself strengthens, whilst the upper figures in Férussac's work (Pl. 109), though the bands are much narrower and paler than in those skinned specimens which I have seen, bear so strong a resemblance to them, that I have preferred the retention of Férussac's name. In Mr. Cuming's skinned specimens the rich reddish-brown, broad, transverse band of the body-whorl, and the basal band of the same colour at the base of the other whorls, contrast strikingly with the pure white which is the ground-colour of the shell. A small rosy fillet runs along the upper edge of the body-whorl, near the suture.

At the bottom of the same plate Férussac has figured another variety with a uniform brown *epidermis*. These appear to have been all the materials upon which Férussac founded his *Helix sarcinosa*.

The latter will form a sixth variety, which I have never seen, but which may be thus characterized:

Var. *g. Tota brunnea* (*Fér. Hist. Nat. Moll. Terr. et Fluv.* Pl. 109, f. 3.).

Mr. Cuming, who found all the shells which I have described, and am about to describe in this paper, on the leaves of trees, informs me that *Helix sarcinosa* deposits a great number of small eggs on the leaves of the trees in the dark forests where he found all the varieties. After the eggs are deposited on the leaf chosen, the animal wraps it round them subconically, so as to resemble in a de-

gree the small paper wrappers in which grocers hand their wares to their customers.

Obs. Though it perhaps may be considered that *Helix sarcinosa* may come within the section named *Cochlostyla* by De Férussac, there appears to me to be almost a sufficient difference in the form of the aperture, the shape and termination of the *columella*, and the ventricose character of all the whorls, to justify a separation. The animal I have not seen, and I wait for further information before I decisively make that separation, being anxious to prevent the multiplication of names, which already involve the student in a sufficiently entangled labyrinth. For the present, therefore, I shall merely observe, that if future observations confirm my present suspicions, I would propose for the group the name of *Helico-bulinus*.

Helix turbinoides. *Hel. testâ subrotundâ, subproductâ, diaphanâ, lineis incrementi obliquè longitudinaliter striatâ; apice rubente; aperturâ effusâ magnâ, cæruleo-albente, labii limbo nigro-purpurascente, lato, recurvo.*

Var. *a. Viridis, anfractu penultimo et ultimo tæniis albis nunc tenuibus nunc latioribus cinctis.* Long. $2\frac{1}{8}$; lat. $2\frac{5}{8}$ unc.

Var. *b. Ochraceo-brunnea lineis tæniisque nigris vittata, anfractu basali fasciâ viridi-nigrâ latâ cincto.*

The green colour is beautifully seen where the animal has polished the shell, on turning it up; but when it is in its natural position it would be difficult to suppose that there were any other colours than the obscure ochraceous or whitish brown and the black lines, fillets and band. On holding the shell between the eye and the light, the green hue becomes perceptible on the back of the shell, and the bands seen transparently through it on holding the aperture toward the eye and against the light, have a very pretty effect.

Var. *c. Tota viridis.*

Hab. ad Albay in insulâ Luzon.

Legit H. Cuming in sylvis.

All the varieties of this noble *Helix* are about the same size, and at first sight bear no distant resemblance to a *Turbo*. The apex and two upper whorls in the first and last varieties are reddish-brown, and pale brown in var. *b*.

Helix Harfordii. *Hel. testâ rotundatâ, diaphanâ, anfractibus valdè ventricosis, superioribus apiceque complanatis, lineis incrementi frequentissimè striatâ, pallidè brunneâ, anfractu penultimo maculis strigisque angulato-nubilosis vario, anfractu ultimo supernè subalbido maculis nigro-brunneis suturam versus ornato, dehinc usque ad fasciam subcentricam obscurè albidam medio brunneo-tæniatam creberrimè nigro-brunneo tæniato et maculato, infra fasciam brunneo nigricante obscurè albido maculato et tæniato; aperturâ subeffusâ, cæruleo-albidâ, labii limbo angusto subrecurvo, flavicanti-subrosaceo.* Long. $1\frac{6}{8}$; lat. $2\frac{1}{2}$ unc.

Hab. in insulæ Negros montibus.

Legit H. Cuming in sylvis.

In honorem viri reverendi Augusti Harfordii hæc species nomen obtineat.

It is almost impossible to describe the varied markings of this fine *Helix*. Only the two last whorls are spotted and striped, the rest being pale brown. The cloudy markings of the penultimate whorl become more distinct, and the colouring becomes deeper as the body-whorl is approached, and there the spots and fillets become more crowded and intense as they approach the subcentral band, till just above it they form a dark-brown zone. The part polished by the animal is of a bright amber hue.—W. J. B. Oct. 12, 1840.

M. Le Baron de la Fresnaye then read his observations on the situation which the genus *Upupa*, in his opinion, should occupy in the classification of Birds, judging from the form of the feet, and from the habits of the species.

Following is a translation of this author's observations :—

"It is surprising, now it is generally known that the classification of species and genera, based solely upon the form of the beak, is often unnatural and vicious, that modern authors should have continued to unite, as did the old authors, the genus *Upupa* with that of *Epimachus* or *Promerops*, and that they should constitute of these genera a little family under the name of *Promeropidæ*.

"It is evident that authors have been guided solely by the structure of the beak in such an association; and if the feet of these genera be compared, we are struck with the enormous difference which exists in their conformation, and consequently, of necessity, with the habits of the species.

"The Hoopoe, in fact, in the shortness of its fore toes, in the almost straight form of the claws, and particularly in the claw of the hind toe, we perceive has evident affinities with the Larks (*Alauda*) and other conirostral ground birds. Like them, also, the Hoopoe seeks its food on the ground, and especially on humid and newly disturbed land. It is often seen in grazing lands, where it searches for its food in the excrement of cattle, in which coprophagous insects abound. Its long and very slender beak is well adapted for pulling out the larvæ of these insects from the small holes in which they live and undergo their transformations: it serves well likewise to divide and disperse the excrement when dried by the sun.

"It is seen that the Hoopoe, with its feet formed like those of the larks, also essentially resembles those birds in its cursorial habits, but that it seeks its nourishment only on the ground, and in moist lands, such as pastures.

"If, on the other hand, we consider the form of the feet of the species of *Promerops*, with which the Hoopoe is usually associated, it will be seen that there exists a very essential difference in these organs. The feet of the *Promerops* are as remarkable for their thickness as those of the Hoopoe (though fitted for walking) are for their slenderness. In the first of these genera the toes are strong; the external toe is elongated, as well as the back toe, as in all those birds which are essentially perchers and which procure their food

upon trees, whether it be in the manner of the species of *Melliphaga*, *Paradisea*, or *Dendrocolaptes*.

"As in these genera likewise, the claws in *Promerops* are very strong and much arched. The birds of this genus, in fact, appear to us to be *Cinnyridæ*, but on a large scale.

"The genus *Upupa*, as at present constituted, consists only of two or three species,—one from Europe, an African species, and one from India: in these there is so great a similarity in form, colouring and habits, that upon a cursory view they might be mistaken for one species.

"This genus, therefore, does not, as in most other genera, present certain species which recede from the type and form a transition between it and other genera, with which it is then natural to group them.

"From these considerations, the genus *Upupa* appears to us to be one of those isolated genera, like many others in the class, which cannot be naturally placed in any other group, but which ought to be regarded as constituting by itself a family or subfamily, under the name of *Upupidæ* or *Upupinæ*, its situation being in the section *Tenuirostres*; and if it be only regarded as a subfamily, it is with another subfamily of the cursorial *Tenuirostres* it should be grouped, which division should contain the genera *Upucerthia* of M. Isidore Geoffroy St. Hilaire, and some other genera peculiar to Chili, described by Killitz, and by Mr. Gould in the Voyage of the Beagle, and the species of which, in the form of their beak and feet as well as in their cursorial habits, afford a positive analogy with our genus *Upupa*, from which the genus *Promerops* is so isolated."

Mr. Gould, after reverting to the account given by him at the Meeting on the 8th of September, of that singular bird the Brush Turkey of New South Wales, proceeded to state that he had since received from Swan River another bird, having similar habits and a similar mode of nidification, but from which it differs in inhabiting the open sandy plains, instead of dense and gloomy glens, and in forming the mound for the reception of the eggs of sand, dead grasses and boughs, depending as much upon the sun's rays as upon the heat produced by decomposition to develope the young.

Mr. Gould added, that a most interesting note, detailing these facts, accompanied the specimens, and that an equally important sketch of its range, &c., had been furnished him by Capt. Grey, who has just returned from the north-west coast of Australia. The acquisition of this new species, and the notes here alluded to, are more than ordinarily acceptable, since they materially tend to clear up the long-disputed point as to what group the Brush Turkey should be referred to. Mr. Gould further stated, that the views of those naturalists who have considered it to be closely allied to the *Megapodii* were perfectly correct, and that the Brush Turkey and the new species now exhibited would in fact form part of a large and singular family of birds inhabiting Australia and the Indian Islands, all of which assimilate in their habits and mode of nidification. This new

species differing considerably in several of its characters from the Brush Turkey (*Talegalla*), Mr. Gould proceeded to characterize it as a new genus, under the name of *Leipoa*, signifying 'a deserter of its eggs.' The specific term of *ocellata* was suggested by the ocellated character of many of the spots with which its body is adorned.

Genus Leipoa.

Gen. Char.—*Rostrum* ferè tàm longum qùam caput; gracile, ad basin tumescens, tomiis undulatis et ad basin incurvatis, naribus amplis, oblongis, operculo tectis, et in foveâ centrali positis. *Caput* subcristatum. *Alæ* amplæ, rotundatæ, concavæ; e remigibus primariis quinto longissimo; tertiariis quàm remiges primarii ferè tàm longis. *Cauda* rotundata, rectricibus quatuordecem. *Tarsi* mediocres, robusti, anticè scutis, posticè squamis rotundatis haud æqualibus, tecti. *Digiti* subbreves; digitis lateralibus inter se ferè æqualibus.

Leipoa ocellata. *Lei. pectore per medium plumas lanceolatas nigras, strigâ centrali albâ ornatas, præbente, plumis corporis supernè albescenti-cinereis, ad apicem guttâ penè ocellatâ, rufâ, nigro marginatâ, notatis.*

Head and crest blackish brown; neck and shoulders dark ash gray; the fore part of the former, from the chin to the breast, marked by a series of lanceolate feathers, which are black with a white stripe down the centre; back and wings conspicuously marked with three distinct bands of grayish white, brown and black near the tip of each feather, the marks assuming an ocellate form, particularly on the tips of the secondaries; primaries brown, their outer webs marked with zigzag lines of darker brown; rump and upper tail-coverts brownish gray, the feathers of the latter transversely marked with two or three zigzag lines near their tip; all the under surface light buff, the tips of the flank feathers barred with black; tail blackish brown, broadly tipped with buff; bill black; feet blackish brown.

Total length, 24 inches; bill, $1\frac{1}{2}$; wing, 12; tail, $8\frac{1}{2}$; tarsi, $2\frac{1}{2}$.

Hab. Western Australia.

Mr. Gould next proceeded to characterize the two following new birds:—The first (*Cracticus argenteus*) is from the collection of Capt. Gray, and the second, a new species of *Amadina*, is from the collection of Mr. Dring, of H.M.S. Beagle.

Cracticus argenteus. *Cra. gulâ corporeque subtùs albis; humeris nigris; dorso argenteo-cinereo.*

Crown of the head, ear-coverts, shoulders, primaries, and all the tail-feathers for three-fourths of their length from the base, black; back silvery gray; throat, all the under surface, sides of the neck, some of the wing-coverts and the margins of several of the secondaries, rump, and tips of the tail-feathers pure white; bill horn-colour; feet blackish brown.

Total length, 11 inches; bill, $1\frac{5}{8}$; wing, 6; tail, $4\frac{1}{2}$; tarsi, $1\frac{1}{4}$.

In size this species is directly intermediate between *Cracticus cinereus* and *C. varius*.

Hab. North-west coast of Australia.

AMADINA PECTORALIS. *Am. gulâ nitidè nigrescenti-purpureo; pectore plumis ad basin nigris, ad apicem albis, fasciato; corpore supernè cinereo-fusco, alarum tectricibus crebrè guttulis albis adspersis.*

Crown of the head and all the upper surface and wings, delicate grayish brown; the tips of the wing-coverts very minutely spotted with white; tail blackish brown; throat and ear-coverts glossy blackish purple; chest crossed by a band of feathers black at the base, strongly tipped with white; abdomen and under tail-coverts vinous gray; the flanks ornamented by a few feathers, similar to those crossing the breast; bill bluish horn-colour; feet flesh-colour.

Total length, $4\frac{1}{2}$ inches; bill, $\frac{1}{2}$; wing, $2\frac{1}{4}$; tail, $1\frac{3}{4}$; tarsi, $\frac{5}{8}$.

Hab. North-west coast of Australia.

Mr. Gould next exhibited and characterized two new species of Kangaroos from Swan River; the first of these is rather less than the *Macropus Bennettii,* and is remarkable for the perfect black colour of the fore part of all the feet, which appear as if they had been dipped in ink or some other black liquid, the black not blending, as usual, with the pale colour of the hind part of the feet, but terminating in an abrupt line. The general tint of the upper parts of the body is deep gray, a tint produced by the admixture of black and white, the hairs being black at the tip, and annulated with white near the tip; the sides of the body, as well as the under parts, are of paler gray, and are tinted with buff-yellow; this yellow tint is almost pure on the abdomen between the hind legs, on the feet and inner side of the ears: the upper surface of the head and muzzle are of a soot-like colour, and the *occiput* and back of the ears, as well as the apical portion in front, are pure black; a yellowish white line is observable on each side of the muzzle, commencing at the tip, and running backwards beneath the eye; the fore half of the hands and feet are pure black, and the greater portion of the tail (which is well clothed with harsh hairs) is of the same colour; at the base, however, it is coloured as the body, and on the upper surface, for a considerable distance from the base, the black hairs are more or less annulated with whitish, producing a grizzled appearance. On the chin is a small black patch.

Mr. Gould gave to this species the specific name *manicatus*: its principal characters may be thus expressed:—

MACROPUS (HALMATURUS) MANICATUS. *Macr. obscurè griseus; vellere apud partes inferiores pallidiore et flavescente; capite supra fuliginoso, occipite necnon auribus externè nigris; utráque genâ lineâ flavescente notatâ; tarsis antipedibusque flavescentibus, anticè nigris; caudâ nigrâ ad basin griseâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	30	0
——— *caudæ*	26	0
——— *tarsi digitorumque* (sine unguibus)..	8	10
——— ab apice rostri ad basin auris	5	0
——— *auris*	2	6

The second species of Kangaroo to which Mr. Gould drew the attention of the members, is nearly allied to the *Macropus penicillatus* of Mr. Gray, but differs in being of a smaller size, paler colour, in having no black mark on the sides of the body, and the tail less bushy; the ears, moreover, are smaller in proportion, and more pointed. The general colour is gray-brown; the under parts of the body are dirty white, obscurely tinted with yellowish: on each side of the body, near the base of the fore leg, is a dusky patch; a dirty white mark is observable on each side of the head, and there is an indistinct mark on the base of the thigh. The tail is moderately bushy, coloured at the base like the body, but the apical third is dusky black.

Mr. Gould gave to this species the name

MACROPUS (PETROGALE) BRACHYOTIS. *Macr. vellere e fusco cinereo, apud partes inferiores albescente; caudâ floccosâ ad apicem nigrâ; utrâque genâ lineâ albescente notatâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin....	21	0
——— *caudæ*	16	6
——— *tarsi digitorumque* (sine unguibus)..	5	0
——— ab apice rostri ad basin auris	3	8
——— *auris*	1	11

Various specimens presented since the last Meeting were exhibited. These donations consisted of a collection of Birds from Australia, presented by L. Chandler, Esq., and some specimens of Birds and Zoophytes from Gibraltar, presented by Mr. Frembly, R.N., Corresponding Member.

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

In consequence of the lamented death of N. A. Vigors, Esq., one of the founders of the Society, and during the first years of its existence its active and zealous Secretary, whose reputation and influence had materially increased its numbers, as his liberality augmented its collections, the Society adjourned to November 10th.

November 10.—William Yarrell, Esq., Vice-President, in the Chair.

A letter from the Rev. R. T. Lowe, dated Madeira, August 8, 1840, was read. It stated that Mr. Lowe had forwarded for the Society's Museum two specimens of Snakes from Demerara, and a specimen of the *Ausonia Cuvieri* of Risso, from Madeira. "The *Ausonia*," observes Mr. Lowe, "I scarcely need remark, is one of the most interesting and valuable of my acquisitions, from the obscurity attending it, and its supposed identity with Rafinesque's *Luvarus imperialis*. It has been altogether passed over by Cuvier and Valenciennes in their *Histoire des Poissons*, though the former had previously taken it up in a note in his second edition of his *Règne Animal*."

A letter from Mr. J. Frembly, R.N., dated Gibraltar, September 23, 1840, was read. In this letter Mr. Frembly states that he had forwarded for the Society a living specimen of a Brazilian Pheasant

(*Penelope pileata* of Wagler), and also a skin of the same species from Para. He had likewise forwarded some specimens of Marine Corallines and other Zoophytes, recently obtained during the prosecution of a coral fishery on the coast of Barbary.

A letter from J. Wardrop, Esq., dated Oct. 29, 1840, was next read. It refers to a Fowl brought by W. Wardrop, Esq., from the Island of Lemurs, and presented to the Society. In this Fowl the spur had been removed from its proper place, and engrafted on the head. The letter moreover states, that the natives of the island mentioned often cause the spurs of the cock bird to grow upon its head, and the comb upon its legs.

The following paper, by G. Gulliver, Esq., F.R.S., entitled "Observations on the Blood Corpuscles of the *Crocodilidæ*," was read.

"According to the observations of MM. Prevost and Dumas, Wagner, Schultz, and others, the long diameter of the oval blood corpuscles of the vertebrate animals is never more than one and a half or twice the short diameter; and M. Mandl states that this accords with his experience, except in regard to the blood corpuscles of the *Crocodilidæ*, of which he says that the long diameter is between two or three times greater than the short diameter.

"M. Mandl's observations are published in the *Annales des Sciences Naturelles*, séconde série, tome xii., in which the following remarks occur: 'En prenant dans les globules des chameaux*, oiseaux, reptiles et poissons, le petit diamètre pour unité, le grand varie entre $1\frac{1}{2}$ à 2; on en rencontre une exception dans les *Crocodiliens*, dont le grand diamètre est 2 à 3 fois plus grand que le petit.'

"It appears that this conclusion was deduced from an examination of the blood of a single species only, the *Crocodilus Lucius* of Cuvier.

"In a short paper 'On the Blood Corpuscles of the Snowy Owl and Passenger Pigeon,' read before the Society on the 9th of June, 1840, I showed that the corpuscles of these birds, particularly of the former, were so very long, in relation to their breadth, as to present a peculiarity in this respect which I had not seen in the corpuscles of any other vertebrate animal; and, however singular it might appear, it was shown in the same communication that the blood-discs might differ remarkably in two nearly allied species of the same genus. Hence it will not appear surprising that I have failed to find the same peculiarity in the figure of the blood corpuscles of two other species of the *Crocodilidæ*, as M. Mandl did in the *Crocodilus Lucius*. In the following measurements the common-sized corpuscles are first noted, then those of extremely small and large dimensions, and lastly the average deduced from a computation of the whole; and they are all expressed in fractional parts of an English inch.

* M. Mandl says in a note, "Nous avons examiné le sang du Dromadaire, de l'Alpaca, et du Chameau." I may add that I have examined the blood of the *Vicugna* and *Guanaco*, and found their corpuscles also of an oval shape, thus completing the history of the singular red particles of the *Camelidæ*. See 'Dublin Med. Press,' November 27, 1839, and 'Trans. of the Royal Med. and Chirurgical Society,' vol. 23.

"1. Sharp-nosed Crocodile (*Crocodilus acutus*).

Long Diameter.		Short Diameter.	
1·1333	Common sizes.	1·2286	Common size.
1·1231		1·2666	Extremes.
1·1145		1·2000	
1·1600	Extremes.		
1·1000			
1·1231	Average.	1·2286	Average.

"The average thickness of the discs was about $\frac{1}{8000}$th of an inch.

"The animal was young, and the blood was obtained from the heart after death.

"2. An Alligator from South America (*Champsa fissipes*, Natterer).

Long Diameter.		Short Diameter.	
1·1455	Common sizes.	1·2666	Common sizes.
1·1333		1·2400	
1·1200		1·2286	
1·1143		1·2000	
1·1600	Extremes.	1·3000	Extremes.
1·1000		1·1895	
1·1259	Average.	1·2315	Average.

"The animal was young and lively. The blood was obtained from a prick of the foot.

"Thus, as is commonly the case in the oval blood corpuscles of the vertebrate animals, in these two examples the long diameter is not equal to twice the short diameter, and it may therefore be concluded that M. Mandl's remarks on the blood corpuscles of the *Crocodilidæ* are not applicable to the corpuscles of all the species of this family. So far, however, from doubting the accuracy of this physiologist's observation on the blood of the *Crocodilus Lucius*, I am disposed to regard the result of my observations, in connexion with the one which he has made, as establishing a remarkable difference in the blood corpuscles of one family of Reptiles, similar to the peculiarity which I have found in the red particles of the Linnæan genus *Strix*, as well as in those of the *Columbidæ*."

A collection of Birds from Tangiers, presented to the Society by G. W. H. Drummond Hay, Esq., was exhibited, and Mr. Hay furnished the following list, accompanied with observations on the species, which was read.

Vultur fulvus, Linn. Arabic name, *Nezer*.

"I shot this bird as he rose heavily from the top of a high rock, near Cape Spartel, on the north coast of Africa, where he had been gorging himself with the body of a dead kid. The species is rare in these parts."

Neophron Percnopterus, Sav. Arabic name, *Erhama*. "Common."

Aquila Chrysaëtos, Vigors. Arabic name, *El Oukab*.

"Very rare, but two specimens having been obtained for many years past."

Pernis apivorus. Arabic name, *Bourreh.*

"This species passes over the country about the beginning of the spring in immense numbers, but is rare at other times."

Falco Subbuteo, Linn. Arabic name, *Tier el Hor.*

"A very daring little bird, used by the Sultan for hawking: it is common in the high lands."

Falco Tinnunculus, Linn. Arabic name, *Bouamira.* "Very common."

Circus rufus, Bechst. Arabic name, *Hedia.* "Rare."

Alcedo Ispida, Linn. Arabic name, *Tier Teberni.* "Common about the rivers."

Caprimulgus europæus, Linn. Arabic name, *Terref el Aiyal.*

"Very common."

Merops Apiaster, Linn. Arabic name, *Liamon.*

"In the grape season this bird is exceedingly abundant; as many as twenty or thirty have been shot at one time from a tree: it is good eating, builds in holes in the ground, and sometimes uses rabbit-burrows for the purpose: feeds upon bees, flying ants, wasps, &c.; has an undulating flight, and does not flap the wings much. Disappears in the winter months."

Coracias garrula, Linn. Arabic name, *Characrac,*—a name which has reference to the noise which it makes.

"It is rather rare; comes generally in the spring, and remains about three months."

Lanius rufus, Linn. Arabic name, *Raich el Rra.* "Rare."

Oriolus Galbula, Linn. Arabic name, *Teir Sofar.*

"Rare: makes its appearance in the beginning of the spring, and leaves at the end of the spring."

Ixos obscura. Arabic name, *Chouchou.*

"Very common, especially in the orange plantations; destroys much of this fruit. Seen throughout the year."

Curruca melanocephala. Arabic name, *Chorrir.* "Rare."

Curruca atricapilla, Bechst. Arabic name, *Chorrir el Quebir.* "Rare."

Phænicura Tithys, Jard. and Selby.

Phænicura ruticilla. "Common."

Sylvia cisticola, Savi. Arabic name, *Boussiou.*

"Rather uncommon: builds near hedges."

Saxicola Stapazina. "Uncommon."

Saxicola aurata, Temm. "Common."

Saxicola Rubicola, Bechst. "Common."

Anthus arboreus, Bechst. Arabic name, *Koba.* "Common."

Anthus pratensis, Bechst. Arabic name, *Koba.* "Common."

Emberiza Hortulana, Linn. "Common."

Serinus flavescens, Gould. Arabic name, *Chimerees.* "Rare."

Sturnus unicolor, Temm. Arabic name, *Garzor Quehal.*

"Rather rare: generally settles in the mosques, where it probably builds."

Upupa Epops, Linn. Arabic name, *Hadhud.* "Common: generally seen about dunghills."

Glareola torquata, Briss. Arabic name, *Harrak Diad.*

"Lays on the ground in barren situations, and does not build a regular nest, but merely places a few straws, &c., loosely together."

Cursorius isabellinus, Meyer. Arabic name, *El-Gueta.*

"Very rare: builds in the desert, in the sand. From the great resemblance between the colour of this bird and that of the sand, it is with difficulty seen, even when flying, since it then keeps very close to the ground."

Ciconia nigra, Ray. Arabic name, *Geringa.*

"Rare. The Moors believe evil spirits to exist in this bird, it being black, whilst the good spirits are supposed to inhabit the white birds."

Platalea Leucorodia, Linn. Arabic name, *Boucarcaba.* "Rare."

Ardea purpurea, Linn. Arabic name, *Said el Meresh*, or Hunter of the Marsh. "Rare."

Botaurus stellaris, Linn. Arabic name, *Seba el Meresh*, the Lion of the Marsh.

"Both the *Ardea purpurea* and the *Botaurus stellaris* are exceedingly pugnacious in their habits, and will not allow any other bird to approach them. Even the female dare not approach the male excepting in the breeding-season."

Ardea Garzetta, Linn. Arabic name, *Boubliga.* "Very rare."

Ardea Verany, Temm. Arabic name, *Tier Abgar.* "Exceedingly rare."

Ardea Ralloïdes, Scops. Arabic name, *Grnok el Serreh.* "Rather uncommon."

Ibis Falcinellus, Temm. Arabic name, *Maiza del Wad.* "Very rare."

Limosa melanura, Leisl. Arabic name, *Chibib.* "Not uncommon."

Squatarola cinerea, Gould. Arabic name, *Dorreis.* "Common."

Charadrias Hiaticula, Linn. Arabic name, *Couba.* "Common."

Strepsialis collaris, Temm. Arabic name, *Charno.* "Rare."

Totanus fuscus, Leisl. "Rare."

Totanus hypoleucos, Temm. "Rare."

Tringa variabilis, Mey. "Rare."

Tringa subarcuata, Temm. "Rare."

Tringa minuta, Leisl. "Very rare."

Tringa carunculata. Arabic name, *El Gor.* "Common."

Undina leucocephala, Gould. Arabic name, *Bugarein.*

"Exceedingly rare. A very excellent diver; will remain under water a long time."

Anas leucophthalmus, Temm. Arabic name, *Bourk el Serrer.*

"Rare: a good diver."

Anas marmorata, Temm. Arabic name, *Bourk el Biad.* "Rare: a good diver."

Podiceps cristatus, Lath. Arabic name, *Bourk el Wad.* "Rare."

Alca Torda, Linn. Arabic name, *Bourk del Bahar.* "Rare."

A paper, in which Mr. G. B. Sowerby continues the descriptions of the shells collected by H. Cuming, Esq., in the Philippine Islands, was next read.

HELIX ANNULATA. *Hel. testâ obovatâ, crassiusculâ, lævi, plerumque flavâ, fusco-cinctâ; spirâ elevatiusculâ, obtusâ, anfractibus quinque rotundatis, ultimo maximo; aperturâ rotundato-subtrapezoidali; peritremate lato, incrassato, albo roseo tincto; labio columellari lato, crasso, planulato, posticè subemarginato, anticè suprà columellam expanso.* Long. 1·0; lat. 0·8 poll.

Hab. in foliis Pandani propè Banqui, provinciæ Iloconis septentrionali ad insulam Luçon, Philippinarum.

This beautiful species bears considerable resemblance to *H. Iloconensis*, but may be distinguished by the dark chocolate colour of the back of the outer lip, which is also narrower, and much less reflected. Five varieties have been found by Mr. Cuming, viz.

a. Bright yellow, with a blood-red antesutural band, which becomes darker, and nearly chocolate-brown on the last volution: back of the lip and circumference of the *columella* dark chocolate-brown.

b. Bright yellow: antesutural band narrow, blood-red; circumferential band blackish brown: in other respects similar to *a.*, and from the same locality.

c. Nearly similar to the last, but having a broader circumferential brown band, and a very narrow brown line between it and the antesutural band. From the same locality.

d. Pale yellow: antesutural band nearly obsolete: in all other respects like *b.*

e. Shell white: no antesutural band; circumferential band broad, and nearly black; last volution suffused with rose-red near the back of the lip.

HELIX BALTEATA. *Hel. testâ subglobosâ, crassiusculâ, lævi, coloribus variis cinctâ; spirâ elevatiusculâ, obtusâ, anfractibus quinque, subplanulatis, ultimo maximo; aperturâ semilunari, intùs albicante; peritremate incrassato, angusto, leviter reflexo, extùs nigro; labio columellari latiusculo, obliquo, planulato, crasso.* Long. 1·0; lat. 0·8 poll.

Hab. in foliis fruticum ad provinciam Ilocos septentrionalis insulæ Luçon, Philippinarum.

In general form and size and colouring this species somewhat resembles our *H. Orbitulus*, from which it may be at once distinguished by its narrow, scarcely reflected, dark-coloured lip. The ground-colour of this species is usually whitish, or lemon-yellow, and the varieties are banded with dark green, gray, nearly black, and light green, and the columellar lip is commonly purplish black, with a crimson tinge. The following is an indication of the varieties:—

a. Apex dull red; ground-colour lemon-yellow; antesutural band

dark green; post-circumferential band light greenish gray; columellar lip purplish black, with rose-coloured edges; columellar circumference green. From Banqui, in the province of North Ilocos.

b. Apex dull red; ground-colour pale lemon-yellow; antesutural band dark green; post-circumferential band greenish gray close to the broad circumferential band, which is reddish black; *columella* purplish black, its circumference green. From Banqui.

c. Apex dull red; ground-colour pale lemon-yellow; antesutural band green, darker in front; post-circumferential band greenish gray, also darker in front; *columella* and its immediate circumference purplish black, around which is a rather broad green band. From Sinait. Found on the leaves of trees.

d. Apex dull red; ground-colour lemon-yellow; antesutural band broad, dark green, composed of several narrow bands, next to which is a broad, pale, greenish gray band; circumferential band dark green, nearly black; *columella* purplish red, its circumference with a broad green band. From Banqui.

e. Apex dull pale red; ground-colour pale lemon-yellow: antesutural band broad, dark green; post-circumferential band very broad, greenish gray, with a very narrow nearly black band in front; then comes a narrow band of the ground-colour, and the remainder is green to the circumference of the *columella*, which is blackish; the *columella* itself is purplish black. From Piddig, in the province of North Ilocos.

f. Apex pale dull red; ground-colour pale lemon-yellow; antesutural band very narrow, dark green; post-circumferential band very broad, greenish gray, united in front to the blackish circumferential band; *columella* blackish, its circumference with a very narrow green band. From Piddig.

g. Apex grayish white; ground-colour bright lemon-yellow; antesutural band narrow, dark green; post-circumferential band grayish green; circumferential band nearly black; *columella* crimson, its circumference green.

h. Apex and ground-colour white; bands as in *g.*; *columella* blackish; its immediate circumference black, around which is a dull green band; the antesutural band in this variety is very narrow, and of a dull colour, and two nearly black bands are distinctly seen within the aperture. From Sinait.

Helix fenestrata. *Hel. testâ subglobosâ, crassiusculâ, lævi, castaneo-nigrâ, epidermide fuscâ albicante-bifasciatâ; anfractibus quinque rotundatis, ultimo maximo, posticè prope suturas fenestratis (attritione epidermidis); aperturâ subrotundâ; peritremate lato, albo, reflexo; labio columellari lato, crasso, subplanulato.* Long. 1·0; lat. 0·85 poll.

Hab. supra foliis arborum ad montes Caravallo, provinciæ Cagayan, insulæ Luzon Philippinarum.

There are two varieties of this pretty species, which in general form resemble *H. Iloconensis* and *H. annulata*: they are

a. Anterior intermediate band dark brown.

b. Anterior intermediate band light brown.

The next paper read was from Mr. G. B. Sowerby, Jun., and is entitled "Descriptions of some new species of *Murex*, principally from the collection of H. Cuming, Esq."

Murex Occa, Conch. Illustr. f. 45. *Mur. testâ clavatâ, ventricosâ, fulvo-glaucescente; spirâ mediocri; caudâ longissimâ, rectâ, ad terminum subexpansâ, subrecurvâ; anfractibus angulatis transversè leviter sulcatis; varicibus tribus, spinis dorsalibus tribus brevibus falcatis, tribusque minutissimis alternantibus, deindè ad caudam tribus ad quatuor subrectis, interstitiis bituberculatis; aperturâ ovatâ, rotundatâ, posticè subangulatâ; labio crenulato, dente unico magno lato marginali; canali ferè clauso.*

Long. 3; lat. extra varicibus, 1 poll.

Hab. ad insulas Nicobaricas.

The comparative smoothness of the whorls, and the short, curved character of the dorsal spines, are sufficient to distinguish this from other clavate species.

Murex Messorius, Conch. Illustr. f. 93. *Mur. testâ clavatâ, subventricosâ, fulvo-rubescente, griseo, rubro, fuscoque maculatâ; spirâ brevi; caudâ elongatâ, rectâ, angustâ, minimè recurvâ; varicibus tribus, crassis, costatis, antè crenulatis, ponè foveolatis, ad angulum posticum spinâ brevi rectâ, ad caudam spinâ falcatâ, subelongatâ, deindè unâ breviore, rectâ; interstitiis duobus ad tribus costis noduliferis; aperturâ ovali, posticè subcanaliferâ; labio interno posticè tumido, intùs crenulato; labio externo denticulato, anticè paululum extante; canali ferè clauso.*

Long. 2·40; lat. ex. var. ·90 poll.

Hab. ——? Mus. Cuming, Stainforth.

Distinguishable by the thickened varices, and the spine at the base of the caudal canal, shaped like a reaper's hook.

Murex rectirostris, Conch. Illustr. f. 95. *Mur. testâ clavatâ, subventricosâ, transversè costatâ, pallidè fulvâ, fusco-rubescente bifasciatâ; spirâ mediocri, anfractibus octo, rotundatis; suturis excavatis: caudâ elongatâ, angustâ, rectâ; varicibus tribus, crassis, antè crenulatis, ponè excavatis, ad angulum posticum spinâ crassâ, brevi, propè caudam tribus minutis proclivis, ad caudam duabus seu tribus tenuibus, rectis: interstitiis tricostatis; aperturâ ovali, peritremate extanti, labio externo crenulato; canali ferè clauso.*

Long. 2·80; lat. ex. var. 1 poll.

The spire is more elongated, the caudal canal is longer and more straight than in *M. recurvirostris*, Brod.

Murex nigrescens, Conch. Illustr. f. 98. *Mur. testâ subclavatâ, subrhomboideâ, transversè leviter costatâ, griseâ, nigro bifasciatâ, ad apicem fusco-rubescente: spirâ subproductâ, anfractibus septem, subangulatis, inter varices trifariàm tuberculiferis; suturis validis: caudâ elongatâ, rectâ, tenui; varicibus tribus, validis, rotundatis, noduliferis, ponè subexcavatis, ad angulum tuberculo subspinoso, ad basin caudæ spinis duabus: aperturâ ovali, labio interno albo, posticè tumido, anticè extante, crenulato, labio externo denticulato, intùs crenulato; canali clauso.*

Long. 2; lat. ex. var. ·80 poll.

Hab. ad Xipixapi. H. Cuming legit.

More ventricose and less clavate than *M. recurvirostris*, Brod., with a larger aperture, thinner varices, and straighter caudal canal. The sutures of the spire are not excavated, and the varices are very slightly so. Sandy mud, 11 fathoms.

Murex pliciferus, Conch. Illustr. f. 102. *Mur. testâ elongatâ, subfusiformi, subventricosâ, atrâ, albâ, pallidè fusco-subfasciatâ; transversè lineis moniliformibus striata spirâ productâ, anfractibus novem, subangulatis, suturis validis, subexcavatis; caudâ subelongatâ, rectâ, paulo exfoliatâ, leviter recurvâ: varicibus tribus, post angulum trifariàm spinoso-fimbriatis, ad angulum posticum spinâ crassâ, subelongatâ, rectâ, deindè quinque, brevioribus apertis, quarum primis duabus et ultimâ brevissimis, ad caudam duabus subelongatis, unâ brevi: aperturâ magnâ, ovali; labio interno lævi, paululùm extante; labio externo levitèr crenulato, canali recto, aperto; interstitiis varicum tuberculo valido, tum costâ elongatâ, plicatâ, deindè costâ elongatâ angustiori subplicatâ.*

Long. 3·40; lat. ex. var. 1·50.

Hab. ——? Mus. Cuming.

There is no danger of confounding this fine species with any other. It is intermediate between the clavate and the fusiform groups.

Murex plicatus, Conch. Illustr. f. 6. *Mur. testâ clavatâ, ventricosâ, pallidè violaceâ, fulvo tinctâ et lineatâ: varicibus tribus, costatis crassis, ad latus marginale crenatis, ponè excavatis, ad angulum anfractuum spinâ crassâ brevi, deindè quinque alternatis, ad caudam tribus, subrectis, subelongatis; interstitiis tribus ad quatuor costis noduliferis; spirâ breviusculâ; aperturâ ovali, posticè canaliferâ; labio crenato; caudâ rectâ, crassâ, subelongatâ; canali ferè clauso.*

Long. 3·0; lat. ex. var. 1·30.

Hab. ad sinus Nocoyo. H. Cuming legit.

Found in coarse sand, at twelve fathoms. Distinguished from other species with elongated caudal canals by its width, and the thickness of the varices, which are deeply excavated at the back, and armed with short thick spines. *M. recurvirostris*, Brod., is the nearest approach, but is not so wide nor so spinose, and the caudal canal is recurved.

Murex formosus, Conch. Illustr. f. 91. *Mur. testâ subclavatâ, transversè leviter costatâ, scabrosâ, fulvo purpurascente: spirâ subproductâ, aculeatâ; anfractibus novem rotundatis; suturis validis; caudâ elongatâ, obliquâ, tenui, recurvâ, validissimè exfoliatâ: varicibus tribus à tergo subexcavatis, spinâ ferè elongatâ ad angulum posticum, deindè tribus apertis subelongatis, cum parvis quinque ad sex proclivis alternantibus, ad caudam duabus mediocribus ferentibus; interstitiis trifariàm noduloso-costatis; aperturâ ovali posticè subcanaliferâ, labio interno anticè vix minimè extante; labio externo denticulato, anticè extante; canali aperto.*

Long. 3·15; lat. ex. var. 1·05 poll.

Hab. ad Loay, Ins. Bohol. Mus. Cuming, Sowerby, Stainforth.

This belongs to the group of which *M. Motacilla* forms the type. It is an extremely elegant shell; the caudal canal is gracefully curved and exfoliated. Sandy mud, 7 fathoms.

Murex mindanaensis, Conch. Illustr. f. 92. *Mur. testâ subclavatâ, subventricosâ, transversè sulcatâ, pallidè fusco-rufescente; spirâ productâ, anfractibus octo rotundatis, suturis validis; caudâ elongatâ, subrecurvâ, exfoliatâ: varicibus tribus, validis, rotundatis, ponè subexcavatis; ad angulum posticum spinâ unicâ brevi; deindè spinis quinque brevioribus, parvisque quinque proclivis alternantibus: interstitiis tricostatis; aperturâ ovali; labio externo crenulato, margine dentato; labio interno lævi, paulo extante; canali ferè clauso.*

Long. 3; lat. ex. var. ·85; *cauda*, 1·5.

Hab. prope Cagayan, provinciæ Misamis ad insulam Mindanao Philippinarum. H. Cuming legit.

This beautiful and very distinct species presents a medium between the groups of which *M. Motacilla* and *M. ternispina* may be taken as the types. It was dredged at Cagayan in sandy mud, at a depth of 25 fathoms.

Murex elegans, Conch. Illustr. f. 84. *Mur. testâ clavatâ, ventricosâ, rhomboideâ, lævi, transversè costatâ, albâ, costis fusco-lineatis; varicibus tribus, crassis, rarissimè subspinosis; interstitiis bituberculatis; aperturâ ovali, labio externo crenulato; caudâ elongatâ, recurvâ, anticè latâ, angulatâ.*

Long. 2·15; lat. ex. var. 1 poll.

Hab. ——? Mus. H. Cuming.

A much smoother shell than *M. Motacilla*, and having two large tubercles between the varices, instead of three. It has been named as above by Dr. Beck in collections, but we believe has never been described.

Murex similis, Conch. Illustr. f. 69, 70. *Mur. testâ subfusiformi, subventricosâ, transversè interrupto-costatâ, pallidè fulvâ, transversè bifasciatâ vel interrupto lineatâ: varicibus tribus, costatis; ad angulum anfractuum unâ spinâ brevi, deindè quatuor ad quinque anterioribus minimis, ad caudam unâ spinâ brevi; interstitiis trifariàm noduloso-costatis: caudâ recurvâ longiusculâ posticè latâ, angulatâ exfoliatâ; aperturâ ovali; labio extante, intùs leviter crenulato; labro crenulato.*

Long. 1·90; lat. ·8.

Hab. ——? Mus. Saul.

The spire is much more elongated, the varices more spinose and less thickened, and the caudal canal less elevated than in *M. Motacilla*, which, in general characters, it much resembles.

Murex scabrosus, Conch. Illustr. f. 73. *Mur. testâ subturbinatâ, ventricosâ, crassâ, corrugatâ, transversè lineis elevatis, scabrosis, distantibus, costatâ, pallidè fulvâ, fusco-maculatâ; spirâ brevi, obtusâ, anfractibus sex ventricosis, suturis validis; caudâ longi-*

tudine aperturam æquante, rectâ, crassâ, latâ, exfoliatâ, ad basin sub-coarctatâ; varicibus tribus, validis, costatis, posticè excavatis; costarum, unâ ad angulum posticum subspinosâ, tribus ad partem anticam anfractus anticè fimbriatis, tribus ad caudam, validis, subspinosis, subfimbriatis; interstitiis tuberculis tribus corrugatis anticè ad basin caudæ læviusculis; aperturâ magnâ, albâ, rotundatâ; labio interno lævi, decumbente, purpureo; labio externo crenulato; canali aperto.

Long. 2·20; lat. ex. var. 1·10 (*spira*, $\frac{1}{3}$; *apertura*, $\frac{1}{3}$; *cauda*, $\frac{1}{3}$).

Hab. ——? Mus. Saul.

We have only seen one specimen of this shell, which resembles, in some degree, the young of *M. pomum*; but the varices are narrower, the tubercles smaller, and there is a smooth space just below the ventricose part of the last whorl. The caudal canal is larger and straighter.

Murex Banksi, Conch. Illustr. f. 82. *Mur. testâ fusiformi, transversè scabroso-sulcatâ, fulvâ, fusco-maculatâ, ad varices nigrescente; spirâ productâ, anfractibus septem, rotundatis, suturis validis, subundatis; caudâ elongatâ, latâ, nisi ad extremitatem rectâ, paululum recurvâ: varicibus tribus, ramis breviusculis acutofrondosis, subrectis, ad caudam quatuor compressis, quorum duobus elongatiusculis: interstitiis tuberculis tribus subpliciformibus: aperturâ albâ, ovali, posticè canaliferâ; labio externo acutissimè denticulato; canali aperto.*

Long. 2·80; lat. ex. var. 1·15 poll.

Hab. ad Mollucas.

The above name, although, we believe, never published, has been applied to this species in several cabinets. The compressed character of the fronds on the caudal canal bring it near to *axicornis*, but the other fronds are much shorter.

Murex Saulii, Conch. Illustr. f. 77. *Mur. testâ fusiformi, transversè lineis elevatis striatâ, pallidè fulvâ, fusco-rubescente vel nigricante lineatâ: spirâ elongatâ; anfractibus novem, rotundatis, gradatim crescentibus; suturis validis: caudâ subelongatâ ad basin planâ, exfoliatâ, rectâ; extremitate obliquâ, recurvâ: varicibus tribus obliquiter continuis, crassis, rotundatis ad angulum posticum; ramo crassiusculo, ad basin subcomplicato, extremitate frondoso, recurvo, roseo; deinde quatuor apertis, angustioribus, roseis, frondosis, cum quinis minoribus proclivibus alternantibus, tum tribus ad caudam subcompressis, roseis, frondosis: interstitiis tuberculis duobus, uno majore, uno minore: aperturâ ovali, posticè canaliferâ, angulatâ; labio interno lævi; labio externo dentibus duodecim acutis; canali aperto, subsinuoso.*

Long. 2·80; lat. ex. var. 1 poll.

Hab. ad insulam Capul, Philippinarum. H. Cuming legit. Mus. Saul, Stainforth, Reeves.

It is somewhat surprising that this species should not have been distinguished ere this from *M. Palmarosæ*, from which it differs in having a smooth inner lip, and in having small projecting fronds on the varices between the larger ones.

Murex torrefactus, Conch. Illustr. f. 110, 111. *Mur. testâ subfusiformi, subventricosâ, transversè costis subscabrosis striatâ: spirâ elongatâ; anfractibus novem, rotundatis, subgradatim crescentibus; suturis subvalidis: caudâ mediocri, latâ, palmatâ, exfoliatâ, ad basin rectâ, ad extremitatem obliquâ, recurvâ: varicibus tribus, crassis; ramis dorsalibus quinque, frondosis, brevibus (uno ad angulum posticum crassiusculo), cum parvis quinque proclivibus alternantibus, ad caudam tribus subcompressis: interstitiis tuberculis duobus, uno majore: aperturâ flavidâ ovali, posticè canaliferâ, subangulatâ; labio interno lævi; labio externo dentibus duodecim acutis; canali aperto, subsinuoso.*

Long. 3·70; lat. 1·60 poll.

Var. *Testâ pallidè fulvâ, fusco-nigricante, lineatâ; frondibus fuscis.*

Var. *Testâ ferè adustâ.*

Var. *Testâ flavido-rufescente, fusco-lineatâ.*

Hab. ad insulam Ticao, Philippinarum. H. Cuming inter alios legit.

Much more ventricose, with a wider caudal canal, and much shorter fronds than *M. Saulii.* Found on coral reefs.

Murex palmiferus, Conch. Illustr. f. 99. *Mur. testâ subfusiformi, transversè scabroso-sulcatâ, fulvo-roseo tinctâ: spirâ elongatiusculâ, acutâ; anfractibus octo, subangulatis: caudâ mediocri, exfoliatâ, obliquâ, paululùm recurvâ: varicibus tribus; frondibus palmatis, ad angulum posticum duobus subelongatis, subconnexis, tum duobus singularibus, deindè duobus connexis, cæteris parvis, proclivibus, ad caudam tribus singularibus, quarum ultimo brevissimo: interstitiis bituberculatis: aperturâ ovali, posticè subangulatâ; labio externo crenulato; canali aperto.*

Long. 1·70; lat. ex. var. ·80 poll.

Hab. Red Sea.

Murex corrugatus, Conch. Illustr. f. 72. *Mur. testâ subrhomboideâ, transversè costatâ, corrugatâ, scabrosâ, albo-lutescente: spirâ productâ; anfractibus septem, subangulatis: caudâ mediocri, exfoliatâ, ad basin latâ: varicibus tribus, tenuibus, costatis; frondibus sub-palmiferis, ad angulum duobus confertis, tum duobus singularibus, deinde tribus confertis, ad caudam duobus seu tribus singularibus: interstitiis bituberculatis: aperturâ magnâ; labio interno lævi; labio externo maximè extante, crenulato; canali aperto.*

Long. 1·30; lat. ex. var. ·60 poll.

Hab. ——? Mus. Cuming, Watson.

Murex laqueatus, Conch. Illustr. f. 78. *Mur. testâ rhomboideâ, transversè costatâ, crassâ, albâ: spirâ mediocri; anfractibus septem, subangulatis: caudâ breviusculâ, rectâ, crassâ: varicibus tribus obliquiter spiram decurrentibus, à tergo tumulosis, fimbriâ laqueatâ carinatis, ad caudam subspinosis: interstitiis tuberculo magno costatis: aperturâ parvâ, ovali; labio externo crenulato; canali aperto.*

Hab. ——? Mus. Saul.

A much thicker shell than *M. tripterus,* Born., and moreover having the caudal canal spinose.

Murex canaliferus, Conch. Illustr. f. 74. *Mur. testâ parvâ, crassâ, subfusiformi, sublævi, albo-lutescente: spirâ productâ; anfractibus sex ad septem, subplanis: caudâ breviusculâ, subrectâ, ad terminum minimè recurvâ: varicibus tribus, fimbriatis, antè inciso-fimbriatis, ponè lævibus, costatis; ramis uncinatis, planis, tubiformibus, ad angulum posticum uno valido, subelongato, ad medium anfractûs uno brevi, tum duobus minimis, obsoletis, ad caudam duobus parvis: interstitiis obscurè quadrifariam nodulosis: aperturâ integrâ, parvâ, ovali; peritremate lævi; canali nisi ad extremitatem clauso.*

Long. 1; lat. ex. var. ·35 poll.

Hab. ——? Mus. Stainforth, Sowerby.

Differing from *M. cancellatus*, in being more fusiform, thin and smooth, in the caudal canal being longer and straighter, and in the sutures of the whorls being simple.

Murex cancellatus, Conch. Illustr. f. 75. *Mur. testâ parvâ, crassiusculâ, fusiformi, cancellatâ, albo-lutescente: spirâ subproductâ; anfractibus quinque; suturis foveolatis: caudâ brevi, crassâ, latâ, ad terminum tortuosâ, minimè recurvâ: varicibus tribus, fimbriatis, crassis, costatis, utrinque foveolatis; ramis tubulatis, uno ad angulum crasso, valido, ad medium anfractûs, uno brevissimo, cæteris obsoletis: interstitiis trifariam noduloso-costatis: aperturâ parvâ, integrâ, ovali; peritremate lævi; canali nisi ad extremitatem clauso.*

Long. ·75; lat. ex. var. ·31 poll.

Hab. ——? Mus. Stainforth.

A small white fimbriated shell, with the canal and a frond open only at the extremities.

Murex Capensis, Conch. Illustr. f. 76. *Mur. testâ parvâ, subfusiformi, lævi, fulvo-rubescente: spirâ productâ, caudam æquante: varicibus tribus, digitato-alatis; spinis quinque planis, subtubulatis, fimbriâ membranaceâ connexis, unâ ad angulum anfractuum falcatâ: aperturâ ovali, posticè subangulatâ; canali nisi ad extremitatem clauso.*

Long. 1; lat. ·40 poll.

Hab. ad Bonæ Spei promontorium. Mus. Cuming, Sowerby, &c.

A pretty little species, with nearly tubular digitations connected by a fringe. The posterior digitation of each varix is hooked.

Murex trialatus, Conch. Illustr. f. 18. *Mur. testâ rhomboideâ, lævi, subventricosâ, fulvâ, fusco-nigrescente fasciatâ: varicibus tribus, alatis, ad marginem undatis, posticè subelongatis, subaculeatis, ad latus marginale fimbriatis, subcanaliculatis, à tergo lævibus, ad terminum exfoliatis: apertura ovali; labio undato: caudâ brevi, latâ: canali clauso: spirâ elongatâ.*

Hab. ——? Mus. Saul.

Murex emarginatus, Conch. Illustr. f. 64. *Mur. testâ rhomboideâ, sublævi, pallidè fusco-rubescente: spirâ brevi; anfractibus quinque, prope suturas angulatis; suturis undatis: caudâ angustâ, obliquiter rectâ, exfoliatâ, leviter recurvâ: varicibus tri-*

bus, crassis, angulatis, anticè dente unico subextanti, unico minore à tergo undato-costatis, supernè fimbriâ anticè dilatatâ, canaliferâ, subitò ad caudam truncatâ carinatis: interstitiis tuberculo magno: aperturâ magnâ, ovali; labio externo undato, extante, anticè dente unico armato; canali nisi ad extremitatem clauso.

Long. 2; lat. ex. var. 1 poll.

This species presents a near approach to *M. Monoceros, nobis,* but the canal is closed, and it is also longer and narrower. The varices are fimbriated. The fringe near the canal is suddenly terminated, being in a manner drawn in.

Murex monoceros, Conch. Illustr. f. 65. *Mur. testâ rhomboideâ, irregulari, transversè minutè striatâ, griseâ, lineis albis inter fasciis fuscis cinctâ: spirâ mediocri; anfractibus septem, subangulatis: caudâ brevi, latâ, exfoliatâ: varicibus quatuor ad quinque subdecumbentibus, paululùm rotundatis, antè quadrifariam denticulatis, uno dente magno prope caudam subextante, uno minore: interstitiis tuberculo magno: aperturâ magnâ, posticè subangulatâ; labio externo, dente magno prope canalem extante, intùs denticulato, canalifero; canali aperto.*

Long. 2·25; lat. ex. var. 1·20 poll.

Hab. —— ? Mus. Norris.

A very remarkable shell in the collection of J. Norris, Esq., with a large tooth on the anterior part of the outer lip, resembling that in *Monoceros.*

Murex fasciatus, Conch. Illustr. f. 86. *Mur. testâ rhomboideâ crassâ, transversè costatâ, albâ, vel pallidè fulvâ, fusco-bifasciatâ: spirâ breviusculâ; anfractibus sex, subrotundatis, paululùm angulatis: caudâ brevi, crassâ, compressâ, subumbilicatâ: varicibus tribus, rotundatis crassis, costatis: interstitiis tuberculo valido, elongato: aperturâ ovali, posticè subcanaliferâ; labio interno lævi; labio externo crenulato, intùs dentato; canali nisi ad extremitatem clauso.*

Long. 1·20; lat. ex. var. ·65 poll.

Hab. ad oras Africanas (River Gambia).

Murex varius, Conch. Illustr. f. 57, 104. *Mur. testâ crassâ, subrhomboideâ, ventricosâ, subscabrosâ, pallidè fulvâ, fusco-fasciatâ; rubro-lineatâ, lineis extantibus submoniliformibus transversè sulcatâ: spirâ mediocri; anfractibus septem, primis angulatis, ultimâ subrotundatâ: caudâ brevi, latâ, crassâ, exfoliatâ: varicibus quinque ad septem, decumbentibus, prope angulum posticum à tergo tumulosis; tuberculis subspinosis, uno ad angulum brevi, crasso, subcrispato, tum aliquando tribus minutis, deinde tribus majusculis, ad caudam uno subelongato: aperturâ magnâ, subrotundatâ, posticè subangulatâ; labio interno lævi, crasso; labio externo crenulato; canali aperto.*

Long. 2·35; lat. ex. var. 1·50.

Hab. Gambia. Mus. Cuming.

Murex tumulosus, Conch. Illustr. f. 71. *Mur. testâ clavatâ, ventricosâ, pallidè fulvâ, fusco-bifasciatâ, transversè scabroso-sulcatâ:*

spirâ brevi; anfractuum suturis excavatis: varicibus septem, validis, crassis, costatis, antè crenulatis, ponè excavatis, ad suturas tumulosis; ad medium anfractuum spinis duabus subelongatis, rectis; ad caudam spinis tribus: caudâ elongatâ: aperturâ magnâ, ovali, posticè subangulatâ; anticè margine sub-producto, intùs crenulato.

Long. 3·60 (*caudæ*, 2·3); lat. ex. var. 1 30.

Hab. ——? Mus. Stainforth.

This species differs from *M. cornutus*, in the thickness of the varices, which are excavated behind. The sutures of the spine are also excavated.

Murex varicosus, Conch. Illustr. f. 49. *Mur. testâ subclavatâ, transversè sulcatâ, albâ, ad varices fusco-nigricante: varicibus sex, tumidis, subfrondosis, anticè inciso-fimbriatis, pone frondes lævibus, integris, posticè ad anfractum proximum dilatatis, ultimo magis expansâ, digitatâ: spirâ breviusculâ; suturis anfractuum excavatis: caudâ subelongatâ, latâ: aperturâ rotundatâ, albâ; canali ferè clauso: caudâ subelongatâ, latâ.*

Long. 1·70; lat. ex. var. ·80.

Hab. ——? Mus. Stainforth.

This species differs from *M. secundus*, in being much less oblique, in not having the labial varix so much larger than the rest, in having a greater number of varices and a somewhat longer spire, and in attaining a larger size.

Murex digitatus, Conch. Illustr. f. 79. *Mur. testâ pyriformi, transversè costatâ, roseo-fulvâ: spirâ breviusculâ; anfractibus quinque, ventricosis, angulatis, supernè complanatis; suturis excavatis: caudâ longiusculâ, ad basin latâ, gradatim angustiore: varicibus octo, costatis, digitatis, posticè usque ad medium proximi anfractûs prolatis; digitis numerosis, nigrescentibus, subproclivibus, rugosis, palmatis, minoribus alternantibus: aperturâ ovali; labio externo crenulato; laminâ canalis latâ.*

Long. 1·55; lat. ex. var. ·80 poll.

Hab. ad insulam Messonam. Mus. Cuming.

In general form resembling *M. Scorpio*, *M. secundus* and *M. varicosus*, but differing from them in being much straighter, having many more varices, the digitations being less connected, and in their being continued across the body of the shell in the form of interstitial ribs.

Murex megacerus, Conch. Illustr. f. 18. *Mur. testâ rhomboideâ, subventricosâ, fulvo-rufescente, intùs albâ, transversè scabroso-sulcatâ: varicibus quinque, ad caudam exfoliatis; frondibus subrectis, crassis, ad terminum foliatis, unâ ad angulum anfractuum magnâ, deinde tribus mediocribus, cum quatuor parvis, proclivibus, alternantibus; ad caudam tribus mediocribus: interstitiis costâ quinquefariam tuberculiferâ: aperturâ ovali, posticè canaliferâ, subangulatâ, margine dentato, undato; canali aperto: caudâ longitudine spiram æquante, latâ, subrecurvâ.*

Long. 3·45; lat. ex. var. 1·90 poll.

Hab. ad mare Pacificum.

Distinguished by the thick, straight, prominent frond on each of the five varices.

MUREX FALCATUS, Conch. Illustr. f. 31. *Mur. testâ fusiformi, tenui, albâ, fulvo-fasciatâ; anfractibus angulatis, apicem versus cancellatis: varicibus quinque ad septem, alatis, lævibus, posticè elongatis, falcatis, ad marginem posticum plicâ involutis, ad caudam exfoliatis: interstitiis in medio uni-plicatis: caudâ elongatâ, subrecurvâ: aperturâ ovali, posticè angulatâ; margine externo perelevato, subcrenato; canali clauso.*

Long. 1·55; lat. ex. var. ·65.

Hab. ad insulam Japan. Mus. H. Cuming.

A beautiful species with five to seven broad, smooth, foliated varices in each whorl. Found in deep water.

MUREX INERMIS, Conch. Illustr. f. 87. *Mur. testâ fusiformi, transversè leviter costatâ, albâ: spirâ elongatâ, acutâ; anfractibus septem, rotundatis, ultimo pyriformi; suturis validis, foveolatis: caudâ elongatiusculâ, tortuosâ: varicibus sex, levitèr noduliferis, posticè paululùm prolatis, ultimo latiore, crassiore: aperturâ ovali; labio interno, extante, lævi; labio externo crasso, intùs levitèr crenulato; ad basin canalis tuberculo valido; canali aperto.*

Long. 1; lat. ex. var. ·40 poll.

Hab. ad mare Japonicum. Dr. Sibbald legit.

This singular shell has some of the characters of *Triton.*

MUREX BALTEATUS, Conch. Illustr. f. 83. *Mur. testâ parvâ, crassâ, subrhomboideâ, albo-rubescente, ad varices fusco-nigricante: spirâ subproductâ; anfractibus sex, angulatis: caudâ breviusculâ, exfoliatâ, recurvâ: varicibus sex, anticè inciso-fimbriatis, à tergo costatis; spinis brevibus, paululùm crispatis, unâ ad angulum posticum, deinde brevioribus quatuor, ad caudam duabus minutis, rectis: aperturâ ovali; labio interno posticè prolato, anticè valdè extante; labio externo crenulato, extante; canali ferè clauso.*

Long. ·95; lat. ex. var. ·47 poll.

Testâ juniore: caudâ elongatâ, validè ascendente.

Var. Testâ breviore: varicibus validioribus: aperturâ roseâ.

Hab. ad insulam Masbate, Philippinarum. H. Cuming legit.

The name given above has been applied to this shell by Dr. Beck, who, however, has not described it. Found in coral reefs.

MUREX CYCLOSTOMA, Conch. Illustr. f. 100. *Mur. testâ rhomboideâ, subventricosâ, pallidè griseo-fulvâ: spirâ longitudine aperturam et canalem æquante; anfractibus quinque, exiguis, rotundatis, transversè costatis; suturis validis, excavatis: caudâ brevi, latâ, recurvâ, exfoliatâ: varicibus sex, angulatis, crassis, magnis, utrinque costatis, anticè inciso-fimbriatis, posticè foveolatis, supernè subspinosis: aperturâ ovali rotundatâ, ferè integrâ; labio interno lævi, extante; labio externo extùs crenulato; canali ferè clauso.*

Variat caudâ elongatâ, valdè recurvâ: varicibus spinis crispis armatis.

Long. ·75; lat. ex. var. ·40; lat. var. incl. ·50.

Hab. ad insulam Bohol Philippinarum. H. Cuming legit.

The elongated, slender, elevated caudal canal, as well as the more distinct spines of the smaller shell, must be considered as a variation resulting partly from difference of age, partly from locality, and other circumstances. Sandy mud, 7 fathoms. —Loay.

MUREX BREVICULUS, Conch. Illustr. f. 37. *Mur. testâ rhomboideâ, brevi, ventricosâ, albâ, fulvo-fasciatâ: varicibus quatuor, crassis, nodulosis, inter nodulos utrinque foveolatis: spirâ brevi; anfractibus rotundatis: aperturâ rotundatâ, ad marginem crenatâ: caudâ brevi, subitò recurvâ; canali ferè clauso.*

Long. ·90; lat. ex. var. ·55.

Hab. —— ? Mus. G. B. S. Sen., H. Cuming, Stainforth.

Differing from *M. tetragonus, Brod.*, in the shortness of the shell, and in the caudal canal, which is turned abruptly over the back of the last whorl.

MUREX PERUVIANUS, Conch. Illustr. f. 116. *Mur. testâ fusiformi, subventricosâ, pallidè fulvâ, transversè costis fuscis, numerosis cingulatâ: varicibus novem; spinis numerosis ad angulum posticum crispatis, ad caudam duabus subelongatis, falcatis: spirâ elongatâ; anfractibus septem, rotundatis, posticè subplanatis: caudâ subelongatâ, exfoliatâ: aperturâ magnâ, posticè subangulatâ.*

Long. 1·20; lat. ·60.

Hab. ad Peruviam. Mus. H. Cuming.

MUREX NODULIFERUS, Conch. Illustr. f. 101. *Mur. testâ subrhomboideâ, crassâ, lævi, albo-lutescente: spirâ elongatâ; anfractibus sex, subangulatis; suturis inconspicuis, undatis: caudâ brevi, subexfoliatâ: varicibus sex, crassis, striatis, posticè obsoletis, lævibus; tuberculis nigrescentibus, ad angulum posticum uno subfrondoso, crasso, recurvo, crispato, minore anticè annexo, in medium anfractûs uno angusto, angulato, minore anticè annexo, ad caudam uno parvo: aperturâ luteâ subquadratâ; labio interno vix extante, lævi, anticè subcrenulato; labio externo angulato, intùs denticulato; canali latè aperto.*

Long. 1·10; lat. ex. var. 55 poll.

Hab. ad insulam Masbate. H. Cuming legit.

Found in coral reefs.

Mr. Gould commenced the exhibition of fifty new species of Birds from his Australian collection, and proposed to bring forward the remainder of them at the succeeding meetings of the Society; those now exhibited were three new species of small Grass Parrakeets (*Euphema* of Wagler); for these he proposed respectively the names *Eu. splendida, aurantia,* and *petrophila.*

EUPHEMA SPLENDIDA. *Euph. facie et plumis auricularibus intensè cæruleis: pectore rufescenti-aurantiaco: humeris et alarum tectricibus lazulino-cæruleis.*

Face and ear-coverts deep indigo-blue, becoming lighter on the latter; all the upper surface grass-green; shoulders above, and wing-coverts beautiful lazuline blue; shoulders beneath deep indigo-blue; primaries and secondaries black, the former margined externally

with blue, the latter with green; two centre tail-feathers dark brown; the remaining feathers black on the base of the internal webs, green on the base of external webs, and largely tipped with bright yellow; chest rich reddish orange; under surface yellow, becoming green on the flanks.

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

Hab. Western Australia.

EUPHEMA AURANTIA. *Euph. vittâ frontali lazulino-cæruleâ; loris viridibus: abdomine maculâ grandi splendidè aurantiacâ ornato.*

Male.—Frontal band blue, margined before and behind with a very faint line of greenish blue; crown of the head and all the upper surface deep grass-green; shoulders, many of the secondaries, and outer edges of the primaries deep indigo-blue; lores, cheeks and breast yellowish green, passing into greenish yellow on the abdomen and under tail-coverts, the centre of the abdomen being ornamented with a large spot of rich orange; two centre tail-feathers green; the next, on each side, blackish brown on the inner, and green on the outer webs; the remainder blackish brown on their inner, and green on their outer webs, and largely tipped with bright yellow; irides very dark brown, becoming lighter on the under side; legs and feet dull brown.

Female.—Possesses the orange spot, but in her it is neither so extensive nor so brilliant.

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

Hab. Van Diemen's Land and the Actæon Islands in D'Entrecasteaux Channel.

EUPHEMA PETROPHILA. *Euph. vittâ frontali intensè cæruleâ; loris et spatio circum oculos sordidè viridibus.*

Frontal band deep indigo-blue, bounded before and behind with a very narrow line of dull verditer-blue; lores and circle surrounding the eye dull verditer-blue; all the upper surface yellowish olive-green; under surface the same, but lighter, and passing into yellow, tinged with orange on the lower part of the abdomen; under surface of the shoulder indigo-blue; a few of the wing-coverts greenish blue; primaries brownish black on their inner webs, and deep indigo-blue on the outer; two centre tail-feathers bluish green; the remainder of the feathers brown at the base on the inner webs, green at the base on the outer webs, and largely tipped with bright yellow; irides dark brown; bill blackish brown; feet flesh-brown.

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

Hab. Western Australia.

Two new and highly interesting species of *Climacteris* were characterized as *Climacteris erythrops* and *C. rufa*; and Mr. Gould observed that four species of this genus now formed part of the Australian fauna.

CLIMACTERIS ERYTHROPS. *Clim.* Mas: *loris et spatio circum oculos rufescenti-castaneis; gulâ albidâ: pectore cinereo.*

Fœm. *plumis pectoris ferrugineis, singulis lineâ albâ centrali notatis, distinguenda.*

Male.—Crown of the head blackish-brown, each feather margined with grayish brown; lores and a circle surrounding the eye reddish chestnut; back brown; sides of the neck, lower part of the back, and upper tail-coverts, gray; primaries blackish brown at the base, and light brown at the tip, all but the first crossed in the centre by a broad band of buff, to which succeeds another broad band of blackish brown; two centre tail-feathers gray, the remainder blackish brown, largely tipped with light gray; chin dull white, passing into grayish brown on the chest; the remainder of the under surface grayish brown, each feather having a broad stripe of dull white, bounded on either side with black running down the centre; the lines becoming blended, indistinct, and tinged with buff on the centre of the abdomen; under tail-coverts buffy white, crossed by irregular bars of black; irides brown; bill and feet black.

The *female* differs in having the chestnut marking round the eye much richer, and in having, in place of the grayish brown on the breast, a series of feathers of a rusty red colour, with a broad stripe of dull white down their middles, the stripes appearing to radiate from a common centre: in all other particulars her plumage resembles that of the male.

Total length, 5 inches; bill, $\frac{7}{8}$; wing, $3\frac{1}{2}$; tail, $2\frac{5}{8}$; tarsi, $\frac{3}{4}$.

Hab. New South Wales.

Climacteris rufa. *Clim. gutture plumis auricularibus, et abdomine ferrugineis.*

Male.—Crown of the head and all the upper surface and wings, dark brown, tinged with rufous on the rump and upper tail-coverts; primaries brown, all but the first crossed by a broad band of rufous, to which succeeds a second broad band of dark brown; two centre tail-feathers brown, indistinctly barred with a darker hue; the remainder pale rufous, crossed by a broad band of blackish brown, and tipped with pale brown; line over the eye, lores, ear-coverts, throat, and under surface of the shoulder rust-brown; chest crossed by an indistinct band of rufous brown, each feather with a stripe of buffy white, bounded on each side with a line of black down the centre; the remainder of the under surface deep rust-red, with a faint line of buffy white down the centre of each feather, the white line being lost on the flanks and vent; under tail-coverts light rufous, with a double spot of blackish brown at intervals along the stem; irides dark reddish brown; bill and feet blackish brown.

Female rather less in size; in colour the same as the male, but much lighter, without the bounding line of black on each side of the buff stripes on the breast, and having only an indication of the double spots on the under tail-coverts.

Total length, 6 inches; bill $\frac{7}{8}$; wing, $3\frac{1}{2}$; tail, $2\frac{5}{8}$; tarsi, $\frac{7}{8}$.

Hab. Western Australia.

And a new and beautiful *Ocypterus*, by far the best-marked species of the genus, as

Ocypterus personatus. *Ocypt. guld et plumis auricularibus nigris: corpore subtùs in toto cinereo.*

Face, ear-coverts and throat jet black, bounded below with a narrow line of white; crown of the head sooty black, gradually passing into the deep gray which covers the whole of the upper surface, wings and tail; the latter tipped with white; all the under surface very delicate gray; thighs dark gray; irides blackish brown; bill blue at the base, becoming black at the tip; legs and feet mealy bluish gray. Total length, $6\frac{1}{2}$ inches; bill, 1; wing, 5; tail, 3; tarsi, $\frac{3}{4}$. About the size and having much the contour of *Ocypt. superciliosus*. It is one of the finest and best-marked species of the genus, the jet black colouring of the face and throat distinguishing it from every other. The sexes are nearly alike in colour.

Hab. Southern and Western Australia.

Ptilotis plumulus. *Ptil. loris nigris: plumis auricularibus fuscis, infra has penicillis duobus, uno angustissimo et nigro, altero lato et nitidè flavo.*

Crown of the head and all the upper surface olive-yellow, approaching to gray on the back; lores black; ear-coverts, throat and under surface yellowish gray, faintly striated with a darker tint; behind the ear two tufts, the upper of which is narrow and black, the lower more spread over the sides of the neck, and of a beautiful yellow; primaries and tail-feathers brown, margined with bright olive-yellow; irides very dark reddish brown; bill black; legs and feet apple-green.

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

Hab. Western Australia.

Hemipodius velox. *Hem. gutture, pectore et lateribus pallidè arenaceo-fuscescentibus; facie, vertice, et plumis auricularibus castaneo-rufis.*

Female.—Head, ear-coverts, and all the upper surface, chestnut-red; crown of the head with a longitudinal buff mark down the centre; feathers of the back, rump, scapularies, and sides of the chest, margined with buff, within which is a narrow line of black running in the same direction; the feathers of the lower part of the back also crossed by several narrow irregular bands of black; primaries light brown, margined with buff on their internal edges; throat, chest, and flanks sandy buff, passing into white on the abdomen; bill horn-colour; irides straw-white; legs and feet yellowish white.

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

Hab. Interior of New South Wales.

The males are much smaller.

Hemipodius pyrrhothorax. *Hem. gutture, pectore et lateribus arenaceo-rufis, faciei plumis, nec non aurium tectricibus, albis, nigro-marginatis.*

Female.—Crown of the head dark brown, with a line of buff down the centre; feathers surrounding the eye, ear-coverts, and sides of the neck, white, edged with black; back and rump dark brown, transversely rayed with bars and freckles of buff and black; wings paler, edged with buff, within which is a line of black; primaries brown, margined with buff; throat, chest, flanks, and under tail-

coverts sandy red, passing into white on the centre of the abdomen; bill horn-colour; irides straw-yellow; feet yellowish white.

Total length, $5\frac{1}{2}$ inches; bill, $\frac{9}{16}$; wing, 3; tarsi, $\frac{3}{4}$.

Hab. Interior of New South Wales.

Males are much smaller.

Mr. Gould also exhibited at this Meeting certain specimens of *Dasyurus*. The *D. Maugei* and *D. viverrinus* of authors, he stated, were the same species, a fact which he ascertained by finding in the same litter both the black and grey varieties: he then proceeded to point out the characters of a new species of *Dasyurus*, which he proposed to name

Dasyurus Geoffroii. *Das. fuscus, flavo lavatus; caudâ elongatâ, dimidio apicali nigro; corpore subtùs albescente, supra et ad latera albo maculato; pedibus posticis halluce parvo instructis.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin. . . .	15	0
——— *caudæ*	11	6
——— *tarsi digitorumque*	2	6
——— ab apice rostri ad basin auris.	2	7
——— *auris*	1	2

Hab. Liverpool Plains.

Like the *D. macroura*, the present species possesses a small thumb to the hind foot, a character which serves to distinguish these species from the *D. Maugei*. The *D. Geoffroii* is intermediate in its colouring between the *D. Maugei* of Geoffroy and the *D. macroura*; it resembles the latter in having a long and not very bushy tail, but is distinguishable by there being no spots on this part: the white spots on the head and body are smaller than in either of the species mentioned.

A small Rodent, supposed to be identical with the *Dipus Mitchellii*, was exhibited by Mr. Gould, as well as a skin and skeleton of the *Hapalotis albipes* of Lichtenstein.

Mr. Ogilby, referring to his paper on these two animals in the 18th volume of the Transactions of the Linnæan Society, pointed out the general conformity of reasoning there adduced in support of the rank and affinities of the latter species with the characters of the specimen exhibited by Mr. Gould. The dentition and structure of the skull, indeed, approach more nearly to that of the typical Rats (and closely agrees with *Hapalotis*) than the Jerboas; but the animal is a true Rodent, and from the conformation of the extremities and other influential external organs, appears, as there stated, to represent in Australia the Jerboas and Gerbilles of the Old World.

The eyes are apparently rather large; the ears are very large, broad at the base, and somewhat attenuated at the apex; the fore-legs are proportionately small; the fore-feet are furnished with four toes, and a rudimentary inner toe having a small rounded nail; the hind-legs and tarsi are long; there are five toes to the feet, of which the three central ones are very long; the outer and inner toes are

small, especially the latter; the metatarsal bones are evidently not consolidated, as in the Jerboas: the tail exceeds the head and body in length (the latter being measured in a straight line), and exhibits scales and minute interspersed hairs at the base, like the Rats; but the apical third is furnished with long hairs, averaging rather more than half an inch in length; those which spring from the upper surface are of a brown-black colour, but on the under surface they are white: the fur of the animal is rather long, and very soft; the general colour of that of the upper surface of the head and body is brownish yellow, freely pencilled with black; on the sides of the body a yellowish hue prevails; the whole of the under parts, as well as the feet, are white; the hairs on both the upper and under parts of the body are of a deep slate-grey at the base. The dimensions of this interesting little animal are as follows:—

	inches.	lines.
From nose to root of tail	5	6
———— ear	1	2
Length of tail	5	7
———— ear.....	0	10
———— *tarsus*	1	2

It was procured by Mr. Gould from Western Australia.

Nov. 24.—William Yarrell, Esq., Vice-President, in the Chair.

A Letter from Mr. Frembly, R.N., Corresponding Member Z.S., dated Gibraltar, November 13th, 1840, was read. In this letter Mr. Frembly states that he had forwarded for the Society's Museum a species of Petrel, rarely met with at Gibraltar, and that he is in expectation of a collection from Brazil, from which he will select some specimens to present to the Society.

In a letter from Charles Clarke, Esq., dated Colwich Molesley, November 2nd, 1840, which was read, that gentleman, at the request of the Curator, furnishes an account of the habits of a bird recently presented by him to the Society. The bird alluded to "is a native of the mountain-forests of Cuba, never being seen nor heard in the plains. It is named the 'Musician' by the coffee-planters, who invariably, in the south-eastern parts of the island, select the mountains for the site of their plantations, from the well-known fact, that the higher the elevation, *cæteris paribus*, the better the coffee; and this rule may be said to hold good in Cuba, to the height of 3000 feet above the level of the sea.

"The presence of this bird, in land intended to be cleared, is always hailed as highly satisfactory, as indicative of a cool temperature, and therefore of a climate suited for the production of high-priced coffee.

"The specimen presented to the Society was shot in a mountain-halt of forest named 'Brazos de Cauto,' varying perhaps from 1500 to 2500 feet of elevation, and it is found in all parts of that range. The thermometer rises in the lowest parts to 80° Fahrenheit in the summer heats (whilst it will stand in Santiago de Cuba at the same time at 90°); below this, and of course in a higher temperature, the bird is not known to exist.

"It confines itself exclusively to the woods, and takes its name of 'Musician' from its notes being very similar to those of the flute: it possesses only a few notes, and repeats nearly an exact repetition of its rather melancholy pipe at intervals, when in song, of two or three minutes.

"It is very rarely seen, although not a rare bird in many spots; repeatedly have I spent five to ten minutes along with my attendants, fellows of the most piercing vision, in vain efforts to discover the little dusky warbler piping above our heads, and that at no great height; but securely hidden, perhaps designedly, in its tangled and leafy covert.

"I never shot any other specimen, and never have seen more than one or two others during a residence in the Cuba woods of eighteen months.

"In conclusion I may observe, that I have always understood this bird to exist in the highest parts of the mountains of Cuba, estimated to reach 3500 feet; and when the thermometer falls in winter during the northern winds, to a degree little elevated, I should imagine, above the freezing-point. I have seen the thermometer, at an elevation of perhaps 1800 or 1900 feet, fall to 47° during a heavy northern wind last January."

The following memoir, "On the Blood-corpuscles of the common Paradoxure (*Paradoxurus Bondar**)," by G. Gulliver, Esq., was next read.

"Referring to my notes concerning the red particles of this animal, I was rather surprised to find that they appeared to be quite peculiar in size, when compared with the particles of the other species of the order *Feræ*. Hence I have been led to examine again the blood-corpuscles of the common Paradoxure, and those of two other species of the genus. The result confirms the general accuracy of my first observations, and as the subject appears to me both novel and interesting, I am induced to bring it briefly before the Society.

"The following measurements are expressed in fractional parts of an English inch. The common-sized corpuscles are first noted, then those of small and large size, and lastly the average deduced from a computation of the whole.

"1. Common Paradoxure (*Paradoxurus Bondar*).

	1·5665
	1·6000
	1·7110
	1·4570
Average . .	1·5693

"2. Two-spotted Paradoxure (*Paradoxurus binotatus*, Temm.).

* The animal in question is marked at the Zoological Gardens *P. typus*, F. Cuv.; and by this name I have previously mentioned it. But I have lately been informed that it is the *P. Bondar* of authors.

	1·4572
	1·4800
	1·5052
	1·6000
	1·3555
Average . .	1·4660

" 3. White-whiskered Paradoxure (*Paradoxurus leucomystax*, Gray).

	1·4500
	1·4365
	1·4000
	1·6000
	1·3200
Average . .	1·4236

" From a comparison of these measurements with the notes of numerous others, published in the Philosophical Magazine for January, February, March and August, 1840, it will appear that, although the corpuscles of the Two-spotted and of the White-whiskered Paradoxure are not very remarkable for minuteness, yet the corpuscles of the common Paradoxure are not only smaller than the red particles, which have yet been examined, of any other carnivorous animal, but so minute as to approach to those of the goat in size.

" The blood-corpuscles of the latter animal were the smallest known to physiologists previously to my announcement in the Dublin Medical Press for November, and in the Philosophical Magazine for December 1839, of the singularly minute size of the corpuscles of the Napu Musk Deer (*Moschus Javanicus*); and I may notice, that another examination of the very remarkable blood-discs of this little ruminant has fully confirmed the accuracy of my former observations.

" It has long since been observed, that the size of the blood-corpuscles does not seem to be influenced by that of the animal. Thus Hewson figures them of the same magnitude in the ox, cat, ass, mouse, and bat. If, however, we compare a great number of measurements, taken from the corpuscles of different animals of the same order, it will appear generally that the larger species have comparatively large blood-corpuscles, and *vice versâ*. For numerous confirmations of this rule, if it may be so called, it will be sufficient to refer to my measurements in the Philosophical Magazine before quoted. Compare, for example, among the Rodents, the blood-corpuscles of the Capybara, the Coypu and Hoary Marmot, with those of the Squirrels; and among the Ruminants the large corpuscles of the Sambur, Wapiti, and Moose Deer, with the small corpuscles of the Napu Musk Deer, Sheep, and Goat. Many exceptions, however, will be found to the rule, particularly in the order *Feræ**; but as I propose, on a future occasion, to treat more at length on the subject, it is merely mentioned now with the view of suggesting what may appear to be a curious and interesting inquiry."

* Vide Proc. Zool. Soc., May 25, 1841.

INDEX TO VOL. VII.

END OF THE SEVENTH VOLUME.

PRINTED BY RICHARD AND JOHN E. TAYLOR, RED LION COURT, FLEET STREET.